The Undergraduate Calendar

Except where otherwise indicated, the information in this Calendar applies to the 1986-87 academic year which commences in May, 1986.

The University of Waterloo publishes:

* An Undergraduate Admissions Handbook
* An Undergraduate Calendar
  A Graduate Studies Calendar
  A Correspondence Program Calendar
  A Part-Time Studies Calendar

And booklets on the following:

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

Those marked * appear in the WATBOX.

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

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

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

Inquiries

Inquiries and formal applications for admission should be directed to:

The Registrar,
University of Waterloo,
Waterloo, Ontario, Canada N2L 3G1

Telephone (519) 885-1211, ext. 2268
The Registrar’s Office is located on the second floor of Ira G. Needles Hall.
Office hours are from 8:30 a.m. to 4:30 p.m. Monday through Friday.

Federated and Affiliated Church Colleges:

Conrad Grebel College
Westmount Road North
Waterloo, Ontario N2L 3G6
(519) 885-0220

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

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

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

Page Numbering System

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

* These programs normally fulfill the academic requirements for registration in the related professions. Pertinent sectors of the Calendar should be consulted.
Many disciplines are also available as Minors and Joint Honours programs.

* These programs normally fulfill the academic requirements for registration in the related professions. Pertinent sectors of the Calendar should be consulted.
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 program earned toward a degree. 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, but some have other weights such as 0.25, 1.0, 2.0. Further explanation is on p. 17.

Cross-Listed Courses
Courses which are listed under 2 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 1 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 the "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 programs. The emphasis may be in another academic subject, as in Honours Chemistry (Physics Option), or in a career-oriented area, such as Honours Physics (Business Administration Option), or Honours Mathematics (Teaching Option).

Preregistration
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 passed prior to registration in another course which lists it as a prerequisite. (“Consent of instructor” is sometimes listed as an alternative to or in addition to a prerequisite.)

Program
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 programs offered such as Honours, General, Pass, Preprofessional, 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.

Term
Refers to a particular 4-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 – 1986**

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<td>Civic Holiday - University Holiday*</td>
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<td>Application Deadline - Correspondence - Fall Term</td>
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<td>Examinations - Correspondence - Spring Term</td>
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<td>Lectures End - Summer Session</td>
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<td>Examinations End - Spring Term</td>
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<td>Examinations - Summer Session</td>
<td>August 16</td>
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<tr>
<td>Final Examination Results Due - Spring; Summer</td>
<td>August 21</td>
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<td>Examination Results Due - Correspondence - Spring Term</td>
<td>August 26</td>
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<tr>
<td>Labour Day - University Holiday*</td>
<td>September 1</td>
<td>Monday</td>
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<tr>
<td>Registration Begins - Undergraduate Programs - Fall Term</td>
<td>September 2</td>
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<tr>
<td>Meeting - Senate Executive Committee</td>
<td>September 2</td>
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<td>Registration - Graduate Studies - Fall Term</td>
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<td>Registration Ends - Undergraduate Programs - Fall Term</td>
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<td>Lectures Begin - Fall Term</td>
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<td>Start of Late Fees - Fall Term</td>
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<td>Meeting - University Senate, 7:30 p.m.</td>
<td>September 15</td>
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<td>Meeting - Board of Governors Executive Committee</td>
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<td>End of Course Change Period - Fall Term - See Individual Faculty Chapters</td>
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<td>Course-Change Deadline - Correspondence - Fall Term</td>
<td>September 26</td>
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<tr>
<td>Meeting - Senate Executive Committee</td>
<td>October 6</td>
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<tr>
<td>Meeting - Board of Governors, 4:30 p.m.</td>
<td>October 7</td>
<td>Tuesday</td>
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<tr>
<td>Thanksgiving Day - University Holiday*</td>
<td>October 13</td>
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<tr>
<td>Application Deadline - Correspondence - Winter Term</td>
<td>October 17</td>
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<tr>
<td>Meeting - University Senate, 7:30 p.m.</td>
<td>October 20</td>
<td>Monday</td>
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<tr>
<td>Fall Convocation</td>
<td>October 24</td>
<td>Friday</td>
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<tr>
<td>Preregistration Begins - Co-operative Programs - Spring Term</td>
<td>October 29</td>
<td>Wednesday</td>
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<tr>
<td>Preregistration Ends - Co-operative Programs - Spring Term</td>
<td>October 31</td>
<td>Friday</td>
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<tr>
<td>Meeting - Senate Executive Committee</td>
<td>November 3</td>
<td>Monday</td>
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<tr>
<td>Meeting - University Senate, 7:30 p.m.</td>
<td>November 17</td>
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<tr>
<td>Meeting - Senate Executive Committee</td>
<td>December 1</td>
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<td>Lectures End - Fall Term</td>
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<td>Examinations Begin - Fall Term</td>
<td>December 5</td>
<td>Friday</td>
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<tr>
<td>Course-Change Deadline - Correspondence - Winter Term</td>
<td>December 12</td>
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<tr>
<td>Meeting - University Senate, 7:30 p.m.</td>
<td>December 15</td>
<td>Monday</td>
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<tr>
<td>Examinations End - Fall Term</td>
<td>December 22</td>
<td>Monday</td>
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<td>Christmas Holidays*</td>
<td>December 25-26</td>
<td>Thursday-</td>
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<td>December 31</td>
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</table>

*Some University Departments may be open for limited service on these days.*
### 1987 Academic Calendar

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Notes</th>
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<tbody>
<tr>
<td>University Holidays*</td>
<td>January 1, 2</td>
<td>Thursday, Friday</td>
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<tr>
<td>Final Examination Results Due – Fall Term</td>
<td>January 5</td>
<td>Monday</td>
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<tr>
<td>Registration – Undergraduate &amp; Graduate Programs – Winter Term</td>
<td>January 5</td>
<td>Monday</td>
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<tr>
<td>Meeting – Senate Executive Committee</td>
<td>January 5</td>
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<tr>
<td>Lectures Begin – Engineering and Science Programs – Winter Term</td>
<td>January 5</td>
<td>Monday</td>
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<tr>
<td>Lectures Begin – Other Programs – Winter Term</td>
<td>January 6</td>
<td>Tuesday</td>
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<tr>
<td>Start of Late Fees – Winter Term</td>
<td>January 6</td>
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<tr>
<td>Course – Drop or Withdrawal Deadline – Correspondence – Fall Term</td>
<td>January 8</td>
<td>Thursday</td>
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<tr>
<td>Meeting – University Senate, 7:30 p.m.</td>
<td>January 19</td>
<td>Monday</td>
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<tr>
<td>Meeting – Board of Governors Executive Committee</td>
<td>January 20</td>
<td>Tuesday</td>
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<tr>
<td>Examinations – Correspondence – Fall Term</td>
<td>January 24</td>
<td>Saturday</td>
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<tr>
<td>End of Course Change Period – Winter Term – See Individual Faculty Chapters</td>
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<tr>
<td>Meeting – Senate Executive Committee</td>
<td>February 2</td>
<td>Monday</td>
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<tr>
<td>Meeting – Board of Governors, 4:30 p.m.</td>
<td>February 3</td>
<td>Tuesday</td>
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<tr>
<td>Application Deadline – Correspondence – Spring Term</td>
<td>February 13</td>
<td>Friday</td>
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<tr>
<td>Meeting – University Senate, 7:30 p.m.</td>
<td>February 16</td>
<td>Monday</td>
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<tr>
<td>Study Week Begins – Arts &amp; Environmental Studies</td>
<td>February 16</td>
<td>Monday</td>
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<tr>
<td>Examination Results Due – Correspondence – Fall Term</td>
<td>February 20</td>
<td>Friday</td>
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<tr>
<td>Meeting – Senate Executive Committee</td>
<td>March 2</td>
<td>Monday</td>
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<tr>
<td>Preregistration Begins – Undergraduate Programs – Fall Term</td>
<td>March 2</td>
<td>Monday</td>
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<tr>
<td>Preregistration Ends – Undergraduate Programs – Fall Term</td>
<td>March 6</td>
<td>Friday</td>
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<tr>
<td>Meeting – University Senate, 7:30 p.m.</td>
<td>March 16</td>
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<tr>
<td>Meeting – Board of Governors Executive Committee</td>
<td>March 17</td>
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<tr>
<td>Course-Change Deadline – Correspondence – Spring Term</td>
<td>March 27</td>
<td>Friday</td>
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<tr>
<td>Lectures End – Winter Term</td>
<td>April 1</td>
<td>Wednesday</td>
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<tr>
<td>Examinations Begin – Winter Term</td>
<td>April 4</td>
<td>Saturday</td>
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<tr>
<td>Meeting – Senate Executive Committee</td>
<td>April 6</td>
<td>Monday</td>
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<tr>
<td>Meeting – Board of Governors, 4:30 p.m.</td>
<td>April 7</td>
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<tr>
<td>Course – Drop or Withdrawal Deadline – Correspondence – Winter Term</td>
<td>April 15</td>
<td>Wednesday</td>
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<tr>
<td>Good Friday – University Holiday*</td>
<td>April 17</td>
<td>Friday</td>
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<tr>
<td>Meeting – University Senate, 7:30 p.m.</td>
<td>April 20</td>
<td>Monday</td>
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<tr>
<td>Examinations End – Winter Term</td>
<td>April 24</td>
<td>Friday</td>
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<tr>
<td>Final Examination Results Due – Winter Term</td>
<td>May 1</td>
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<tr>
<td>Examinations – Correspondence – Winter Term</td>
<td>May 2</td>
<td>Saturday</td>
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<tr>
<td>Meeting – Senate Executive Committee</td>
<td>May 4</td>
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<tr>
<td>Registration – Undergraduate &amp; Graduate Programs – Spring Term</td>
<td>May 4</td>
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<tr>
<td>Lectures Begin – Engineering and Science Programs – Spring Term</td>
<td>May 4</td>
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<tr>
<td>Lectures Begin – Other Programs – Spring Term</td>
<td>May 5</td>
<td>Tuesday</td>
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<td>Start of Late Fees – Spring Term</td>
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<tr>
<td>End of Course Change Period – Spring Term – See Individual Faculty Chapters</td>
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<tr>
<td>Victoria Day – University Holiday*</td>
<td>May 18</td>
<td>Monday</td>
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<tr>
<td>Meeting – University Senate, 7:30 p.m.</td>
<td>May 19</td>
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<tr>
<td>Meeting – Board of Governors Executive Committee</td>
<td>May 19</td>
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</tbody>
</table>

*Some University Departments may be open for limited service on these days.*
### Spring Convocation (Arts, Human Kinetics and Leisure Studies)
- May 28, Thursday

### Spring Convocation (Environmental Studies, Independent Studies, Science)
- May 29, Friday

### Examination Results Due - Correspondence - Winter Term
- May 29, Friday

### Spring Convocation (Arts Accountancy Studies, Engineering, Mathematics)
- May 30, Saturday

### Meeting - Senate Executive Committee
- June 1, Monday

### Meeting - Board of Governors, 4:30 p.m.
- June 2, Tuesday

### Preregistration Begins - Co-operative Programs - Winter Term
- June 3, Wednesday

### Preregistration Ends - Co-operative Programs - Winter Term
- June 5, Friday

### Meeting - University Senate, 7:30 p.m.
- June 15, Monday

### Canada Day - University Holiday*
- July 1, Wednesday

### Registration - Summer Session
- July 6, Monday

### Lectures Begin - Summer Session
- July 6, Monday

### Start of Late Fees - Summer Session
- July 7, Tuesday

### Course - Drop or Withdrawal Deadline - Correspondence - Spring Term
- July 22, Wednesday

### Lectures End - Spring Term
- July 31, Friday

### Civic Holiday - University Holiday*
- August 3, Monday

### Examinations Begin - Spring Term
- August 4, Tuesday

### Examinations - Correspondence - Spring Term
- August 8, Saturday

### Lectures End - Summer Session
- August 14, Friday

### Examinations End - Spring Term
- August 15, Saturday

### Examinations - Summer Session
- August 15, Saturday

### Final Examination Results Due - Spring; Summer
- August 21, Friday

### Examination Results Due - Correspondence - Spring Term
- August 25, Tuesday

* Some University Departments may be open for limited service on these days.
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<th>Year</th>
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<td>1987</td>
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There are two routes to the UW Campus from Hwy. 401. The first route is to exit at Hwy. 8 to Kitchener; enter the Conestoga Pkwy.; by following Hwy. 8 East signs; then follow the Pkwy.; and exit at University Ave. West; drive in a westerly direction on University Ave to University of Waterloo. The second route follows the first route to the Conestoga Pkwy.; enter the Pkwy.; following Hwy. 7 & 8 West; Stratford, continues on the Pkwy.; and exit at Fischer Dr. cutoff. Turn left at the Fischer-Hallman Dr. traffic lights and continue north west along Fischer Dr. Fischer Dr. becomes Hallman Rd. at Erb St.; continue on Hallman Rd., until you reach Columbia Dr. Turn right onto Columbia and drive easterly until you reach the University of Waterloo.
The Undergraduate Calendar

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

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

The Calendar is arranged in chapters which fall into 4 divisions. The first division describes the various services offered at the University. The second division outlines the undergraduate programs and the third division describes the courses offered in these programs. The last division of the Calendar describes the general administrative structure of the University.

Except where otherwise indicated, the information in this Calendar applies to the 1988-89 academic year which commences in May, 1989.

The University

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

The Campus

The University is situated on a beautiful 1,000 acre campus in the northwest section of the City of Waterloo. Waterloo, and its twin city Kitchener, are steadily growing industrial centres in mid-western Ontario with a combined population of approximately 200,000.

Since the opening of the first permanent structure on campus in 1956, the University has expanded steadily. More than 40 teaching and service buildings presently on campus include a Computing Centre, a Physical Activities Building, an ice arena, extensive library facilities, 2 theatres, and a variety of modern residential accommodation in University and Church College residences.

University Colours and Coat of Arms

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

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

Motto
Concordia Cum Veritate - In Harmony with Truth

The University Mace

The symbolic theme may be described as follows:

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

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

The four-fold diversity is significant because of the 4 Faculties existing at the time the Mace was presented to the University and as well, of the 4 church-related colleges federated and affiliated with the University. These diverse elements together form a crown, and the points of the crown, while tending toward a union do not quite touch but remain as individuals suspended in tension and yet engaged in a deep harmony. This creative process is focused not on the traditional spherical orb of static perfection but rather on an elliptical silver ovum - the egg-shaped symbol of creativity - the marvellous potential of a new individual life.

University Jurisdiction

The University exercises its statutory jurisdiction and authority with respect to the operation, protection and control of its property and plant and the regulation of persons on campus insom ar as is necessary to ensure the orderly performance of the University's functions.

In addition it should be recognized that all members of the University, as members of society at large, are subject to the general public, civil and criminal jurisdictions whether on or off campus.
Academic Organization

The University of Waterloo

Academic Organization

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

Full-time enrolment for each Faculty including church colleges and off-campus students (anticipated as of November 1, 1965):

- Faculty of Arts: 3357
- Faculty of Engineering: 3196
- Faculty of Environmental Studies: 1229
- Faculty of Human Kinetics and Leisure Studies: 1160
- Independent Studies Program: 56
- Faculty of Mathematics: 3344
- Faculty of Science: 2167

Total Undergraduate Enrolment (Full-time): 14499
Graduate Student Enrolment (Full-time): 1317

The Church Colleges

There are 4 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. Students admitted to the University of Waterloo can register at St. Jerome’s in all Regular programs and in some Co-operative programs in the Faculty of Arts, and in all Regular and Co-operative programs in the Faculty of Mathematics. St. Jerome’s students choose courses offered at the College, other affiliated Colleges, or the 6 Faculties on campus. Graduates of the College receive University of Waterloo degrees in accordance with the terms of the federation agreement. A continuous building program since 1962 finds St. Jerome’s presently with a teaching and administrative building, a library, an auditorium complex, a men’s residence accommodating 126 students 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. The College offers the advantages of study in a small college with the resources of a major university. Academic offerings at Renison serve students registered in:

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

Social Development Studies is an interdisciplinary program of courses in Social Work, Psychology, Sociology and Interdisciplinary Social Science leading to a BA of the University of Waterloo with emphasis on both classroom study and community involvement. The College also offers courses in Arts, English, Fine Arts, Geography and Religious Studies. Renison College Faculty members and courses are indicated by an R suffix in this Calendar. The College has 2 residences accommodating 100 men and 74 women.

Conrad Grebel College

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

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

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

The College offers 2 Interdisciplinary Options which students may take in conjunction with degree programs at the University of Waterloo. The Canadian Studies Option allows students to gain expertise in the social, cultural, economic, geographic, and political aspects of Canadian life. Studies in Personality and Religion enables students to understand the relationship between religious growth and experience, as they relate to the dynamics of personality development.

Students should consult the appropriate section of the University Calendar for more information about these 2 Options.

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

There is an attempt on the part of the College to 'integrate its academic life with life in the residence. Resident life in the College provides a valuable contribution to university experience beyond that which comes from courses taken for credit. Through a program of athletics, community dinners, and interest groups, students are able to involve themselves with various projects and issues related to the University, the Church, personal life and society. Residents and Associates of the College participate in a vital and enriching community.

Degrees Offered

The University of Waterloo offers the following undergraduate degrees:

Bachelor of Architecture
Bachelor of Arts
Bachelor of Applied Science
Bachelor of Environmental Studies
Bachelor of Independent Studies
Bachelor of Mathematics
Bachelor of Science
Doctor of Optometry

Master of Applied Science
Master of Mathematics
Master of Philosophy
Master of Science
Doctor of Philosophy

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

Honorary Degrees

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

Doctor of Divinity
Doctor of Engineering
Doctor of Environmental Studies
Doctor of Laws
Doctor of Letters
Doctor of Mathematics
Doctor of Science

Systems of Study

The University offers students 2 different systems of study, the Regular System and the Co-operative System. Some programs are offered under 1 system only, while others are offered under either system. Each of the program sections in this Calendar contains information concerning the System of Study that can be followed for the program described.

Regular System

Under the Regular System of Study the student follows the conventional 8-month academic year from September to April.

Co-operative System

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

Part-Time Studies, Correspondence Courses, and Continuing Education

By making courses available at times and locations convenient to part-time students and by offering numerous courses through correspondence, the University of Waterloo encourages students to take university credit courses for any purpose they may choose. No academic distinction is made between part-time and full-time students; grading practices and promotion policies are precisely the same. Adults may
be admitted to degree study under UW's Adult Student Admission Policy. The great majority of adult students are in part-time studies. Tuition is assessed as a fee per course.

The Fall & Winter Part-Time Studies Calendar and the Spring and Summer Bulletin, both published annually, list the late afternoon and evening course schedule and provide complete details of admission, registration, and services for part-time students.

Activities relating to part-time study, correspondence courses and continuing education are co-ordinated by the Teaching Resources and Continuing Education Office (TRACE).

Mature Student Services
Mature Student Services offers programs and numerous services designed for students who are returning to the classroom after a number of years.

Regularly scheduled orientation workshops and talks on careers are offered, as well as special services such as a course information file, learning skills packages, a buddy system, a library of cassette tapes, and a monthly newsletter.

The office serves as a general advisory centre for all mature students and may be used for consultation on academic, personal, and career concerns.

Appointments can be made by phone (exts. 2147/2429) or by visiting the office in the Modern Languages Building (Rooms 224/225). Regular hours are 8:30 a.m. to 4:30 p.m., Monday through Friday.

Part-Time Studies on Campus
Part-time students often enrol in classes scheduled in the evening or in late afternoon. However, part-time students are welcome to enrol in daytime classes as well. Students may earn most degrees (the engineering degree is one exception) entirely through part-time studies or by a combination of part-time and full-time attendance. For some programs in HKLS, Math, and Science, required courses are available only during the day. Students may pursue their studies in the fall, winter, or spring terms or during the summer sessions.

Part-Time Studies Off Campus
Several University of Waterloo credit courses are now offered each year in community centres such as Kitchener and Waterloo, Cambridge, Stratford, Halton Hills, and Walkerton. Most of these courses meet one evening a week for 3 hours in the fall, winter, or spring terms. Students earning credit in these courses may, if they wish, apply them toward a degree with credits earned on campus or through correspondence courses.

The public is invited to attend off-campus courses as free public lectures. During the first 2 weeks of lectures, anyone who wishes to take a course for credit may apply to do so directly at the lecture location.

Correspondence Courses
The University of Waterloo operates one of the largest university-level distance education programs in Canada. More than 300 university credit courses are offered over the fall, winter, and spring terms.

Students should obtain a Calendar from the Correspondence Office to acquaint themselves with the offerings, the method of operation, the fee structure, and the application deadlines. For application deadlines see also p. 2:8 of this Calendar.

General degrees in Arts, Environmental Studies, Mathematics, and Science may be earned entirely through correspondence. In working toward their degree, students may combine on-campus and off-campus courses with distance education courses.

Fees for correspondence courses are the same as for courses offered on and off campus, except that a deposit is required on the audio tapes used for lectures and on other special materials that may be required.

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

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

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

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

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

Courses taken part time at UW can qualify police officers for 3 designations awarded by the Canadian and Ontario Police Colleges:

- The Certificate in General Police Studies;
- The Certificate in Advanced Police Studies;
- The Diploma in Police Management Studies;

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

**Other Continuing Education Opportunities**

The University of Waterloo offers a variety of continuing education opportunities including the following:

- Certificate and Diploma Programs in Economic and Industrial Development;
- professional development courses in the School of Optometry;
- the Certificate in Gerontology
- certificates in Social Work through Renison College

The University co-operates with a number of outside organizations regarding their program and designations. Certain UW courses count for credit in the following:

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

**Non-Credit Courses**

The University offers some non-credit courses throughout the year on such topics as Understanding Microcomputers and Starting Your Own Business.

**Inquiries**

Inquiries concerning part-time studies, off-campus courses, diploma programs and continuing education opportunities should be directed to:

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**The University of Waterloo**

Cross-registration with Wilfrid Laurier University

Grading System

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**Part-Time Studies and Continuing Education**

University of Waterloo

Waterloo, Ontario N2L 3G1

(519) 888-4002

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**Cross-registration with Wilfrid Laurier University**

Cross-registration procedures have been developed through a joint co-operative advisory council to enable full-time students to take advantage of courses available at both the University of Waterloo and Wilfrid Laurier University.

Both universities conduct pre-registration as part of the timetabling process for their own students who plan to return in the next academic year or term. Courses given at the other university as integral parts of specified academic programs or options may be chosen routinely during pre-registration. Requests to cross-register in other courses must be submitted on a special form, and are processed only after academic timetables are finalized.

Students must pay all fees at their home university regardless of the number of courses taken by Cross-registration. The basic academic regulations, prerequisites for courses, grading systems etc., of the host university will be applicable. Grades are reported to the student’s home university based on the grading system of the host university and are combined with the results of the student’s other courses to complete the examination report. A student’s overall academic standing is determined solely by the home university.

Regulations concerning the dates for adding or dropping a course as well as petitions for cross-registered courses are governed by the student’s home institution. Students should be careful to note the examination schedules of each university as they may not coincide.

For further details, contact the Registrar’s office.

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**Grading System**

Grades for all courses appear on grade reports and transcripts either as one of 15 letter grades from A-plus through F-minus or as numeric marks on a percentage scale depending upon the faculty of registration.

Overall standings are reported in all faculties as numeric averages. The weighting factors are used for calculating overall averages for students on the letter grade system, and for converting assigned letter grades where required, for students whose faculty is on the numeric system.
Please refer to the individual Faculty chapters for a complete explanation of the appropriate grading system.

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

Non-Graded Standings
- AEG: Aegrotat, credit granted due to illness
- AUD: Audit only, no credit granted
- CR: Credit granted
- DNW: Did not write examination, no credit granted
- INC: Incomplete course work, no credit granted
- IP: Course in progress, no grade assigned at this time
- NCR: No credit granted
- NMR: No mark reported

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

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

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

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

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

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

Examination Regulations

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

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 thereater.

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 7-10 of this Calendar, normally ends 2 or 3 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 Regulations and Student Discipline

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

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

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

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

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

IV. Penalties
Should a student be found guilty of committing an academic offense, the penalty recommended will be one or more of the following:
1. Reprimand.
2. Submission of a failing grade in an examination, test, assignment, course, or term.
3. Probation.
4. Suspension.
5. Expulsion.

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

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

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

2. Computer programs written or partially written by a student in support of a project, thesis or other original work, may have potential value as a marketable intellectual property. The University acknowledges the student's ownership of all rights with respect to such software except as follows:
   a) Students may be required to sign a waiver of rights to software by the academic department for which a supervised project or thesis is to be undertaken, or by the faculty supervisor of the project or thesis.
   b) The University assumes a non-exclusive, paid-up royalty-free licence to use, for the University's administration, education and research activities, all software written using University facilities or written in support of academic work at the University. This licence does not include the right to use the software for commercial purposes or to distribute the software to others.
   c) Students acquire no rights to software written under supervision in the course of employment by the University.
   d) In cases where students are paid from research grants or contracts, ownership rights to software produced by them will be vested in the supervising Faculty member or the University, unless the grant or contract stipulates otherwise.

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

The University of Waterloo
Ownership of Student's Work
Student Academic Records
Student and Administrative Services

Student Academic Records

Student academic records shall be the property of the University; access to those records, and release of information concerning them, shall be governed by the general law and by the University's policies with respect thereto.

Student and Administrative Services

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

Federation of Students

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

Objects

The principle "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 coordinate 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 Student's Council is the governing body of the Federation and includes 32 elected students from all Faculties, St. Jerome's and Renison Colleges plus all Executive members. The functions of Council include upholding the above objectives, administration and control of finances and control of all Boards, Commissions and Standing Committees of Council. All activities are overseen by Council so make sure that your Faculty representatives attend Council meetings.
The Executive Board is composed of the principal officers including the President, Vice-President Operations and Finance, the Vice-President University Affairs, all Board Chairpersons, and all Commission Commissioners. The Board controls day-to-day administration, finance, and recommends policy to the Students' Council.

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

The Vice-President Operations and Finance works with the Business Manager to oversee the Federation's activities. The Vice-President is responsible for the supervision of the Federation's Ancillary Services and other services such as Fed Flicks, the Toronto Bus Service, SCOOPS, the Legal Resource Office, Women's Centre and Birth Control Centre. This Vice-President also oversees the Boards of Entertainment, Communication and Creative Arts.

The Vice-President University Affairs is directly responsible to Council, to make sure they are informed of all matters pertinent to Federation policy. This position also is responsible for the supervision of the Speaker and Secretary of Council as well as the Boards of Academic Affairs, External Liaison, Education, Internal Liaison and Women's Commission.

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

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

The Board of Entertainment co-ordinates and supervises all campus-wide programs such as Orientation, Homecoming, Winter Carnival, pubs, and concerts.

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

The Creative Arts Board provides assistance and participation to most on-campus musical, drama, and dance activities.

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

The University of Waterloo
Student and Administrative Services

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

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

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

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

Other Federation Services include WORDS - a Word Processing Service, the Record Store, Campus Shop, Post Office, Used Books Store, the Bombshelter Pub and Patio, Federation Hall, Chinese Library, and Classical Record Library.

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

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

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

Student volunteers are needed perpetually to typeset copy, design pages, research and write stories, take photos, review everything from books to concerts, organize departments, and keep accounts. Experience for any position is not necessary because training is provided in all areas.
The University of Waterloo
Student and Administrative Services

Imprint can be reached from 9:00 a.m. to 5:00 p.m. at 885-4048 or University ext. 2331 Monday through Friday. Inquiries should be directed to the Editor.

Athletics
The University of Waterloo offers a broad and complete range of athletic programs. The University holds membership in the Ontario Universities Association with 15 other Ontario universities, and competes in over 40 sports in this inter-university league. Campus Recreation provides an intramural program at a competitive, recreational, and instructional level, including such sports as slow-pitch, softball, scuba, ballroom dancing and many others. The Physical Activities Complex, along with a golf course, numerous outdoor fields, Seagram Stadium, Columbia icefield arena and other facilities provide excellent accommodation for these well-rounded programs.

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

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

Centre for the Arts
Room 161, Hagey Hall of the Humanities
Entertainment is available on campus throughout the fall and winter terms in UW's 2 attractive theatres, at special discounts for students. The UW Arts Centre offers a series of professional shows in comedy, stage, popular and Classical Music and children's entertainment.

The Humanities Theatre, located in Hagey Hall is a 720-seat theatre with 1 balcony and proscenium stage. Most of the professional shows take place here and it is also the performing home of the UW Drama group. The International Film series screenings also take place in this theatre. The Theatre of the Arts, located in the Modern Languages building is modelled after the Stratford Festival Theatre. It is the smaller of the 2 theatres, seating just over 500 people and is the scene of the Chamber Music series, Miss Oktoberfest pageant, drama presentations, free noon hour concerts and various campus events.

In addition, the Centre co-operates with the Federation of Students and other campus organizations in many other university-based theatrical events. The 2 theatres are also rented from time to time to community organizations such as local dance schools, the Kiwanis Club, Gilbert and Sullivan Society and more. The UW Arts Centre general offices and box office are located in Room 161, Hagey Hall of the Humanities, at ext. 2126 or 2127. Free brochures and tickets are available on campus, or call 885-4280 for immediate mail service. This number is at a BASS outlet supplying tickets to the Humanities theatre, Theatre of the Arts and many other events using Visa or Mastercard.

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

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

Health and Safety Department
Health and Safety Department Building
The Health and Safety Department is the Medical clinic centrally located on campus. It provides comprehensive care to all students and emergency care to anyone on campus. Physicians, nurses and counsellors are on staff at the clinic which is open Monday to Friday from 8:30 a.m. to 5:00 p.m. Also provided is a 24-hour physician-on-call service. Physicians' fees at Health Services, as well as laboratory work, x-rays, and most referrals are paid for by the Ontario Health Insurance Plan. More details are given in The Ontario Health Insurance Plan General Guide available without cost at the Health and Safety Department.

All full-time students are also covered by a Student Supplementary Health Insurance Plan which provides partial payment for prescriptions and other services. For further information, obtain a copy of "The People Place" at the Health and Safety Department or call the clinic at (519) 885-1211, ext. 3541.

Mature Student Services
Mature Student Services offers programs and numerous services designed for students who are returning to the classroom after a number of years.
Regularly scheduled orientation workshops and talks on careers are offered, as well as special services such as a course information file, learning skills packages, a buddy system, a library of cassette tapes and a monthly Newsletter.

The office serves as a general advisory centre for all mature students and may be used for consultation on academic, personal, and career concerns. Appointments can be made by phone (exts. 2147/2429) or by visiting the office in the Modern Languages Building (Rooms 224/225). Regular hours are 8:30 a.m. to 4:30 p.m., Monday through Friday.

Office of the Registrar
Needles Hall
Student admissions, Secondary School liaison, registration, records and financial aid for undergraduate students are administered by the Registrar's Office.

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

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

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

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

3. Research Involving Human Subjects: The 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 Co-ordinator is also responsible for obtaining school age children as subjects for suitable University research projects.

4. Research Involving Animals: The Committee on Animal Care reviews University research proposals involving animals according to the requirements of The Animals for Research Act and the Canadian Council on Animal Care Guide. It is the responsibility of the Committee to co-ordinate and review all activities and procedures relating to the care of research animals.

5. International programs: Assistance is available on preparation and submission of international projects. Liaison is maintained with government and other international funding agencies. The Office also provides financial administration and logistical assistance.

6. Research/Technology Park: The University is promoting the development of an industrial Research/Technology Park on the North Campus. This initiative will further enhance industry and university co-operation at all levels.

Residences
Accommodation is available at the University for approximately 4,000 students. There are 2 large undergraduate residences, Village I and Village II; 5 smaller Federated & Affiliated College residences, St. Jerome's, Notre Dame, Conrad Grebel, Renison, and St. Paul's; the Minota Hagey residence for graduate students; and the Waterloo Co-operative residence. The Co-op residence is situated just off-campus, and is owned and operated by students. Also situated just off-campus is the University Married Students' Apartments complex which contains 240 one-bedroom and 360 two-bedroom apartments. An off-campus housing information service is also provided. Inquiries should be made as follows:

For Village I, Village II, and Minota Hagey write:
Housing Office,
Village I,
University of Waterloo,
Waterloo, Ontario N2L 3G1
or phone (519) 884-0544
For off-campus information write:
Off Campus Housing Office,
Village I,
University of Waterloo,
Waterloo, Ontario N2L 3G1
or phone (519) 885-1271

For Federated & Affiliated Colleges, Waterloo Co-op Residence, and Married Students’ Apartments, write:
Conrad Grebel College,
Westmount Rd. N.,
Waterloo, Ontario N2L 3G6
or phone (519) 885-0220

Married Students’ Apartments,
159 University Ave. W.,
Hoom L104,
Waterloo, Ontario N2L 3E8
or phone (519) 884-0310

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

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

St. Jerome’s College,
Waterloo, Ontario N2L 3G3
or phone (519) 884-6110

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

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

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

All buildings on campus have at least one wheelchair-accessible entrance. Most buildings have wheelchair-accessible washrooms or are linked to a building that does. Improvements are continually being made to improve campus accessibility.

Both Village I and II have wheelchair-accessible rooms and disabled students are given priority for acceptance. Students may request a trial stay in residence prior to making application to assess and evaluate the facilities.

A Centre for Sight Enhancement, with up-to-date technical equipment including a Kurzweil reading machine, has been established in the Optometry Department to aid visually disabled students. For information call ext. 3581.

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

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

Foreign Student Office
The Foreign Student Office (FSO) located on the second floor of Needles Hall (within Counselling Services) assists foreign students through its special programs. Information is provided on many aspects of living in Canada - immigration regulations, community services, legal problems and cultural adjustment.

Programs include Host Families, International Friends, English conversation class, emergency loans, English tutors, and temporary housing.

All students from outside Canada are invited to visit the Foreign Student Office, Needles Hall, Room 2080, ext. 2614. Office hours are 9:30 a.m. to 4:30 p.m., Monday to Friday.

Teaching Resource Office
The Teaching Resource Office (TRO) of the University of Waterloo was established in 1976, following the recommendation to the Undergraduate Council of Senate by the Vice-President Academic “that the University appoint a person to act as a teaching consultant to the Faculties.” Terms of reference for the Teaching Resource Person include providing assistance to individual faculty members in improving their teaching performance, offering assistance to departments on teaching methods and evaluation of learning (including advice on the training of teaching assistants), and keeping the University community informed about developments and innovations relevant to teaching and learning in higher education. In 1985 the TRO became part of the new Teaching Resources and Continuing Education Office (TRACE) which also has responsibility for the University’s continuing education offerings, part-time studies, and the correspondence program. The office is located in Needles Hall, Room 3005 (ext. 2579), and includes a library of computer-catalogued resource materials.
Visitors Reception Centre
The centre, located in Optometry, Room 306, is open daily, Monday to Friday, from 8:30 a.m. to 4:30 p.m. Campus tours leave from the Centre at 10:30 a.m. and 1:30 p.m. and are about 1½ hours long. Students can also arrange to visit specific departments and meet with Faculty members about programs or facilities. Many Faculties have set aside all or several Wednesdays to provide students with the greatest exposure to lectures, other students, and faculty. Visitors to the campus are invited to phone to make arrangements. The number to call is (519) 885-1211, ext. 3614.
**General Information**

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

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

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

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

Applicants are advised to outline thoroughly their educational background in order to facilitate the admission process. The admission information and requirements set forth in the Calendar are applicable for admission beginning in September, 1986.

**Authority to Admit**

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

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

The University reserves the right to withdraw the Offer of Early Admission made to an Ontario secondary school student if the applicant fails to complete diploma requirements with a minimum final overall average of 60% in 6 Grade 13 or Ontario Academic Course credits or with any other specific final average or condition stated on the Offer of Admission.

**St. Jerome's College**

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

**Admissions**

General Information

General Admission Requirements

Inquiries and correspondence should be directed to:

The Registrar, St. Jerome's College.

Renison College

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

Inquiries and correspondence regarding admissions should be directed to:

The Registrar, Renison College.

**General Admission Requirements**

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

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

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

**English Proficiency Test**

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

**Permanent Resident Status**

Because of the nature of the Co-operative programs at the University, in which a student alternates 4 months of study on campus with 4 months of practical work experience in business, industry, or government, applicants from other countries must obtain Permanent Resident Status in Canada before applying for
admission to a Co-operative program. Until such proof of Permanent Resident Status is received, applicants will be considered for a comparable program, if available, under the Regular system of study. If applying to Co-operative Engineering programs, Permanent Residents must have completed at least 1 year of formal academic study or have 1 year's work experience in Canada before applying for admission.

Notice of Nondiscriminatory Policy as to Students

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

Applicants to Year 1

A) Applicants From Ontario Secondary Schools
See the 1986-87 Admission Requirements for Year 1 Programs on pages 2.5-2.7 for general admission requirements and specific program requirements.

B) Equivalent Certificates
All applicants are required to hold the specific subject requirements indicated on pages 2.5-2.7 in addition to the equivalent level of education.
Applicants are required to submit official transcripts for all years spent in secondary and post-secondary education. Transcripts must indicate subjects studied, the grades received and an interpretation of the grading system used.

Applicants from Other Canadian Provinces

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

Applicants from Other Countries

Countries following a "British" System of Education
General Certificate of Education or equivalent with Passes in at least 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 28.

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 program.

Europe
Maturity or Matriculation Certificate.

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

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

Countries Using French System
Baccalauréat Passable

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

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

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

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

Mature Student Admission
Individually of mature age who have been away from formal education for more than 2 years and who do not possess the minimum requirements for admission, stated in terms of Ontario secondary school preparation, may apply as mature students.

Applicants applying as mature students are advised to contact the Assistant Registrar of the desired Faculty to discuss admissibility and appropriate qualifying work. Generally, it is recommended that applicants who are applying to enter the University as adult students attempt to obtain standing in at least 1 university - entrance level subject (or its equivalent) that relates to the program of interest. Applicants to programs requiring specific subject prerequisites normally must have standing in these required subjects to be considered for admission. Mature students not meeting the requirements for degree candidacy may in certain cases be admitted to degree studies on a part-time probationary basis. Each application is considered on its own merit by the Admissions Committee.

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

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

Admissions
Other Applicants

Advanced Standing
Applicants to advanced years must specify the Faculty to which they are seeking admission, the program they wish to study, and the level of admission sought. All programs, with the exception of Architecture, Engineering, Independent Studies and Optometry operate on a course credit system where a student's progress is measured by courses completed rather than by years completed. Applicants to Faculties which operate under the course credit system will have previous work evaluated on an individual course basis. For other applicants advanced standing will be determined to the appropriate year or term. Applicants are expected to submit course descriptions, in addition to an official academic transcript from the institution(s) they have previously attended or are presently attending. The provision of such information will greatly facilitate the evaluation of previous work and the consideration of possible transfer credits.

Transfer Credit
Transfer credit will depend upon the program applied to, the relevancy of the previous program studied, and approval from the appropriate department that such courses are to be credited to the student’s program.

As the specific transfer credit policies vary with each Faculty, students are advised to refer to the Faculty sections in this Calendar for detailed regulations.

Applicants from Ontario Colleges of Applied Arts and Technology
As a general policy, applicants who have achieved first class honours or high second class honours in each of the 3 years of a program at an Ontario College of Applied Arts and Technology are considered for admission with advanced credit for as much as 1 year of a degree program.

Applicants who have completed 2 years with first class honours or high second class honours are considered for admission to Year One. Each application will be considered on its merits by the Admissions Committee of the desired Faculty.

Letters of Permission
In addition to completing the appropriate application form, applicants wishing to take a course on a “Letter of Permission” must obtain a Letter of Permission form from their “home” university specifying the courses to be taken. Usually no further documents are required.
Specific Faculty Program Recommendations and Requirements

<table>
<thead>
<tr>
<th>Faculty/Program</th>
<th>Required University-Entrance Subjects and Minimum Averages</th>
<th>Recommendations</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td>The Ontario Universities' Application Centre (OUAC) codes for the various programs are given below to assist applicants in completing their applications.</td>
<td>The following recommendations are intended to provide additional academic advice which applicants should consider when planning their university preparation programs.</td>
<td>The following comments are intended as guidelines only. Competition for available places each year may result in changes to the factors which affect admission decisions. Competition is keen for all programs because the number of qualified applicants usually exceeds the number of places available. Since factors, other than marks, are often considered in the admissions decision, students who are interested in particular programs are encouraged to apply regardless of their expected average.</td>
<td></td>
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<tr>
<td>Arts</td>
<td>6 Grade 13 or Ontario Academic Course credits including English.</td>
<td>Along with the credit in English, preferably a course that stresses writing skills, applicants should take university-entrance level courses in Algebra and Calculus. Students lacking Algebra and/or Calculus must rectify this deficiency in Year 1.</td>
<td>Applicants with averages over 75% will be given first consideration. Unless there is evidence of interest in Arts programs other than Accounting, applicants not admitted to Accounting Studies will not be considered for admission to Regular Arts (WA).</td>
</tr>
<tr>
<td>Arts (Regular)</td>
<td>OUAC codes: University - WA, St. Jerome's - WJA, Recreation (Social Development Studies) - WSA, Recreation (Other Arts Programs) - WRA</td>
<td>Along with the credit in English, preferably a course that stresses writing skills, applicants should take university-entrance level courses in Algebra and Calculus. Students lacking Algebra and/or Calculus must rectify this deficiency in Year 1.</td>
<td>Applicants with averages over 80% will be given first consideration. Students will register in either Co-op Chartered Accountancy or Co-op Management Accountancy. Students not admitted to Co-op Accountancy Studies will be considered for the Arts Regular (Accountancy Studies) program and may apply for admission to the Co-op program after completion of the Fall term. Unless the university is evidence of interest in Arts programs other than Accounting, applicants not admitted to Co-op Accountancy Studies will not be considered for admission to Regular Arts (WA).</td>
</tr>
<tr>
<td>Arts (Regular)</td>
<td>OUAC code: WAB</td>
<td>Along with the credit in English, preferably a course that stresses writing skills, applicants should take university-entrance level courses in Algebra and Calculus. Students lacking Algebra and/or Calculus must rectify this deficiency in Year 1.</td>
<td>Applicants with averages over 75% will be given first consideration. Unless there is evidence of interest in Arts programs other than Accounting, applicants not admitted to Accounting Studies will not be considered for admission to Regular Arts (WA).</td>
</tr>
<tr>
<td>Co-op</td>
<td>6 Grade 13 or Ontario Academic Course credits including English.</td>
<td>Along with the credit in English, preferably a course that stresses writing skills, applicants should take university-entrance level courses in Algebra and Calculus. Students lacking Algebra and/or Calculus must rectify this deficiency in Year 1.</td>
<td>Applicants with averages over 80% will be given first consideration. Students will register in either Co-op Chartered Accountancy or Co-op Management Accountancy. Students not admitted to Co-op Accountancy Studies will be considered for the Arts Regular (Accountancy Studies) program and may apply for admission to the Co-op program after completion of the Fall term. Unless the university is evidence of interest in Arts programs other than Accounting, applicants not admitted to Co-op Accountancy Studies will not be considered for admission to Regular Arts (WA).</td>
</tr>
<tr>
<td>Co-op (Accountancy Studies)</td>
<td>OUAC code: WAA</td>
<td>Along with the credit in English, preferably a course that stresses writing skills, applicants should take university-entrance level courses in Algebra and Calculus. Students lacking Algebra and/or Calculus must rectify this deficiency in Year 1.</td>
<td>Applicants with averages over 80% will be given first consideration. Students will register in either Co-op Chartered Accountancy or Co-op Management Accountancy. Students not admitted to Co-op Accountancy Studies will be considered for the Arts Regular (Accountancy Studies) program and may apply for admission to the Co-op program after completion of the Fall term. Unless the university is evidence of interest in Arts programs other than Accounting, applicants not admitted to Co-op Accountancy Studies will not be considered for admission to Regular Arts (WA).</td>
</tr>
<tr>
<td>Co-op (Applied Studies)</td>
<td>6 Grade 13 or Ontario Academic Course credits including English.</td>
<td>Along with the credit in English, preferably a course that stresses writing skills, applicants should take university-entrance level courses such as History, Mathematics, a second language, and Science.</td>
<td>In recent years, most students admitted have had averages of 70% or better. A number of students with lower averages, however, are admitted on the basis of other indicators. Applicants not admitted to Arts Co-op (Applied Studies) will be considered for the Arts Regular program. Applicants interested in a specific Departmental Co-op program should apply initially to Arts Regular.</td>
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</table>

*NOTE: Ontario secondary school students seeking admission in September 1966 or thereafter, must present the Secondary School Honour Graduation Diploma (SSHGD) or Ontario Secondary School Diploma (OSSD) including a minimum of 6 Grade 13 or Ontario Academic Courses. An overall average of 60% on 6 Grade 13 or Ontario Academic Courses is the minimum required for consideration, but higher averages may be required for admission to individual programs in which the demand for places by qualified applicants exceeds the supply of places available in those programs. The actual averages required for admission to particular programs are determined each year on the basis of the number of applicants and the marks of those applicants. The Secondary School Honour Graduation Diploma and the Ontario Secondary School Diploma will normally be given equal credit for admission purposes. The length of time taken by an applicant to complete the secondary school program will not of itself be a determining factor in the admission decision providing the student has proceeded normally through the program without repeating any courses or credits. As the Ontario Academic Course curriculum guidelines are implemented, it is expected that some specific subject requirements for admission will change. The Faculty of Engineering and the Faculty of Mathematics anticipate that their subject requirements in the area of Mathematics may be reduced from 6 Grade 13 credits (Algebra, Calculus, Relations & Functions) to two Ontario Academic Course credits (Algebra & Geometry, Calculus). Students wishing to apply to Co-op Engineering or Co-op Mathematics should consult the University's Admissions Office for the requirements for those programs.
<table>
<thead>
<tr>
<th>Faculty/Program</th>
<th>Required University-Entrance Subjects and Minimum Averages</th>
<th>Recommendations</th>
<th>Comments</th>
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<tr>
<td><strong>Engineering</strong></td>
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<tr>
<td>OUAC codes for Engineering (Co-op)</td>
<td>6 Grade 13 or Ontario Academic Course credits including Calculus, Algebra, Relations &amp; Functions, Physics, and Chemistry.</td>
<td>Applicants with high numeric overall standing who are missing 1 or 2 of the 5 specific requirements must contact the Admissions Officer no later than December for September admission. Applicants will be evaluated and advised on the courses of action required to meet the specific requirements.</td>
<td>Year 1 enrolment is limited to 600 students. Approximately 85% of those places are filled by Ontario Secondary School students. In recent years, most students admitted have had averages of 75% or better. However, a number of students with lower averages are admitted when other evidence indicates extensive involvement in extracurricular activities and an aptitude and interest in Engineering.</td>
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<td>Chemical - WC</td>
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<td>Civil - WR</td>
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<td>Computer - WWJ</td>
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<td>Systems Design - WD</td>
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<tr>
<td>Electrical - WFW</td>
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<td>Geodetic - WWG</td>
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<td>Mechanical - WWH</td>
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<tr>
<td><strong>Environmental</strong></td>
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<td><strong>Studies</strong></td>
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<tr>
<td>OUAC code WR</td>
<td>(Requirements are listed below by Department or School.)</td>
<td>Because of the increasing use of statistics and quantitative methods in environmental research, a university-entrance level Mathematics course is recommended for applicants to any Environmental Studies program.</td>
<td>Selected applicants are normally required to come to the University for an interview as part of the admission process. Selection for the interview is based on grade 12 and university-entrance level academic records. Admission is based on the results of the interview (including a required portfolio), an English press-writing exercise designed to test skills of analysis and expression, and on secondary school achievement. The first-year program is limited to 65 students. In recent years, most students admitted had Grade 13 averages of 75% or better.</td>
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<tr>
<td>Architecture</td>
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<tr>
<td>(pre-professional program)</td>
<td>6 Grade 13 or Ontario Academic Course credits including Relations &amp; Functions, Calculus, Physics, English (francis).</td>
<td>Applicants should take university-entrance level Geography and 1 of Algebra, Calculus, Relations &amp; Functions. Good English writing skills are required.</td>
<td>Selected applicants are normally required to come to the University for an interview as part of the admission process. Selection for the interview is based on grade 12 and university-entrance level academic records. Admission is based on the results of the interview (including a required portfolio), an English press-writing exercise designed to test skills of analysis and expression, and on secondary school achievement. The first-year class consists of approximately 110 students. Applicants with an average of 70% or better are given first consideration.</td>
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<tr>
<td>OUAC code WR</td>
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<td><strong>Geography</strong></td>
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<tr>
<td>OUAC code: WG</td>
<td>6 Grade 13 or Ontario Academic Course credits.</td>
<td>Applicants should take university-entrance level Geography and 1 of Algebra, Calculus, Relations &amp; Functions. Good English writing skills are required.</td>
<td>The first-year class consists of approximately 110 students. Applicants with an average of 70% or better are given first consideration.</td>
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<td><strong>Man-Environment</strong></td>
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<td>Studies</td>
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<tr>
<td>OUAC code: WNK</td>
<td>6 Grade 13 or Ontario Academic Course credits.</td>
<td>Applicants should take at least 1 Grade 12 or university-entrance level Science. A course in Relations &amp; Functions is recommended. Good English writing skills are required.</td>
<td>The first-year class consists of approximately 70 students. Applicants with an average of 70% or better are given first consideration.</td>
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<td><strong>Urban and Regional</strong></td>
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<td>Planning</td>
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<tr>
<td>OUAC code: WP</td>
<td>6 Grade 13 or Ontario Academic Course credits.</td>
<td>Applicants should include 1 of university-entrance level Algebra, Calculus, Relations &amp; Functions. Of the 3 recommended Mathematics courses, Calculus has top priority. Good English writing skills are required.</td>
<td>The first-year program is limited to 65 students. Applicants with an average of 70% or better 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 &quot;Statement of Interest&quot; form, letters of reference and secondary school achievement.</td>
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<tr>
<td><strong>Human Kinetics</strong></td>
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<td>&amp; Leisure Studies</td>
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<td>Dance</td>
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<td>OUAC code: WO</td>
<td>6 Grade 13 or Ontario Academic Course credits.</td>
<td>Applicants to the General or Honours BA degree program, should include English and History in their university-entrance level program.</td>
<td>Applicants living within a reasonable commuting distance of Waterloo should arrange an interview with the Undergraduate Officer regarding admission to one program. Applicants unable to travel to Waterloo should contact the Undergraduate Officer to make other arrangements. Auditions are held at the start of classes for advanced placement in studio courses.</td>
</tr>
</tbody>
</table>
### Faculty/Program

<table>
<thead>
<tr>
<th>Required University-Entrance Subjects and Minimum Averages</th>
<th>Recommendations</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Health Studies</strong></td>
<td></td>
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<tr>
<td>OUAC codes:</td>
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<td></td>
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<tr>
<td>Regular - WF</td>
<td></td>
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<tr>
<td>Co-op - WW</td>
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</tr>
<tr>
<td>6 Grade 13 or Ontario Academic Course credits including Biology and Chemistry.</td>
<td>Applicants should include university-entrance level Calculus in their program as preparation for first-year Chemistry.</td>
<td>Applicants with overall averages above 80% are given first consideration. Students applying to the joint Honours program in Health Studies/Kinesiology must fulfill the Kinesiology admission requirements.</td>
</tr>
<tr>
<td><strong>Kinesiology</strong></td>
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<tr>
<td>OUAC codes:</td>
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<tr>
<td>Regular - WW</td>
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<tr>
<td>Co-op - WW</td>
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<tr>
<td>6 Grade 13 or Ontario Academic Course credits including 1 Mathematics course from Algebra, Calculus, Relations &amp; Functions and 2 Science courses from Biology, Chemistry, Physics.</td>
<td>Applicants should include 4 university-entrance level courses from Biology, Chemistry, Physics, Relations &amp; Functions, Algebra and Calculus. Physics and Calculus are especially recommended.</td>
<td>The Kinesiology program includes required university courses in Biology, Calculus, Chemistry, Computer Science, Psychology and Sociology.</td>
</tr>
<tr>
<td><strong>Recreation</strong></td>
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<tr>
<td>OUAC codes:</td>
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<tr>
<td>Regular - WW</td>
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<td></td>
</tr>
<tr>
<td>Co-op - WW</td>
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</tr>
<tr>
<td>6 Grade 13 or Ontario Academic Course credits.</td>
<td>Applicants should include 1 of university-entrance level Algebra, Calculus, Relations &amp; Functions.</td>
<td>Applicants with overall averages above 60% are given first consideration. Students 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 &quot;Statement of Interest&quot; form, letters of reference and secondary school achievement.</td>
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<tr>
<td><strong>Independent Studies</strong></td>
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<tr>
<td>OUAC code: WI</td>
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<td><strong>Mathematics</strong></td>
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<tr>
<td>OUAC codes:</td>
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<tr>
<td>Regular - WF</td>
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</tr>
<tr>
<td>C.A. Option (Co-op) - WW</td>
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<td></td>
</tr>
<tr>
<td>Exempt C.A. Option (Co-op) - WT</td>
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<tr>
<td>Regular - WM</td>
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<tr>
<td>6 Grade 13 or Ontario Academic Course credits including Calculus, Algebra, and Relations &amp; Functions with a minimum grade of 60% in each of the 3 required Mathematics courses.</td>
<td>Students with high overall academic standing who are missing 1 of the 3 required mathematics courses, may be considered for admission in exceptional circumstances. Such students should contact the Assistant Registrar for Mathematics as soon as possible to discuss their particular situation. Students who have exhibited breadth in their program of study will receive primary consideration. In particular, a subject requiring literary and writing performance, such as English, is recommended.</td>
<td>Admission to mathematics programs is competitive, and most students admitted have averages of 75% or higher. Students with lower averages may be admitted if there is evidence to indicate an exceptional aptitude and interest in mathematics. Extra-curricular activities, a teacher's recommendation, and performance in the Secondary Mathematics Competition may enhance an applicant's probability of admission. Students not offered admission to the program of their choice are considered for all other Mathematics programs.</td>
</tr>
<tr>
<td><strong>Science</strong></td>
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<tr>
<td>All Programs</td>
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<tr>
<td>OUAC codes for Science:</td>
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<tr>
<td>Applied Chemistry (Co-op) - WW</td>
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<tr>
<td>Applied Physics (Co-op) - WW</td>
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<tr>
<td>Biology (Co-op) - WU</td>
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<tr>
<td>Applied Earth Science (Co-op) - WY</td>
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<td></td>
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<tr>
<td>Biology and Chemistry (Co-op) - WY</td>
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<tr>
<td>Optometry (Years 1-4) - WB (Application is made after completion of Year 1 Science.)</td>
<td>Applicants should include both university-entrance level Chemistry and Physics if they are applying to any Science program. A course requiring writing skills would be an asset. For Co-operative Applied Chemistry and Physics university-entrance level Relations &amp; Functions, and Algebra are both recommended. For the orthophysics Option within Co-operative Applied Earth Sciences, university-entrance level Algebra is recommended.</td>
<td>The most recent minimum averages of successful applicants are: Regular Science - 65%. Co-operative Biology - 70%. Co-operative Biology &amp; Chemistry 70% (70% required in Chemistry and 70% in Mathematics). Co-operative Applied Chemistry - 70% (70% required in Chemistry and 70% in Mathematics). Co-operative Applied Earth Sciences - 70%. Co-operative Applied Physics - 75% (75% overall required in Physics &amp; Mathematics, with at least 70% in Physics and 70% in Calculus). In recent years, competition for places in some programs has been such that the Secondary School averages required for admission have been higher than the stated minimum. Students not admitted to the program of their first choice are automatically considered for other programs in Science for which they qualify. Total expected enrolment in Year 1: 600 students.</td>
</tr>
</tbody>
</table>
Admissions
Application Procedures

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

<table>
<thead>
<tr>
<th>Session/Term starting</th>
<th>Last date for application</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 1986</td>
<td>March 1, 1986</td>
</tr>
<tr>
<td>July 1986</td>
<td>June 1, 1986</td>
</tr>
<tr>
<td>*September 1986</td>
<td>July 1, 1986</td>
</tr>
<tr>
<td>January 1987</td>
<td>November 1, 1986</td>
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</tbody>
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Correspondence Program

<table>
<thead>
<tr>
<th>Term</th>
<th>Last date for application</th>
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</thead>
<tbody>
<tr>
<td>Fall Term 1986</td>
<td>August 8, 1986</td>
</tr>
<tr>
<td>Winter Term 1987</td>
<td>October 17, 1986</td>
</tr>
<tr>
<td>Spring Term 1987</td>
<td>February 13, 1987</td>
</tr>
</tbody>
</table>

*Applications and all supporting documentation must be received no later than May 1, 1986 for all Year 1 limited-enrolment programs, with the following exceptions:

1. Architecture requires that applications must be dated as received at the OUAC no later than March 15 and that supporting documents be received at the University no later than April 15.

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

3. Recreation requires that supporting documents be received at the University no later than April 15.

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

Application Procedures

1. Applicants who wish to pursue degree studies on a full-time basis must submit their applications through the Ontario Universities' Application Centre (OUAC):
   a) Applicants presently enrolled in an Ontario Secondary School as a full-time day student must complete OUAC form 101 available from the secondary school guidance departments.
   b) All other applicants (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 who wish to pursue degree studies on a part-time basis or non-degree or post-degree studies should contact the Registrar's office for the appropriate application forms.
   b) Applicants who wish to take courses by correspondence should write to the Correspondence Program, University of Waterloo, Waterloo, Ontario N2L 3G1 or call (519) 888-4050.

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

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

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

All Ontario Secondary School applicants will be notified on or after June 13, 1986 of the status of their application for admission. Ontario Secondary School applicants who do not receive an offer of admission at this time will have their applications deferred until the final marks are received by the University. When these marks have been received, qualified applicants will be admitted until the remaining places are filled. Ontario Secondary School applicants who complete their studies in the Fall semester will be considered when final grades are received.

Ontario Secondary School applicants who receive an early offer of admission on June 13, 1986 are encouraged to confirm as soon as possible, but are not required to respond before June 27, 1986.

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

Release of Academic Information

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

Registration and Fees

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

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

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

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

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

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

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

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

Assessment
Fees are assessed as follows: (Foreign Students – see note 4 on page 3:7)

Fees and Registration
Preregistration, Registration, Fees

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

B) REGULAR PROGRAMS:
1. All Terms
   a) Architecture Year 1, Independent Studies and Optometry
      Students are assessed on a per term basis for the Total Tuition and Incidental Fees shown on the Schedule of Fees.
   b) Other Regular Programs
      Students are assessed by course at the Unit Course Fee shown to a maximum of the Basic Fee. Students taking more than two term courses are also assessed Incidental Fees.

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

Payment
A) TIMING AND AMOUNTS DUE
All fees are due and payable by the end of the registration period. See pages 7-10 for appropriate dates. Students must pay or arrange fees by these dates, whether or not a final class schedule has been received.

For Total Tuition Fees and Unit Course Fee see Schedule of Fees.

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

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

1. Fees should be paid with cash, money order or cheque payable to "University of Waterloo."

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

3. Students who have received a "Notice of Assessment" under the Ontario Student Assistance Program may arrange payment of fees using this source of funds.

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

<table>
<thead>
<tr>
<th>Term</th>
<th>First Day of Registration</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 1986</td>
<td>2 September 1986</td>
</tr>
<tr>
<td>January 1987</td>
<td>5 January 1987</td>
</tr>
<tr>
<td>May 1987</td>
<td>4 May 1987</td>
</tr>
</tbody>
</table>

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

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

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

8. Students who fail to fulfill fee payment arrangements will be assessed a 5% surcharge on the total fees outstanding plus 1 1/2% per month service charge applied to the balance outstanding and calculated from the due date.

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

Banking Information

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

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

LATE REGISTRATION

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

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

See pages 7-10 for dates when late fees start. Students will not be allowed to register after the dates shown below.

<table>
<thead>
<tr>
<th>Term Starting</th>
<th>Last Date to Register</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 1986</td>
<td>27 June 1986</td>
</tr>
<tr>
<td>July 1986</td>
<td>31 July 1986</td>
</tr>
<tr>
<td>September 1986</td>
<td>31 October 1986</td>
</tr>
<tr>
<td>January 1987</td>
<td>30 January 1987</td>
</tr>
<tr>
<td>May 1987</td>
<td>30 June 1987</td>
</tr>
</tbody>
</table>

Withdrawals

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

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

a) Students withdrawing before the start of classes will receive a full refund.

b) Students withdrawing in the first 3 weeks of a term (first week for Summer Session) will receive a full refund less a $25 registration charge. Part-time students will be charged $10.

c) Students withdrawing during weeks 4 to 7 of a term (second week of Summer Session) will receive a refund of 50%.

d) Refunds are not provided to students after week 7 of a term (week 3 of Summer Session).

The specific withdrawal dates are included in the registration information package sent to students each term.
e) Requests for refunds of refundable incidental fees must be addressed to the organization concerned. Such refunds are available for only 3 weeks, after the start of classes.
f) The Intercollegiate Athletic Fee, the Co-op Fee and the Computer Fees are refundable upon withdrawal on the same basis as tuition fees.
g) The Health Insurance Fee is refundable on a pro rata basis and the benefits associated with it will be cancelled. The Health Insurance card must be returned at the time of withdrawal.
h) The Recreational Facility Fee and Federation Hall Fee are not refundable.
i) Certain scholarships and bursaries are given on the condition of completion of the term involved. Any withdrawal refunds will be credited to the agency as required.

Drop/Adds
For students assessed on the per course basis, net drop/add activity may change the fee assessment. In general, a net add is assessed at the full rate while a net drop is assessed on the same basis as a withdrawal. It is the student's responsibility to ensure the necessary payment for added courses is made promptly. Failure to do so will result in penalty charges being assessed.

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

Schedule of Fees – Undergraduate Programs – Tuition & Incidentals for all Years – Canadian Citizens and Permanent Residents.
Foreign Students on Student Authorizations should refer to page 3:7 for fee information.

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Term</th>
<th>Basic Fee</th>
<th>Co-op Fee</th>
<th>Computer Service Fees</th>
<th>Total Tuition</th>
<th>Total Incidental Fees</th>
<th>Total Fees</th>
<th>Unit Course Fee (Note 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architecture</td>
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<tr>
<td>– Yr 1</td>
<td>Term</td>
<td>659.50</td>
<td>–</td>
<td>60.00</td>
<td>719.50</td>
<td>79.93</td>
<td>799.43</td>
<td>135.00</td>
</tr>
<tr>
<td>– Upper Yr, Co-op</td>
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<td>659.50</td>
<td>150.00</td>
<td>60.00</td>
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<td>–</td>
<td>40.00</td>
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<td>77.43</td>
<td>724.93</td>
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</tr>
<tr>
<td>– Co-op</td>
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<td>150.00</td>
<td>40.00</td>
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<td>89.40</td>
<td>886.90</td>
<td>135.00</td>
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<tr>
<td>– Regular</td>
<td>Term</td>
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<td>–</td>
<td>28.00</td>
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<td>– Co-op</td>
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<td>150.00</td>
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<td>89.90</td>
<td>875.40</td>
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<td>Human Kinetics &amp; Leisure Studies</td>
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<tr>
<td>– Regular</td>
<td>Term</td>
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<td>–</td>
<td>28.00</td>
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<tr>
<td>– Co-op</td>
<td>Term</td>
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<td>150.00</td>
<td>28.00</td>
<td>785.50</td>
<td>89.90</td>
<td>875.40</td>
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<tr>
<td>Mathematics</td>
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<tr>
<td>Major</td>
<td>Term</td>
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<td>100.00</td>
<td>707.50</td>
<td>79.93</td>
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</tr>
<tr>
<td>– Co-op</td>
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<tr>
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<td>– Regular</td>
<td>Term</td>
<td>659.50</td>
<td>–</td>
<td>60.00</td>
<td>719.50</td>
<td>78.93</td>
<td>798.43</td>
<td>135.00</td>
</tr>
<tr>
<td>Science</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Regular</td>
<td>Term</td>
<td>607.50</td>
<td>–</td>
<td>60.00</td>
<td>667.50</td>
<td>78.93</td>
<td>746.43</td>
<td>135.00</td>
</tr>
<tr>
<td>– Co-op</td>
<td>Term</td>
<td>807.50</td>
<td>150.00</td>
<td>60.00</td>
<td>817.50</td>
<td>90.90</td>
<td>908.40</td>
<td>135.00</td>
</tr>
<tr>
<td>Summer Session</td>
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</tr>
<tr>
<td>Half Course</td>
<td></td>
<td>(0.5 credits)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>135.00</td>
</tr>
<tr>
<td>Full Course</td>
<td></td>
<td>(1.0 credits)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>270.00</td>
</tr>
</tbody>
</table>

Computer Service Fees for part-time students: 10.00

Schedule of fees effective May 1, 1985.

Registration in Co-operative programs is available only to students who are Canadian Citizens or Permanent Residents.
Fees and Registration
Schedule of Fees

Fees for Foreign Students with Student Authorizations (see also Note 4)
The fees shown are those for the 1985/86 year and will be changed for the 1986/87 year. A revised fee schedule will be included with the student registration information.

1. For an undergraduate student on Student Authorization who was registered in a term before September 1982 and who had successfully completed in his or her program, work equivalent to at least the normal load for a term of a full-time student in that program:
   Regular program fees for registration in an undergraduate program are $1266.00 per term plus the applicable computer service fees and incidental fees as shown below. The Unit Course Fee is $253.45 per Term Course.

2. For an undergraduate student on Student Authorization who was registered in a degree program for the first time in a term beginning September 1982 or January 1983 or one who had not by September 1982 successfully completed in his or her program, work equivalent to at least the normal load for a term of a full-time student in that program:
   Regular program fees are $2063.50 per term plus the applicable computer service fees and incidental fees as shown below. The Unit Course Fee is $416.75 per Term Course.

3. For an undergraduate student on Student Authorization who was registered for the first time in a term beginning May 1983 or later:
   a) Registration in an undergraduate program* in Architecture, Engineering, or Optometry:
      Regular program fees are $3735.00 per term plus the applicable computer service fees and incidental fees as shown below. The Unit Course Fee is $747.00 per Term Course.
   b) Registration in any other undergraduate program.*
      Regular program fees are $2292.00 per term plus the applicable computer service fees and incidental fees as shown below. The Unit Course Fee is $456.40 per Term Course.

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

Incidental Fees
The following incidental fees are compulsory:

<table>
<thead>
<tr>
<th>Service</th>
<th>Regular Fee</th>
<th>Co-op Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercollegiate Athletics</td>
<td>$21.75</td>
<td></td>
</tr>
<tr>
<td>Health Insurance</td>
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<tr>
<td>(See Note 5)</td>
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<td></td>
</tr>
<tr>
<td>- Regular</td>
<td>$13.68</td>
<td>$25.65</td>
</tr>
<tr>
<td>- Co-op</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recreational Facilities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(See Note 6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Federation Hall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(See Note 7)</td>
<td></td>
<td>$7.50</td>
</tr>
<tr>
<td>Photo I.D. Cards</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(See Note 8)</td>
<td></td>
<td></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 term:

<table>
<thead>
<tr>
<th>Organization</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federation of Students</td>
<td>$13.75</td>
</tr>
<tr>
<td>(See Note 9)</td>
<td></td>
</tr>
<tr>
<td>Student Society (See Note 10)</td>
<td></td>
</tr>
<tr>
<td>- Architecture</td>
<td>$5.00</td>
</tr>
<tr>
<td>- Arts</td>
<td>$2.50</td>
</tr>
<tr>
<td>- Engineering</td>
<td>$8.50</td>
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<tr>
<td>- Env. Studies</td>
<td>$2.25</td>
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<tr>
<td>- HKLS</td>
<td>$3.00</td>
</tr>
<tr>
<td>- Independent Studies</td>
<td>$-</td>
</tr>
<tr>
<td>- Mathematics</td>
<td>$5.00</td>
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<tr>
<td>- Optometry</td>
<td>$4.00</td>
</tr>
<tr>
<td>- Science</td>
<td>$4.00</td>
</tr>
<tr>
<td>WPIRG (See Note 11)</td>
<td>$2.50</td>
</tr>
<tr>
<td>Sanford Fleming Foundation (See Note 12)</td>
<td></td>
</tr>
<tr>
<td>Radio Waterloo (See Note 13)</td>
<td>$3.50</td>
</tr>
<tr>
<td>Imprint (See Note 14)</td>
<td>$2.25</td>
</tr>
</tbody>
</table>

Note 1 – Term
Term refers to a particular 4-month (13 week) period of registration: Fall term – September to December; Winter term – January to April; Spring term – May to August.

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

In offering co-operative programs, the University incurs significant extraordinary costs in the academic departments, as well as in the Department of Coordination, the Registrar’s Office, and other departments which serve the students. These costs are not provided for in the operating grants received from Government.
The University recovers a portion of the extra costs of co-operative programs by collecting a special Co-op service fee from students registering in these programs. The fee is set at a level which distributes the cost recovery over all terms of the co-operative programs.

Students registered in co-operative programs normally are not allowed to withdraw from them and register in regular programs. However, in the event that such a change of registration is approved for strong academic reasons, the University reserves the right to impose a transfer fee on those students who have not yet paid Co-op fees in proportion to the services received in the co-operative program.

The Co-op service fee now represents approximately 52% of the extraordinary cost of supporting the co-operative program. To assist in planning for their educational expenses, students registering in co-operative programs are advised that this fee will be increased over a three-year period to a level which will recover about 80% of these costs.

Note 3 – Unit Course Fee (1985-86)
The fee assessed at $135.00 for each term course at a weight of 0.5; and at a prorated value for other course weights. The Unit Course Fee for Foreign Students with Student Authorization is shown above.

Note 4 – Student Authorizations
The Ontario Government has established a policy of higher tuition fees for foreign students studying in Ontario on Student Authorizations. The policy came into effect as of 1 January 1977. The higher fees apply to all students beginning a program on or after 1 January 1977, except for those who qualify for exemption under one of the following categories.

1. A citizen of Canada within the meaning of the Canadian Citizenship Act or a person registered as an Indian within the meaning of the Indian Act;
2. A Permanent Resident within the meaning of the Immigration Act, 1976;
3. A visitor admitted to and remaining in Canada under clause 10(c) of the Immigration Act, 1976 who has entered Canada or is in Canada to carry out his official duties as a diplomatic or consular officer or representative or official properly accredited of a country other than Canada, or of the United Nations or any of its agencies or of any intergovernmental organizations in which Canada participates or as a member of the staff of any such diplomat, consular officer, representative or official;
4. A dependant 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) and 10(b) of the Immigration Act, 1976 who is sponsored and financially assisted by the Canadian International Development Agency (including the Commonwealth Scholarships and Fellowships), or by any program of financial assistance to students under an aid program of the United Nations or its agencies provided such a program is recognized and directly or indirectly assisted by the Government of Canada;
7. A person admitted to and remaining in Canada under clause 10(a) or 10(b) of the Immigration Act, 1976 provided he or she is studying in Canada under a cultural exchange agreement between the Government of Canada and the government of another country or a formal agreement between a provincially-assisted institution in Ontario and a post-secondary institution in another country, provided that under such an agreement, the number of places made available in Ontario universities, Ryerson or the Ontario College of Art normally equals the number of places made available to Ontario residents in the other country or institution as the case may be.
8. A person admitted to and remaining in Canada under clause 10(a) or 10(b) of the Immigration Act, 1976 who is the holder of an Ontario graduate Scholarship.

In clause 4, “dependent” means 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 $18.60 for a Regular student per term and $34.88 for a Co-operative student at each registration.
This plan does not include the premium or benefits of the Ontario Health Insurance Plan. It is the student's own responsibility to ensure that such personal coverage is obtained. Further details are available from Health Services.

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

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

Note 8 - Photo I.D. Cards
All on-campus full-time and part-time undergraduate students will be assessed a one time only fee of $4.25 to cover the cost of issuance of individual photo I.D. cards. This fee is compulsory and non-refundable. See Note 18 re: replacement cost.

Note 9 - Federation of Students
Payment of the Federation of Students fee is required at registration, but a student who does not wish to participate may obtain a refund by applying to the Federation of Students within three (3) weeks after the start of lectures as indicated on pages 7 to 10 of this Calendar.

Note 10 - Society Fees
Payment of the Society Fee is required at registration, but a student who does not wish to participate may obtain a refund by applying to the respective society within three (3) weeks after the start of lectures as indicated on pages 7 to 10 of this Calendar.

Note 11 - WPIRG (Waterloo Public Interest Research Group)
A student funded environmental and social research group:
This fee is voluntary, refundable, and not a requirement for registration. Requests for refunds or questions concerning WPIRG should be directed to the on-campus WPIRG office within three (3) weeks after the start of lectures as indicated on pages 7 to 10 of this Calendar.

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

Note 13 - Radio Waterloo
The on-campus student radio station.
This fee is voluntary, refundable, and not a requirement for registration. Requests for refund should be directed to the Radio Waterloo office within three (3) weeks after the start of lectures for the term involved as indicated on pages 7 to 10 of this Calendar.

Note 14 - Imprint
The student newspaper.
This fee is voluntary, refundable and not a requirement for registration. Requests for refunds should be directed to the Imprint office within three (3) weeks after the start of lectures for the term involved as indicated on pages 7 to 10 of this Calendar.

Note 15 - Computer Service Fees
Non-refundable fees assessed to all on-campus students.

Note 16 - Other Costs
The fees shown do not include the costs of text books, class notes, Correspondence Program tape or kit deposits, mandatory supplies, certain accommodation or other costs associated with field trips, or other miscellaneous expenses, some of which are noted below:

Miscellaneous
Re-examination fee (Engineering only) $25.00
Returned Cheques - Handling charge (plus late registration penalty as applicable) $15.00
Duplicate Tax Receipt $ 2.00
Replacement of lost or stolen student Photo Identification Card $ 10.00
Replacement of lost or stolen student Health Insurance Card $ 5.00
Transcript of Record $3.00 for first copy
-$1.50 for each additional copy ordered at the same time as the first copy.
Letter of Permission $20.00
To Whom It May Concern Letters
-$3.00 for first copy
-$ .50 for each additional copy ordered at the same time as the first copy.

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

Receipts for income tax purposes for fees paid covering the academic period 1 May 1986 to 30 April 1987 will be available after 1 March 1987.

- receipts to part-time students and Co-operative program students on work term will be mailed to the home address on record.
- receipts to on-campus students will be available for pick-up at specified location(s) on campus.

(Notification of pick-up location(s) will be published in the University of Waterloo Gazette, prior to 1 March 1987.)
Scholarships and Prizes, Bursaries and Financial Aid
Scholarships and Prizes, Bursaries and Financial Aid

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

Students requiring information regarding the awards listed below or any other information regarding financial aid are invited to contact the Student Awards Office, Needles Hall, University of Waterloo. Unless otherwise stated, no application is required for the awards listed below.

Regulations Governing University of Waterloo Undergraduate Scholarships

1. The first charge against any scholarship payment will be for tuition and fees.
2. If no qualified applicant is found for a particular award in any year, the University reserves the right to withhold the award.
3. Awards based on donations from outside sources cannot be guaranteed by the University and can be forwarded only after the funds have been received from the donor.
4. If a student withdraws or otherwise fails to complete the term(s) covered by a scholarship, the scholarship may be pro-rated.

University of Waterloo Entrance Scholarships

The University awards a substantial number of entrance scholarships to entering students. With the exception of special awards for students from Waterloo County secondary schools, these scholarships are awarded on the basis of the Faculty to which the student is seeking admission.

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

Chemistry Scholarships
Students must write the CHEM 13 NEWS Competition.

Mathematics
Students must write the Descartes Mathematics Competition.

Physics
Students must write the Sir Isaac Newton Physics Competition.

Engineering
Students must write at least 1 of the above and are strongly encouraged to write all 3.

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

ARTS FACULTY SCHOLARSHIPS

The Faculty of Arts is offering several entrance scholarships in recognition of academic excellence. Entrance scholarships, awarded on the basis of secondary school performance, have values ranging from one-year $1000 awards to two-year $2000 awards of which $1200 is allocated for first year and an additional $800 for second year, if the student maintains an A average. The Faculty also offers numerous Arts Scholar Awards valued at $100.

Federal-Provincial Conference Simulation Entrance Award

One award valued at $100 will be made annually by the Political Science Department to a student entering the first year of full-time studies at the University of Waterloo who has been a participant in the annual Federal-Provincial Conference Simulation sponsored by the Department and the History Heads Council of the Waterloo County Board of Education.

J. Sayer Minas Entrance Scholarship

The award, valued at $1500 in the first year and renewable at $1200 for 3 years, if the student maintains an A average, to a possible total value of $5100, is given to the most outstanding student entering first year in the Faculty of Arts.

Mary Rosenthal Entrance Scholarship

One scholarship, valued at $300 will be presented to a top student from Wellington County entering the Faculty of Arts.

ENGINEERING FACULTY ENTRANCE SCHOLARSHIPS

The Faculty of Engineering offers 3 types of scholarships: (1) a large number of one-term tuition awards (2) a small number of one or two year awards each with a total value of $1100 to $2900 (3) 1 or 2 awards valued at $2000 for Year 1 and renewable for Years 2, 3 and 4 each having a total value of $4200. A term average of 80% is required for renewal of entrance scholarships. Scholarships are awarded on the basis of Grade 13 average, the results of the CHEM 13 NEWS Competition, Sir Isaac Newton Physics Competition and Descartes Mathematics Competition, and information supplied on the Personal Information...
Form for Applicants. Students are strongly encouraged to write all three of the Chemistry, Physics and Mathematics Contests, but must write at least one.

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

**Association of Professional Engineers Entrance Award**
The Association of Professional Engineers of the Province of Ontario provides a $750 entrance award to an outstanding student who is entering an accredited engineering program at the University of Waterloo.

**Dr. Sidney Blair Scholarship in Geological Engineering**
Dr. Sidney Blair was a prominent Canadian geologist who was awarded an honorary degree from the University of Waterloo. Through a donation from his estate, the Alumni Association is offering an entrance scholarship of $1200 renewable for 3 years to a total value of $4800 if the student maintains a term average of 80%. The award will be made as funds permit to an outstanding student entering Geological Engineering.

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

**Hilliker Engineering Entrance Award**
One award of $500 will be given to an outstanding student entering the Faculty of Engineering from Annandale High School or Glendale High School, Tillsonburg, Ontario. Preference will be given to students entering Systems Design.

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

**ENVIRONMENTAL STUDIES FACULTY SCHOLARSHIPS**
Awards are available in varying amounts for 1 year. All students with a Grade 13 average of 85% or better are considered.

**Architecture**
Awards are offered on the basis of an interview, a written précis and academic standing.

**Scholarships and Prizes, Bursaries and Financial Aid**
**University of Waterloo Entrance Scholarships**

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

**Man-Environment**
Awards are offered on the basis of comments on the supplementary information form and academic standing.

**Planning**
Awards are offered on the basis of a personal interview and academic standing.

**HUMAN KINETICS AND LEISURE STUDIES FACULTY SCHOLARSHIPS**
Awards are available in varying amounts for 1 year. All students with a Grade 13 average of 85% or better are considered.

**MATHEMATICS FACULTY SCHOLARSHIPS**
René Descartes Scholarships, Fellowships and Bursaries
Entrance awards in varying amounts are offered through the Faculty of Mathematics to first-year students enrolled in that Faculty and showing the University of Waterloo as their first choice on the application for admission to the University. In order to be eligible, a student must write the Descartes Mathematics Competition and submit the applicant supplementary information form.

**K. D. Fryer Entrance Scholarship**
This award is given in recognition of an incoming freshman student's excellent high school record and a sustained superb performance on the Math contests (including the Descartes Contest) as conducted by the Canadian Math Competition Office of the Faculty of Mathematics. The recipient will also have demonstrated an interest in extracurricular activities, such as student government or sports, or a devotion to the development of additional talents in music or the arts. The student will receive a $9,000 scholarship in support of an entire undergraduate Math program at Waterloo.

**SCIENCE FACULTY SCHOLARSHIPS**
A limited number of entrance scholarships may be awarded to students entering General Science.

**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 1 year at a time and are valued at $500 for 1 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 a competition held in April.
Chemistry Scholarships
Scholarships in varying amounts are awarded to students entering first-year Chemistry.

Sir Isaac Newton Scholarships
The Department of Physics awards Sir Isaac Newton (SIN) Scholarships to recognize and encourage academic excellence in students proceeding towards an Honours Physics degree. The awards are made mainly on the basis of the SIN Physics Competition, written in secondary schools early in May. The awards are valued at $1200 for Year 1. Satisfactory academic performance leads automatically to SIN Assistantships in upper years. These carry a stipend of $700 and involve a minor academic or research project within the Department. In addition, SIN Assistants may also win upper year SIN Scholarships described later, so the total value could approach $7000. (These scholarships may be limited by other major concurrent awards held by the recipient.)

UNIVERSITY OF WATERLOO — WATERLOO COUNTY ENTRANCE SCHOLARSHIPS
One Entrance Scholarship per school is awarded to an outstanding student entering the University from a Waterloo County Secondary School. A small number of two-year Special Entrance Scholarships may also be awarded with eligibility for the second year being dependent on the student maintaining an average of 80%.

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

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

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

UNIVERSITY OF WATERLOO ALUMNI ASSOCIATION SCHOLARSHIPS
Entrance scholarships with a maximum value of $4800 of which $1200 is allocated in the first year and $1200 may be allocated in each of 3 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.

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

University of Waterloo Upper Year Scholarships

ARTS FACULTY SCHOLARSHIPS
Upper year scholarships valued at $800 are awarded on the basis of the previous year's standing. Part-time students may be eligible for awards of $100 after completing at least 10 half credits at UW.

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

Undergraduate Research Assistantships
These awards are valued at $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 - 4B terms. To be eligible, a student must apply at the beginning of the term and show an interest in a particular field. The Assistantship is made available through the professor pursuing research in that area.

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

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

HUMAN KINETICS AND LEISURE STUDIES FACULTY AND STAFF SCHOLARSHIPS
A limited number of upper year scholarships in varying amounts are made available each year. Scholarships are based on academic achievement in the previous year.

Lois Matthews Scholarship Program for Human Kinetics and Leisure Studies
These scholarships, valued at $600, are awarded annually to the student with the highest overall cumulative academic average at the completion of Year 2 in each of Honours Dance, Honours Health Studies, Honours Kinesiology and Honours Recreation.
MATHEMATICS FACULTY SCHOLARSHIPS

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

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

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

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

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

CHEM 13 NEWS Research Assistantships
The Department of Chemistry offers CHEM 13 NEWS Research Assistantships to recognize academic excellence in students proceeding to a degree in Chemistry. The awards are made for 1 year at a time and are valued at $500 for 1 year. Award holders are required to work with a professor or his research group within the Department. Awards to students entering upper years are based on the previous year’s academic performance.

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

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

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

Sir Isaac Newton Scholarships
SIN Scholarships are awarded annually to the top 4 students entering each of second, third, and fourth years in Honours Physics, both Regular and Co-op. Values are $750, $600, $450, $300 in each year. (These scholarships may be subject to the condition that no other scholarships are held concurrently).

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

Aetna Canada Award
Two scholarships of $500 each will be awarded to the outstanding students in the second year of the Actuarial Science program. Applications should be submitted during the 1B term.

Alberta Optometric Association Scholarships
The Alberta Optometric Association presents 2 scholarships in the amount of $500 to each of 2 students admitted to the first professional year of the School of Optometry. These are awarded on the basis of academic achievement to students who are residents of Alberta.

Allergan Research Scholarship
The Allergan Research Scholarship will be awarded to a student entering the third professional year of the Optometry program who has demonstrated academic excellence in physiological optics and who wishes to undertake research in this field during the summer. The candidate for this award will be selected by the graduate committee of the School of Optometry.

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

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

Arts Associate Dean’s Undergraduate Prize
The award is presented in the Faculty of Arts student with the highest overall average in courses taken at the University of Waterloo. The recipient must be in good standing, have completed Year 2 and be continuing in a Year 3 or Year 4 full-time undergraduate degree program.
Association of Professional Engineers Gold Medal for Academic Achievement Award
The Association of Professional Engineers of the Province of Ontario makes this award to the student in the fourth year of an accredited Engineering program who, having received honours, has obtained the highest standing in the final examinations of the current academic year.

Association of Professional Engineers Undergraduate Scholarship
The Association of Professional Engineers of the Province of Ontario offers 3 annual scholarships of $375, 1 to the student in each of the first, second and third years in an accredited Engineering program who has the highest average in the examinations for that year.

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

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

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

The George Barnard Statistics Prize
This prize is awarded once each year to a student completing third-year studies, and who has taken STAT 331, STAT 333, and at least 1 other third or fourth year Statistics course. It goes to the student deemed by the Statistics and Actuarial Science Department to have obtained the best results in these courses. The prize consists of 1 or more books in probability and statistics.

Barnes-Hind Student Recognition Award
This award for $500 is to be given to a graduating student from the School of Optometry, demonstrating academic and clinical expertise in the area of contact lenses.

Scholarships and Prizes, Bursaries and Financial Aid
Undergraduate Scholarships

Bausch and Lomb, Soflens Division Outstanding Achievement Awards
Total value of these awards is $1000. 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 Optometry student.

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

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

Bell Canada Scholarship
The value of these awards is tuition for the final undergraduate year plus an offer of work-term employment with Bell Canada, although acceptance of employment is not a condition of the award. The awards are available to third year Engineering or Computer Science students who rank in the top half of their class, have an interest in telecommunications or related fields and have been involved in on-campus or community activities. Applications should be submitted during the 2B term.

J.P. Bickell Foundation Scholarships
The Trustees of the J.P. Bickell Foundation provide a number of J.P. Bickell Foundation scholarships to be awarded to qualified students in the Chemical Engineering Department and the Earth Sciences Department in any of the second, third or fourth years of the program. To be eligible for 1 of these scholarships a student must obtain a minimum average of 75% in the previous term’s or year’s examinations.

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

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

Canadian Association of Geographers Prize
A prize is awarded annually for academic proficiency to a graduating student in a 4-year Geography program.

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

Canadian Ophthalmic Laboratories' and Suppliers' Prizes
The Canadian Ophthalmic Laboratories and Suppliers provide funds to award the following prizes. Since the amount in the fund varies from year to year, they will be awarded in sequence until the fund is exhausted each year.

1. Three General Proficiency Prizes (value $250 each) awarded to the student in the School of Optometry standing highest in General Proficiency in each of the first, second and third years.
2. Three General Proficiency Prizes (value $200 each) awarded to the student in the School of Optometry standing second highest in General Proficiency in each of the first, second and third years.
3. Two awards to final year students of academic excellence or proficiency in specified subjects.
4. In addition to the above, prizes are awarded for highest academic standing in certain second, third and fourth year subjects as funds allow.

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

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

Centennial Optical Scholarships
The Centennial Optical Company offers 2 scholarships in the amount of $250 to each of 2 students admitted to the first professional year of the School of Optometry. These awards are made on the basis of academic achievement. Recommendations for these awards are made by the Scholarship Committee of the School of Optometry.

Central Optical Award
An award of $1500 will be given to 2 or 3 final year optometry students who have achieved excellence in their special studies.

Certified General Accountants Association of Ontario Award for Excellence
An annual award of $1000 composed of a cash award of $150 plus a credit of $850 to be drawn down as and when the successful candidate wishes, for the purpose of defraying any fees related to courses in the CGA study program. The award will be made to an outstanding graduating student who has displayed achievement in accounting. Applications should be submitted during fourth year.

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

Dr. John H. Chapman Memorial Prize in Communications Engineering
A prize of $1500 has been donated by Spar Aerospace Limited, Toronto in memory of the late Dr. John H. Chapman whose work and contributions in satellite communications resulted in his becoming known as "the father of the Canadian space program." The prize will be awarded to the fourth-year student with the highest academic standing in the Electrical Engineering Communications Option.

Chemical Institute of Canada Prize
Two awards, 1 each to a Chemistry and a Chemical Engineering student, are made annually by the Institute. The awards, consisting of an engraved medal and a Certificate of Merit, are given to the student with the highest academic standing in the penultimate year of either course.

Chevron Canada Resources Limited Scholarship
Two awards of $1000 will be awarded to outstanding undergraduate students entering the final year in Engineering. One award of $1000 will be awarded to an outstanding undergraduate student entering third year Earth Sciences. Preference will be given to students who have displayed an indicated interest in
the field of petroleum. Scholarships are not awarded on the basis of academic excellence alone; other factors such as personality, initiative, community involvement, will also be considered. Applications from Earth Science students should be submitted during the 2B term. Applications from Engineering students should be submitted during the 3B term.

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

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

Classical Studies Essay Prize
The Classical Studies Essay Prize of $75 will be awarded every September to the student who, in the opinion of faculty, has submitted the best essay in any course offered by the Department in the previous academic year.

Classical Studies Scholarship
An award of up to $500 will be provided annually to an outstanding upper-year student registered in a major or honours program in the Department of Classical Studies.

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

COM DEV Microwave Prize
One award of $1000 will be given to a student graduating from Electrical Engineering who has shown outstanding performance in microwave courses and other microwave area activities.

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

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

Scholarships and Prizes, Bursaries and Financial Aid
Undergraduate Scholarships

E.T. Davies Memorial Prizes
In memory of the late Professor E.T. Davies, his colleagues in the Applied Mathematics Department offer annually 2 prizes of the approximate value of $150 each. One prize is for a first year student, enrolled in Applied Mathematics. The other prize is for the third year Applied Mathematics student who ranks first on the final examinations.

John Deere Limited Scholarship
An award valued at $1000 is available to an outstanding student entering fourth year Mechanical Engineering who has an interest in manufacturing and/or product design. Applications should be submitted during the 3B term.

Charles E. DeLeuw Transportation Scholarship
The DeLeuw Cather and Company of Canada Limited, in memory of the company's founder, is making an annual award available to a fourth year Civil Engineering student with the transportation option. The award is in the amount of $500 and will be given to the student showing high academic achievement, good character, and financial need. Applications should be submitted during the 4B term.

Digital Equipment of Canada Ltd. Award of Merit
A certificate and a cash award of $200 will be presented each year to an outstanding third year student in Computer Science or Electrical Engineering.

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

Randy Duxbury Memorial Award
The $800 award is allocated to a student in third year Chemical Engineering who has a good academic record, has demonstrated a strong interest in extracurricular activities and athletics and has evidence of leadership qualities. Applications should be submitted during the 3B term.

J.W. Dyck Honours Scholarship
An annual award of approximately $1,000 will be provided to a student entering the second year of a German and/or Russian program. Interested students should apply to the Department of Germanic and Slavic Languages and Literature during the Winter term of their first year.
Scholarships and Prizes, Bursaries and Financial Aid
Undergraduate Scholarships

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Eaton Foundation Scholarship
Two scholarships of $2500 each will be awarded to 2 students entering fourth year Computer Science Information Systems Option. The decision will be based on performance in specific Information Systems Option courses along with work-term performances and work-term report evaluations. Applications should be submitted during the 3B term.

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

Electrohome 75th Anniversary Scholarship
Established by the Victor Company of Japan Ltd. and Kanematsu-Gosho Ltd. in recognition of the 75th Anniversary of Electrohome Ltd., 1 scholarship of $1500 will be awarded to an outstanding undergraduate entering the final year of Computer Science. The award will be based on academic performance in several Computer Science courses. Applications should be submitted during the third year or 3B term.

Elgin County Scholarship
Elgin County offers 2 scholarships of $200 each to the 2 students from Elgin County attaining the highest academic standing.

English Language Proficiency Prize
Several prizes of $100 each are awarded to students from all Faculties who achieve the highest scores on the English Language Proficiency test.

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

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

L. Fejer Award in Mathematics
The Scholarship will not exceed $3200 per annum and may be awarded wholly or in part to 1 or more graduate students or senior undergraduate students enrolled in the Faculty of Mathematics and proceeding to a degree at the University of Waterloo.

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

Scott Kelsey Fevreau Memorial Award
A $600 award has been established in memory of Scott Kelsey Fevreau, a first-year Mathematics student. The award is to be presented to a second-year Honours Co-op Mathematics student, based on high academic achievement, extra curricular activities and personal characteristics.

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

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.

Sandford Fleming Medal for Academic Achievement
The Sandford Fleming Foundation has established 6 medals for graduating students, 1 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 6 academic terms of the undergraduate program.

Sandford Fleming Medal for Co-operative Program Proficiency
The Sandford Fleming Foundation has established 5 medals for graduating students, 1 in each of the Engineering programs: Chemical, Civil, Electrical and Mechanical and Systems Design. In each Department the award is made for outstanding overall performance in both the work-term experience and the academic program of Co-operative Engineering education. The nominees are selected jointly by the Academic Faculty and the Department of Co-ordination.

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.
General Motors of Canada Limited Co-operative Student Awards
Up to 5 new awards per term will be offered to cover tuition and an allowance for books and materials. All Co-op students who have successfully completed at least 2 work terms with GM are eligible to apply. Selection of recipients will be based on work-term performance evaluations, university marks, work-report evaluations, interest in continuing Co-op employment with GM and in becoming a permanent GM employee, extra-curricular activities, and an interview. Interested Co-op students should apply to the Co-operative Education Co-ordinator at any GM plant location during their second work term at GM.

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

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

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

Don Hayes Award
This award is given annually to a deserving undergraduate student who has a minimum B average and is involved in or contributes to athletics or the sports training function in the University or the community. Letters of recommendation and the application should be forwarded to the Student Awards Office by October 15.

Percy Hermant Centennial Bursary Scholarships
These awards are the gift of Sydney Hermant. The Bursary Scholarships are awarded on the basis of financial need and academic achievement in first year General Science at any Canadian University to a student who is proceeding into Year 1, School of Optometry. Six scholarships are available, each of a total possible value of $2000, being $500 per year over the 4 professional years (Years 1, 2, 3, and 4) provided a satisfactory standing is maintained. One scholarship is awarded to a student who is a resident of 1 of the Maritime provinces; 2 scholarships are awarded to students who are residents of Ontario; 3 scholarships are awarded to 3 students who are residents of the Western provinces. The various Provincial Optometrical Associations are consulted in awarding these Bursary scholarships. Applications should be submitted to the Student Awards Office before September 15 of each year.

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

Hewlett-Packard (Canada) Limited Award
Two awards of calculators will be made annually. The calculators will be awarded to the top student entering the final year of the Electrical Engineering and Computer Science programs.

Lynn Holmes Memorial Award
An award of $450 is presented annually to a Fine Arts student who has completed with distinction 3 years of studio work and elects to continue in the fourth year of the Honours program.

Huron County Scholarships
Huron County Council is offering two $200 Scholarships to be awarded to the male and female from Huron county who obtain the highest standing regardless of the year in which he or she is registered.

Institution of Production Engineers Canadian Council Award
This prize consists of a book and a one-year membership in the institution. It is awarded annually to the best all-round fourth-year student in the production and manufacturing option of Mechanical Engineering, based on academic standing and involvement in student affairs. The award was established in memory of Stan Thurgar and all the members of the Institution who have conscientiously worked for the good of Canadian industry.

K-W Optical Company Limited Awards
Awards are made to the 2 students in each of the second, third and fourth professional years in Optometry who have shown the greatest improvement in academic standing. In the fourth professional year, the awards are for $250 and $200. In the other years the awards are for $200 and $150.
Scholarships and Prizes, Bursaries and Financial Aid
Undergraduate Scholarships

Bruce Wyler Kelly Memorial Prizes
Two prizes are awarded to the 2 Science students with the highest standing at the end of Year 2. One prize is to be awarded to a student in regular or Co-op Honours Biology and Chemistry and 1 prize to a student in Co-op Honours Biology.

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

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

James D. Leslie Prize
This prize was established to recognize the contribution of Prof. J.D. Leslie the first director of the Correspondence program. It is awarded to the graduating student with the highest average who has completed at least 50% of his or her credits through the University of Waterloo Correspondence program.

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

RJR-Macdonald Accounting Excellence Scholarship
This scholarship, valued at $4,000, is awarded annually to the student pursuing the Masters of Accounting program who is judged to be the outstanding member of the graduating class in Honours Accountancy Studies, based on excellence in academic performance and demonstrated leadership. The scholarship is paid to the student in two equal instalments during the first two terms of the Master of Accounting program.

MacDonald Dettwiler and Associates Ltd. Scholarship
Two awards of $1000 each to students in Computer Science and Electrical Engineering who are entering fourth year and who have displayed high academic standing and leadership abilities through involvement in department or student society activities. Applications should be submitted during the 3B term.

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

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

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

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

J.C. McKegney Memorial Fund
Two awards are given to the third or fourth year students in the Faculty of Arts who have shown outstanding academic performance and/or extra curricular interests in the Hispanic Area: 1 in Peninsular Spanish Studies and 1 in Spanish American Studies. Applications should be submitted no later than February.

Harry McLeod Co-op Chemistry Scholarship
A scholarship is normally awarded annually to a high-ranking student entering Year 4 of the Co-op Chemistry program, selected on the basis of academic performance in 3A and 3B terms. No application is necessary.

Mediacom Inc. Scholarship
An annual scholarship of $350 is awarded to a third or fourth year student in Urban and Regional Planning based on high academic standing and an interest in planning.

Jerome T. Miller Memorial Prize
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
program which combines studies in Chemistry and Physics.

**W.I. Miller Scholarship**
The W.I. Miller scholarship, worth $1500, is awarded annually to a fourth-year student in the Mathematics Co-op Teaching Program who has demonstrated academic excellence and who has also displayed, during co-op teaching terms, the promise of leadership in mathematics teaching.

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

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

**OIRCA Award**
A sum of $500 is provided by the Ontario Industrial Roofing Contractors Association annually. This is awarded to the winner of an architectural competition open to all students in the School of Architecture. Selection of the winner is made by 4 judges, 2 of which are invited external experts.

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

**Ontario Association of Architects Second Year Award**
The award of $1000 is based on studio performance in second year and overall performance up to the second year.

**Ontario Association of Architects Third Year Award**
An award of $1000 is based on studio performance in third year and overall performance up to third year.

**Ontario Rubber Group/Rubber Chemistry Division, CIC Award**
The Ontario Rubber Group and the Rubber Chemistry Division of the Chemical Institute of Canada have made available two $300 awards. The recipients must be in either Engineering or Science, have demonstrated interest in the rubber industry and have high academic standing. Consideration will also be given to experience gained in work terms in a rubber related field. Applications should be submitted during the 3B term.

**Paradine Canada Ltd. Award**
One award of $1000 is available to a student entering third year Electrical Engineering and who has demonstrated strong academic performance. Preference will be given to students who have demonstrated interest in the development of computer communications equipment. Applications should be submitted during the 2B term.

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

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

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

**Procter & Gamble Engineering Award**
Two annual awards of $500 each are available to third-year Engineering students who have demonstrated active participation in the Engineering Society and who have achieved an average of 70% or better in Year 2 and in the first term of Year 3. One award will be made to each stream. Applications are available from the Engineering Society or from the Student Awards Office and should be submitted in September by applicants in the A stream and in January by those in the B stream.

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

**G.E. Reaman Scholarship**
A scholarship valued at $300 is offered each year to a third or fourth year student for study and research in the social history of Upper Canada, from the earliest
time to 1818. The award will be made by the Department of History on the basis of a formal Research Paper prepared by the candidate.

Recreationists’ Association of West Central Ontario

One award valued at $100 will be presented to a third-year Recreation student based on exceptional performance on field placement, volunteer work, and involvement in school activities. A minimum overall average of ‘B’ will also be required. In addition to the cash award a 1-year free membership in RAWCO and a commemorative plaque will also be awarded. Applications should be submitted during the 2B term.

Glyn Reesor Prize

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

Richard B. Rodgers Memorial Prize

This book prize was established with funds contributed by relatives and friends in memory of the late Richard B. Rodgers, B.E.S. ‘71 (Geography). The book is to be awarded each year, on the basis of marks, to a Geography student completing the third year of study.

Royal Architectural Institute of Canada Medal

The medal is awarded to a graduating student on the basis of high proficiency in the BArch program.

Saskatchewan Optometric Association Scholarships

The Saskatchewan Optometric Association presents 2 scholarships of $500 to each of 2 students admitted to the first professional year of the School of Optometry. These awards are made to students who are residents of Saskatchewan. They are awarded on the basis of academic achievement.

Marj Schaefer Prize in Architecture

An annual award to an Architectural student who has been elected to serve on one of the School committees and who combines academic proficiency with a contribution to student affairs and student life in the School of Architecture.

Science Memorial Scholarships

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

| Alfred Babineau       | David Lamb           |
| Nicola Duthie         | Wade Mesher          |
| Anne Fiedtkou         | E.J. (Ted) Mulrooney  |
| Roman Guzowsky        | Robert G. Sommerville |

Smale Fellowship

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

Society of Chemical Industry Award

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

Spanish Book Prizes

In conjunction with the Spanish Embassy 4 books will be awarded annually to the most deserving students in Beginning, Intermediate, Honours and Correspondence Spanish.

Stearns-Catalytic Limited Scholarship

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

H.A. Stein Scholarship

A $500 scholarship will be awarded to a student who has demonstrated academic excellence in the Optometry program and who has applied and been accepted to spend a summer in Optometrical Research support.

Sun Life of Canada Award

This $500 award will be awarded to an outstanding student who is entering the third year of the Honours Actuarial Science program. Applications should be submitted during the 2B term.

Superlite Research Scholarship

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

J.C. Thompson Memorial Prize

The $125 Award of the Alumni Association in memory of the late Dean J.C. Thompson is made to the final year student in the School of Optometry who has ranked highest in Optometry (Optometry 242, 252, etc.).
Scholarships and Prizes, Bursaries and Financial Aid
Work-Term Report Awards

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

University of Waterloo Alumni Association Gold Medals
The University of Waterloo Alumni Association is providing a maximum of 6 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: 1 each to a student in each of the 6 Faculties of the University who has demonstrated outstanding academic performance on completion of an undergraduate degree program.

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 program (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.

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

Michael Wright Memorial Scholarship
$300 is awarded to an outstanding student in a course in Political Science. Established in 1975 in memory of Michael Wright by his mother and sister.

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

Work-Term Report Awards
All of the following are awards for work-term reports judged best for clarity, grammar and other communication skills. The technical content of the report is important but not a qualifying requirement. The awards are made each term and the winners will be determined by the Department of Co-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 or fourth year Electrical Engineering students.

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

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

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

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

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

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

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.

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

The Sir Casimir Stanislaus Gzowski Award for Work-Report Proficiency
This award, in the amount of $100 is presented to a Civil Engineering student in each of the 1B spring and 2A fall terms, provided in each case that the student is in good academic standing. It is given to the student who has submitted the best work report (graded 'Outstanding') in the class in the first work term. In the event that no student completes an 'Outstanding' work report, no award will be presented.

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

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

Kerr Addison Mines Limited Work-term Report Award
Three awards of $100 to second, third or fourth year Applied Geology students.

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

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

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

Northern Telecom Canada Ltd. Work-Term Report Award
Three awards of $100 to second, third or fourth year Electrical Engineering students.

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

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

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

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

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

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

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

Bursaries

Bursaries are awarded to first-time undergraduates experiencing financial difficulties and normally maintaining a B average. Students with Student Authorizations who have not been in Canada for more than 1 year will not normally be considered. Students in a Regular program should apply by January 30th. Co-op students may apply only in their B term. All bursaries are applied for on a common University of Waterloo application form, available from the Student Awards Office, unless otherwise stipulated.

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

BP Canada Bursary
Two bursaries of $500 are offered annually to 2 students enrolled in Earth Sciences, Engineering, Commerce or Economics at the University of Waterloo.

Bechtel Foundation of Canada Limited Bursary
Bechtel Canada Limited has made available 6 bursaries, each in the amount of $500 to be awarded to 6 students entering second year Engineering at the University of Waterloo. Each award will be disbursed in a manner that shall not serve to reduce the amount of any federal or provincial loan and/or grant to which any recipient may otherwise be eligible. Financial need and scholastic standing shall be criteria employed in determining award winners.

J.P. Bickell Foundation Bursaries
The Foundation makes available a sum of money to be used in providing bursary assistance to Chemical Engineering and Earth Science students of good academic standing who need financial assistance.
Scholarships and Prizes, Bursaries and Financial Aid

Bursaries

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

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

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

Canadian Federation of University Women-Kitchener-Waterloo Bursaries
The Canadian Federation of University Women has established a bursary fund at the University of Waterloo to assist 1 or more women studying full time 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. Mature women students meeting these requirements are encouraged to apply.

Canadian Federation of University Women — Kitchener-Waterloo Part-time Bursaries
A limited Bursary Fund has been established for mature women students studying on a part-time basis. Candidates must be pre-registered or registered in a degree program, have completed at least 2 half credits and working toward an undergraduate degree through part-time studies. An application form as well as an explanation regarding financial need must be submitted to the Student Awards Office prior to the month in which the study period begins.

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

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

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

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

Huron County Bursaries
Huron County Council has established a bursary fund at the University of Waterloo for students who attended high school in Huron County and whose home is in the County. The bursaries, offered annually, will be for an amount of $200 and will be awarded to full-time undergraduate students in any faculty of the University who have good academic records and who are in need of financial assistance to enable them to continue their studies.

I.O.D.E. — Tommy Atkins Chapter Bursary
A bursary valued at $150 is awarded annually to a needy full-time undergraduate whose permanent residence is in Kitchener or Waterloo.

Interprovincial Pipe Line Company Bursary
The Company provides $2000 for bursaries for students beyond the first year who are in need of financial assistance. At least 50% of the funds granted must go to students in Engineering. Preference will also be given to students whose normal residence is Canada or the USA.

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

Kitchener-Waterloo Community Foundation Bursary
A bursary of $350 may be awarded annually to a full-time student from the Kitchener and Waterloo area registered in an Arts or Music program.

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

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

The Minnesota Mining and Manufacturing of Canada Limited Bursaries
Two bursaries valued at $500 each, are awarded to students in either business or science related fields.

Mike Mosar 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 extracurricular activities. A bursary application plus a resume and letters of reference should be directed to the Associate Dean, Faculty of Human Kinetics and Leisure Studies. Application deadline is November 1.

A.C. Nielsen Company of Canada Ltd. Bursary
A.C. Nielsen Company of Canada Ltd. has made available 2 bursaries each in the amount of $500, to be awarded to 2 students entering second-year Computer Science at the University of Waterloo. The awards are presented on the basis of financial need and academic standing. Applications should be submitted during the 1st term.

Ontario Credit Union Charitable Foundation Bursary
One $250 bursary will be awarded annually to a 2nd, 3rd, or 4th year student in Business Management courses in Accounting, Economics or Management Studies.

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

A.F. (Tony) Pickard Memorial Award
An award has been established in memory of A.F. (Tony) Pickard, former research co-ordinator, Applied Analysis and Computer Science, at the University of Waterloo. The amount of the award will vary from year to year depending upon the capital investment income. Undergraduates enrolled in the Faculty of Mathematics who have an active interest in Computer Science and show academic promise combined with financial need may apply for this award.

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

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

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

Alan W. Shattuck Memorial Bursaries
Normally 2 bursaries of $400 to $500 are awarded annually on the basis of academic standing and financial need to students in fourth-year Civil Engineering. The funds were made available by associates of Mr. Shattuck in recognition of his contribution in both pollution and water control resources.

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

University of Waterloo Staff Association Bursary
The Staff Association of the University of Waterloo offers a bursary valued at $100 to dependent students of Staff Association members only. Students experiencing financial difficulties should apply.

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

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

The Awards Office administers a number of emergency loan funds which are intended to provide emergency assistance to students experiencing temporary, short-term financial problems. The funds are provided on an interest free basis for a stipulated period of time.

To be eligible for these loans, students must be in good standing and must demonstrate adequate repayment terms. Students wishing to obtain assistance from 1 of the following funds should apply to the Student Awards Office.

Alpay, Elligsen, Nicoll Memorial Loan Fund
This fund was established by the Sandford Fleming Foundation in memory of Robert Elligsen, a Masters graduate of the Department of Mechanical Engineering (1965) and Professors Alpay and Nicoll, Department of Mechanical Engineering, from funds contributed by faculty, staff and others. Emergency loans are made available to students in the Faculty of Engineering.

Alumni Association Student Assistance Plan
This loan fund has been instituted by the Alumni Association, University of Waterloo. Loans up to $200 with repayment periods of up to 4 months are available to students in all faculties.

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

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

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

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

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

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

Scholarships and Prizes, Bursaries and Financial Aid

Engineering Student Loan Fund
This fund was established by the Faculty of Engineering. Loans up to $200 for a period of up to 90 days are intended for Engineering students who have been faced with unexpected expenses during their academic term.

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

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

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 1 full year of academic study. Maximum loans are $200 with repayment terms extending up to 90 days.

Dorothy J. Guest Friendship Fund
Established by H.K.L.S. Alumnae and varsity athletes in recognition of the help and encouragement given to them by Dorothy J. Guest. Short-term loans of up to $300 for 100 days may be awarded to any female student in H.K.L.S. or female varsity athlete.

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

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

The Sandford Educational Press Loan Fund
This loan fund was established by the Sandford Educational Press to provide emergency short-term loans, interest-free, to Engineering undergraduate students during their academic terms or their work terms. The loans are normally for $100 or $200 for up to 90 days.
University of Waterloo Foreign Student Emergency Loan
Undergraduate foreign students in their final year of studies, encountering financial difficulties should arrange to speak with either the Foreign Student Officer or the Financial Aid Officer regarding assistance from this source.

University of Waterloo Loan Fund
Loans up to $300 for a maximum of 90 days are available to full-time undergraduate students experiencing short-term financial difficulty.

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

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

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

OSAP consists of the following 5 plans:

1. Under the Ontario Study Grant Plan, Ontario students may apply for non-repayable grant assistance without having to borrow money first.

2. The Canada Student Loans Plan provides assistance in the form of interest-free loans to students who wish to pursue post-secondary studies who are not eligible for any, or sufficient, grant assistance.

3. The Ontario Student Loans Plan makes interest-free loan assistance available to students whose needs are not fully met by the Ontario Study Grant Plan and the Canada Student Loans Plan.

4. The Ontario Special Bursary Plan provides assistance based on financial need to students taking 40% or less of a normal full course load. This Plan is intended for individuals who are unemployed, receiving social assistance, or have a low family income. A personal interview is normally required.

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

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

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

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

Students from provinces other than Ontario should approach the provincial assistance authority in their home provinces concerning the possibility of assistance from that source. Applications and/or addresses are available from the Student Awards Office, Needles Hall.
The Department of Co-ordination and Placement
This Department is responsible for the work-term aspect of all Co-operative programs. The staff includes professional personnel who have extensive business and industrial experience.

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

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

Operation of the Plan
Necessary arrangements for integrating work terms, securing potential employers, arranging interviews, and generally managing the employment process are the responsibilities of the 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. In some programs such as Engineering, Mathematics and Science, the class is split into 2 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 programs shown on the chart are single stream programs where no choice is available in Year 1. Variations may be requested due to academic or work situations in upper years. The dates for the beginning and end of academic terms are shown in the Academic Calendar. Precise start and finish dates for work terms are established in consultation with Co-operative employers.
Co-ordination and Placement

Work-Study Sequence

Note:
The letters A and B denote academic terms. W/T denotes work term.

Program (By Faculty)

Applies to:

<table>
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<tr>
<th>Term</th>
<th>1A</th>
<th>1B</th>
<th>2A</th>
<th>2B</th>
<th>3A</th>
<th>3B</th>
<th>4A</th>
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<td>1B</td>
<td>2A</td>
<td>W/T3</td>
<td>W/T2</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
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<td>2B</td>
<td>3A</td>
<td>4A</td>
<td>W/T5</td>
<td>4B</td>
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Economics (Applied)

Regular term
- 2A W/T1 2B W/T2 3A W/T3 3B W/T4 4A W/T5 4B

English

Regular term
- 2A W/T1 2B W/T2 3A W/T3 3B W/T4 4A W/T5 4B

 Anthropology, Political Science, Psychology, Sociology

Regular term
- Reg 2B W/T1 3A W/T2 3B W/T3 4A W/T4 4B

Engineering

Chemical, Civil, Computer Science, Electrical, Mechanical, Stream 6

Stream 4

Geological

Systems Design

Environmental Studies

Architecture

Geography

Man-Environment Studies

Urban and Regional Planning

Human Kinetics and Leisure Studies

Health Studies, Kinetics, Recreation and Leisure Studies

Mathematics


Stream 6

Stream 4


Math/Chartered Accountancy

Math/Management Accounting

Math Teaching Option

Science

Biology, Biochemistry, Applied Chemistry, Stream 6

Stream 4

Applied Earth Sciences

Applied Physics, Stream 6

Stream 4

* This 4-month term is spent at University of Western Ontario. Although the Co-op program begins in 2A, admission is made to the program at the time of the initiation application to the University.

** Faculty of Education, London.

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

- Teaching work term.

* Admission occurs by January for the 2B term.
Employment
Although every effort is made by the Department to find a sufficient number of work-term positions for students enrolled in all Co-op programs, no guarantee of employment can be made. The employment process is competitive, and academic performance, skills, motivation, maturity, attitude, and potential, will determine whether a student is offered a job. If a student is not placed by the interview process, the Department will attempt to find suitable work experience for that student.

Seeking Employment and Employer Interviews

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

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

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

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

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

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

Deleting Job Choices
The deletion of a job choice will be considered when the student consults with the appropriate Coordinator or Program Administrator. Failure to obtain the approval for a ranking deletion may result in the student being placed “On Own – University Imposed”.

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

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

Work Terms
Quantity
Upon entry to a Co-op program a student is expected to follow the work-term/academic-term sequence appropriate for that particular program. A student may, for one reason or another, fail to satisfactorily complete the full complement of work terms. For these students, and for students given advanced admission to a Co-op program, a certain minimum number of satisfactory work terms must be completed before graduation, namely, a number of work term/months equal to, or greater than, half the number of academic term/months in the program from the time the program begins. In those Faculties which offer both regular and co-operative programs, the minimum number of related work terms required for a co-operative degree is normally four. In those Faculties offering only the co-operative program, the minimum number of work
terms normally equals the number of work terms available and remaining to the student in the program from his/her point of entry.

Allowance can be made for personal considerations, educational opportunities, and other "On Own" conditions with prior approval from the Department of Co-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. The student should ensure that the employer has sent a completed evaluation to the University.

Academic Record for a Student Enrolled in a Co-operative Program
The Student Examination Report for the student's last academic term will be sent to the Co-operative student 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 to an employer will be recorded on the Co-operative Student Record as "Failed work term - refusal to honour previous agreement". Withdrawal from the program may also be required.

Leaving Employer Without Prior Approval
Terminating employment without prior approval from the Department of Co-ordination and Placement may result in the Co-operative Student Record having the notation "Failed work term - terminating employment without prior approval". Withdrawal from the program may also be required.

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

Dismissed With Cause
Dismissal of a student by an employer will be investigated by the student's Co-ordinator and will normally be recorded on the Co-operative Student Record as "Failed work term - dismissed with cause".

Commitment
A minimum of two consecutive work terms with an employer is expected. Provision is, however, allowed for such situations as one-term jobs and economic uncertainty. In all cases, failure to obtain approval from the appropriate Co-ordinator to not return for a second consecutive work term will normally be recorded on the Co-operative Student Record as "Failed work term - refused to honour previous agreement".

Unsatisfactory Performance
Unsatisfactory performance by a student on a work term is investigated by the student's Co-ordinator. If benefits from further professional training are questionable, the student may be required to withdraw from the program.

On Own
This condition, as recorded on the Co-operative Student Record, does not count towards the minimum requirements for graduation. This terminology is used to denote the following conditions:

- **On Own - Self Imposed:** The student has been granted a term off by the Department of Co-ordination and Placement for personal reasons. This condition may be changed on the student record should the student find suitable employment through his own efforts.

- **On Own - Unable to Find Suitable Employment:** The student was unable to obtain suitable employment through the normal placement process. If suitable employment is subsequently found, student records will be altered accordingly.

- **On Own - University Imposed:** This notation normally indicates that a student has not complied with a program regulation or procedure. Reasons for this notation include, but are not restricted to missing interviews without just cause, and failure to discuss deleting job rankings.

Change of Term Sequence
Term sequence changes are considered by the Faculty in which the student is enrolled. Application, in the form of a letter from the student (supported by an employer and/or a Co-ordinator) must be made to the appropriate Assistant Registrar. For some Faculties, an appropriate application form must be completed. Normally the request should be made within the first two weeks of the term preceding the switch point. In addition, the student's academic performance must be "in good standing". It should be noted that the student's academic program may be restricted due to lack of choice of core or elective subjects during particular terms.
Communication with the Department of Co-ordination and Placement

Each student is expected to maintain communication with the Department on all matters pertinent to participation in the Co-operative program. Consultation with the appropriate Co-ordinator, Program Administrator or Placement Advisor is essential where regulations and procedures for Co-operative programs are an issue. It is the student's responsibility to ensure that his/her student file is current and correct.

Standings and Appeals

Applicable to information on pages 5:4 and 5:5. The Department of Co-ordination and Placement which administers these Regulations and Procedures will first present any notation of "Failed Work Term", "On Own - University Imposed", or "Required to Withdraw" (as a result of unsatisfactory work-term performance) to the appropriate Faculty examinations, promotions or standing committee for a decision. The student is notified by letter of the final decision made by the committee. The decision may be appealed through the normal appeal channels within the Faculty.

Work Reports

Quantity

Normally the minimum number of satisfactory work reports required for graduation is four, the first one to be written during the first work term. Exceptions to this requirement are stated in the calendar or in the individual student's file. Employers, as well, may require additional reports from students as part of the job. Normally for a report to be considered it must have been written during the work term and be related to or evoked by the work-term activity.

Grading

Work reports are graded as "Outstanding", "Satisfactory", "Unsatisfactory" (resubmit) or "Unacceptable". Provision is made for students to upgrade "Unsatisfactory" work reports for re-evaluation by the beginning of the student's next academic term.

Content and Format

The University provides a common set of written guidelines for all Co-operative programs. Some faculties/departments also provide written addenda.

Confidentiality

In programs where a faculty member or a Co-ordinator normally evaluates the report, provision may be made for the appropriate Co-ordinator or employer to evaluate a confidential report. Some faculties/departments may provide more specific requirements in published addenda. Students should consult with their Co-ordinator or Program Administrator before writing a confidential work report.

Evaluator

Each program has a policy stating that work reports are evaluated and graded by either a faculty member, an employer, a Co-ordinator or some combination of these.

Receipt and Return

When the work report is to be evaluated by a faculty member or a Co-ordinator, the report is presented by the student to the Department of Co-ordination and Placement and a receipt is issued. Normally the report may be retrieved from the faculty/department responsible for the evaluation. Reports that are not picked up by the first week of the student's next academic term are destroyed. If the student is in a program where the employer evaluates and grades the report, a copy of the report must be turned in to the Department of Co-ordination and Placement at return-to-campus time. No copy is required if the report has been declared "confidential" by the employer.

Graduation Requirements for Co-operative Programs

WORK TERMS

Quantity

See p. 5:4.

Performance Evaluation:

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

In programs having no stated minimum, the required number of satisfactory work terms is one less than the number of work terms remaining in the program from point of entry, provided that the number of work terms available to the student is greater than five; otherwise all work terms must be satisfactory.

WORK REPORTS

Quantity and Grading

In most programs the submission of a minimum of four work reports graded "Satisfactory" or better is a requisite for graduation. Provision is usually made for students to upgrade unsatisfactory reports or submit new reports. Special arrangements may be considered for cases such as those for which there are less than four work terms available to the student, and other special situations which might arise.
Registration Through Final Term

All work terms must be completed before the final academic term and the last work report must be submitted no later than the beginning of the final academic term. In all Co-operative programs, students must be registered as full-time students in the program in all terms from point of entry through to the final academic term. The only exception occurs in programs on a credit system in which a student may have sufficient credits to be able to register as a part-time student in the final term.

Co-operative Degree Designation

Since Architecture and Engineering are mandatory Co-op programs, University of Waterloo graduates in those disciplines are known to have gone through the Co-operative system. In programs which can be taken on the Co-operative or Regular basis, graduates completing the Co-operative plan requirements will receive a “Co-operative” degree designation.

Waterloo Advisory Council

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

R. G. Taylor (President)
Telepanel Inc.

S. Gendron (Past President)
Inco Metals Co.

J. D. MacDonald (Vice-President)
Northern Telecom

P. A. McLagan (Secretary)
DMR and Associates

J. D. Miller (Public Relations Chairman)
Dow Chemical Canada Inc.

F. G. Brown (Membership Chairman)
IBM Canada Limited

A. Beaumont
Ministry of Government Services

D. W. Brown
Consultant for Air Canada

D. M. Caughey
CADENCE Computer Corporation

R. D. Colling
Petro Canada

G. E. Cooper
Noranda Exploration Company Limited (Retired)

S. H. Cornforth
Price Waterhouse

A. Edinborough
The Council for Business and the Arts in Canada

J. K. Hogan
Shell Canada Resources Limited

J. E. Hunt
Concord Scientific Corporation

W. I. Krenzinski
CP Rail

D. S. Layne
Toronto General Hospital

A. M. Levine
Allan Levine, Architect

R. T. Mahler
Amdahl Limited

K. D. Mills
Westinghouse Canada Inc.

P. B. Patterson
The Mercantile and General Reinsurance Company

H. G. Payne
Corporation of the City of Windsor

E. L. Pursey
Canadian Imperial Bank of Commerce

J. D. Reynolds
The Mutual Life Assurance Company of Canada

I. W. Scott
City of Mississauga

G. G. Stewart
Labatt Brewing Company

J. E. Urbanic
General Motors Canada Ltd.
Graduate Placement

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

Graduate Placement Co-ordinators
R. Mateyk, BASc (Toronto), PEng
F. M. Ruszer, BA, MSc (Guelph)

Graduate Placement Advisors
M. Bryan, BA (Waterloo)
D. Hudspeth

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

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

Each year, several hundred employers are invited to conduct on-campus interviews for all graduating students. Employers interested in hiring Co-operative graduates interview students during a three-week period in January. Students in Regular programs and graduate students participate in a two-week interview period in November-December and in the January interviewing period. Summer and part-time employment opportunities are also available for non Co-op students.

The Graduate Placement offices are located on the first floor of Ira G. Needles Hall.

Career Information Centre

The Career Information Centre contains material which assists students in self-assessment and career choice, resume and letter preparation, creative approaches to job searching and preparation for interviews. Employer information can be obtained from files and directories. Calendars and educational directories for Canada and abroad assist in exploring educational possibilities.

The Centre also has material to assist in planning travel, study and work abroad and a section on self-employment and alternative, non-traditional careers. A bulletin board on the first floor of Needles Hall contains summer jobs from October to April and part-time jobs year round. Hours are from 8:30 a.m. to 4:30 p.m., Monday through Friday.
The following is a list of employers who participated in Waterloo's Co-operative programs in 1985. The list does not acknowledge the many hundreds of individual departments within the organizations who participated.

Aart's Hair & Fitness Studio
Abitibi Price Inc.
Acuflex Industrial Hose Ltd.
Accograph Corporation
Accu Ray Corp.
Aeros International Limited
Adamson Associates
Adcom Electronics
Addiction Research Foundation
Adelaide Club
Adnet Information Systems
Adult Occupational Centre
Aea Electronic Ltd.
Aero Irrigation Limited
AES Data Inc.
AES Data Limited
Aetna Canada Excelsior Life Insurance Company
Agnew Peckham & Associates
Agriculture Canada
Agriculture Canada Harrow Research Station
Agriculture Canada London Research Centre
Agri Services Laboratory Inc.
Agulnik & Greenberg
Ainley & Associates Limited
Air Canada
Air Trac Inc.
Alair & Swanson
Ala-Kantti Associates
Leo Alarie Sons Ltd.
Albert College
Alcan Liée Société d'Électrolyse et de Chimie
Alcan Canada Products Limited
Alcan Smelters & Chemicals Ltd.
Alcan-Bradley Canada Ltd.
Allan A. Allen & Co.
Allinson-Ross Corp'n
Allstate Insurance Co.
Alphaneuclear Company
Argco Computer Corp.
Amadih Communications Inc.
American Can Canada Inc.
American Express Canada Inc.
American Motors (Canada) Inc.
Amoco Canada Petroleum Company Ltd.
Ampheng Canada Limited
Anchester Aquatic Centre C/O Town of Ancaster
Arthur Andersen & Company
Anglo-Gibraltar Insurance Group
H.H. Angus & Associates Ltd.
Annuity Life Insurance Co.
Antel Optronics Inc.
A Ont. Min. of Transportation & Communications
Apex Inc.
Apple Computer
Applewood Heights Secondary School
Aquescape Pool & Patio
Arch & McEvneue Chartered Accountants
Arco Architects Collaborative Inc.
Arco Architects Planners
Arco Associates
Ariss Construction
Armak Chemicals Ltd.
Armco Westell Inc.
Arrowcraft Corporation
Arrowhead Metals Limited
The Art Gallery at Harbourfront
Arvax Management Inc.
Asea Inc.
Associated Tube Industries Ltd.
Association of Municipal Clerks & Treasurers of Ontario
ASW Computer Systems Ltd.
Atlantic Films Limited
Atlantic Flight Research Inc.
Atlas Supply Company of Canada Ltd.
Atlas Distribution Centre
Atomic Energy of Canada
Ault Foods Ltd.
Automation Tooling Systems Inc.
Avery Label Systems
Babcock & Wilcox Canada
Bakelite Thermosets Limited
Baird & Franklin
Dr. Ballard's Pet Foods
Ball Forestry Service
Kenneth W. Ball & Company
Roy Ball Associates Ltd.
Bank of Canada
Bank of Montreal
Bank of Nova Scotia
Barbecon Inc.
Barber Hydraulic Turboine Ltd.
Subsidiary of Marsh Engineering
Barclays Bank of Canada
W. E. Barnett Architect
Barrie Public Utilities Commission
barton Tubes Limited
BASP Canada Inc.
Bata Limited
Baycar Steel Fabricating Ltd.
Baycrest Hospital
Bayley Engineering Ltd.
Bay Mills Midland Ltd.
Bayview Wildwood Resorts
BBM Bureau of Measurement
BCB Electronic Sales
Beaon & Wills
Beaver Engineering Ltd.
Beaver Lumber Company Limited
Bectis Associates Architect/Site Planner
Belanger Edwards & Sovran Chartered Accountants
Bell Canada
Belleville PUC
Bell-Northern Research
G. E. Bemi & Associates
Benjamin Thompson & Associates Inc.
Beminghammer Corp. Ltd.
Bernard & Associates Food Services Consultants
Beatek Micro Devices & Systems Inc.
Bethesda Home
Bic-Mutatech Inc.
Bird Archer Inc.
Bird Construction Company Limited
Birla Industries Inc.
Birnbaum Prenick Stoker Co.
Bishop's College School
Bishop Strachan School
Black & McDonald Ltd.
Blackstone Industrial Products Ltd.
G. R. Block Resource & Development
Blood Hughes Architects
Blooreview Childrens Hospital
Blue Mountain Resorts Limited
BMI Division of Canadian Medical Labs
H. Boehmer & Company
Boise Cascade Canada Ltd.
Borg-Warner (Canada) Ltd.
Borg Warner Chemicals
Borough of Scarborough Transportation Division
Bouris Wilson Scott & Proctor
Bramalea Limited
Branchton Camp
Branford PUC
Bregman & Hamann
Breithaupt Centre
Bretonwood Sales
Breslube Enterprises
Brian Engineering Limited
Karl Briestensky
Brisbin Brook Beynon
برتول-مایر کانادا لیمیتد
British Columbia Systems Corp.
Brookside School
Brouwer Turf Equipment Limited
Thomas E. Brown Architect
Brunton Browning Day & Partners
Budd Canada Inc.
Building Design Partnership
The Building Design
Building Products of Canada Ltd.
Bulcock Systems
Burgess Vibro-Acoustics Ltd.
R. V. Burgoyne
Burns Fry Ltd.
R. J. Burnside & Associates Ltd.
Burroughs Canada
Burlton Correctional Centre
Butler Metal Products Co. Ltd.
Butler Polymet
Bytes of Learning Inc.
Edmund Cachia & Co.
Cadence Computer Corporation
CAE Electronics Ltd.
Calar Home Products Limited
Caledon Laboratories
Cambridge International College
Camco Inc.
Campbell Resources Inc.
Camp Huronda
Camp Kandalore
Camp Oconto
Camp Robin Hood Ltd.
Camp Taylor
Camp Wahanowin
Camp Wanakita Hamilton YMCA Office
Camp White Pine
Canada Cement Lafarge Limited
Canada Employment & Immigration Commission
Canada Life Assurance Co.
Canada Packers Inc.
Canada Permanent Trust Company
Canada Post Corporation
Canada Packers Inc.
Co-ordination and Placement
Organizations Employing Co-operative Students
Hammond Manufacturing Co. Limited
Hanson (1984) Inc.
Harbourfront Corporation
Douglas Harvie Architect
Hargreaves & Beatty
Harley Little Associates Ltd.
Harris Media Systems Limited
Harris Title & Wasserman
Hart Chemical Ltd.
Hatch Associates Ltd.
Bev Hatch Industries Limited
Havergal College
Hay Associates Canada Limited
Hayes Dana Inc.
Health & Welfare Canada
H.J. Hertz Co. of Canada Ltd.
Helix Research
Hewlett Packard (Canada) Ltd.
Hexemer Associates
H.G. Engineering Limited
James F. Hickling
High Park Phynotherapy & Sports Medicine Clinic
Highway Product International Inc.
Hillfield-Strathallan College
C. M. Hincks Treatment Centre
Barry J. Hobin Architect
Home Hardware Stores Ltd.
Pain Division
Honeywell Limited
The Honeywell Centre
Hockey University Canada
Horseshoe Valley Resort
Horton Bail Walter Fedy McCargar
Hachborn
Hospital for Sick Children Research Development Corporation
Hotel Dieu Hospital
Houghton Millfin Canada Limited
Hovey Industries Ltd. Vehicle Systems Engineering
Howard Applied Research Limited
G. J. Hreni Architect
Hudson Bay Mining & Smelting Co. Ltd.
Hudson’s Bay Company
The Hugh MacMillan Medical Centre
Human Computing Resources
Humanmann inc.
Humber College of Applied Arts & Technology
Humerview School
Hume Publishing Limited
Humpage Taylor McDonald & Company
Huntac (70) Limited
Hurin County Health Unit
Huronia Regional Centre
Husky Injection Molding Systems Limited
Husky Oil Operations
Hyde Houghton & Company
Hydro Mississauga
IBM Canada Limited
Image Video Ltd.
impc Health Services Ltd.
Imperial Flavours
Imperial Oil Limited
Imperial Tobacco Limited
Inco Limited Occupational Health Dept.
The Independent Order of Foresters
Indian & Northern Affairs Canada
The Individual Education Centre
Inducon Consultants of Canada
Industrim Limited
Info Centre
Infomart
Inforntech Computing Inc.
Infotech Ltd.
Insurance Services
Integra Foundation
Intel Semiconductor of Canada Limited
Interactive Image Technologies Inc.
Intercon Security Ltd.
International Sintered Metals Inc.
International Verifict Inc.
Intertechnology Engineering Corp.
Intertech Remote Sensing Ltd.
Intresco
Irving Pulp & Paper Limited
ISS Equipment Ltd.
Istec Limited
ITL Circuits
ITL Research Corporation
ITT Canada Limited Business Communications
Jackson Ryder
James River-Marathon Ltd.
J. A. Turner Secondary School
Jay-Vee Canada
Jenkins & Associates
Jo-Ad Industries Limited
Barry Johns Architect Ltd.
Johnson & Higgins Willis Faber Ltd.
Johnson & Johnson
Johnson & Johnson
Johnson & Matthey Ltd.
D. W. Jolly Co. (1975) Ltd.
Jedd Jones
Jures & Kirkland Architects
Jung/Branenl Associates Inc.
William Kachmaryk
Kaufman Consulting
Kellogg Salada Canada Inc.
Kemp Ellis & Blair
Kemptville College of Agricultural Technology
Kenhar Products Inc.
Kentner Kelly & Wilson
Kerr Addison Mines Limited
Kerr Vayne Systems Ltd.
Kidd Creek Mines Ltd.
Kimberly-Clark of Canada Limited
Kime Ditchfield Mills & Dunlop
Kitchener Public Library
Kitchener Transit
Kitchener Waterloo Collegiate Vocational School
Kitchener-Waterloo Symphony Orchestra
Klein Taylor Goldsmith
Erdmann W. Knaack
Koeching Canada
Kohler Dickey & Edmundson
Kolatron
Korzire Indusries Ltd.
Kott-Warnke Inc. Contractors & Engineers
Kramer & Grebe Canada Ltd.
KTS Business Systems Inc.
KVA Communications & Electronics Co.
KWIP Technology Corp.
Kyles Garratt & Markievitz
Labatt Brewing Company Limited
Labour Surgical Ltd.
Laboet Inc.
Lackie Bros. Ltd.
Lakefield Dist. Secondary School
Lakehead University
Lake Ontario Steel Company Ltd.
Lakeside Lodge
Lalonde Giroard Letendre & Associates Ltd.
Lamb & Jorden Architects/Planners
Lanpar Technologies Inc.
Laser International Ltd.
Lalandeong Conveying Ltd
Laurier Life Insurance
Laventhal & Horwath
La-Z-Boy Canada Limited
Lea-Siegener Industries Ltd.
Boris A. Lebedinski Architect
Leeds-Grenville County Board of Education
Lee Martick & Associates Limited
Leigh Engineering & Aerospace Div.
Leitch Video Ltd.
Leman Group
Lever Detergents Limited
Alistair Levine Architect
LSS Data Processing Consultants Inc.
Li Architects Inc.
Joseph Liff Architect
Linamar Machine Ltd.
Lingwood Architect
The Linton Technology Group Ltd.
Lipton Wiseman Albaum & Partners
Liquid Transfer systems
Lithwick Johnston & Mox
Liton Systems Canada Ltd.
Livingston International Inc.
Loblaws Limited Central Information Services Div.
Locitle Canada Inc.
Loeb Inc.
Loreen Ondaatje McCutcheon & Co. Ltd.
LOF Glass of Canada Ltd.
Logo Computer Systems Inc.
London Life Insurance Company
London Psychiatric Hospital
London Rehabilitation Service
Long Manufacturing
Division Borg-Warner (Canada) Ltd.
Looking Glass Software
Loop Bailey & Associates
Lorne Park Secondary School
Lumonics Inc.
Lutheran Life Insurance Society of Canada
Lutron Electronics
Lynx Technology
MacDonald/Daytulk & Associates
Macgillivray & Co.
Andrew Machalski & Associates
A. F. Mclaren & Company
Maclaren Engineers Planners & Scientists Inc.
Maddett Haar & Partners
Magic Pantry Foods Inc.
Magic White (1973) Inc.
Majoratic Modern House Inc.
Malcolm & Boyko Architects
Management Board of Cabinet
Mandelbaum Rosenberg
Manitoba Mineral Resources Ltd.
Management Council Industrial Technology Centre
Manitoue Telephone Systems
Manufacturers Life
Markham District High School
Markham Racquet Club
Mark Musselman McIntyre Combe
Mar-Land Engineering Limited
Marshall Mackin Monaghan Ltd.
Marsh Engineering Ltd.
Vicar Marsh & Associates
B. H. Martin Consultants Ltd.
Massey Ferguson Industries Limited
Central Electronics Group.
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<td>Toronto Hydro Electric System</td>
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<td>Toppilt Lodge on Sparrow Lake</td>
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<td>Turrington Inc.</td>
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<td>Tossell &amp; Caughill Architect &amp; Consulting Engineer</td>
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<td>Totten Sima Hubicki</td>
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<td>Touche Ross &amp; Company</td>
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<td>Touche Hess &amp; Partners</td>
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<td>Towers Perrin Forster &amp; Crosby</td>
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<td>Townsend Stela Baleshia &amp; Nichols Architects</td>
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<td>Town of Dundas</td>
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<td>Town of Gravenhurst Planning Department</td>
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<td>Town of Halton Hills</td>
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<td>Town of Kincardine</td>
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<td>Town of Oakville</td>
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<td>Town of Orangeville Parks and Recreation</td>
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<td>Town of Pickering</td>
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<td>Town of Wasaga Beach</td>
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<tr>
<td>Township of Muskoka Lakes</td>
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<td>TPK Solar Systems Inc.</td>
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Co-ordination and Placement
Organizations Employing
Co-operative Students

Tracon Engineering Inc.
Trafalgar Castle School
Transcoanda Pipelines
Transport Canada
Trans-Tec Vehicles Inc.
Travelers Canada
Trench Electric Limited
Trent Rubber Services Limited
Trical Energy Systems Ltd.
Tridem Manufactured Products Inc.
Trow Ltd.
Truswa System Canada Limited
TRW Canada Ltd.
Tudor Walters Architects
Turner McCabe & Associates
Peter Turner
TV Ontario
Ultimate Aeronautics Limited
Unico Foods
Unifin Division of Keeprite Products Ltd.
Union Carbide Canada Limited
Union Gas Limited
Unroyal Limited
United Co-operatives of Ontario
United Way of Greater Toronto
United Way of Kitchener-Waterloo and Area
Unitron Industries Limited
University Hospital
University of Guelph
University of Notre Dame
Radiation Laboratory
University of Toronto
University of Waterloo
Watsun User Service
University of Western Ontario
The Upjohn Company of Canada, Upper Canada College
Upper Thames River Conservation Authority
Utah Mines Limited Exploration Dept.
Vaitkus Jamieson Architects Ltd.
Vathalla Inn Recreation and Fitness Centre
Valley Blades Ltd.
Valleyview Home for the Aged
Vanspar of Canada Ltd.
Coatings Division
Vanier Centre for Women

Varian Canada Ltd.
C.A. Ventin
Vericom Systems Ltd.
Vertigo Graphics Ltd.
Via Rail Canada Inc.
Vickers Manufacturing Co. Inc.
Viewstar Inc.
Vijoen Associates
Vins Plastics Limited
Volkswagen Canada
Wainman & Kydd
B.P. Walker Associates Ltd.
Walker Exhausts
Hiram Walker & Sons Limited
Walt Disney World
Watec satirnate
Walter Brothers Quarries
Walter Fedy McCargar Hachborn
Paul B. Walters & Associates Ltd.
Consulting Engineers
Wample Inc.
Wang Canada Limited
The Was Amputations of Canada
Key Tag Service
Wardair Canada (1975) Ltd
Ward Mallette
Watcom Products
Watcom Systems Inc.
Waterloo Arts Research Group
Waterloo County Board of Education
Waterloo Distance Education Inc.
Waterloo Metal Stampings Ltd.
Waterloo Microsystems Inc.
175 Columbia Street West
Waterloo Minor Baseball
University of Waterloo
Waterloo Regional Police
Waterloo Scientific Inc.
Weall & Cullen Nurseries
Weblen Enterprises of Canada
Canners Ltd.
L.R. Wechsler Ltd.
Gao A. Welch & Co.
Wellco Plastics
Wellesley Hospital
Wellington County Board of Education
Weilerman & Guy
Western Foundry Co. Ltd.
Western Ontario Breeders Inc.
Westervelt Business School
Westinghouse Canada Inc.
West Park Hospital
Wheel Chair Society
Whitby Hydro Commission
White Farm Manufacturing Canada Limited
Allen Wilcox Architect
Wildwood Conservation Authority
Wilkinson & Company
Witco Chemical Canada Limited
Woodbridge Foam Corp.
Wood Candy Inc.
Woodingford Lodge
Carson Woods
Woods Gordon
Woodstock General Hospital
Woodstock PUC
Wood & Woolen Architects
F.W. Woolworth Co. Ltd.
Workers' Compensation Board
Oleson Worland Architects
Worthington Pump Division
Dresser Industries Inc.
Wright Green & Dingfelder
The Wyatt Company
W.Z.M.H. Group Architects Ltd.
Xerox Canada Inc.
Xicom Technologies Corp.
Xios Systems Corporation
Omar Yeung Architect
YMCA Burlington
YMCA Cambridge
YMCA Collingwood District
YMCA Kitchener-Waterloo
Family Y Branch
YMCA North York Branch
YMCA of Metropolitan Toronto
YMCA Scarborough
YMCA Stratford
YM-YWCA London
York Central Association for the Mentally Retarded
York Central Association for the Mentally Retarded (YMCAR)
York County Hospital
Yorkie Rosenberg Mardall Architects & Planners
Yorkie Children's Centre
York Support Services Network
Yorkville Sound Ltd.
R.S. Zacks
Zepf Technology Inc.
Zochem Div. of Houston Bay Mining
3M Canada Inc.
The University Library

<table>
<thead>
<tr>
<th>Position</th>
<th>Name</th>
<th>Degree/Country</th>
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</thead>
<tbody>
<tr>
<td>University Librarian</td>
<td>M. C. Shepherd, BEd</td>
<td>Saskatchewan, MA (LS) (Denver)</td>
</tr>
<tr>
<td>Associate Librarian, Planning &amp; Systems</td>
<td>C. Frassey, AB</td>
<td>Hunter, MLS (Pratt)</td>
</tr>
<tr>
<td>Co-ordinator, Library Administrative Services</td>
<td>L. Beattie</td>
<td>Loyola of Montreal, MA (Waterloo)</td>
</tr>
<tr>
<td>Special Collections Librarian</td>
<td>S. Bellingham</td>
<td>Waterloo Lutheran, MLS (Western Ontario)</td>
</tr>
<tr>
<td>Librarian</td>
<td>J. Eadie</td>
<td>Queen’s, MLS (Western Ontario)</td>
</tr>
<tr>
<td>Business Administrator</td>
<td>J. Jorgensen, BA</td>
<td>Toronto</td>
</tr>
<tr>
<td>Co-ordinator, UW Publications Service</td>
<td>G. Smith</td>
<td>ARCT (Toronto), BA (McMaster)</td>
</tr>
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Collections Division

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<tr>
<th>Position</th>
<th>Name</th>
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<tbody>
<tr>
<td>Associate Librarian, Collections</td>
<td>C. D. Emery, BA</td>
<td>Durham, ALA</td>
</tr>
<tr>
<td>Head, Cataloguing Department</td>
<td>W. Oldfield</td>
<td>Waterloo Lutheran, MLS (Western Ontario)</td>
</tr>
<tr>
<td>Cataloguers (Catalogue Department)</td>
<td>H. Calogheridis</td>
<td>BA, MLS (McGill)</td>
</tr>
<tr>
<td></td>
<td>Y. Gordon</td>
<td>BA (Manitoba), BLS (Toronto)</td>
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<tr>
<td></td>
<td>L. Halford</td>
<td>BSc (York), MLS (Western Ontario)</td>
</tr>
<tr>
<td></td>
<td>R. Lamb</td>
<td>BA (Guelph), MLS (Western Ontario)</td>
</tr>
<tr>
<td></td>
<td>L. Teather</td>
<td>BA, MLS (British Columbia)</td>
</tr>
<tr>
<td></td>
<td>M. Wan</td>
<td>BSc (Hong Kong), BMath (Waterloo), MA, MLS (Western Ontario)</td>
</tr>
<tr>
<td>Head, Materials Acquisition Department</td>
<td>B. Bruder</td>
<td>Waterloo Lutheran</td>
</tr>
<tr>
<td>Cataloguers (Materials Acquisition Department)</td>
<td>T. Canini</td>
<td>BA, MA (Helsinki), MLS (Western Ontario)</td>
</tr>
<tr>
<td></td>
<td>J. Kuhn</td>
<td>BA, MA (Creighton), MLS (Western Ontario)</td>
</tr>
<tr>
<td>Co-ordinator, Collections Management</td>
<td>S. MacKinnon</td>
<td>BA (Mount Allison), BLS (McGill)</td>
</tr>
<tr>
<td>Collections Development Librarian</td>
<td>L. Leger</td>
<td>BSc (Toronto), MLS (Western Ontario)</td>
</tr>
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Public Services Division

<table>
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<tr>
<th>Position</th>
<th>Name</th>
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<tbody>
<tr>
<td>Associate Librarian, Public Services</td>
<td>B. MacNeil</td>
<td>BSc (Laurentian), MLS (McGill)</td>
</tr>
<tr>
<td>Co-ordinator, User Education</td>
<td>C. Draper</td>
<td>BA, MA, PhD, MLS (Western Ontario)</td>
</tr>
<tr>
<td>Co-ordinator, User Services</td>
<td>S. Routliffe</td>
<td>BA (Carleton), MLS (Western Ontario)</td>
</tr>
<tr>
<td>University Map Librarian</td>
<td>R. Pinnell</td>
<td>BSc (Toronto), MSc, MLS (Western Ontario)</td>
</tr>
<tr>
<td>Cataloguer (University Map and Design Library)</td>
<td>A. Chan</td>
<td>BA (Hong Kong), MLS (Western Ontario)</td>
</tr>
<tr>
<td>Co-ordinator, Information Services</td>
<td>L. Claxton</td>
<td>BA (Waterloo), BLS, MLS (Toronto)</td>
</tr>
<tr>
<td>Head, Arts Reference &amp; Collections Development</td>
<td>T. Eadie</td>
<td>BA (Queen’s), MLS (Western Ontario)</td>
</tr>
<tr>
<td>Reference &amp; Collections Development Librarians</td>
<td>M. Aquan-Yuen</td>
<td>BA, MLS (Toronto), MA (Waterloo)</td>
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<tr>
<td></td>
<td>J. Begio</td>
<td>BA (Waterloo Lutheran), BA (Waterloo), MA, MLS (Toronto)</td>
</tr>
<tr>
<td></td>
<td>D. Binkley</td>
<td>BA (Toronto), MLS (Western Ontario)</td>
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<tr>
<td></td>
<td>M. Block</td>
<td>BA (Waterloo), MLS (Western Ontario)</td>
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<tr>
<td></td>
<td>R. Cruz</td>
<td>BA (Ceylon), BLS (Toronto), MA (Waterloo)</td>
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<td></td>
<td>D. Fitzpatrick</td>
<td>BA, MA (Windsor), MLS (Toronto)</td>
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<tr>
<td></td>
<td>A. Lakos</td>
<td>BA (Jerusalem), MLS (British Columbia)</td>
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<tr>
<td></td>
<td>G. Man</td>
<td>BSc (Wisconsin-Oshkosh), MLS (Toronto)</td>
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<tr>
<td></td>
<td>S. Moekel</td>
<td>BSc, (Wisconsin-Madison), MLS (Western Ontario)</td>
</tr>
<tr>
<td>Head, EMS Reference &amp; Collections Development</td>
<td>L. Claxton, Acting Head</td>
<td>BA (Waterloo), BLS, MLS (Toronto)</td>
</tr>
<tr>
<td>Reference &amp; Collections Development Librarians</td>
<td>J. Cummings</td>
<td>AB, MLS (California, Berkeley)</td>
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<td>D. Harding</td>
<td>BSc (Guelph), MLS (Western Ontario)</td>
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<td>K. Kuklis</td>
<td>BSc (Guelph), BEd (Toronto), MLS (McGill)</td>
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<td>J. MacDonald</td>
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<td>W. Macpherson</td>
<td>BSc, MLS (Dalhousie)</td>
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<td>J. Parrott</td>
<td>BSc (Queen’s), MSc, BLS (Toronto)</td>
</tr>
<tr>
<td>Co-ordinator, Industrial and Business Information Service</td>
<td>F. Abrams</td>
<td>BA (Sir George Williams), MLS (McGill)</td>
</tr>
<tr>
<td>Co-ordinator, Machine Assisted Reference Service</td>
<td>D. Morton</td>
<td>BSc, MLS (Western Ontario)</td>
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The University Library

The Library is central to the academic programs of the University. Its function is to provide books, journals and other library materials to support these programs. The library staff, aided by the university community, works to make the library a base for teaching, study and research. The University Library is composed of 2 divisional libraries, the Dana Porter Library, and the Engineering, Mathematics and Science Library; 1 branch library, the University Map and Design Library; and 1 reading room, the Optometry Reading Room.

The Library uses an on-line circulation control system to record the loan of material to library borrowers. The system has enabled the Library to speed up the circulation process and to display a variety of information to the borrower.

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

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

Special services including a brailor and a 4 track cassette recorder and playback unit are available for the visually handicapped. A room on the seventh floor of the Dana Porter Library is available for use by the visually handicapped and their readers. The Library can also provide access to talking book material through the W. Ross Macdonald School, Brantford. All libraries are accessible by wheelchair.

The Dana Porter Library, situated in the centre of the campus and rising to a height of 10 stories, is the focal point of the University. The lower floors house the main public services and support services departments. Public services located on the first floor include a large Reserve Heading Room with seating for 160 readers, the Doris Lewis Rare Book Room, a Listening Room with facilities for both phonodiscs and audio cassettes, and 8 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. Floors 6 through 10 house the circulating book collection and contain seating accommodation for more than 700 library users.

The Dana Porter Library houses collections to support programs in the arts, social sciences and humanities. The collection numbers over 1,800,000 items including books, pamphlets, theses, microforms, documents, reports, sound recordings and other material. The Library subscribes to over 6,000 periodicals and over 50 newspapers, both important elements of the collection.

The Engineering, Mathematics and Science Library occupies the fourth floor of the Mathematics and Computer Science Building. The 3 principal public areas: the Catalogue, the Circulation and Information Desks are visible from the entrance to the Library. Seating is provided for 776 readers.

The E.M.S. Library collection numbers over 400,000 items including books, microforms, government publications, technical reports and maps. The Library subscribes to over 4,000 current serials.

The University Map and Design Library is located on the main floor of the Environmental Studies I Building. It is the principal centre on campus for the provision of service relating to cartographic and architectural design materials. The collection consists of more than 95,000 items including maps, air photographs, books, theses, and periodicals. Like the Dana Porter and E.M.S. Libraries, the resources of this library are available to all members of the University.

The Optometry Reading Room contains the Library’s collection in the field of optometry.

The Federated and Affiliated colleges (St. Jerome’s, Conrad Grebel, St. Paul’s and Renison) have their own libraries which are accessible to University of Waterloo students, staff, and faculty. Conrad Grebel College Library has approximately 13,000 items which include a special collection on Peace Studies. It is also the home of a Mennonite Archive which consists of church records and documents of the Mennonites of Ontario. St. Jerome’s College Library has a collection of about 29,000 volumes. St. Paul’s College Library has about 3,000 books specializing in the areas of Religious Studies and Canadian Studies. The 5,000 volumes in the Renison Library serve the College’s Social Development Studies Program and its courses in Third World Studies and General Arts. A small section deals with Anglican theology.

The University of Waterloo, Wilfrid Laurier University, York University, the University of Western Ontario, Brock University and the University of Guelph Libraries have reciprocal borrowing agreements which allow students, faculty and staff of one institution to borrow monographs from the other Libraries. Wilfrid Laurier University’s collection is particularly strong in the fields of Christian Religion, Business, Social Work, and Music. The University of Guelph has large holdings in Agricultural Science, Family and Consumer Studies, and Veterinary Medicine. Collection strengths at York include Social Sciences (especially Canadian
History, Psychology and Sociology); Literature; Fine Arts (principally twentieth century, but some strength in the nineteenth century); Physical Education and Law. The University of Western Ontario has strong holdings in Law, Medicine, Education and Canadiana.

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

Service to the business and industry community is provided through the Library's Industrial and Business Information Service (IBIS). The Service draws on the collections at Waterloo and other institutions, including hundreds of databases around the world. The Service, available for a fee, can be used in person, by phone, mail, or electronic system.

The Library Handbook is available in all the libraries. It explains the use of the libraries, the classification system, the card catalogues, the serials list and general rules and procedures. Also available are other publications, such as bibliographies and guides to using the reference materials.

The University Library offers a full range of orientation and instructional services designed to introduce users to the Library and to assist them in their use of library resources. Ranging in scope from introductory tours to term-paper strategy sessions, these services are available at scheduled times and upon request throughout the year.
Computing Services on Campus
Computing Services on Campus

DEPARTMENT OF COMPUTING SERVICES

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

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

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

The Department of Computing Services, located on the first 2 floors of the Mathematics and Computer building, provides computing facilities and services for faculty, staff, graduate and undergraduate students. The facilities include terminals, program preparation areas, high speed printers, a wide variety of micro-computers, an incremental plotting facility, and other 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 computers in course assignments. Administrative staff use computers in applications such as student records, course timetables, examination results and financial accounting.

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

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

Computing Services on Campus

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

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

ARTS FACULTY COMPUTING

Manager
V. G. Neglia, BSc (Waterloo)

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

The ACO operates a UNIX system on a VAX 750 computer, a VMS system on a VAX 765 computer and a network of IBM PC microcomputers. These systems are available to any member of the Faculty. The UNIX system is connected to the central system operated by DCS, providing file transfer and remote output services to that system. Also, high quality printing services are available using a Diablo 630 ECS printer with a dual bin sheet feeder and envelope adapter. Public terminals are available in PAS 1098, PAS 1099 and HH 236.

MATHEMATICS FACULTY COMPUTING FACILITY

Director
J. Li. Morris, BSc (Leicester), PhD (St. Andrews)

Manager - Operations
G. P. Embro

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

The Mathematics Faculty Computing Facility (MFCF) at the University of Waterloo exists to satisfy the special computing needs of the faculty and students in the Mathematics Faculty. It has a dual mandate: to supply a research tool for computer science research, and to provide all 5 departments of the Mathematics Faculty with advanced computing services supplementary to those available from the University computing centre. The principal service provided to meet both parts of this mandate is general purpose time-sharing.
A medium-size general-purpose computer, the Honeywell DPS8/49, was installed in August 1983. Stock Honeywell GCOS8 operating system software (SR2000), with modifications, is used on the DPS8/49. These modifications allow the human interface to be extensively transformed to what we believe is better human engineering which includes substantial numbers of Waterloo-built additions and enhancements. This Honeywell configuration has been adequate to support peak loads of over 90 simultaneous users, and provide on-line file storage for over 5,000 users. A Honeywell LEVEL 6 minicomputer is also maintained by MFCF.

In 1980 MFCF received the first DEC VAX 11/780 on campus. This computer was purchased to provide a different computing environment for students and faculty. It is primarily used in the teaching of computer science courses. Since 1980 a number of VAXen have been placed under MFCF support. At the present time MFCF operates 3 VAX 11/785s and 3 VAX 11/780s. These computers provide the popular UNIX operating system in a relatively controlled environment. The VAXen under MFCF, run the UC Berkeley version of the UNIX operating system. A high-speed data link is provided between the Honeywell/GCOS8, IBM VM/CMS, and VAX/UNIX systems. Software driving this link provides file transfers in both directions and allows transfer of material to be printed on the Honeywell high-speed printers. Hardcopy output can be retrieved from several laser printers or a Printronix raster printer. These devices are also used for graphics output because of their good resolution and are being utilized by the computer graphics course.

The primary mode of access to these computer systems is via a wide variety of terminals. Communication between the computers and terminals is done in 1 of 3 ways: Sytek (local area network), Gandalf modems, and dialup over telephone lines (possibly on DATAPAC). Computers in the Mathematics building communicate using the Sytek local area network, an assortment of dedicated digital lines and an ETHERNET.

ENGINEERING MICROCOMPUTER NETWORKS (WATSTAR)

Director, Associate Dean of Engineering, Undergraduate Studies
P.H.O’N.Roe, BASc (Toronto), MASC, PhD (Waterloo), PEng

Supervisors
J.G. Wilson, MASC (Waterloo)
- Operations & Information Systems
B.T. Campbell, DMATH (Waterloo)
- Systems

The Faculty of Engineering operates an extensive network of microcomputers within the Engineering buildings. This network is called WATSTAR and was designed and developed by the staff of the WATSTAR Project Office. Students from the co-operative programs are normally employed in this office each term and several participated in the early design work. WATSTAR was designed specifically to serve the computing needs of academic courses and programs but has proved to be extremely valuable, as well as popular, as a general purpose computing facility. WATSTAR has a primary objective to support Year 1 Engineering but also provides facilities for any other course which can be scheduled. Graphics support is also available in part of the system. This serves as a good introduction to first-year computer graphics and also as a useful tool for senior projects. The system also has good mid-range documentation production facilities and students are encouraged to use these resources for report writing. Other computing needs for undergraduate engineering courses are provided by the central facilities of the Department of Computing Services whose consultant staff also support WATSTAR.

The first WATSTAR became operationally available in May 1981 and uses the CP/M operating system. It has been continuously available 24 hours/day since that time. WATSTAR/pc came on line in September 1984 using IBM microcomputers and DOS. During 1985 the network was extended so that it now supports 90 workstations, 4 file servers and hosts over 1,000 user accounts. It is anticipated that, in the foreseeable future, all Engineering students will automatically be given permanent accounts for the duration of their time at Waterloo.
COMPUTING SERVICES ON CAMPUS

ENGINEERING EDUCATION RESEARCH CENTRE

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

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

OTHER FACILITIES

In addition to these major centres, a number of other computer systems are located in various laboratories across the campus. Some of these are used in courses and others are dedicated to research.
The Faculty of Arts

The main objective of the Faculty of Arts is to provide a liberal arts education which is designed to acquaint the student with some of the major ideas and forces that shape our civilization and other civilizations, to develop the ability to think clearly, critically and creatively, and to make a contribution to living a full life.

Degrees
The degree of Bachelor of Arts (BA) is awarded by the University upon successful completion of any of the undergraduate programs described under Arts Programs.

ADMISSION

1. General Requirements
The admission requirements of the Faculty of Arts are the same as the General Admission Requirements of the University for applicants from Ontario Secondary Schools and for those not currently registered in Ontario Secondary Schools. Admission requirements for part-time students are the same as for full-time students. See Chapter 2 for the admission categories, requirements and procedures for all programs.

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

Applicants who wish to study on a part-time or non-degree basis or through correspondence courses may obtain application forms from the Registrar's Office (Needles Hall) at the University of Waterloo.

2. Transfer Credit
Upon admission to Arts, transfer credit may be given for university courses related to a Waterloo Arts degree in which a grade of 60% or better was obtained. Students entering Waterloo from other universities may have their transferred courses count toward the University of Waterloo degree; however, marks obtained in these courses will not be included in the calculation of the students' University of Waterloo averages.

Students admitted to Arts from Faculties within the University may elect to transfer all passed Arts Faculty courses and all pertinent courses taken from other Faculties in which they earned marks of at least 60% (C). These courses will not be counted in the students' cumulative averages. Alternatively, students may elect to transfer all pertinent attempted courses (passed and failed). Under this option, these courses will be counted in the students' cumulative averages.

Arts Programs

All Arts programs should be drawn up in consultation with the Departmental Undergraduate Advisor.

GENERAL PROGRAMS

1. With a Major
The University offers a General Bachelor of Arts (BA) degree upon successful completion of either a 3-year General or 4-year General program. A 3-year General BA is offered in the following disciplines:

- Anthropology
- Classical Civilization
- Drama and Theatre Arts
- Economics
- English
- Fine Arts
- French
- Geography
- German
- Greek
- History
- Japanese
- Linguistics
- Modern Languages
- Philosophy
- Political Science
- Psychology
- Religious Studies
- Russian
- Social Development Studies
- Sociology
- Spanish
- Social Services

The following 4-year General BA programs are also available:

- Anthropology
- Classical Civilization
- Economics
- English
- Fine Arts
- French
- Geography
- History
- Japanese
- Modern Languages
- Philosophy
- Political Science
- Psychology (EC)
- Religious Studies
- Sociology
- Spanish
- Social Services

There are no minors or double majors in General Programs.

2. Non-Major
Students with interests in a variety of disciplines may choose an individualized program rather than major in a single discipline. Any standard first-year Arts program will satisfy the needs of a student contemplating a General Arts (non-major) Program. The program of non-major General Arts students must be arranged through the Arts Faculty Undergraduate Office.

Note 1
It is recommended that students register in no more than 5 courses in a term unless they have achieved at least a B average in previous studies and have discussed their situation with an academic counsellor.
HONOURS PROGRAMS

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

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

Almost any 2 Honours programs may be combined or 1 Arts Honours program may be combined with a number of Honours programs offered in other Faculties for a Joint Honours degree. Joint Honours programs other than those already listed under each Department may be arranged by consultation with the appropriate Department advisors. The Undergraduate advisors of both Departments should be consulted for any Joint Honours programs. Descriptions of the single Honours Programs and each discipline's requirements for Joint Honours Programs can be found in the section entitled "Departmental Programs" beginning on p. 8:9.

2. Co-operative Programs
A Co-operative Program is an Honours Program that allows the student to integrate work experience with an academic program. (For a detailed description of the Co-operative plan, see Chapter 5). Beginning in the first or second year the Co-op student alternates 4-month terms on campus for academic studies with 4 months off campus for practical training in business, industry, or government.

Students in departmental co-operative programs are required to complete a minimum of 4 work terms beyond the 2A level in order to be eligible to receive a co-op designation at the time of graduation.

The following Co-operative programs are now offered:

Applied Studies Co-op (See Note 1)
Co-op Honours Anthropology
Co-op Honours Applied Economics
Co-op Honours Chartered Accountancy Studies
Co-op Honours English

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

Notes:

1. The Applied Studies Co-operative Program combines an Honours Program in most disciplines in Arts with Applied Studies courses. The Applied Studies courses are intended to provide the student with a basic and practical general, education and with skills appropriate to a wide range of careers. With the approval of the department, most Honours Programs in Arts at the University may be combined with the Applied Studies courses for this Co-operative program. See the section entitled "Departmental Programs" for details.

2. It is recommended that students register in no more than 5 courses in a term unless their program requires 6 or they have achieved at least a B average in previous studies and have discussed their situation with an academic counsellor.

MINOR PROGRAMS
Students enrolled in Honours Programs in Arts or other Faculties may elect a Minor in an Arts discipline. A Minor program in Arts requires the successful completion of 10 term courses in the Minor discipline with an overall cumulative average of 65% in those courses. Students should consult with departmental undergraduate advisors for details of more specific requirements.

A Minor is available in Italian although there is no Major program in that discipline.

INTERDISCIPLINARY OPTIONS
Students in a General Non-Major Program and in many Honours Programs within Arts may choose an interdisciplinary Option or Minor which will be designated on the diploma. Students in some General Programs may choose one of several available Options. Options are available in:

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

SELECTION OF YEAR 1 PROGRAMS
All Year 1 students are officially classified as being in the General Arts Program, the Arts Co-op Program or the Accounting Co-op Programs. Students in Accounting Co-op programs have a highly specified first year and should refer to the Accounting Program section. Students in General Arts and Arts Co-op do not select a specific major or Honours program until Year 2. The first year is a broad exploratory year, and the student should select a program of courses that keeps as many options as possible open for advanced work. Students admitted to Arts Co-op must select several required courses in Year 1 (see "Applied Studies," Departmental Programs). Students in Year 1 General Arts usually choose 5 term courses in both the fall and winter terms. In each 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. In choosing courses, 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 1 course in mathematics or science.

Notes:
1. From time to time, due to space limitations, students admitted to the University or continuing students in good standing, cannot be granted course and program selections of their choice.
2. Each student’s program must be approved on or before registration date by a faculty advisor from the Faculty of Arts.
3. Students interested in Social Development Studies should consult the Undergraduate Officer at Renison College before selecting a Year 1 program.

COURSE AND PROGRAM CHANGES
1. Changes in courses or programs must be submitted for approval to the appropriate Undergraduate Officer.
2. Courses may be added during the first 2 weeks of the term in which they begin only with the signature of the Undergraduate Officer of the student’s major Department. Courses may be dropped during the first 3 weeks of the term in which they begin only with the signature of the Undergraduate Officer of the student’s major Department.
3. After these specified periods, courses may be added or dropped only with the permission of the Examinations and Standings Committee acting on the recommendation of the instructor of the course and the Undergraduate Officer of the student’s major Department, and only if the student can support his/her case with reasons showing that such a change in his/her program will serve his/her academic interests.
4. Courses offered during the Summer Session may be added or dropped during the first 3 days in which the course begins only with the signature of the Undergraduate Officer of the student’s major Department, and thereafter only with the permission of the Examinations and Standings Committee.
5. A course that has not been dropped officially (i.e. recorded in the Registrar’s Office) will receive a grade and be counted in the student’s average.

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

Teacher Certification in Ontario
The Ontario Teacher’s Certificate may be granted by the Ministry of Education after the successful completion of a program taken at an approved Ontario Faculty of Education. The Faculties of Education require that applicants hold an acceptable University degree (B.A. or B. Sc. or equivalent, 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 1 area of specialization, or
• 14 credits in 2 subjects (no fewer than 6 in each) for 2 areas of specialization.

In addition, the applicant for the HSQ must have completed a Faculty of Education program and 2 years of teaching in an Ontario high school.
Degree Requirements

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

It is the student's responsibility to ascertain that all requirements for graduation have been met. Any exceptions in graduation requirements requested by a student must be approved in writing by the Examinations and Standings Committee of the Arts Faculty.

General Major Program

Students in the 3-year General program with a major must complete a minimum of 30 term courses with a passing mark in each. Students in a 4-year General program must complete a minimum of 40 term courses with a passing mark in each. All students in General programs with a major must achieve an overall cumulative average of at least 60% and a cumulative average in their major of 65% or better (some programs require a higher major average) and successfully complete

either:

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

or

ii) courses from no more than 7 disciplines

and

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

General Non-Major Program

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

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

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

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

A cumulative average of 60% is required for graduation with an average of 65% in Arts Faculty courses.

Honours Program

Students in an Honours program must complete 40 to 48 term courses (as specified in a Departmental Honours program), with a passing mark in each and an overall cumulative average in the honours discipline of at least 75%. The Faculty of Arts Group A and B requirements (see below) must also be met. Students are asked to refer to "Departmental Programs" for other departmental requirements.

Term Course System

A term course lasts 1 academic term (fall, winter, or spring) and carries a minimum of one-half credit (0.5). A course carrying 0.75 credit weight is counted as 1 term course. Two 0.75 credit courses are equivalent to 2 term courses. Courses with a 0.25 credit weight may be accumulated in pairs to equal one term course to a maximum of two term courses. Only the first four 0.25 credit courses appearing on the student's record are included in term course and average calculations.

English Language Proficiency Program

Over the past several years the Faculty of Arts has become concerned that some students may experience academic difficulties because they lack the basic writing skills required for university work. In order to help these students the Faculty has introduced an English Language Proficiency Program. This program comprises 1) an English Language Proficiency Examination which all students must write at the beginning of their first year in the Faculty of Arts, and 2) a Writing Clinic where students may receive individual help with their writing problems. All students whose initial registration in degree programs in the Faculty of Arts was Fall 1977, or thereafter, must demonstrate competence in written English in order to qualify for the Bachelor of Arts degree. Students may fulfill this requirement by achieving a mark of at least 50% on the English Language Proficiency Examination or by demonstrating this competence in their Writing Clinic assignments.

Students who receive a mark below 50% on the English Language Proficiency Examination should attend the Writing Clinic. Students who do not fulfill the English Language Proficiency requirement by the beginning of their second year must attend the Writing Clinic.

English Language Proficiency Program - Off-Campus Students

When students who are completing all their Arts degree requirements through Correspondence courses or at off-campus centres have finished 15 of their 30 term courses toward the General BA, they will be required to sit the English Language Proficiency Examination during a normally scheduled examination time at a convenient location.
Group A and B Requirements
All Arts students must meet the Faculty of Arts Group A and B requirements. Group A comprises courses in the humanities, and Group B comprises courses in the social sciences:

Group A (i) English, History, Philosophy
Group A (ii) Dutch, French, German, Greek, Italian, Latin, Polish, Russian, Spanish, Ukrainian. (See Notes)
Group A (iii) Classical Civilization, Drama, Fine Arts, Music, Religious Studies
Group B Anthropology, Economics, Geography, Political Science, Psychology, Sociology.

Only courses taken in the subjects listed above will satisfy the Group A and B requirements.

In order to complete the Group A and B requirements an Arts student must complete with passing marks a minimum of 6 term courses from Group A and a minimum of 4 term courses from Group B. Of the 4 term courses used to satisfy the Group B requirement, no more than 2 may be in the same discipline. A student may take more than 2 term courses in a specific discipline in Group B but only 2 of them will be applied to meet the 4 course requirement. The student should note that Group A is further subdivided 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 courses from Group A (i).
- a minimum of 2 term courses from Group A (ii).
- a minimum of 2 term courses from any of the subjects listed in A(i), A(ii) or A(iii).

Notes:
1. RS 105: Elementary Biblical Hebrew and RS 106: New Testament Greek may be used to meet the Group A (ii) requirement.
2. Arts students should note that they may elect to meet the Group A (ii) requirement in their second or subsequent years by completing with passing marks 2 of the following courses: FR 291, FR 292, GEH 271, GEH 272, RUSS 271, RUSS 272, SPAN 217, SPAN 218, C CIV 201, C CIV 202, or ITAL 291. ITAL 292. These courses are taught in English and are not open to first year Arts students. These courses are the only approved alternative to the A (ii) requirement.

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

Arts
Degree Requirements
Examinations and Standings

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

Examinations and Standings

The following regulations govern final examinations and standings in the Faculty of Arts. These regulations also apply to students in part-time and special programs. Further details concerning University Examination Regulations can be found in Chapter 1, page 1.7.

Students should note that the Faculty of Arts operates under a course system in which student progress is measured by courses successfully completed rather than by years. Students who have successfully completed fewer than 10 term courses are considered Year 1 students; those who have successfully completed at least 10 term courses 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 of Arts constitutes the examining body for all examinations. When a final written examination is required it is normally held at the end of the course. Oral examinations may be required at the discretion of individual departments. The normal time for written examinations is 3 hours.

2. In all courses each student is required to submit, in such form and at such time as may be determined by the instructor, evidence of satisfactory participation in term work. The marks obtained for such work during term may be used, in part or in whole, in determining grades. At the discretion of the chairman of the Department concerned and of the Dean, a student may be barred from the final examination if the course requirements are not completed to the satisfaction of the instructor.

3. Failure to write an examination may be considered a failure to pass. A student who defaults a final examination, except for a properly certified reason, shall have no make-up examination privileges. If a student fails to write for medical reasons, a Doctor's certificate, covering the precise period of absence must be filed in the Registrar's office within a reasonable period of time after the examination should have been written.

4. No instructor shall be permitted to administer and no student shall be required to sit final examinations in the formal lecture period.
Grading System

1. Normally all courses should be completed within the term in which they are offered. Letter grades are used to signify evaluation in individual courses. For the purpose of calculating averages, the following weights will be assigned to grades received in individual courses:

\[
\begin{align*}
A+ & : 95 & B+ & : 78 & C+ & : 68 & D+ & : 58 & F+ & : 46 \\
A & : 89 & B & : 75 & C & : 65 & D & : 55 & F & : 38 \\
\end{align*}
\]

Overall standing is determined by the cumulative average of grades assigned for all courses taken at the University (at any time, whether passed or failed) while registered in a degree program in the Faculty of Arts.

Note

When a course is repeated, the 2 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 3-week drop period.

In satisfaction of the minimum degree requirements students in General Programs may present up to 6 term courses with a grade of Credit (Cr) in courses outside their major. Students in Honours Programs may present up to 8 term courses with a grade of Credit (Cr) in courses outside their Honours area.

Students considering teaching careers should especially note that the Ministry of Education will not accept courses with credit grades as satisfying the minimum requirements in defined Specialist Fields.

3. An Incomplete (INC) may be assigned by an instructor in exceptional circumstances, with the consent of his Department. This extension of completion date is granted to students as a privilege for a limited and specified time and in normal circumstances shall be no longer than 3 months.

Students should make themselves familiar with the internal procedures established by their major Department in handling incomplete courses. This is particularly important in that a student with outstanding incompletes on his record will be given Conditional Standing and will not be able to graduate until the INC has been replaced by a letter grade.

4. Students may request to register for Audit (AUD) in a course. No credit is granted for a course in which an AUD grade is awarded. Students interested in an Audit must consult with the course instructor at the beginning of the course to ascertain what conditions are attached to the granting of an AUD by the course instructor.

5. There are a number of courses in the Faculty of Arts which are essentially year courses (of two terms duration) although they are listed as two separate term courses. Letter grades are not awarded until the second half of the course is complete and then the same grade is applied to both term courses. An In Progress (IP) grade is assigned to the first term course until a grade is designated for the second term course.

The use of the IP grade is normally limited to 400-level courses which are Senior Honours Essay or Senior Seminar courses and which normally require eight months or so to complete. The grade may be used in other courses only with the prior approval of the Undergraduate Affairs Group of the Arts Faculty.

6. Some courses which are listed under separate labels or numbers have overlapping content. Only one of these courses may be taken for credit. These are designated with notes after the courses which would indicate one of the following:

- the courses are cross-listed;
- credit will only be granted for one of a pair of courses;
- a course formerly was designated with a different number and/or label; or
- students should refer to the following tables.

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

Set A - Basic Statistics Courses

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

Course Load

Regular full-time students in both General and Honours Arts programs normally register for 5, or occasionally 6, term courses each academic term. Full-time students in General Arts programs 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 programs may not enrol in more than 1 term course per academic term in excess of the number specified for their program (see Departmental Honours Programs) except with the permission of the Examinations and Standings Committee.
Correspondence Courses
Because of the different start dates and the different final exam periods for correspondence and on-campus courses, students enrolled in full-time on-campus courses must have the permission of their Undergraduate Advisor and the Examinations and Standings Committee to register for a Correspondence Course.

Part-Time Studies
Students may pursue degree studies part-time (in both General and Honours Programs) by enrolling in one or two regularly scheduled courses meeting in either the day or evening. In addition, courses may be taken in the 6 week summer program or by correspondence. There is no distinction between part-time and full-time students as to admission requirements, grading practices, or promotion policies.

Standing
1. To be considered in good standing in a General program, a student must maintain a cumulative overall average of at least 60%, as well as an average of at least 65% in all courses taken in the Major discipline (unless the department specifies a higher average). If a student’s overall average falls between 58 and 60%, or the major or non-major average falls below 65% (unless the department specifies a higher average), the student may be granted conditional status for 2 academic terms. During this period the student must make reasonable progress toward obtaining good standing or the student will be required to withdraw from the Faculty of Arts.

2. To be considered in good standing in an Honours program, a student must maintain a cumulative overall average of at least 60%, as well as an average of at least 75% in all courses taken in the Honours discipline (unless the department specifies a higher average). A student in a Joint Honours program must maintain a cumulative average of 75% in all courses taken in the 2 Honours disciplines (unless the departments specify higher averages). If an Honours degree candidate’s major average falls below the prescribed minimum the candidate will be considered for the General degree and the regulations in (1) above will apply. If subsequently the student raises the average to the required level, he/she may, through the Department Chairman, petition the Examinations and Standings Committee to review his/her case.

3. Even while otherwise in good standing, a student who fails 4 or more term courses in any academic year (10 term courses) may be required to withdraw if the Examinations and Standings Committee considers that the student will not profit by further study.

4. A student who has been required to withdraw for academic reasons is eligible to apply for re-admission after 2 terms’ absence. If such a student is re-admitted, previous course work does not count in the cumulative average; however, all previous course attempts remain recorded on the student’s University transcript.

5. Students whose cumulative average(s) has been cleared as in 4. above will be required to complete a minimum of 10 additional courses whether or not this will bring the total number of courses in excess of the number required.

6. Students may withdraw before the final day of classes without penalty to their record; however, students who withdraw to avoid a number of failures will likely be ineligible for re-admission for at least 2 terms.

Dean’s List
To recognize outstanding academic achievement the Arts Faculty has established a Dean’s List.

The academic record of each student enrolled in a degree program is examined after the completion of at least 10 term courses. Each record is examined again after the completion of a minimum of 10 further term courses from the point of any previous considerations and each student’s academic record is examined at graduation. To be included on the Dean’s List the student must have achieved a cumulative overall average greater than or equal to 83.0%. A student with an INC or NMR grade is not eligible for inclusion on the list.

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

Grade Appeal Procedures
1. If a student wishes to appeal a course grade, the student should (as soon as possible and at the latest within 6 months of receipt of the grade) try to work the matter out informally with the instructor concerned. If the problem cannot be resolved in this way, the student may submit a formal, written appeal to the appropriate department chairman or head of the affiliated colleges or dean of the federated college. Because of their familiarity with problems specific to their disciplines, departmental or collegial review bodies offer the appellant the best opportunity for a thorough and a fair review of the appeal.

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

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

If 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 Programs

Accounting

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

The Honours Chartered Accountancy Studies or Honours Management Accountancy Studies programs (hereinafter referred to as Honours Accountancy Studies), permit students to meet the minimum course requirements for the CA and RIA/CMA* certificates in a 4-year honours program. In addition, the Honours Accountancy Studies programs can be used as a base from which to proceed to a Master of Accounting program which offers opportunities for both regular and professionally accredited graduate study. Students interested in professional accounting certification are advised to give careful consideration to completing the Professionally Accredited Stream in the Master of Accounting program (see below).

*In 1985 the RIA (Registered Industrial Accountant) designation was officially changed to CMA (Certified Management Accountant).

Recommended Program

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<th>Term 1B</th>
<th>Term 2A</th>
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<td>MATH 111B**</td>
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**Students who have not completed Grade 13 calculus will be required to take MATH 104 before taking MATH 113A. Students who have not completed Grade 13 algebra may be required to complete MATH 103 before taking MATH 111B.
Honours Accountancy Studies - Regular Program
(Honours Chartered Accountancy Studies and Honours Management Accountancy Studies)

Students may apply for direct admission to Year 1 Regular Honours Accountancy Studies. Continued enrolment in these programs is limited, based on academic performance in terms 1A through 2B. Eligibility for the degree of Bachelor of Arts in the Honours Accountancy Studies programs require:

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

2. The following courses are required for both CA and CMA/ARIA:
   a) ACC 101, 131, 231, 281, 291, 341, 351, 371, 372, 381, 382, 392, 401, 441, 461, 462, 491;
   b) ECON 101, 102, 201, 202, 211#, 221, and
   c) either
      Specialization A - (Honours Chartered
      Accountancy Studies)
      ACC 132
      or
      Specialization B - (Honours Management
      Accountancy Studies)
      M SCI 211 or PSYCH 333
   # Students who have taken MATH 111B and 113A will not be required to take ECON 211. ECON 211 may not be taken for credit if MATH 111B and MATH 113A have been taken for credit.

3. Those interested in qualifying as a Chartered Accountant should complete Honours Chartered Accountancy Studies by electing Specialization A above. At the end of this program the student will have completed all the formal university courses required at present by the Institute of Chartered Accountants of Ontario. The other principal requirement for qualification as a CA is a minimum of 2 years of work experience with a public accounting firm, passing of the Institute's screening examinations, successful completion of the Institute's School of Accountancy (offered in May-June by the Institute) and successful completion of the Uniform Final Examinations.

   Those interested in qualifying as a Registered Industrial Accountant/Certified Management Accountant should complete Honours Management Accountancy Studies by electing Specialization B above. Of the 18 course requirements, students can presentty qualify for 14 complete course and examination exemptions. Three others qualify as course exemptions (the examinations are written through the Society). The remaining course is offered and examined by the Society. The other principal requirement for qualification as an RIA/CMA is the completion of a minimum of 2 years of acceptable work experience.

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

Students may apply for direct admission to Year 1 Co-op Honours Accountancy Studies. Enrolment in this program is limited. If not admitted to the first year of the Co-operative program, students will be considered for admission to the Regular program and may apply for admission to a limited number of Co-op positions after completion of their first term of study. These students must contact the Undergraduate Officer by December 15 of the fall term in Year 1.

There are 5 work terms available in the Co-operative program: students complete 1 or 2 terms on campus and then alternate work terms and academic terms until the program is completed (see page 5:3 for specific sequences). Work-term placements are in accounting settings in the public and private sectors. Because of the nature of the Honours Accountancy Studies Co-operative Program, which requires work experience, admission to this program requires Canadian Citizenship or Permanent Residence Status in Canada.

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

Master of Accounting: Professionally Accredited Stream
The Professionally Accredited Stream (PAS) of the Master of Accounting (MAcc) program provides a complete and integrated program of professional accounting studies that qualifies students for special advanced standing towards professional certification.

Students should be aware that the PAS is the final phase of an integrated sequence of accounting and related-area studies. Entrance to the PAS requires (in addition to meeting regular MAcc admission requirements) successful completion of the earlier phase of study (set out below). Students who complete the course work set out below, with a 75% average, and also meet the requirement of the Honours Accountancy Studies program will normally be eligible for entrance to the PAS in the MAcc program.

<table>
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<tr>
<th>Fall Term</th>
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<td>STAT 311</td>
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<td>ENGL 210</td>
<td>ACC 414</td>
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Note: # Students who have taken MATH 111B and 113A will not be required to take ECON 211.
Because of restricted resources, the total number of students allowed to take the Year 3 and 4 studies set out above will be limited. Students interested in the Master of Accounting PAS should apply to the Accounting Group prior to commencing their 3A term of studies for admission. Interested students are referred to the Graduate Calendar and the Graduate Officer of the Accounting Group for further information on the PAS.

Special Recognition by the Accounting Profession of the MAcc Program, Professionally Accredited Stream
Students who complete the Professionally Accredited Stream of the MAcc program are prepared directly to write the Uniform Final Examinations of The Institute of Chartered Accountants (CA) and the Society of Management Accountants (FIA/CMA). This course of study is the only one in Ontario that has been accredited by The Institute of Chartered Accountants of Ontario as being sufficiently complete to justify special status for its graduates. Graduates are granted exemption from all ICAO education requirements (including the accounting, auditing and taxation admission examinations and the ICAO Professional Summer School) except the Uniform Final Exams which can be written at the first opportunity following graduation from the PAS of the MAcc program. Similarly, students receive maximum possible exemptions from the Society of Management Accountants. The course of study is unique in Ontario in that students are exempted from all but the 3 Final Accreditation Exams (FAE).

Transfer Students
Students in other programs at the University of Waterloo or elsewhere may apply to transfer to Honours Accountancy Studies and the PAS. To be eligible for admission to the pre-PAS program, students must have completed at least 2 years of university studies including the following courses:

Two term courses in Introductory Economics
One term course in each of:
  Financial Accounting
  Managerial Accounting
  Statistics
  Computing
  Calculus (beyond Grade 13 in Ontario)
  Algebra (beyond Grade 13 in Ontario)
  Psychology or Sociology
  English
  Humanities elective (English, History, Philosophy or a foreign language)
  Intermediate Macro or Microeconomics

Anthropology
(Anthropology includes Archaeology, Socio-Cultural Anthropology, Physical Anthropology, and Linguistics.)

Three Year General Anthropology
Eligibility for graduation in the Three Year General Anthropology program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least 10 term courses must be in Anthropology. ANTH courses must include:
   a) 101, 201, 202, 260, 330;
   b) 102A or 102B;
   c) 103 or 283 or 290.

Four Year General Anthropology
Eligibility for graduation with a Four Year General degree in Anthropology includes the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with a cumulative overall average of at least 60% and a cumulative major average of at least 65%.
2. At least 16 term courses must be in Anthropology and must include the courses required in the Three Year General program.

Honours Anthropology
Eligibility for graduation in the Honours Anthropology program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 20 term courses must be in Anthropology. ANTH courses must include:
   a) 101, 201, 202, 260, 300, 330, 499A/B;
   b) 102A or 102B;
   c) 103 or 283 or 290;
   d) one additional 400-level term course.
Anthropology Joint Honours Program
Joint Honours programs have been approved for Anthropology and:
- Biology
- Classical Studies
- Drama and Theatre
- Arts
- English
- French
- Geography
- German
- History
- Man-Environment
- Studies
- Political Science
- Psychology
- Sociology

Eligibility for graduation in the Joint Honours Anthropology program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 14 term courses must be in Anthropology.
   - ANTH courses must include:
     a) 101, 201, 202, 260, 300, 330;
     b) 102A or 102B;
     c) 103 or 263 or 290;
     d) one 400-level term course.
   - 498A/B (the Anthropology Honours Essay) is recommended, but is optional if an Honours Essay is written in the Joint discipline.

Honours Anthropology (Co-op)
Co-op Anthropology students will pursue a normal first year Arts program, taking ANTH 101 and either ANTH 102A or 102B. In the second year and thereafter the student is required to pursue a normal Honours program. It is strongly advised that ANTH 300 be taken in the second year.

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

Honours Anthropology (Applied Studies Co-op)
Students may combine an Honours Anthropology program with Applied Studies Co-op. The requirements in Anthropology are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 8.12.

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

Applied Studies Co-op
A student in the Applied Studies Co-op program must maintain good standing in an Honours program in Arts and must complete 14 to 16 term courses 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 program 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, 6 work terms alternate in regular sequence with 6 study terms. A special non-credit seminar (ARTS 090, ARTS 091), which is designed to prepare students for their Co-op employment experience, is offered during the 2 terms preceding the first work term at the end of Year 1.

Required Program

| Year 1A | A second language  
ACC 131  
CS 100 or CS 102 or ARTS 198  
ARTS 090  
Proposed Major Subject and Electives  
(3 term courses). |

| Year 1B | A second language  
ACC 132  
ENGL 109  
ARTS 091  
Proposed Major Subject and Electives  
(3 term courses). |

| Year 2A | HIST 253X or P SCI 260A  
ACC 121  
Major Subject and Electives (3 term courses). |

| Year 2B | HIST 254X or P SCI 260B; and PHIL 145  
A Computer Science or approved Applied Studies course  
Major Subject and Electives (3 term courses). |
Year 3A
2 approved courses in Applied Studies
Major Subject and Electives (4 term courses).

Year 3B
An approved Applied Studies course
Major Subject and Electives (4 term courses).

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

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

Notes:

1. Students must have an overall average of 75% in their Applied Studies courses in the first term of Year 1 (1A) to remain in the program.

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.

3. An Arts Administration specialization is available for qualified applicants at the beginning of the 2A term. Details in ML 119.

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

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

Classical Studies

(Latin, Greek, Classical Studies, Classical Civilization)

Three-Year General Programs
Eligibility for graduation in the General Latin, Greek or Classical Civilization program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least 10 term courses must be in the major field. In the Latin or Greek programs, normally not more than 2 of the 10 may be in Classical Civilization. In the Classical Civilization program, normally not more than 2 of the 10 may be in Latin or Greek. Knowledge of neither Latin nor Greek is required to obtain a General degree in Classical Civilization.

Four-Year General Program
Eligibility for graduation in the Four-Year General Classical Civilization program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least 14 term courses must be in Classical Civilization and normally not more than 4 of the 14 term courses may be in Latin or Greek.

Honours Programs
Eligibility for graduation in the Honours Classical Studies or Latin program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 20 term courses must be in the major field. In the Classical Studies program, 6 of the 20 term courses must be either Greek or Latin courses or both. In the Latin program, normally not more than 6 of the 20 term courses are Classical Civilization courses. Furthermore, in the Latin program, it is strongly recommended that students complete 2 of the following courses before graduation:
   a) LAT 251, 352, 451.
Honours Classical Studies

Recommended Program

Year 1
GRK 100A/B, or LAT 100A/B or LAT 203/204
C CIV 101/102
6 additional term courses.

Year 2
LAT 203/204, or 2 term courses in Latin at the 200 level, or 2 term courses in Greek at the 200 level
C CIV 251/252, 265/266
4 additional term courses.

Year 3
2 term courses in Greek or Latin at senior level
C CIV 301/302, 351/352
4 additional term courses.

Year 4
4 term courses in Classical Civilization
6 additional term courses.

Honours Latin

Recommended Program

Year 1
LAT 100A/B or 203/204
8 additional term courses.

Year 2
4 term courses in Latin
2 term courses in Classical Civilization
4 additional term courses.

Year 3
4 term courses in Latin
2 term courses in Classical Civilization
4 additional term courses.

Year 4
4 term courses in Latin
2 term courses in Classical Civilization
4 additional term courses.

Honours Classical Studies or Latin
(Applied Studies Co-op)

A student may combine an Honours Classical Studies or Latin program with Applied Studies Co-op. The requirements in Classical Studies or Latin are identical to the Joint Honours requirements listed below. The Applied Studies requirements are listed on page 8:12.

Joint Honours Programs

Eligibility for graduation in the Joint Honours Classical Studies or Latin program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 16 term courses must be in the major field. In the Classical Studies program, 4 of the 16 term courses must be in either Latin or Greek or both. In the Latin program, normally not more than 4 of the 16 term courses are in Classical Civilization. Furthermore, in the Latin program it is strongly recommended that students complete 2 of the following courses before graduation:
   a) LAT 251, 352, 451.

Joint Honours Classical Studies

Recommended Program

Year 1
GRK 100A/B or LAT 100A/B, or LAT 203/204
C CIV 101/102
6 additional term courses.

Year 2
LAT 203/204, or 2 term courses in Latin at the 200 level, or 2 term courses in Greek at the 200 level
C CIV 251/252, 265/266
6 additional term courses.

Year 3
C CIV 301/302, 351/352
6 additional term courses.

Year 4
2 term courses in Classical Civilization
10 additional term courses.

Minor Programs

Minor programs are offered in Classical Civilization, Greek and Latin. Students interested in planning a sequence of 10 term courses to complement their Major field of study are encouraged to consult the Undergraduate Advisor in Classical Studies. All Minor programs must be approved by the Department.
Drama and Theatre Arts

General Drama and Theatre Arts
Eligibility for graduation in the General Drama and Theatre Arts program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least 12 term courses must be in Drama and Theatre Arts, including:
   a) DRAMA 101A must be taken in the first term, and DRAMA 101B and 102 must be taken in the second term;
   b) any 3 of DRAMA 251, 252, 253, 254, 255, 258, 259, 301, 302, 351, 355, 356, 357, ENGL 362, 363, 190;
   c) DRAMA 243, 371 or 372, 409.

Honours Drama and Theatre Arts
The Honours program is designed so that a student can work through a particular sequence of courses in one field (acting, academic, directing, technical) which would in effect become an area of specialization. The DRAMA 499 project in the fourth year would then presumably be centred on this specialization.

Eligibility for graduation in the Honours Drama and Theatre Arts program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 20 term courses must be in Drama and Theatre Arts including:
   a) DRAMA 101A must be taken in the first term, and DRAMA 101B and 102 must be taken in the second term;
   b) 3 of DRAMA 251, 252, 253, 254, 255, 258, 259, 301, 302, 351, 355, 356, 357, ENGL 362, 363;
   c) DRAMA 243, 371, 372, 409;
   d) DRAMA 499 or 2 other DRAMA courses may be taken if the other department of the Joint Honours program does not have a Senior Seminar. If the other department requires the equivalent of a Senior Seminar of its Joint Honours students the Drama Group would waive the 499 requirement, and the student would take 2 other Drama classes.

Minor Program
DRAMA 101A and 101B and DRAMA 102 plus 7 other term courses of which 2 must be in dramatic literature.

Note For All Programs
A student who has taken ENGL 362/363 may not also take ENGL 190.
Three-Year General Economics
Eligibility for graduation in the General Economics program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least 10 term courses must be in Economics. 4 of these 10 term courses must be at the 300-level or above. ECON courses must include:
   a) 101, 102, 201, 202, 231;
   b) 211 or 221.

Four-Year General Economics
Eligibility for graduation in the Four-Year General Economics program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least 14 term courses must be in Economics. 6 of these 14 term courses must be at the 300 level or above plus 2 term courses must be at the 400 level. ECON courses must include:
   a) 101, 102, 201, 202, 231, 301, 302;
   b) 211 or 221.

Honours Programs
Prerequisite
It is desirable, but not mandatory, that students planning to enter Honours Economics should offer a minimum of 1 Ontario Grade 13 credit in Mathematics or the equivalent.

Honours Economics (Regular Program)
Eligibility for graduation in the Honours Economics program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 18 term courses must be in Economics, including ECON:
   a) 101, 102, 201, 202, 211, 221, 231, 301, 302, 321, 401, 402;
   b) 241 or 263;
   c) 3 additional term courses at the 300 level or above. (ECON 303 is recommended but not mandatory.)

Recommended Program

Year 1
ECON 101, 102
8 additional term courses*
*Students without Ontario Grade 13 Mathematics or equivalent should select MATH 103, 104 as an elective.

Year 2
ECON 201, 202, 231
3 additional term courses in Economics
4 additional term courses.

Year 3
ECON 301, 302, 321
3 additional term courses in Economics
4 additional term courses.

Year 4
ECON 401, 402*
2 additional term courses in Economics
6 additional term courses.
*ECON 401, 402 need not be taken in the order as listed.

Honours Economics (Applied Studies Co-op)
A student may combine an Honours Economics program with Applied Studies Co-op. The requirements in Economics are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 8:12.

Honours Applied Economics (Co-op)
Eligibility for graduation in the Honours Applied Economics (Co-op) program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 18 term courses must be in Economics including ECON 101, 102, 201, 202, 221, 231, 241, 263, 301, 302, 303, 321, 401, 402, 403, 421, 422. In addition, students are required to complete 1 additional term course at the 300 level or above.
3. In addition, the following courses are required:
   a) MATH 111B, 113A
   b) ACC 121, 122
   c) CS 100 or 102.

Continued
Recommended Program for Honours Applied Economics (Co-op)

**Year 1**
- ECON 101, 102
- ACC 121, 122
- CS 100 or 102
- ENGL 109 or 150
- MATH 111B

3 additional term courses.

**Year 2A**
- ECON 201, 221, 231
- MATH 113A

2 additional term courses.

**Year 2B**
- ECON 202, 241

4 additional term courses.

**Year 3A**
- ECON 263, 302, 321

3 additional term courses.

**Year 3B**
- ECON 301, 303, 421

3 additional term courses.

**Year 4A**
- ECON 401, 422

1 additional term course in Economics at the 300 level or above
- 2 additional term courses.

**Year 4B**
- ECON 402, 403

3 additional term courses.

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

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**Economics Joint Honours Programs**

Eligibility for graduation in the Joint Honours Economics program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average (in Economics) of at least 75%.

2. At least 14 term courses must be in Economics including ECON 101, 102, 201, 202, 211, 221, 231, 301, 302, 401, 402.

**Notes Regarding Joint Honours Programs:**

1. **Economics and Geography**
   - The degree requirements of the Faculty of Arts must be met for the BA Degree and those of the Faculty of Environmental Studies for the BE Degree. Students must take ECON 221 or ENV S 271 and the above core courses.

2. **Economics and Mathematics**
   - Substitute ECON 311, 321, for ECON 211, 221. ECON 421, 422 to be included in the above core courses. Students in Years 1 and 2 may take this program in either Faculty, but at the end of the second year, they will decide whether to continue towards a degree in Arts or a degree in Mathematics. The program must then be approved by the Economics Department or by an appropriate department of the Faculty of Mathematics.

3. **Economics and Political Science**
   - ECON 263 must be taken along with the above core courses.

4. **Economics and Sociology**
   - Students may take either ECON 227 or SOC 20.

**Minor Program in Economics**

A total of 10 term courses in Economics must be taken, and must include:

a) ECON 101, 102, 201, 202, 231;
b) ECON 211 or 221.

Math students should substitute ECON 211 or ECON 221 with ECON 311 or 321.
Three-Year General English
Eligibility for graduation in the General English program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least 12 term courses must be in English, including:
   a) 2 term courses from 102A, 102B, 103A, 103B, 105A, 105B, 108, 190 (see Note 1);
   b) 200A, 200B (Survey of British Literature - see Notes 2 and 3);
   c) 251A, 251B (Practice and Theory of Criticism - see Note 3);
   d) 2 term courses from 305A, 305B, 306A, 306B, 306C, 306D (Language and Early Literature);
   e) 4 term courses from 310A, 310B, 330A, 330B, 350A, 350B, 362, 363, 410A, 410B (British Literature to 1800);
   f) 2 term courses from 430A, 430B, 451A, 451B, 460A, 460B (British Literature since 1800);
   g) 2 term courses from 313, 314, 315, 316, 343, 344, 345, 346, 347, 415 (North American Literature);
   h) 4 other English major term courses.

Students in the General program must gain either a) a minimum of 16 term courses beyond the 100 level or b) credits from no more than 7 subject fields.

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

Honours English (Regular)
Eligibility for graduation in the Honours English program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 20 term courses must be in English, and these 20 courses are usually divided 2-6-6-6 among the four years. English courses must include:
   a) 2 term courses from 102A, 102B, 103A, 103B, 105A, 105B, 108, 190 (see Note 1);
   b) 200A, 200B (Survey of British Literature - see Notes 2 and 3);
   c) 251A, 251B (Theory and Practice of Criticism - see Note 3);
   d) 2 term courses from 305A, 305B, 306A, 306B, 306C, 306D (Language and Early Literature);
   e) 4 term courses from 310A, 310B, 330A, 330B, 350A, 350B, 362, 363, 410A, 410B (British Literature to 1800);
   f) 2 term courses from 430A, 430B, 451A, 451B, 460A, 460B (British Literature since 1800);
   g) 2 term courses from 313, 314, 315, 316, 343, 344, 345, 346, 347, 415 (North American Literature);
   h) 4 other English major term courses.

Honours English (Co-operative Program)
The program leading to the Degree of Bachelor of Arts in Honours English (Co-operative Program) is designed for students who intend to enter careers in business, industry, government, or the communications media. Qualified students will ordinarily be admitted to the program after completion of their first 2 academic terms at the University of Waterloo and will proceed through the Honours English BA program consisting of 6 further terms of study on campus and 5 paid work terms with participating employers in the media, business, government, and industry.

The academic requirements of the Co-operative program are essentially those of the regular Waterloo Honours BA in English. In addition, students must complete, by the start of their 3A term (20 term credits), 2 term credits in a language other than English and 2 term credits in computer science at the university level from any faculty.

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

Honours English (Applied Studies Co-op)
Students may combine an Honours English program with Applied Studies Co-op. The requirements in English are identical to the Honours requirements listed above. In addition, students must complete by the start of their 3A term (20 term credits), 2 term credits in a language other than English and 2 term credits in computer science at the university level from any faculty. The Applied Studies requirements are listed on page 8:12.
Rhetoric & Technical Writing Option

The Rhetoric and Technical Writing Program is available only as an honours program (not as a general program) and may be taken as either a regular program or a co-operative program. A total of 44 courses is required, and students must maintain an average of 75% in English courses, and 70% in their Intensive Study areas. In addition to English courses (English 103A/B is recommended), good course choices for first year include Arts Group B courses, a language other than English, and Computer Science.

The Intensive Study areas can be made up of courses drawn from all faculties except Engineering. The courses will be taken either from a single department (e.g. Biology, Economics) or closely related disciplines (e.g. Biology and Health Studies, Economics and Accounting, Legal Studies). Lists of approved "packages" for intensive study may be obtained from the Undergraduate Officer of the Department of English, who also has lists of recommended courses relevant to the program in History, Linguistic Studies, Philosophy, and Political Science.

Students preparing themselves for teaching careers or graduate studies in English may include further courses in literature as part of their electives.

English Requirements (20 courses)

1. First Year: 2 courses at 100 level or above (103A/B is recommended)
2. Literature: 200A/B; 251A/B; 4 further courses, at least 2 of which are at the 300 or 400 level
3. Linguistics: 306A and 1 of 306 B/C/D
4. Writing: 2 of 209, 219, 210A/C; 309A/B; 409A/B
5. Linguistics or Writing Option: 2 of 306B/C/D or English 309C/D

Non-English Requirements (24 courses)

A Language other than English: minimum of 2
Computer Science: minimum of 2
Arts Group B requirements: 4
Intensive Study area: minimum of 5
Elective Areas: 11

English Joint Honours Program

Eligibility for graduation in the Joint Honours English program includes fulfillment of the requirements listed below.

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 70% (with no more than 3 term course grades below 72%) in the English component of the program, together with an average of at least 75% in both areas of specialization combined.

2. At least 16 term courses must be in English, including:
   a) 2 term courses from 102A, 102B, 103A, 103B, 105A, 105B, 108, 190 (see Note 1);
   b) 200A, 200B (Survey of British Literature - see Notes 2 and 3);
   c) 251A, 251B (Theory and Practice of Criticism - see Note 3);
   d) 2 term courses from each of:
      i) 305A, 305B, 306A, 306B, 306C, 306D (Language and Early Literature);
      iii) 430A, 430B, 451A, 451B, 460A, 460B (British Literature since 1800);
      iv) 313, 314, 315, 316, 343, 344, 345, 346, 347, 415 (North American Literature);
      e) 2 other English major term courses (see Note 4).

Minor Program for Students in Other Disciplines

Ten term courses in English are required, as follows:
1. 200A/B (Survey of British Literature);
2. 251A/B (Practice and Theory of Criticism);
3. 2 English Major term courses, numbered 300 or above;
4. 4 other English Major term courses.

Notes for All Programs

1. Students may use only 2 English term courses at the 100 level to fulfill the minimum English requirements. Some English courses do not fulfill the English Major requirements for a degree in English (see English Undergraduate Course Descriptions). Students not in the Rhetoric and Professional Writing program may take for English credit ENGL 335 and 336 and a maximum of 2 other writing courses at the 200 and 300 levels.
2. Students who have taken ENGL 101 in 1980/81 or earlier will not be required to take ENGL 200A/B. If taken, it will not count as an English Major credit.
3. ENGL 200A, 200B, 251A, 251B are strongly recommended for second year.
4. Students planning to go on to graduate work are advised to choose the following English courses:
   b) 2 term courses from 305A, 305B, 310A, 310B;
   c) 2 term courses from 330A, 330B, 350A, 350B;
   e) 2 term courses from 211, 212, 232, 233;
   f) 343;
   g) 1 term course from 313, 314, 315, 316;

5. Students planning to teach high school are advised to choose the following English courses:
   a) 102A, 102B, 200A, 200B, 251A, 251B, 362, 363;
   b) 2 term courses from 306A, 306B, 306C, 306D;
   c) 2 term courses from 305A, 305B, 310A, 310B;
   e) 2 term courses from 211, 212, 232, 233, 343, 344;
   f) 2 term courses from 313, 314, 315, 316, 415.

Fine Arts

Three-Year General Fine Arts
Eligibility for graduation in the General Fine Arts program (Studio Option, Art History Option or Film Studies Option) includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least 12 term courses must be in Fine Arts. For the different Options, the required courses are as follows:

   Studio Option:
   a) FINE 110, 111, 120, 121, 220, 222, 224, 225;
   b) 4 additional Fine Arts courses, 2 of which must be Art History.

   Art History Option:
   a) FINE 110, 111, and 6 additional Art History courses.
   b) Fine 120 and 3 additional Studio courses.

   Film Studies Option:
   a) FINE 110, 111, 250, 251, 270W, 360, 361, 470, 471;
   b) FINE 350 or 351;
   c) at least 2 term courses in Film to be selected in consultation with the Fine Arts Film advisor. These may include FINE 350, 351, 352, 353, 252, 255R, 271W, 258W.

Four-Year General Fine Arts
Eligibility for graduation in the Four-Year General Fine Arts program (Studio Option, Art History Option, or Film Option) includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least 16 term courses must be in Fine Arts. For the different Options, the required courses are as follows:

   Studio Option:
   a) FINE 110, 111, 120, 121, 220, 222, 224, 225;
   b) 4 additional Fine Arts courses, 2 of which must be Art History.

   Art History Option:
   a) FINE 110, 111, 120, 121, 210, 211, 212, 213, 219, 316;
   b) and 3 additional term Studio courses.
   c) 4 term courses in Fine Arts at the 3rd or 4th year level, 2 of which must be 390A and 490A.

Honours Fine Arts
To graduate with an Honours degree in Fine Arts, it is necessary to complete FINE 490/491. Admission to this course is by portfolio, Art History or Film Studies presentation, submitted after successfully completing 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.

Eligibility for graduation in the Honours Fine Arts program (Studio Option, Art History Option or Film Studies Option) includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 20 term courses must be in Fine Arts. For the different Options, the required courses are as follows:
Studio Option:
a) FINE 110, 111, 120, 121, 220, 222, 224, 225;
b) 6 additional term courses in Fine Arts, 4 of which must be in Art History.
c) 4 term studio courses on the 3rd year level chosen from: FINE 226, 301, 324, 325, 320, 321, 322, 323;
d) FINE 490, 491.

Art History Option:
a) FINE 110, 111, 120, 121, 210, 211, 212, 213, 219, 316;
b) 2 additional term studio courses;
c) 6 term Art History courses on the 2nd or 3rd year level, 1 of which must be 390A;
d) FINE 490, 491.

Film Studies Option:
a) FINE 110, 111;
b) 2 term courses chosen from Fine 120, 121, 210, 211;
c) Fine 250, 251, 270W, 350, 351, 360, 361, 470, 471;
d) at least 5 additional term courses in Film to be selected in consultation with the Fine Arts Film advisor. These may include FINE 252, 255R, 271W, 258W, 352, 353;
e) FINE 490, 491.

Honours Fine Arts (Applied Studies Co-op)
A student may combine an Honours Fine Arts program with Applied Studies Co-op. The requirements in Fine Arts are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 8:12.

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

Minor in Fine Arts (Studio, Art History or Film Studies Option)
Eligibility for graduation with a Fine Arts Minor (Studio, Art History or Film Studies Option) includes fulfillment of the following requirements:
1. Successful completion of a minimum of 10 Fine Arts term courses with a cumulative average in these Fine Arts courses of 65%.
2. For the different Options, the required Fine Arts courses are:
   Studio or Art History Option:
   FINE 110/111, 120/121.
   Film Studies Option:

Arts
Fine Arts
French

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

French

Three-Year General French
Eligibility for graduation in the General French program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least 12 term courses must be in French of which at least 6 term courses must be at the 300 or 400 level. At least one term course must be taken in each of the following areas: 17th, 18th, 19th, 20th century literature, French-Canadian literature, and linguistics. The student must also have completed French 301 and 302 or equivalent.

Four-Year General French
Eligibility for graduation in the Four-Year General French program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least 16 term courses must be in French of which 8 must be at the 300 and 400 levels. Of the 8 courses at the 300 and 400 level, 2 must be FR 401, 402. At least one term course must be taken in each of the following areas: 17th, 18th, 19th, 20th century literature, French-Canadian literature, and linguistics.

Honours French
Eligibility for graduation in the Honours French program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 20 term courses must be in French of which at least 12 term courses must be at the 300 or 400 level. At least one term course must be taken in each of the following areas: 17th, 18th, 19th, 20th century literature, French-Canadian literature, and linguistics.
literature, and either the Renaissance or the Medieval periods. The student must complete one course in linguistics and FR 402 or equivalent.

Recommended Program

Year 1
FR 192 and/or FR 195/196.
8 additional term courses.

Year 2
a) In language, a minimum of FR 251 plus 1 of FR 252, 207, 208 or 255.
b) A minimum of 4 additional term courses in French literature or linguistics.
c) Additional courses.

Year 3
a) In language, a minimum of FR 301/302.
b) A minimum of 4 additional term courses in French literature or linguistics.
c) Additional courses.

Year 4
a) In language, a minimum of FR 401/402.
b) A minimum of 4 additional term courses in French literature or linguistics.
c) Additional courses.

Honours French (Applied Studies Co-op)
Students may combine an Honours French program with Applied Studies Co-op. The requirements in French are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 8:12.

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

Anthropology  Man-Environment Studies
Classical Studies  Mathematics
Economics  Philosophy
English  Political Science
Fine Arts  Psychology
Geography  Religious Studies
German  Russian
History  Sociology
Latin  Spanish

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

Eligibility for graduation in the Joint Honours French program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 16 term courses must be in French (in the case of Political Science only 14 are required) of which at least 8 must be at the 300 or 400 level, including FR 402. At least one term course must be taken in each of the following areas: 17th, 18th, 19th, 20th century literature, French-Canadian literature, linguistics and either the Renaissance or the Medieval periods.

Recommended Program

Year 1
FR 192 and/or FR 195/196.
8 additional term courses.

Year 2
a) In language, a minimum of FR 251 plus 1 of FR 252, 207, 208 or 255.
b) A minimum of 4 additional term courses in French literature or linguistics.
c) Additional courses.

Year 3
a) In language, a minimum of FR 301/302.
b) A minimum of 2 additional term courses in French literature or linguistics.
c) Additional courses.

Year 4
a) In language, a minimum of FR 401/402.
b) A minimum of 2 additional term courses in French literature or linguistics.
c) Additional courses.

Minor Program in French
A minor program in French will consist of 10 term courses in French Language and/or Literature. Students must demonstrate written and oral ability in French equal to that expected in FR 301/302. French 151, 152 and 155 may not be counted as credits towards a French minor.

Notes for All Programs

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

Geography

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

Three-Year General Geography
Graduation in the General Geography program demands fulfillment of the following requirements:

1. Successful completion of the equivalent of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least 12 term courses must be in Geography; only 4 of these 12 courses may be Environmental Studies courses but all ENV S courses are included in the calculation of the major average.

Recommended Program

Year 1
GEOG 101 Introduction to Human Geography
GEOG 102 Introduction to Physical Geography
GEOG 110 Introduction to the Field of Geography
GEOG 160 Introduction to Cartography and Map Analysis
and 1 but not more than 2 of:
ENV S 195 Introduction to Environmental Studies
GEOG 125R Introduction to the Third World
GEOG 126R Development in the Third World
GEOG 127 Regional Problems of Europe
and additional courses.

Year 2
ENV S 200 Field Ecology
GEOG 201 Geomorphology and Soils
GEOG 202 Economic and Urban Geography
1 of:
GEOG 208 Applied Climatology
GEOG 309 Physical Climatology
and 1 of:
GEOG 203 Topics of Cultural and Regional

Four-Year General Geography
Graduation in the Four-Year General Geography program demands fulfillment of the following requirements:

1. Successful completion of the equivalent of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least 20 term courses must be in Geography; only 4 of these 20 courses may be Environmental Studies courses but all ENV S courses are included in the calculation of the major average.

Recommended Program

Year 1
GEOG 101 Introduction to Human Geography
GEOG 102 Introduction to Physical Geography
GEOG 110 Introduction to the Field of Geography
GEOG 160 Introduction to Cartography and Map Analysis
and 1 but not more than 2 of:
ENV S 195 Introduction to Environmental Studies
GEOG 125R Introduction to the Third World
GEOG 126R Development in the Third World
GEOG 127 Regional Problems of Europe
and additional courses.

Year 2
ENV S 200 Field Ecology
GEOG 201A Geomorphology and Soils
GEOG 202 Economic and Urban Geography
1 of:
GEOG 208 Applied Climatology
GEOG 309 Physical Climatology
GEOG 275 Introductory Air Photo Analysis and Remote Sensing
ENV S 277 Introduction to Environmental Research Methods
ENV S 377 Advanced Environmental Research Methods
and 1 of:
GEOG 203  Topics of Cultural and Regional Geography
GEOG 204  Soviet Union
GEOG 205  Africa
GEOG 220A  World Regional Geography
GEOG 221  The United States
and additional courses so that a student should have completed by the end of second year 20 term course equivalents.

Year 3
GEOG 381  The Nature of Geography
GEOG 391  Field Research
1 of:
GEOG 307  Social Survey Techniques
GEOG 316  Multivariate Statistics
GEOG 317  Nonparametric Statistics
GEOG 318  Spatial Analysis
GEOG 319  Economic and Social Techniques for Regional Planning
GEOG 360  Preparation of Maps and Illustrations
GEOG 375  Air Photo Interpretation
GEOG 376  Environmental Remote Sensing
ENV S 378  Applications of Computer Programming in Environmental Studies

Year 4
Electives

Honours Geography
Graduation in the Honours Geography program demands fulfillment of the following requirements:

1. Successful completion of the equivalent of 40 term courses including Faculty of Arts Group GEOG 307 requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 20 term courses must be in Geography; only 4 of these 20 courses may be Environmental Studies courses but all ENV S courses are included in the calculation of the major average.

Recommended Program

Year 1
GEOG 101  Introduction to Human Geography
GEOG 102  Introduction to Physical Geography
GEOG 110  Introduction to the Field of Geography
GEOG 160  Introduction to Cartography and Map Analysis
and 1 of, but not more than 2 of:
ENV S 195  Introduction to Environmental Studies
GEOG 125R  Introduction to the Third World
GEOG 126R  Development in the Third World
GEOG 127  Regional Problems of Europe

Year 2
ENV S 200  Field Ecology
GEOG 201  Geomorphology and Soils
GEOG 202  Economic and Urban Geography
GEOG 275  Introductory Air Photo Analysis and Remote Sensing
ENV S 277  Introduction to Environmental Research Methods
ENV S 377  Advanced Environmental Research Methods
1 of:
GEOG 208  Applied Climatology
GEOG 309  Physical Climatology
and 1 of:
GEOG 203  Topics of Cultural and Regional Geography
GEOG 204  Soviet Union
GEOG 205  Africa
GEOG 220A  World Regional Geography
GEOG 221  The United States
and additional courses so that a student should have completed by the end of second year 20 term course equivalents.

Year 3
GEOG 381  The Nature of Geography
GEOG 390  Senior Honours Thesis Proposal
GEOG 391  Field Research
1 of:
GEOG 307  Social Survey Techniques
GEOG 316  Multivariate Statistics
GEOG 317  Nonparametric Statistics
GEOG 318  Spatial Analysis
GEOG 319  Economic and Social Techniques for Regional Planning
GEOG 360  Preparation of Maps and Illustrations
GEOG 375  Air Photo Interpretation
GEOG 376  Environmental Remote Sensing
ENV S 378  Applications of Computer Programming in Environmental Studies

Year 4
GEOG 490A/B Senior Honours Thesis

Geography Joint Honours and Minor Programs
(See p. 10.17.)

Notes For All Programs

1. Electives: By the end of second year, 1 course is required from English Group One (p. 16:49); ENGL 109, 129R, 140R or 150 may be taken in Year 1; ENGL 209 or 210 may be taken in Year 2.
In the 4 year programs, CS 100 is recommended in Year 1 for students without computer experience in high school.

2. For some courses, extra fees may be required to defray heavy equipment/travel costs, e.g. GEOG 391 (Field Research). Statements on extra costs will be found with the course description.

3. Students intending to teach in Secondary Schools are advised to take at least 4 term courses in Regional Geography.

4. Students considering graduate work should take at least 2 term courses in a foreign language related to their field of interest.

5. Up to 3 term course equivalents may be taken as Independent study courses in Geography.

German

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

- Three-Year General Program in German
- Honours Program in German
- Honours German (Applied Studies Co-op)
- Joint Honours Program with German
- Minor Program in German

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

<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 Grade 12 standing in German or equivalent</td>
</tr>
</tbody>
</table>
| First Year  
GER 101/102                  | First Year  
GER 121/122 and/or GER 151/152 |
| Second Year  
GER 201/202                  | Second Year  
GER 251/252  
GER 291/292                  |

Three-Year General German

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

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least 12 term courses must be in German.

Honours German

Eligibility for graduation in the Honours German program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 20 term courses must be in German.

Honours German (Applied Studies Co-op)

A student may combine an Honours German program with Applied Studies Co-op. The requirements in German are identical to the Joint Honours requirements listed below. The Applied Studies requirements are listed on page 8.12.

German Joint Honours

A Joint Honours program with German may be taken in combination with any other discipline in which an Honours program is offered, subject to approval by the Departments concerned.

The following Joint Honours programs have been approved with German:

- Anthropology  
- Classical Studies  
- Drama  
- Economics  
- English  
- French  
- Geography  
- History  
- Mathematics  
- Music  
- Philosophy  
- Political Science  
- Psychology  
- Russian  
- Sociology  
- Spanish

Eligibility for graduation in the German Joint Honours program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 16 term courses must be in German.
Minor Program in German
Students of all departments may elect German as a Minor field of studies in consultation with the Department of Germanic and Slavic Languages and Literatures. A minor requires the completion of a minimum of 10 term courses in German with an overall cumulative average of at least 65% in those courses, of which:

a) not more than 4 term courses may be chosen from courses on the 100 level, and
b) at least 2 term courses must be chosen from courses above the 200 level.

Waterloo in Germany Program
The Department offers a yearly program of studies at the University of Mannheim on the Rhine. The program is normally open to students entering third-year courses. In exceptional cases second year students will also be considered. Students of all disciplines may apply, provided they have an adequate knowledge of German. The application deadline for students who wish to begin studies in Mannheim in the Winter Semester (October 15 to February 15) is April 1. The application deadline for those who wish to begin their studies in the Summer Semester (April 15 to July 15) is February 1. Applications should be submitted to “Waterloo in Germany”, Department of Germanic and Slavic Languages and Literatures, University of Waterloo, Waterloo, Ontario N2L 3G1.

Notes For All Programs
1. First-year students who wish to major in German are strongly advised to consult the Undergraduate Advisor of the Department.
2. Before graduation all students must complete GER 291/292, normally in Year 2.
3. GER 271/272, GER 355, and GER 391/392 are open to all students. However, these courses will normally count toward the Major or Honours requirement for Stream A students only.
4. Although students may take both GER 121/122 and GER 151/152, only 1 of these courses will normally count toward the Major or Honours requirement in German.

Greek
See Classical Studies.

History
The Department of History offers the following programs:

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

Three-Year General History
Eligibility for graduation in the General History program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least 10 term courses must be in History with at least 2 above the 250 level and no more than 2 at the 100 level.

Four-Year General History
Eligibility for graduation in the Four-year General History program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least 14 term courses must be in History with at least 2 in the 300 level, and no more than 2 at the 100 level.

Honours History
Eligibility for graduation in the Honours History program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 16 term courses and 2 Senior Seminars must be in History. No more than 2 term courses may be at the 100 level and no more than 4 may be in the 200-249 range. The Department of History's Undergraduate Officer is responsible for ensuring that individual programs are not too narrowly specialized.
Recommended Program

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

HIST 100
1 of HIST 102A-U
8 other term courses.

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

Year 3
6 term courses in History.
4 other term courses.

Year 4
2 Senior Seminars (2.0 course credits)
2 term courses in History.
2 other term courses.

Honours History (Applied Studies Co-op)
A student may combine an Honours History program with Applied Studies Co-op. The requirements in History are identical to the Joint Honours requirements listed below. The Applied Studies requirements are listed on page 8:12.

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

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

Eligibility for graduation in the Joint Honours History program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 10 term courses and 2 Senior Seminars must be in History.

Minor Program
To qualify for a Minor in History, students must complete 10 term courses in History, with at least 2 above the 250 level and no more than 2 at the 100 level. Students from other departments and faculties who are interested in taking a Minor in History should consult with the Department of History's Undergraduate Office. They must maintain a 65% average in History courses.

Notes For All Programs
1. CIV 251 and 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.

Italian

Minor Program
Students enrolled in Honours Programs in Arts or other faculties may elect a Minor in Italian, which requires the successful completion of at least 10 term course equivalents with an overall cumulative average of 65% or more in those credits. Students are required to take the following 6 term courses:

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

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

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

Note
Those students with Grade 13 Italian or whose competency in the language excludes them from ITAL 101, 102 must substitute ITAL 291, 292 for this requirement.

Latin

See Classical Studies.
Medieval Studies

Students interested in an interdisciplinary approach to university education and to an examination of the Middle Ages may take either a General or an Honours BA in Medieval Studies. Such a degree is designed to provide a general awareness of our cultural heritage. In addition, the program is flexible enough to prepare students for careers in teaching, or for the pursuit of a graduate degree.

The Medieval Studies program is administered jointly by the English Department at St. Jerome's College (Dr. D. Letson) and by the Department of Classical Studies (Dr. P. Forsyth). Interested students may call or write either of these advisors for further information.

Three-Year General Medieval Studies
Eligibility for graduation in the General Medieval Studies program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least 14 term courses must be from an approved list of Medieval Studies or related courses, including at least 2 term courses from each of 4 of the 8 subject fields specified below.
3. Successful completion of at least 6 term courses, (not all of which need be medieval in content) in one of the subject fields specified below.

Honours Medieval Studies
Eligibility for graduation in the Honours Medieval Studies program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 20 term courses in Music, including MUSIC:
   a) 100, 250, 251;
   b) at least 3 of 253, 254, 353, 354.
3. Participation in at least 6 terms of Music Ensemble.

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 266, 267, 366, 367.

Music Joint Honours Program
Eligibility for graduation in the Music Joint Honours program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group Requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 16 term courses in Music, including MUSIC:
   a) 100;
   b) at least 3 of 253, 254, 353, 354;
   c) at least 3 of 250, 251, 370, 371;
   d) 9 additional term courses of which at least 6 must be above the 100 level;
   e) 490A/B or a senior honours essay in the other discipline.

3. Participation in at least 6 terms of Music Ensemble.

   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 266, 267, 366, 367.

Minor Program
Eligibility for graduation with a Minor in Music includes fulfillment of the following requirements:

1. At least 10 term courses in Music, including MUSIC:
   a) 100, 250;
   b) 8 additional term courses selected in consultation with the Music Department.

2. Participation in at least 2 terms of Music Ensemble.

Note For All Programs
Students electing to take Music Studio must arrange for an audition before the Music Faculty. Normally a level of performance equal to Grade 8 standing at the Royal Conservatory of Music of Toronto is expected for admission to Music Studio. Music Studio courses are available only to Music majors and minors.

Philosophy

Three-Year General Philosophy
Eligibility for graduation in the General Philosophy program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least 10 term courses must be in Philosophy, including PHIL:
   a) one of 140, 145, 241, 242, 243, or 440A/B;
   b) 221;
   c) any 2 of 380 - 387.

St. Jerome's Philosophy students must meet the basic requirements as listed above, and their PHIL courses must include:
   a) one of 200J, 140, 145, 241, 242, 243, or 440A/B;
   b) 218J or 221;
   c) any 2 of 380 - 387.

Four-Year General Philosophy
Eligibility for graduation in the Four-year General Philosophy program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least 14 term courses must be in Philosophy, and must include the courses required in the Three-Year General program.

Honours Philosophy
Eligibility for graduation in the Honours Philosophy program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 20 term courses must be in Philosophy, including PHIL:
   a) one of 241, 242, 243, or 440A/B;
   b) 221, 322, 499A/B;
   c) any 4 of 380 - 387.

St. Jerome's Philosophy students must meet the basic requirements as listed above, and their PHIL courses must include:
   a) one of 241, 242, 243, or 440A/B;
   b) 218J or 221;
   c) 322;
   d) any 4 of 380 - 387;
   e) 499A and either 499B or 499J.

College students are also expected to take 450J.
Honours Philosophy (Applied Studies Co-op)
A student may combine an Honours Philosophy program with Applied Studies Co-op. The requirements in Philosophy are identical to the Honours requirements listed above except that only 16 term courses in Philosophy are required. The Applied Studies requirements are listed on page 8:12.

Philosophy Joint Honours Program
A Joint Honours program with Philosophy may be taken in combination with any other discipline in which an Honours program is offered, subject to approval by the Departments concerned. Joint Honours programs have been approved with:
- Economics
- Political Science
- English
- Psychology
- French
- Religious Studies
- German
- Russian
- History
- Social Development
- Latin
- Studies
- Mathematics
- Sociology

Eligibility for graduation in the Joint Honours Philosophy program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group Requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 14 term courses must be in Philosophy, including PHIL:
   a) one or 2 of 140, 241, 242, 243, or 440A/B (depending on program);
   b) 221, 322;
   c) any 4 of 360 - 387;
   d) a Philosophy course which is relevant to the other subject (e.g. Aesthetics for Philosophy and English);
   e) a Senior Honours essay in PHIL 499A/B or in the other subject.

Students registered at St. Jerome’s in a Philosophy Joint Honours program may substitute St. Jerome’s Philosophy Courses in the same way as for the Philosophy Honours program.

Minor Program in Philosophy
To be eligible for a Minor in Philosophy, students must successfully complete 10 term courses in Philosophy that have been approved by the Department.

Political Science
The Department of Political Science offers a series of undergraduate programs designed to meet the needs of students with varying interests. Requirements for each program are restricted to the completion of a specified number of courses in different fields of the discipline before graduation. For these purposes Political Science courses above the 100 level are numbered according to the field within which they fall.

The key to this scheme is the second digit of the course number as follows:
1 - methodology
2 - normative theory
3 - public administration, public law, and public policy
4 - local and regional politics
5 - comparative politics (more than one country)
6 - comparative politics (specific countries)
7 - the political process
8 - international politics

with the number 9 reserved for special courses which are not regarded as dealing with a particular field of the discipline. P SCI 291 and 292 are non-program courses (see Note p. 8:32).

Three-Year General Political Science
Eligibility for graduation in the General Political Science program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 12 term courses must be in Political Science. Ten of these 12 courses must be above the 100 level, of which at least 1 term course from each of 4 different fields of discipline listed above must be taken. At least 4 term courses must be taken at the 300 level or higher.

Four-Year General Political Science
Eligibility for graduation in the Four-Year General Political Science program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 46 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 70%.
2. At least 18 term courses must be in Political Science. Sixteen of these 18 courses must be above the 100 level, of which at least 2 term courses from each of 4 different fields of discipline listed above must be taken. At least 4 term courses must be taken at the 300 level or higher.

Honours Political Science
Eligibility for graduation in the Honours Political Science program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 20 term courses must be in Political Science. Eighteen of these 20 courses must be above the 100 level, of which at least 2 term courses from each of 4 different fields of discipline listed above must be taken. At least 4 term courses must be taken at the 400 level.

Recommended Program

Year 1
P SCI 101/102
8 other term courses.

Year 2
6 term courses in Political Science (see Note)
4 other term courses.

Year 3
6 term courses in Political Science (see Note)
4 other term courses.

Year 4
6 term courses in Political Science at least 4 of which must be at the 400 level (see Note)
4 other term courses.

Honours Political Science (Administrative Studies Option)
Eligibility for graduation in the Honours Political Science with an Administrative Studies Option includes fulfillment of the following requirements:
1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average (including Administrative Studies courses) of at least 75%.

2. At least 20 term courses must be in Political Science and 14 term courses must be in Administrative Studies. The requirements for an Honours Political Science degree apply for the Honours Political Science with an Administrative Studies Option, plus the following courses must be taken:
a) ECON 101, 102, P SCI 260A/B, 331;
b) 1 of P SCI 332 or 333;
c) 4 term courses in Political Science beyond the 100 level which have been designated as Administrative Studies courses by the Department of Political Science;
d) 4 term courses not in Political Science, selected from courses which have been designated as Administrative Studies courses by the Department of Political Science.

Other Options
The following study Options are also open to students in Honours Political Science: Women's Studies, Iberoamerican Studies, Legal Studies, Peace and Conflict Studies, Personnel and Administrative Studies, Canadian Studies.

Co-operative Program in Honours Political Science
The program leading to the Degree of Bachelor of Arts in Honours Political Science (Co-operative program) is designed for students who intend to enter careers in government, the mass media, business, political parties, or public opinion organizations. Qualified students will ordinarily be admitted to the program after completion of their first 3 academic terms with a minimum average of 78% in at least 2 Political Science term courses. The program consists of 6 further academic terms and a minimum of 4 paid work terms with participating employers.

The academic requirements of the Co-operative program are identical with those of the Regular Honours program in Political Science. The program is open to students enrolled in either the Regular Honours Political Science program or Honours Political Science (Administrative Studies Option).

The first work term of the Co-operative program occurs after the successful completion of Year 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 2 academic terms.
Honours Political Science (Applied Studies Co-op)
A student may combine an Honours Political Science Program with Applied Studies Co-op. The requirements for Political Science are a minimum of 16 term courses, with at least 14 beyond the 100 level. There must be at least 1 term course from each of 4 different fields of the discipline as defined above. At least 4 term courses must be taken at the 400 level. The Applied Studies requirements are listed on page 6:12. Students planning to enrol in Honours Political Science (Applied Studies Co-op) should consult the Department's Co-op Officer.

Political Science Joint Honours Program
Students who wish to combine a study of Political Science with a broad training in a related discipline such as Sociology or History, or in fact in any other discipline in which they are interested, can do so in a Joint Honours program. Joint Honours programs have been approved between Political Science and:

- Anthropology
- Economics
- English
- French
- Geography
- History
- Man-Environment
- Philosophy
- Psychology
- Sociology

Eligibility for graduation in the Political Science Joint Honours program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 14 term courses must be in Political Science. Twelve of the 14 courses must be beyond the 100 level, of which there must be at least 1 term course from each of 4 different fields of discipline as defined above. Two term courses must be at the 400 level.

Recommended Program

Year 4
4 term courses in P SCI, at least 2 of which must be at the 400 level (see Note)
4 term courses in the other discipline.
4 other term courses.

Minor Program
Any student in an Honours program may qualify for a Minor in Political Science by completing 10 term courses in Political Science before graduation with a cumulative average of 65% or better. Courses must be selected to meet the following requirements:

a) at least 1 term course in each of 3 different fields of the discipline;
b) the equivalent of at least 2 term courses above the 200 level.

Note For All Programs
No student in a General, Honours, Joint Honours or Minor program in Political Science may use P SCI 291 or 292 to meet program requirements.

Psychology

Three-Year General Psychology
Eligibility for graduation in the General Psychology program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least 10 term courses must be in Psychology, including PSYCH:
   a) 101;
   b) 200;
   c) at least 1 of 203, 206, 207, 261, 271;
   d) at least 1 of 211, 253, 355, 357;
   e) at least 1 of 212, 213, 333, 334, 335, 341.

Honours Psychology
Eligibility for graduation in the Honours Psychology program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 18 term courses must be in Psychology, including PSYCH:
   a) 101;
   b) 291, 292, 391;
   c) at least 2 of 203, 206, 207, 261, 271;
   d) at least 2 of 211, 253, 355, 357;
   e) at least 2 of 392, 393, 394, 395, 396, 397, 398;
   f) 499A/B.

PSYCH 291, 292, 391, and 2 of the following courses:
PSYCH 392, 393, 394, 395, 396, 397, 398 should be completed prior to the beginning of the fourth year of the program.

It is also recommended that honours students take at least 2 senior seminars or special topics courses (at either the 300 or 400 level) in Psychology.

Recommended Program

<table>
<thead>
<tr>
<th>Year</th>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PSYCH 101/102</td>
</tr>
<tr>
<td></td>
<td>The equivalent of 8 additional term courses.</td>
</tr>
<tr>
<td>2</td>
<td>PSYCH 291/292</td>
</tr>
<tr>
<td></td>
<td>The equivalent of 2 additional term courses in Psychology.</td>
</tr>
<tr>
<td></td>
<td>The equivalent of 6 additional term courses.</td>
</tr>
<tr>
<td>3</td>
<td>PSYCH 391</td>
</tr>
<tr>
<td></td>
<td>2 of PSYCH 392, 393, 394, 395, 396, 397, 398</td>
</tr>
<tr>
<td></td>
<td>The equivalent of 3 additional term courses in Psychology.</td>
</tr>
<tr>
<td></td>
<td>The equivalent of 4 additional term courses.</td>
</tr>
<tr>
<td>4</td>
<td>PSYCH 499A/B.</td>
</tr>
<tr>
<td></td>
<td>2 senior seminars or special topics courses in Psychology.</td>
</tr>
<tr>
<td></td>
<td>The equivalent of 2 additional term courses in Psychology.</td>
</tr>
<tr>
<td></td>
<td>The equivalent of 4 additional term courses.</td>
</tr>
</tbody>
</table>

Honours Psychology (Applied Studies Co-op)
A student may combine an Honours Psychology program with Applied Studies Co-op. The requirements in Psychology are identical to the Honours requirements listed above except only 16 term courses in Psychology are required. The Applied Studies requirements are listed on page 8:12.

Honours Psychology Co-operative Program
The Department of Psychology offers a Co-operative Honours program in Psychology, in which academic studies are combined with relevant work experience. Generally, students are placed as research or program assistants in such work settings as government and private research organizations, personnel departments, management training programs, correctional institutions, and other educational and/or treatment institutions.

The Co-op program consists of 6 academic terms beyond the first year, and 4 paid work terms. Each work term is of 4 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 program is normally made in November of the second year, with interviews taking place before the end of the fall term. However, interested students are advised to consult with the Co-op Faculty Advisor when planning their second-year programs.

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

- Anthropology
- Classical Studies
- Dance
- Drama
- Economics
- English
- Fine Arts
- French
- Geography
- German
- History
- Kinesiology
- Man-Environment Studies
- Mathematics
- Music
- Philosophy
- Political Science
- Recreation
- Religious Studies
- Russian
- Social Development Studies
- Sociology
- Spanish
- Statistics

Eligibility for graduation in the Joint Honours Psychology program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%. (These are requirements for students registered in the Faculty of Arts. Students registered in other faculties should consult the degree requirements of their faculty.)

2. At least 14 term courses must be in Psychology, including PSYCH:
   a) 101;
   b) 291, 292, 391;
   c) at least 2 of 203, 206, 207, 261, 271;
   d) at least 2 of 211, 253, 355, 357;
   e) at least 2 of 392, 393, 394, 395, 396, 397, 398;

3. Honours thesis in either major program. (In Psychology, PSYCH 499A/B.)
PSYCH 291, 292, 391, and 2 of the following courses. PSYCH 392, 393, 394, 395, 396, 397, 398 should be completed prior to the beginning of the fourth year of the program.

Students are advised that unless they elect to also do their Honours thesis in Psychology, their Psychology component would not be equivalent to the Honours program normally expected for admission to graduate programs in Psychology.

Early Childhood Education and Care Programs
The Department of Psychology offers both a Four-Year General and an Honours program with Early Childhood Education and Care Option. At the end of both programs, students will have completed all of the formal university training required by the Association of Early Childhood Education (Ontario), and the Ministry of Community and Social Services for working in a preschool and day care setting. The other principal requirement for the Early Childhood Education Certificate is 1 year of full-time teaching experience in the Ontario preschool setting. Interested persons are encouraged to request a brochure from the Department of Psychology which outlines in detail the recommended programs.

Four-Year General Psychology with Early Childhood Education and Care Option
Eligibility for graduation in the General Psychology program with Early Childhood Education and Care Option includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative Psychology average of at least 65%, and a grade of at least 75% in each graded Early Childhood Education course (PSYCH 322A/B, 341, 422A/B).
2. At least 20 term courses must be in Psychology for letter grades, including PSYCH: 101, 211, 212, 213, 291, 292, 311, 312, 322A/B, 341, 391, 392, 393, 422A/B, 463; 203 or 207; or 499A/B.

Students are also required to take PSYCH 323A/B and 423A/B for credit. DANCE 264B and HLTH 140 are also required.

In addition, it is recommended that students take at least 1 additional seminar or special topics course (300 or 400 level) in child psychology.

The major admission requirement to gain entrance to the Honours Psychology program with Early Childhood Education and Care Option is a 75% average in the first 2 years of Psychology courses and some previous work experience with children. Students are required to apply for admission to this Option in the second term of their second year. Application must be made with the Director of this program. Following admission, courses must be approved by the Director. For further information about the program students should obtain the Early Childhood Education and Care brochure which is available from the undergraduate secretary.

Honours Psychology with Early Childhood Education and Care Option
Eligibility for graduation in the Honours Psychology program with Early Childhood Education and Care Option includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative Psychology average of at least 75%, and a grade of at least 75% in each graded Early Childhood Education course (PSYCH 322A/B, 341, 422A/B).
2. At least 20 term courses must be in Psychology for letter grades, including PSYCH: a) 101, 211, 212, 213, 291, 292, 311, 312, 322A/B, 341, 391, 392, 393, 422A/B, 463; b) 203 or 207; c) 499A/B.

Students are also required to take PSYCH 323A/B and 423A/B for credit. DANCE 264B and HLTH 140 are also required.

In addition, it is recommended that students take at least 2 undergraduate seminars or special topics courses (300 or 400 level) in child psychology.

The major admission requirement to gain entrance to the Honours Psychology program with Early Childhood Education and Care Option is a 75% average in the first 2 years of Psychology courses and some previous work experience with children. Students are required to apply for admission to this Option in the second term of their second year. Application must be made with the Director of this program. Following admission, courses must be approved by the Director. For further information about the program students should obtain the Early Childhood Education and Care brochure which is available from the undergraduate secretary.

Honours Psychology with a BSc Degree
An Honours Psychology degree program is also available in the Faculty of Science. See Chapter 14.

Minor Program In Psychology
Students choosing a Minor program in Psychology must successfully complete 10 term courses in Psychology including PSYCH:

a) 101;
b) 200;
c) at least 1 of 203, 206, 207, 261, 271;
d) at least 1 of 211, 253, 355, 357;
e) at least 1 of 212, 213, 333, 334, 335, 341.
Religious Studies

Purpose of the Program in Religious Studies:

a) to expose students to the issues and problems involved in, and to the nature of the questions raised by, the study of religious phenomena and ideas;

b) to enable students to approach, in a methodical way, the study of the major religious traditions living today for the purpose of encountering and understanding the life and the expression of religion through the various religions of the world.

c) to introduce them to the distinctive features of one or more religious tradition and to the methods for their systematic study.

The course offerings of the Religious Studies Department fall into the following 5 areas:

1. World Religions
2. History of the Christian Tradition
3. Biblical Studies
4. Theology - Philosophy - Ethics
5. Religion, Society and Culture.

Areas of Religious Studies to which courses belong are indicated by the area number below the course description.

Three-Year General Religious Studies

Eligibility for graduation in the General Religious Studies program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least 10 term courses must be in Religious Studies including RS;
   a) 100A, 200, 230, 231;
   b) 1 other course, from the RS 100A-K sequence;
   c) 2 term courses at the 300 or 400 level.

Four-Year General Religious Studies

Eligibility for graduation in the Four-Year General Religious Studies program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least 14 term courses must be in Religious Studies including RS;
   a) 100A, 200, 230, 231;
   b) 1 other course, from the RS 100A-K sequence;
   c) 4 term courses at the 300 or 400 level.

Honours Religious Studies

Eligibility for graduation in the Honours Religious Studies program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 20 term courses must be in Religious Studies including RS;
   a) 100A, 200, 230, 231, 490A/B;
   b) 1 other course, from the RS 100A-K sequence;
   c) 1 term course from each of the 5 RS areas;
   d) at least 5 term courses at or above the 300 level, not including RS 490A/B.

Honours Religious Studies (Applied Studies Co-op)

A student may combine an Honours Religious Studies program with Applied Studies Co-op. The requirements in Religious Studies are identical to the Honours requirements listed above except the overall number of term courses in Religious Studies is 16 rather than 20. The Applied Studies requirements are listed on page 8:12.

Religious Studies Joint Honours Program

The Religious Studies Department offers Joint Honours programs with the following Departments:

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

The requirements in Joint Honours programs are the same as the Honours program, except the overall number of Religious Studies courses is 14 instead of 20. The RS 490 requirement may be waived for students who choose to do their senior honours essay in the other Department. There will be consultation between the Undergraduate Officers of the 2 Departments.

Minor Program in Religious Studies

Requirements:
Successful completion (65% average) of a minimum of 10 term courses from at least 4 of the 5 areas of Religious Studies. The sequence of courses to be determined in consultation with the Undergraduate Advisor of the Department.
Note For All Programs
Students at the University of Waterloo and Wilfrid Laurier University may, with the permission of their advisor, take courses in Religious Studies at either University. For details regarding registration procedures and courses available at Wilfrid Laurier University, consult the Undergraduate Officer, Religious Studies.

Russian and Slavic Studies
The Department of Germanic and Slavic Languages and Literatures offers the following programs in Russian and Slavic Studies:

Three-Year General Program in Russian
Honours Program in Russian
Honours Program in Slavic Studies
Honours Slavic Studies (Applied Studies Co-op)
Joint Honours Program with Russian
Minor Program in Russian

Three-Year General Russian
Eligibility for graduation in the General Russian program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 85%.

2. At least 12 term courses must be in Russian.

Honours Russian
Eligibility for graduation in the Honours Russian program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 20 term courses must be in Russian.

Honours Slavic Studies
Eligibility for graduation in the Honours Slavic Studies program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 20 term courses must be in Slavic Studies, of which 12 will normally be in Russian and 8 in the other Slavic languages.

Honours Slavic Studies (Applied Studies Co-op)
A Student may combine an Honours Russian program with Applied Studies Co-op. This program includes the following requirements:

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 16 term courses must be in Slavic Studies, of which 10 term courses will normally be in Russian and 6 in the other Slavic languages.

Russian Joint Honours Program
A Joint Honours program with Russian may be taken in combination with any other discipline in which an Honours program is offered, subject to approval by the Departments concerned. Listed below are approved combinations with Russian:

- Drama
- Economics
- English
- French
- Geography
- German
- History
- Mathematics
- Philosophy
- Political Science
- Psychology
- Sociology
- Spanish

Eligibility for graduation in the Russian Joint Honours program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75% in each of the 2 Honours disciplines.

2. At least 16 term courses must be in Russian.

Minor Program in Russian
Students of all departments may elect Russian as a Minor field of studies in consultation with the Department of Germanic and Slavic Languages and Literatures. A Minor requires the completion of a minimum of 10 term courses in Russian with an overall cumulative average of at least 65% in those courses, of which:

a) not more than 4 term courses may be chosen from courses on the 100 level, and

b) at least 2 term courses must be chosen from courses above the 200 level.

Russian Workshop in the USSR
For details see Chapter 16, page 1671.
Social Development Studies

Social Development Studies, administered by Renison College, is an integrated multidisciplinary program providing a liberal education with concentration in certain pure and applied social sciences. The interrelated courses of this Major are used to help the student develop an appreciation of the interdependence of the social sciences and a facility in applying material and perspectives from one discipline to questions in other areas of study. The College offers its own courses for the Major in Interdisciplinary Social Science, Psychology, Social Work and Sociology. Students select their remaining courses from the Departments of the University, Renison or the other Colleges to serve particular needs and interests. In the program, particular attention is given to the development of human personality in the context of the major social institutions and our cultural traditions and to the study of the development of certain contemporary social problems. Courses in Social Work provide an opportunity to study various types of social intervention. The College assists students to find places as volunteers in a number of local agencies. Through this volunteer work students are given an opportunity to increase the experience which they can bring to their studies and to test and apply their theoretical understanding in practical settings. In the case of those following the Diploma in Social Work, a program co-ordinator assists the students and the agencies to fulfil placement expectations.

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

Major Courses

Listed below are courses from the 4 subject areas which combine in the Social Development Studies Major.

<table>
<thead>
<tr>
<th>Interdisciplinary Social Science</th>
<th>Social Work</th>
<th>Sociology</th>
<th>Psychology</th>
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General Social Development Studies

Eligibility for graduation in the General Social Development Studies program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative Major average of at least 65%.

2. At least 14 term courses must be from the Major with the following stipulations:
   a) in the first year students must register in the Fall term for SOCWK 120R, PSYCH 120R, and ISS 150R. In the Winter term which follows, students must register in SOC 120R, ISS 131R and PSYCH 121R.
   b) in the second year, all students are required to take ISS 250R and 251R.
   c) 4 term course equivalents from the Major must be completed in each of the 3 years.
   d) the 14 term course equivalents must be distributed over at least 3 of the 4 subject areas in the Major with a maximum of 6 term course equivalents within a single area counting towards the requirement.

Honours Social Development Studies

Eligibility for graduation in the Honours Social Development Studies program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 42 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative average of at least 75% in the Major.

2. At least 18 term course equivalents must be from the Major.
3. At least 6 term courses must be taken that are related to a multidisciplinary theme area that has been selected in consideration of the students' own needs and plans. In consultation with Renison's Undergraduate Officer, courses are chosen which will explore a topic in depth.

Social Development Studies Joint Honours Program
Joint Honours programs are currently available with:
- Music
- Philosophy
- Psychology
- Recreation
- Religious Studies
- Sociology

Eligibility for graduation in the Social Development Studies Joint Honours program typically includes fulfillment of the following requirements (variations may occur depending on the other discipline being considered):
1. Successful completion of from 42 to 46 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 80% and a cumulative Major average of at least 75%.
2. At least 14 term courses must be in Social Development Studies including:
   a) 4 term courses from ISS 131R, ISS 150R, PSYCH 120R, SOC 120R, SOC WK 120R;
   b) ISS 250R, 251R (Methodology);
   c) ISS 320R, plus 5 term course equivalents beyond the first-year level;
   d) ISS 499A/B (Senior Honours Essay).
3. At least 6 term courses relating to a chosen theme area must be completed (see number 3 under Honours program).

Course selection for a Joint Honours program with Social Development Studies should only be made after consultation with Renison's Undergraduate Officer.

The Social Work Stream
Within the Social Development Studies program, the College has developed a stream to meet the particular needs of students who plan to pursue graduate studies in Social Work or to follow vocations in Social Work or the related helping professions. The courses in this stream meet the Faculty of Arts requirements for the BA, the College's requirements for the Major and in addition include a range of courses particularly appropriate to the needs of such students (see details in Renison College calendar). Course selection should be made in consultation with Renison's Undergraduate Officer.

Diploma in Social Work
Students following the Social Work Stream within the Social Development Studies program may additionally apply at the end of Year 1 for admission to the Diploma in Social Work administered by the College. To qualify for the diploma, students must successfully complete 400 hours of supervised and evaluated field placement, attend seminars of the College, and in their final year write an essay synthesizing their field work with their studies.

Minor Program
A Minor in Social Development Studies consists of 10 term courses which have been approved for the Major. Courses may be selected to fill the needs of the individual student, but course selection should only be made after consultation with the Undergraduate Officer for Social Development Studies. The following requirements apply to all Minors in Social Development Studies:
   a) ISS 131R, ISS 150R, SOC WK 120R;
   b) 7 term courses beyond the first-year level including at least 2 term courses in each of 2 different disciplines.

Of the 10 term courses required for the Minor, no more than 6 may be taken in any one discipline.

Notes For All Programs
1. For students in Minor programs who do not have at least 1 term course in statistics and 1 term course in research, and especially those considering graduate studies in Social Work, ISS 250R and ISS 251R are strongly recommended.
2. For further information regarding any of the programs, consult the Registrar, Renison College, Waterloo, Ontario N2L 3G4.

Sociology
General Sociology
Eligibility for graduation in the General Sociology program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative Major average of at least 65%.
2. At least 10 term courses must be in Sociology, including SOC:
   a) 101 (introductory course); 321 (sociological methods course);
   b) one of 271, 405, 406 (sociological theory);
Students are strongly encouraged to select SOC 280, although this is not required.

Honours Sociology
Eligibility for graduation in the Honours Sociology program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 19 term courses must be in Sociology, including SOC:
   a) 101, 280, 321, 322, 405, 406, 499A/B.

Recommended Program

Year 1
SOC 101
1 other term course in Sociology.
8 term course equivalent electives.

Year 2
SOC 280
4 term courses in Sociology.
5 term course equivalent electives.

Year 3
SOC 321, 322
4 term courses in Sociology.
4 term course equivalent electives.

Year 4
SOC 405/406
SOC 499A/B
2 term courses in Sociology.
4 term course equivalent electives.

Honours Sociology Co-operative Program
The Department of Sociology is a participating Department in the Co-operative program in the Behavioural Sciences. This is an Honours program into which students may be admitted at the start of the winter term of their second year. Students interested in applying for admission to this program should consult with the Department's Co-op advisor sometime in their first year so that they may select their courses to maximum advantage.

Honours Sociology (Applied Studies Co-op)
A student may combine an Honours Sociology program with Applied Studies Co-op. The requirements in Sociology are identical to the Honours requirements listed above except only 16 term courses in Sociology are required. The Applied Studies requirements are listed on page 6:12.

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

<table>
<thead>
<tr>
<th>Anthropology</th>
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<tr>
<td>Economics</td>
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<td>Mathematics</td>
<td>Spanish</td>
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<td>Philosophy</td>
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Eligibility for graduation in the Joint Honours Sociology program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average in each major of at least 75%.

2. At least 15 term courses must be in Sociology, and these courses are usually distributed as follows:
   a) A term course in Introductory Sociology (101);
   b) A term course in Statistics (280);
   c) 2 term courses in research methods (321/322);
   d) 2 term courses in sociological theory (405, 406);
   e) The equivalent of 7 term courses of electives in Sociology plus 499A/B or the equivalent of 9 term courses of electives in Sociology plus the equivalent of 498A/B in the related department.

Note For Joint Honours Program
In the Joint Honours program with French, SOC 280 may be replaced by an elective in Sociology.

Minor Program
Students electing a Minor program in Sociology must complete 10 term courses in Sociology with a minimum 65% average for all Sociology courses. The required courses in Sociology for the General program in Sociology are also required of students choosing the Minor program.
Spanish

(Offered jointly with Wilfrid Laurier University)

Three-Year General Spanish
Eligibility for graduation in the General Spanish program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least 12 term courses must be in Spanish of which:
   a) 6 term courses are language;
   b) 2 term courses are Survey of Spanish Literature.

Four-Year General Spanish
Eligibility for graduation in the Four-Year General Spanish program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 70%.
2. At least 12 term courses must be in Spanish of which:
   a) 6 term courses are language;
   b) 2 term courses are Survey of Spanish Literature;
   c) 2 term courses are Survey of Spanish American Literature;
   d) 1 term course in Golden Age.

Honours Spanish
Eligibility for graduation in the Honours Spanish program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 20 term courses must be in Spanish, and 10 of these 20 term courses must be in courses as outlined above under the Four-Year General program.

Recommended Program

Year 1
SPAN 201A/B. (Students with little or no Spanish will take SPAN 101/102 in the first year and SPAN 201A/B in the second year.)
8 additional term courses.

Year 2
A minimum of 6 term courses in Spanish, including SPAN 251A/B, (or 201A/B), and 205/206.
4 additional term courses.

Year 3
A minimum of 6 term courses in Spanish, including SPAN 351A/B, (or 251A/B), 227/228 and 326 or 327.
4 additional term courses.

Year 4
A minimum of 6 term courses in Spanish.
4 additional term courses.

Honours Spanish (Applied Studies Co-op)
A student may combine an Honours Spanish program with Applied Studies Co-op. The requirements in Spanish are identical to the Joint Honours requirements listed below. The Applied Studies requirements are listed on page 8.12.

Spanish Joint Honours Program
The Department of Spanish recognizes combined Honours programs in Spanish and the following:

Classical Studies  History
English           Latin
French           Sociology
German           Psychology

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

Eligibility for graduation in the Joint Honours Spanish program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 16 term courses must be in Spanish, and 10 of these 16 term courses must be in courses as outlined above under the Four-Year General program.
Recommended Program

Year 1
SPAN 201A/B. (Students with little or no Spanish will take SPAN 101/102 in the first year and SPAN 201A/B in the second year.)
8 additional term courses.

Year 2
A minimum of 4 term courses in Spanish, including SPAN 251A/B, (or 201A/B), and 205/206.
6 additional term courses.

Year 3
A minimum of 6 term courses in Spanish, including SPAN 351A/B, (or 251A/B), 227/228 and 326 or 327.
6 additional term courses.

Year 4
A minimum of 4 term courses in Spanish.
6 additional term courses.

Minor Program in Spanish
Students in an Honours Program interested in Spanish as a complement to the Major field of study will be expected to complete 10 term courses in Spanish. Please consult the Undergraduate Officer in Spanish for Minor in Spanish.

Notes For All Programs:
1. By agreement, students at the University of Waterloo and Wilfrid Laurier University can be expected to take courses in Spanish at either university. While most language courses are taught concurrently every year at both universities, most other courses are taught either at one university or the other, and a few courses may rotate from year to year.

2. With the permission of the Department, students may spend the third year enrolled in an acceptable university in Spain or Spanish America.

3. Students in Years 3 and 4 must have the permission of the home department to enrol in Spanish courses at the 100 or 200 level.
The Co-operative Engineering Program

The preparation for an engineering career includes both formal academic studies at a university and intensive training in the practice of engineering. A similar pattern is to be found in preparation for careers in medicine or law, and is characteristic of any development of professional competence. The Co-operative Engineering program at the University of Waterloo provides a completely integrated pattern of academic study and industrial experience in various phases of engineering with ultimate graduation requiring satisfactory performance in both areas. The degree program covers almost 5 calendar years, comprising 8 terms each of about 4 months' duration of university work on campus which are pursued alternately with 6 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 4 “academic years.”

The engineering curricula at the University of Waterloo provide a sound basis in Mathematics and Pure Science and in Engineering Science and Design. The first year of the program is essentially common for all programs except Chemical and Systems Design Engineering. A substantial part of the work of the first and second years is common to all programs. Students elect one of the 7 principal divisions of engineering starting with the first year. The curriculum for each of the 7 basic programs combines required “core” subjects essential to the field, and “elective” subjects permitting considerable diversity in individual programs of study. An important part of the curriculum is a series of electives in the Humanities and Social Sciences.

A more detailed explanation of the Co-operative program is given in Chapter 5, as well as specific requirements 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 programs:
- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Electrical Engineering
- Geological Engineering
- Mechanical Engineering
- Systems Design Engineering

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

Admission

All Year 1 students enrol in September. These Year 1 students spend the Fall term together at the University, after which they are divided into 2 groups. They also complete the last term of the program and graduate together. Both groups have the same total time on campus and in industry, one group having a double academic term at the start of the program and the other having a double academic term at the end of the program. Precise dates for the beginning and end of the various terms are shown in the academic Calendar on pages 7-10.

The programs in Computer Engineering, Electrical Engineering, Geological Engineering and Systems Design Engineering are not divided into two groups. All Electrical Engineering and Systems Design Engineering students start with 4 months of school before going out on the first work term in the Winter. All Computer Engineering and Geological Engineering students start with 8 months of school before their first work term.

The admission categories, requirements and procedures for all programs are outlined in Chapter 2 of this Calendar. The following emphasize some of the admission requirements which relate specifically to the Faculty of Engineering.

Applicants from Ontario Secondary Schools

Applicants must present 6 credits, 5 of those must be: Relations and Functions, Calculus, Algebra, as well as Chemistry and Physics in their overall university-entrance level program. Applicants with high overall standing who are missing one of the 5 specific course requirements must contact the Admissions Officer no later than December (for September admission). Applicants will be evaluated and advised on possible courses of action required to meet the specific requirements.

Admission as an Adult Student

Applicants must obtain standing in Ontario Grade 13 or Ontario Academic Course Mathematics and Science or their equivalent. The University has developed special pre-university mathematics and science courses which can be taken by correspondence and which are recommended for Adult Students. To discuss admissibility and appropriate qualifying work applicants are advised to contact the Admissions Officer for the Faculty of Engineering.

Admission to Advanced Standing

Because of the co-operative nature of the Engineering program, no student will be admitted above Year 3, term A level. Any student thus admitted will be required to register in the January term and to complete satisfactorily the final four academic terms and the final three University of Waterloo work terms and work reports. The level of advanced admission is
determined by an examination of the applicant's academic and work experience.

Credit for previous work experience can be applied only to those work terms preceding the level of admission and cannot exceed 3 work terms.

Examinations and Promotions

(These regulations apply to students who will graduate in the class of 1990 or thereafter.)

The Faculty constitutes the examining body for all examinations and is responsible for all decisions on grades, promotions, failures, deferred examinations, appeals, and recommendations for the granting of degrees. Students are examined and grades are set for individual courses on the completion of work for those courses. Upon examination of the student's performance at the end of each term, the Examinations and Promotions Committee assigns an academic decision. The possible decisions and their effect on the student's progress in the program are as follows:

1. Promoted - proceed to next term.
2. Proceed on Probation - proceed to next term, but subsequent progress is contingent upon clearing pending conditions.
3. Academic Decision Deferred - may not proceed until conditions cleared.
4. Required to Repeat Term - must stay out two terms before repeating.
5. Required to Withdraw from Engineering - readmission possible only through application to Admissions Committee after at least three terms out and with new evidence of ability to succeed.
6. Recommended for BASc Degree at (Spring/Fall) Convocation - program successfully completed.
7. Promoted (Aegrotat) - student has adequate understanding of the material, but due to illness or other extenuating circumstances, normal evaluation was not possible; proceed to next term.

At the end of each term, the examining Faculty members submit grades for that term's courses. Each department then reviews the performance of students registered in that department and makes recommendations to the Examinations and Promotions Committee. The Examinations and Promotions Committee then considers the evidence on which the departments have made their recommendations and assigns the official academic decision, which may be reviewed by the Engineering Faculty Council. All academic decisions and grades are reported to the student through the Registrar's Office. All recommendations to award degrees must be approved by the Senate of the University.

The rules which are applied when the student's performance is assessed are as follows:

1. To be Promoted in the program, a student must have a term average of 60% or better, with no course below 50%. Students who fail to meet this requirement will either be Required to Repeat the Term, be Required to Withdraw from Engineering, have the Academic Decision Deferred, be allowed to Proceed on Probation, or be granted Aegrotat Standing, according to the conditions identified below.

2. To remain in the program, a student must have a term average of 50% or better. Students who fail to meet this requirement will be Required to Withdraw from Engineering. Except in 1A, a student receiving an average below 50% who has never before had an average below 60% will have the Academic Decision Deferred for 2 months to allow the student an opportunity to bring forward evidence of extenuating circumstances which affected the term performance.

3. A student who achieves a term average of 60% or better, but who has one or two courses below 50%, will have the Academic Decision Deferred. Such a student must satisfy the Faculty that his preparation for the succeeding term is satisfactory before continuing in the program. This may be done through one of the following, subject to the approval of the department in which the student is enrolled:
   a) A department may permit, at its discretion, a re-examination of certain of its courses in which the student received a grade of less than 50%, by either oral or written examination. Such re-examination will not affect the student's term average. There is a non-refundable re-examination fee of $25.00 for each such examination.
   b) The student may repeat those courses in which a grade of less than 50% was received and must achieve a grade of more than 50% in each such course. These grades will not affect the student's term average.
   c) The student may enrol in and take other courses as required by the Faculty or Department which may be equivalent to or replacements of the failed courses. The student must achieve a grade of at least 50% in each such course. These grades will not affect the student's term average.

A student who fails to satisfy these conditions within two terms will be Required to Repeat the Term in which he received grades of less than 50% in some courses.

4. A student who achieves a term average of 50% or better, but less than 60%, or a student who achieves a term average of 60% or better, but who has more than two courses below 50%, will normally be Required to Repeat the Term.

A student who achieves a term average of 60% or better, but less than 60%, or a student who achieves a term average of 60% or better, but who has more than two courses below 50%, will normally be Required to Repeat the Term.

Engineering Examinations and Promotions
5. The term No Penalty may be appended to the decision to repeat a term. In this case, the requirement to stay out for two terms before repeating the term is waived and the term is not counted as a repeat term with regard to the number of times a term can be repeated or in the calculation of the total number of terms of full-time study in the program. This condition is normally applied as a result of extenuating circumstances which affected the student’s performance in the failed term.

6. A student on a repeat term must achieve a term average of 60% or better with no course below 50% or he will be Required to Withdraw from Engineering. Only two repeated terms are permitted in total, with no single term being repeated more than once; otherwise the student will be Required to Withdraw from Engineering. While on a repeat term, a student may be excused from repeating individual courses in which a grade of 70% or better has been achieved. If this is permitted, however, he must register in other appropriate courses, at the Department’s discretion, such that a full work load is maintained. In all cases, the program must be completed in no more than 10 terms of full-time study.

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

8. A student may withdraw voluntarily from the program at any time prior to 4 weeks before the commencement of the final examination period in the term by giving written notification of withdrawal. IN 1A ONLY, a student may withdraw voluntarily from the program at any time prior to the commencement of the final examination period in the term by giving written notification of withdrawal. Should a student who has voluntarily withdrawn wish to re-enter the program, he may re-apply to the program directly through application to the Admissions Committee of the Faculty.

9. A student may be Required to Withdraw from Engineering at any time if, in the opinion of the Faculty, the student is unlikely to benefit from further participation in the program or if the student leaves the program without notification and fails to write examinations.

10. Courses taken by students during work terms will not be included in the average for any term. The grades for courses taken at the University of Waterloo or at another university on Letter of Permission, however, will be reported on the student’s transcript. Normally, such courses are considered as enrichment to the student’s program; when the material of such a course is deemed to cover a subsequent course in the program, the student may receive permission to replace the subsequent course by a free elective (technical or non-technical) approved by the Associate Chairman of his department. Courses taken during work terms may not be used to reduce the number of courses taken in any subsequent term. Normally, all students will be expected to register in the minimum number of courses specified in the Calendar for each term of the program.

11. Grades for courses that are in addition to the degree requirements will not be included in the term average but will be reported on the student’s transcript. The Faculty of Engineering does not permit students to register in any of its courses for audit only.

12. Students who have successfully met all of the requirements of the program and have been recommended for the Bachelor of Applied Science degree will have First, Second, or Third Class Honours standing designated according to the cumulative 3A-4B average as follows:
   - First Class Honours: Average 80-100%
   - Second Class Honours: Average 70-79%
   - Third Class Honours: Average 60-69%

13. Individual departments may designate additional minimum grade requirements in certain courses. Also, there are individual department rules regarding the grading and averaging of General Studies elective courses.

14. All courses in the Faculty are assigned a numerical grade (between 0 and 100) by the examiners. The following exceptions are permitted:
   - AEG - Aegrotat. The student was ill according to medical evidence but has satisfactory understanding of the course.
   - CR - Credit granted. Performance was satisfactory.
   - NCR - No credit granted. Performance was unsatisfactory.
   - INC - Incomplete. The course work is incomplete and the student has permission to extend the work beyond the term. If the work is not completed within six months from the end of the term, a grade will be submitted based on the available information.
   - DNW - Did not write. The student did not withdraw from the course and was not eligible for an incomplete grade. The student did not complete a sufficient proportion of the assignments, tests, and examinations for an evaluation to be made.

In cases where students take courses in a Faculty where letter grades are assigned, the letter grades will be converted for the purposes of reporting and averaging according to the following table:
15. Students who have reason to believe that a grade, term average, or academic decision is incorrect or unjust may launch an Appeal. Reasons in support of the appeal including medical certificates and similar documents must be submitted with the appeal. All appeals should be addressed to the Chairman of the Engineering Examinations and Promotions Committee, Registrar’s Office, University of Waterloo. Appeals should be received prior to 4 weeks after the date of issue of the marks for the term in order to facilitate entry into the immediately following term if so desired by the student. Appeals which are launched later than six months after the end of the term being appealed will not be considered.

16. Changes to the set of courses which a student is taking in a particular term may be permitted at the discretion of the student’s department. Such changes must normally be arranged and approved before the end of the normal “Drop/Add” period, which is a period of two weeks at the beginning of each term. After this period, only exceptional cases will be considered.

17. Students must demonstrate consistent satisfactory performance during their work-term employment. They must also submit the required number of satisfactory work-term reports (see booklet entitled Regulations and Procedures for Co-operative Programs).

Challenge for Credit
When students are able in their own time, or through experience in a work-term job, to study the material of a course that they would normally be required to take in their program, they may show evidence as to why they should be excused from taking the course and demonstrate their competence in a manner acceptable to the department offering the course. This process is known as "Challenge for Credit." Additional information may be obtained from the student’s department.

Undergraduate Co-operative Work-Term Reports
Satisfactory work reports and work terms are recognized formally as part of the requirements for the Bachelor's degree. The regulations related to work-term reports are:

1. Prior to graduation each Engineering student is required to submit a minimum of 4 satisfactory work reports which must be related to the work of the term reported and must have identifiable analytic content. For those students admitted to advanced standing into 2B or 3A with only 3 work terms remaining, only 3 satisfactory work reports would be required.

2. Work reports are due 7 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 5 work-terms. Students are encouraged to reserve a report for their final work-term. If students wish, they may submit the additional reports and the evaluations of these reports will be added to their work-term record.

5. Work reports, other than those completed by first year students, shall be evaluated by the Engineering Faculty following the same procedure suggested in Item 3. This shall include reports marked by employers.

6. Work reports rated as unsatisfactory may be rewritten and re-submitted during the academic term. Students with unsatisfactory work reports may be required to take formal instruction in technical report writing.

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

Dean's Honours List
To recognize outstanding academic achievement each term, the designation "Dean's Honours List" will be awarded to exceptional undergraduate Engineering students. To achieve this standing, a student must be unconditionally promoted, must, in the normal case, be in the top 5% of the class, and must, normally, attain a term average of at least 85%. This designation will be reflected on the student’s mark report and official university transcript.

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

An Alumni Gold medal is awarded annually to recognize the academic excellence of the top undergraduate in Engineering.

Engineering Examinations and Promotions

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General Studies Program 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 program. The Engineering Faculty Council and the Senate of the University approved the underlying principles of a "General Studies Program" as a response to that requirement. "General Studies", as an integral component of Engineering at Waterloo, is intended to provide some understanding of the wider human and societal context within which an Engineering career must grow and with which it must interact.

Students in the Faculty of Engineering must complete, as a part of the BASc requirements, a program consisting of courses in Humanities and Social Sciences. The subjects from which the courses may be taken are divided into 3 groups of disciplines, as follows:

Group A: SOCIAL SCIENCES
i) - Courses offered within the Faculty of Engineering Management Sciences non-technical courses
   Economics
   Political Science
   Psychology
   Sociology

Group B: HUMANITIES
i) - Courses offered within the Faculty of Engineering General Engineering non-technical courses
ii) - Courses offered in the Faculty of Arts
   English
   French
   History
   Philosophy

Group C: GENERAL
   Anthropology
   Canadian Studies
   Classical Civilization
   Fine Arts
   Greek
   Latin
   Music
   Peace and Conflict Studies
   Religious Studies

Students are required to complete at least 2 courses from 1 discipline in Group A and at least 2 courses from 1 discipline in Group B. The approved courses to satisfy this requirement are:

Group A:
Management Sciences:  M SCI 211 and M SCI 311
Economics:  ECON 101 and ECON 201
Political Science:  Two of P SCI 102M, 260A, 260B
Psychology:  PSYCH 101 and PSYCH 253
Sociology:  SOC 101 and SOC 265

Group B:
General Engineering:  GEN E 411 and GEN E 412 (when available)
English:  ENGL 105A and ENGL 214
French:  Either FR 195 or FR196 and one of FR 232, 253, 275.
History:  HIST 130 and either HIST 253 or HIST 254
Philosophy:  PHIL 200A and either PHIL 200B or PHIL 300X

To satisfy the requirement of the General Studies Program, students must additionally complete further courses. These may be selected from those listed above, from additional courses in the disciplines of Groups A or B, or from the disciplines of Group C. Any choices other than those from the published lists require the approval of the student’s departmental advisor.

Notes:
1. The only General Engineering courses that may form part of a student’s General Studies program are GEN E 351, 352, 411 and 412; students may substitute CIV E 491 or ME 401 for GEN E 411
2. The only Management Sciences courses that may form part of a student’s General Studies program are M SCI 211, 311 and 461.
3. Every effort will be made to ensure that all courses listed in Groups A and B will be scheduled in such a way as to satisfy all Engineering students’ timetables.
4. GEN E 411 is a new course to be developed as a Faculty-wide offering in Law as it affects the Profession of Engineering. When developed it will be offered in the Spring and Fall terms.
5. GEN E 412 is a new course, entitled Ethics and the Engineering Profession, developed jointly by Philosophy and Engineering, and will be crosslisted with PHIL 315.
6. PHIL 300X is a new course developed by the Department of Philosophy; this course, which will discuss the contributions of notable philosophers of the late nineteenth and early twentieth centuries, is intended for students in a number of Honours programs in the Faculty of Arts.

Note: These courses change regularly but your department should keep you informed.
Course Availability and Timetabling
All the courses available in groups A and B will be timetabled in at least one of the following slots:

11:30 - 12:30 MWF
07:00 - 10:00 M
07:00 - 10:00 T

The 'first course' in a sequence may be taken in 2A, 2B, 3A, 3B, 4A in the Fall term; in 1B, 2A, 3A, 3B in the Winter term; in 1B, 2B, 3A, 4A in the Spring term.

The 'second course' in a sequence may be taken in 2A, 2B, 3A, 3B, 4A in the Fall term; in 2A, 3A, 3B, 4B in the Winter term; in 2B, 3A, 4A in the Spring term.

Not all the courses will be available each term. The following is the pattern for the General Studies, courses from the Faculty of Arts:

<table>
<thead>
<tr>
<th>Fall Term</th>
<th>Discipline</th>
<th>First Course</th>
<th>Second Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economics</td>
<td>101</td>
<td>201</td>
<td></td>
</tr>
<tr>
<td>English</td>
<td>105A</td>
<td>214</td>
<td></td>
</tr>
<tr>
<td>French</td>
<td>195</td>
<td>275</td>
<td></td>
</tr>
<tr>
<td>History</td>
<td>130</td>
<td>263</td>
<td></td>
</tr>
<tr>
<td>Philosophy</td>
<td>200A</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Political Science</td>
<td>260A</td>
<td>260A</td>
<td></td>
</tr>
<tr>
<td>Psychology</td>
<td>101</td>
<td>253</td>
<td></td>
</tr>
<tr>
<td>Sociology</td>
<td>101</td>
<td>265</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Winter Term</th>
<th>Discipline</th>
<th>First Course</th>
<th>Second Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economics</td>
<td>101</td>
<td>201</td>
<td></td>
</tr>
<tr>
<td>English</td>
<td>105A</td>
<td>214</td>
<td></td>
</tr>
<tr>
<td>French</td>
<td>196</td>
<td>232,253</td>
<td></td>
</tr>
<tr>
<td>History</td>
<td>130</td>
<td>254</td>
<td></td>
</tr>
<tr>
<td>Philosophy</td>
<td>-</td>
<td>200B,300X</td>
<td></td>
</tr>
<tr>
<td>Political Science</td>
<td>102M, 260B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychology</td>
<td>101</td>
<td>253</td>
<td></td>
</tr>
<tr>
<td>Sociology</td>
<td>101</td>
<td>265</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Spring Term</th>
<th>Discipline</th>
<th>First Course</th>
<th>Second Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economics</td>
<td>101</td>
<td>201</td>
<td></td>
</tr>
<tr>
<td>English</td>
<td>105A</td>
<td>214</td>
<td></td>
</tr>
<tr>
<td>French</td>
<td>-</td>
<td>232,253</td>
<td></td>
</tr>
<tr>
<td>History</td>
<td>130</td>
<td>254</td>
<td></td>
</tr>
<tr>
<td>Philosophy</td>
<td>200A</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Political Science</td>
<td>102M</td>
<td>260B</td>
<td></td>
</tr>
</tbody>
</table>

It is to be expected that, when development is complete, GEN E 411 (new Law course) will be offered to 4A students in the Spring and Fall terms, and GEN E 412 (new Ethics course) will be offered to 4B students in the Winter term.

Combined Bachelor's - Master's Program

I. INTRODUCTION
The Faculty of Engineering offers a combined Bachelor's - Masters' Program. The program is a response to a number of needs among which are:

- recognition of outstanding students and provision of academic enrichment for them;
- provision of an introduction to the postgraduate milieu for good undergraduate students who might otherwise overlook the opportunity of graduate studies;
- provision of a reasonably firm time horizon for the completion of the MASc program.

This program provides a mechanism for the institution of a quicker route to the MASc degree, for outstanding students, on a Faculty-wide basis. The framework is a minimum requirement and departments may add to, but not delete from the requirements of the program.

II. GENERAL PRINCIPLES OF COMBINED BACHELOR'S - MASTER'S PROGRAMS
A combined Bachelor's - Master's program is one in which it is deemed academically advantageous to treat the educational process leading through the BASc to the MASc degree as a single continuous integrated whole, while at the same time satisfying the requirements for both degrees. This stands in contrast to treatment of the Bachelor's and Master's degree programs each as terminal activities. Such structured programs, starting at the undergraduate level and terminating with a MASc degree in the Faculty of Engineering provide an alternative means, complementary to the existing undergraduate and graduate programs, for the attainment of the MASc degree.

The following are some general conditions that all such combined Bachelor's - Master's degree programs should satisfy:

A) Students who elect to enter and pursue the combined Bachelor's - Master's programs will fulfill the degree requirements of both the BASc program and the MASc program. This implies that:

1. eight terms of full-time registration at the undergraduate level and at least 2 terms of full-time registration (or equivalent) at the graduate level are mandatory;
2. the graduate program must include at least 4 (graduate) courses and a thesis, or 8 courses and a MASc project.
the Co-operative work-term requirements of the BASc program must be met.

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

C) Admission to the combined program is on the basis of merit, as is continuance in the program. Students who fail to maintain sufficiently high standing will be required to revert to the regular program, or even if circumstances so warrant, to withdraw from the University.

D) The culmination of the combined program is the Master's degree; this may be attained either through the completion of a Master's degree project or research thesis.

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

F) Recruitment into a combined Bachelor's - Master's degree program must have the flexibility to satisfy the requirements of individual students; at the same time it must have coherence — each student's program must be addressed toward a well-defined area of specialization.

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

A) Application and Admission

Admission to the combined Bachelor's - Master's degree program is normally restricted to students with a consistently good academic record at the end of the 3A term who would be granted "conditional admission to the MASc program." The condition to be fulfilled is "satisfactory completion of the requirements of the BASc degree with at least a B average."

Students who are granted this admission would be notified at the start of the academic term preceding their 6th work term. As in any program culminating in a Master's degree, a Faculty Supervisor is appointed on admission.

1. Academic and Administrative Responsibility

Although the Supervisor advises students, all course selections and other academic administrative matters concerning each student are subject to the approval of the Department Associate Chairmen for Undergraduate and Graduate Studies.

B) Course Programs

The courses chosen by the student (with the advice of the Supervisor and approval of the Associate Chairman) in the 4A, 4B, 5A, and 5B terms should form a coherent series which (together with the MASc project or thesis) complete the requirements of the Bachelor's and, ultimately, the Master's degree.

In each of the 4A and 4B terms one course (normally 600 level) should be chosen for credit to the MASc degree. In some departments this course may replace one of the technical electives in each of those terms. Technically, it is necessary for students to register for these courses as "extras" in order to avoid counting them towards the requirements of both degrees.

If a student is proceeding to an MASc with a research thesis, the balance of courses (2 courses numbered 500 or above) will normally be taken in the 5A (fall) term. There will be no course requirement for the 5B (winter) term.

A student who is proceeding to a MASc with a Master's degree project, would normally select 3 courses in each of the 5A and 5B terms (with the advice of the Supervisor and approval of the Associate Chairman).

C) Co-operative Work Terms

The combined Bachelor's - Master's program includes 2 work terms. These may take 2 forms:

1. "Special" Off-Campus Work Terms

It is expected that most of the students proceeding to the MASc degree by course work and project will be involved in off-campus work terms. Because of the calibre of these students it should be possible to make special arrangements for significant projects to be completed in these terms, so that they form a coherent pair, and that the students have special supervision in industry. The "work reports" generated on the "special" work terms will form the basis for the MASc project report. The Faculty Supervisor will be expected to maintain liaison with the off-campus organization in which the student works during these terms.

2. "Special" On-Campus Work Terms

It is expected that most of the students proceeding to the MASc degree with a research thesis will be involved in on-campus work terms. During these work terms they will not be registered students; they may be hired as associate researchers for the purposes of various research grants, without the restriction of student salaries. They may also work as teaching assistants during these terms. This combination can be attractive from the various points of view of available research time, income generation for the student, total research cost from a grant and effective teaching assistantships.

D) Fourth-Year Projects

All Departments have some requirement or opportunity for projects in the 4A/4B terms. For students in the combined Bachelor's - Master's program these projects may be integrated with their special work-term projects as well as their work in 5A and 5B.
E) Granting of Degrees
The BASc degree will be granted at the normal time, i.e. at the Spring Convocation following the 4B term. The program, however, culminates in the MASc, which is normally granted at the Convocation following the 5B term. In some cases, additional time may be required to complete the thesis or project.

F) Postgraduate Scholarships
Students in the combined Bachelor's - Master's program may apply for NSERC, OGS, CMHC scholarships, etc. at the same time as their colleagues in the regular programs. They are also eligible for FOE scholarships during the 5A and 5B terms.

G) Withdrawal or Failure
Students may remain in the combined Bachelor's - Master's program provided they maintain sufficiently high academic standards. The minimum is a cumulative B average (73% to the end of 4B, 70% thereafter).

A student who fails to maintain this standard will be required to withdraw from the combined degree program. In such a case, all courses taken up to the end of 4B, including those originally intended to fulfill part of the Master's degree requirements, will be counted towards the Bachelor's degree program and marks therefrom included in the 4A and 4B averages as appropriate. Should the student have then satisfied the requirements for the BASc degree, it will be granted at the next convocation. Such a student will not be permitted to enter the regular MASc program.

If a student does maintain at least the minimum standard mentioned above, but decides to withdraw voluntarily from the combined Bachelor's - Master's program, the 4A and 4B results will be calculated including the courses originally intended to fulfill part of the Master's degree requirements, and if the requirements for the Bachelor's degree are then satisfied, the BASc will be granted at the next Convocation. Such a student will be allowed, at a later date, to enter the regular MASc program, but the graduate courses taken in the final undergraduate year may not be applied to the Master's degree.

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 Programs
The core programs for each of the 7 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 optional programs developed under the guidance of Faculty Advisors.

For further enlargement of the programs, refer to the departmental section in this chapter.

Year 1 Engineering Programs
All students enrolling in Year 1 are required to choose one of the following programs:

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

Students enrolling in a Year 1 Engineering program (other than Chemical and Systems Design) must register in the courses indicated in the following table:

(Course descriptions can be found in Chapter 16).

<table>
<thead>
<tr>
<th>Term 1A</th>
<th>Course Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 110A</td>
<td></td>
</tr>
<tr>
<td>MATH 114</td>
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</tr>
<tr>
<td>CH E 102</td>
<td></td>
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<tr>
<td>PHYS 115</td>
<td></td>
</tr>
<tr>
<td>GEN E 115</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Term 1B</th>
<th>Course Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 110B</td>
<td></td>
</tr>
<tr>
<td>PHYS 125</td>
<td></td>
</tr>
<tr>
<td>GEN E 121</td>
<td></td>
</tr>
<tr>
<td>GEN E 123*</td>
<td></td>
</tr>
</tbody>
</table>

One technical option from the following:
CIV E 126
EL E 126
GEO E 126
M E 126

One General Studies elective (to be chosen from the list of recommended courses which will be published each year)**
*Computer Engineering students must take EL E 222 in lieu of GEN E 123.
*Electrical Engineering students must take EL E 123 in lieu of GEN E 123.
*Mechanical Engineering students must take GEN E 124 in lieu of GEN E 123.

*Students who wish to take the Management Sciences Option package in upper years should choose a course from the Humanities in Term 1B.

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

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

Faculty of Engineering
Option in Mathematics

The aim of the mathematics option is to provide the student with a broad background in either pure or applied mathematics with an opportunity to take some courses in an area of specialization.

1. The Faculty of Engineering Option guidelines will apply.
2. There are 6 required courses.
   - MATH 211 Calculus 2 (or equivalent)
   - MATH 212 Advanced Calculus (or equivalent)
   - MATH 234A Linear Algebra 2
   - MATH 234B Abstract Algebra 1
   - ELE 316 Probability and Statistics (or equivalent)
   - PMATH 331 Real Variables or MATH 332B Complex Variables
3. A student must additionally take 2 electives from Group A, subject to availability and time-table constraints.

Group A
PMATH 334 Abstract Algebra 2
PMATH 340 Elementary Number Theory
PMATH 360 Geometry
PMATH 365 Differential Geometry and Tensor Analysis
PMATH 367 Set Theory and General Topology
AM/PMATH 380A Introduction to Information Theory
AM/PMATH 380B Information Theory with Applications
PMATH 430A Introduction to Mathematical Logic
PMATH 430B Introduction to Mathematical Logic

AM 365 Introduction to Continuum Mechanics
AM 371 Partial Differential Equations
AM 381 Ordinary Differential Equations
AM 396 Mechanics
MATH 332B Complex Variables or PMATH 331 Real Variables
C&O 230 Introduction to Combinatorics
C&O 342 Graph Theory 1
C&O 350 Linear Programming
C&O 367 Nonlinear Programming

The list of courses in Group A will be subject to change from time to time.

Faculty of Engineering
Option in Physics

The physics option is intended for students who want to have a better background in the fundamentals of physical science than is available in the regular program.

1. The Faculty of Engineering Option guidelines will apply.
2. There are 5 required courses:
   - PHYS 115 Mechanics
   - PHYS 125 Physics for Engineers
   - PHYS 263 Classical Mechanics and Special Relativity
   - PHYS 354 Atomic and Molecular Physics
   - ME 250 Thermodynamics (or equivalent) or PHYS 356
3. A student must additionally take 3 electives from Group A or 3 electives from Group B, subject to availability and time-table constraints.

Group A
PHYS 259 Crystallography & X-Ray Diffraction
PHYS 359 Statistical Mechanics
PHYS 364 Mathematical Physics 1
PHYS 365 Mathematical Physics 2
PHYS 434 Introductory Quantum Mechanics
PHYS 435 Solid State Physics
PHYS 442 Structure of Solids
PHYS 443 Continuum Mechanics
PHYS 455 Nuclear & Particle Physics

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

The list of courses in Groups A and B will be subject to change from time to time.
**Chemical Engineering**

The basic objective of the undergraduate program is to provide the student with an education appropriate for a career in the chemical industry, or for future studies in Science or Engineering, or other professions such as Medicine, Law, or Business. To be most effective in a rapidly changing technological age, the program deals primarily with scientific and engineering principles. In the early years, chemistry, physics and mathematics form the foundations. In the senior years, subjects such as economic analysis and pollution control enable the student to reach a more relevant understanding of the earlier studies. Specialization is available through the following 6 Options.

**Biochemical and Food Engineering**
This Option deals with the application of chemical engineering principles to biotechnology, with emphasis on bioprocesses. Examples are fermentation operations, biofuels, food processing, and waste treatment and utilization, using either microbial cell or enzyme systems. The usefulness of these studies is obvious in a world with increasing food and health problems, and for the Canadian economy in which agricultural products play a significant role.

**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 per cent of the Ontario chemical industry is directed to 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.

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<table>
<thead>
<tr>
<th>Guide to Undergraduate Chemical Engineering Course Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>The code for the course numbers is consistent with the graduate course numbers and is as follows:</td>
</tr>
<tr>
<td><strong>First digit (1-5) year</strong></td>
</tr>
<tr>
<td>1-4: Year of study, core courses</td>
</tr>
<tr>
<td>5: Fourth year, elective courses</td>
</tr>
<tr>
<td><strong>Second digit (0-8): Subject matter</strong></td>
</tr>
<tr>
<td>0: General Engineering</td>
</tr>
<tr>
<td>1: Transport Processes</td>
</tr>
<tr>
<td>2: Mathematics, Control, Economics</td>
</tr>
<tr>
<td>3: Chemistry, Kinetics, Catalysis</td>
</tr>
<tr>
<td>4: Polymer Science and Engineering</td>
</tr>
<tr>
<td>5: Extractive and Process Metallurgy</td>
</tr>
<tr>
<td>6: Biochemical and Food Engineering</td>
</tr>
<tr>
<td>7: Ecology, Environmental Engineering</td>
</tr>
<tr>
<td>8: Projects, Seminars</td>
</tr>
<tr>
<td><strong>Third digit (0-9): Term</strong></td>
</tr>
<tr>
<td>Even numbers: A Term</td>
</tr>
<tr>
<td>Odd numbers: B Term</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A) Core Courses (Beyond Year 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH E 210 Transport Processes 1 (Equilibrium Stage Operations)</td>
</tr>
<tr>
<td>CH E 213 Transport Processes 2 (Fluid Mechanics)</td>
</tr>
<tr>
<td>CH E 220 Applied Mathematics 1</td>
</tr>
<tr>
<td>CH E 230 Physical Chemistry 1</td>
</tr>
<tr>
<td>CH E 231 Physical Chemistry 2</td>
</tr>
<tr>
<td>CH E 232 Inorganic Chemistry 1</td>
</tr>
<tr>
<td>CH E 233 Physical Chemistry Laboratory</td>
</tr>
<tr>
<td>CH E 326 Organic Chemistry 1</td>
</tr>
<tr>
<td>CH E 336 Organic Chemistry 2</td>
</tr>
<tr>
<td>MATH 210 Calculus 2</td>
</tr>
<tr>
<td>MATH 216 Differential Equations</td>
</tr>
<tr>
<td>CH E 314 Transport Processes 3 (Heat Transfer)</td>
</tr>
<tr>
<td>CH E 317 Transport Processes 4 (Mass Transfer)</td>
</tr>
<tr>
<td>CH E 320 Applied Mathematics 2</td>
</tr>
<tr>
<td>CH E 321 Process Dynamics and Control 1</td>
</tr>
<tr>
<td>CH E 330 Chemical Engineering Thermodynamics</td>
</tr>
<tr>
<td>CH E 331 Chemical Reaction Engineering</td>
</tr>
<tr>
<td>CH E 332 Inorganic Chemistry 2</td>
</tr>
<tr>
<td>CH E 333 Instrumentation Methods of Chemical Analysis</td>
</tr>
<tr>
<td>CH E 382 Engineering Economics and Process Design 1</td>
</tr>
<tr>
<td>CH E 410 Chemical Engineering Laboratory</td>
</tr>
<tr>
<td>CH E 484 Engineering Economics and Process Design 2</td>
</tr>
<tr>
<td>CH E 485 Technical Seminar</td>
</tr>
<tr>
<td>CH E 007 General Awareness Seminar</td>
</tr>
</tbody>
</table>
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>
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<tr>
<td>3B</td>
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<td>1</td>
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<tr>
<td>4A</td>
<td>0</td>
<td>2</td>
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</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 or CH E 585.

Five electives must be chosen, in addition to the 1B elective, to satisfy the General Studies program requirements described on page 9:6. The remaining 7 electives must be technical electives, and must include either the seventh option group given below, or 1 of the first 6 option groups and 1 of CH E 583 or CH E 585. The other technical electives may be other 500 level CH E courses, or courses from other Departments of a level and content appropriate to the student's program. Courses from outside the Department must be approved by the Associate Chairman - Undergraduate Studies.

The "Free" electives in fourth year are normally required to satisfy the General Studies program. Students who wish to take these as technical electives are encouraged to complete the General Studies requirement by non-degree, correspondence, or Letter-of-Permission study, after consultation with the Associate Chairman - Undergraduate Studies.

The 3 technical electives for each of the 7 Chemical Engineering Option groups are identified below. Within each Option group, the first course is normally taken in the 3B or 4A terms and the other 2 courses are normally taken in the 4B term.

1) Transport Processes
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 570 Introduction to Biochemical Engineering
CH E 571 Water Pollution

7) Research/Design Option
CH E 580 Research-Design Project 1
CH E 581 Research-Design Project 2
(weighted as 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 8 specific M SCI courses as electives. Two of these are part of the CH E core. (M SCI chart is on p. 9:23.)

The 6 other courses use 6 of the 12 elective course choices (4 GS and 2 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 satisfactory completing the Option.

Academic Program for Each Term

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.
**Civil Engineering**

The complex problems and needs of current and future societies have created challenges for engineering unparalleled in our history. To interpret and satisfy these needs, Civil Engineers currently direct the spending of more than one tenth of Canada's gross national product – more than any other professional group. The Civil Engineer must deal with the human impact of engineering – the social, moral and legal issues – to a far greater degree than ever before.

Historically, Civil Engineering is the oldest branch of engineering and goes back at least 5,000 years to the profession of "master builder" involving pyramids, temples and irrigation projects. Civil Engineering has become an extremely diverse field with opportunities for graduates in many areas of application.

Furthermore, the introduction of new electronic data collection methods and the use of microcomputers has revolutionized the practice of Civil Engineering. Consequently, our curriculum is being constantly reviewed in order to produce graduate engineers who can use advanced aids to solve complex problems.

The Civil Engineering program is designed to provide the necessary fundamentals of mathematics and the natural sciences but also provides perspectives from the fields of the social sciences and humanities. The emphasis is on "problem-solving".

The Department of Civil Engineering at Waterloo is one of the largest in Canada, and therefore specialized programs in each of the following Options can be offered.

**Structural Engineering**

Deals with the design and construction of all types of structures. Emphasis is placed on a broad foundation in mechanics and behaviour of materials.

**Water and Waste Management Engineering**

Addresses water and wastewater treatment, surface and groundwater pollution and control, solid and hazardous waste management, contaminant transport and behaviour in the environment. Support areas involving aquatic chemistry, computer modelling, simulation and laboratory experimentation as examples are also stressed.

**Transportation Engineering**

Deals with the planning, design, construction, traffic operation and evaluation of streets, highways, airports, and transit systems. Emphasis is placed on planning, design, operation and evaluation, particularly as related to demands.

**Geotechnical Engineering**

Familiarizes the student with the engineering properties of soils, the fundamentals of soil mechanics, and the application of geotechnical data and fundamentals to the design of foundation elements, earth-retaining structures, excavations, earth embankments and highway pavements.

**Engineering Mechanics**

For students with a strong interest in a rigorous study of Mechanics, applied mathematics and related fields, leading to an understanding of advanced analysis and serving as a preparation for graduate study in structural engineering, hydraulics, mechanics of solids and fluids, or properties of materials.

**Water Resources Engineering**

Deals with the planning, management, design and operation of water supply and distribution systems, in flood control and flood hazard mapping, in the hydrologic and hydraulic aspects of environmental issues, and in the application of remotely-sensed data to hydrologic and environmental problems.
Experimental Mechanics
Intended for students with an interest in experimental investigations of the static and dynamic response of structures and machines, and in the development of improved techniques to obtain and analyse experimental data.

Materials
An option intended to provide the student interested in structural engineering, mechanics or properties of materials with a background in materials science.

Additional Programs
Alternatively, the student can choose a more general pattern of study involving courses from several topic areas, or a program outside the traditional Civil Engineering field. For instance, with the approval of the Associate Chairman for Undergraduate Studies, the student may augment Civil Engineering course programs with elective courses from:
- Public Administration
- Planning
- Management Science
- Business Administration
- Bioengineering
- Environmental Health, and others.

To this end, the Civil Engineering Curriculum has been designed to allow the maximum possible flexibility while still meeting the requirements for the professional degree.

The profession of Civil Engineering is principally involved with the creation, operation and maintenance of structures associated with water resources, transportation, power generation, and a wide range of industrial, commercial and institutional buildings and complexes including whole urban structures. The activities include investigation planning design, construction and evaluation.

Vocationally a Civil Engineer may specialize in one of the following areas: biomechanics, solid mechanics, fracture mechanics, elasticity, building structures, bridges, hydrology, hydraulics, sanitation (public health), industrial wastes, water resource structures, irrigation and drainage, inland waterways, harbours, aerospace, highways (roads and streets), railroads, pipelines, geology, meteorology, soil mechanics, foundations, tunnelling (rock mechanics), surveying and cartography, urban and regional planning and overall project planning. The list is by no means complete. For example, some of our graduates become involved in aquaculture. A Civil Engineering education may also be combined to advantage with another discipline or profession, such as Economics, Law, Medicine or Biology.

The Civil Engineer, regardless of whether he or she is a generalist or a specialist, draws heavily upon the work of the physical and social sciences, other professions and other branches of engineering. Moreover, as engineers have become involved in many interdisciplinary activities over the last decade, the job demarcation between boundaries of engineering has become much less restrictive.

Certainly one of the advantages of completing a Civil Engineering program is that it allows professional registration while simultaneously providing a basis for further study and professional development in a large variety of specialized fields.

A) Core Program
a) Credit Courses
   CIV E 126 Civil Engineering Concepts
   203 Statics
   204 Mechanics of Solids 1
   205 Mechanics of Solids 2
   221 Calculus 2
   222 Differential Equations
   223A Computer Workshop A
   223B Computer Workshop B
   224 Probability and Statistics
   253 Geology for Engineers
   265 Structure and Properties of Materials
   280 Fluid Mechanics and Thermal Sciences
   281 Survey Camp
   292 Engineering Economics
   300 Civil Engineering Project 1
   303* Structural Analysis
   342* Transport Principles and Applications
   355* Geotechnical Engineering 1
   375* Water Quality Engineering
   400 Civil Engineering Project 2
   491 Engineering Law

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

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

b) Non-Credit Courses
   CIV E 296 Civil Engineering Seminars
   CIV E 299 Civil Engineering Seminars
   CIV E 398 Civil Engineering Seminars
   CIV E 399 Civil Engineering Seminars
   CIV E 498 Civil Engineering Seminars
   CIV E 499 Civil Engineering Seminars

Civil Engineering Seminar
These seminars are designed to enrich the undergraduate program by providing guest lectures, informal lectures, mock trials and films relating to principles, methods and practise of Civil Engineering and the role of the engineer in society.
B) Electives
Each student is responsible for selecting his or her own program of electives, in keeping with the ultimate career objectives after graduation. The program must satisfy the requirements of the Department of Civil Engineering. This includes having to meet minimum requirements in:
- Mathematical Foundations
- Basic Sciences
- Engineering Sciences
- Design and Synthesis
- Humanities and Social Sciences

a) Technical electives
Elective courses may be selected from the following list, in accordance with the academic program for the term, and in consultation with the Faculty Advisor. A number of elective courses may be taken from the offerings of other departments including Wilfrid Laurier University.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIV E 313</td>
<td>Structural Concrete Design 1</td>
</tr>
<tr>
<td>343</td>
<td>Traffic Engineering</td>
</tr>
<tr>
<td>344</td>
<td>Urban Transport Planning</td>
</tr>
<tr>
<td>354</td>
<td>Geotechnical Engineering 2</td>
</tr>
<tr>
<td>381</td>
<td>Hydraulics</td>
</tr>
<tr>
<td>401</td>
<td>Civil Engineering Project 3</td>
</tr>
<tr>
<td>403</td>
<td>Structural Analysis 2</td>
</tr>
<tr>
<td>404</td>
<td>Structural Analysis 3</td>
</tr>
<tr>
<td>405</td>
<td>Structural Dynamics</td>
</tr>
<tr>
<td>406</td>
<td>Mechanics of Deformable Solids 3</td>
</tr>
<tr>
<td>407</td>
<td>Building Science &amp; Technology</td>
</tr>
<tr>
<td>413</td>
<td>Structural Steel Design</td>
</tr>
<tr>
<td>414</td>
<td>Structural Concrete Design 2</td>
</tr>
<tr>
<td>415</td>
<td>Structural Systems</td>
</tr>
<tr>
<td>422</td>
<td>Finite Element Analysis</td>
</tr>
<tr>
<td>430</td>
<td>Experimental Mechanics</td>
</tr>
<tr>
<td>440</td>
<td>Transport Systems Analysis</td>
</tr>
<tr>
<td>442</td>
<td>Pavement Structural Design</td>
</tr>
<tr>
<td>454</td>
<td>Geotechnical Engineering 3</td>
</tr>
<tr>
<td>460</td>
<td>Orthopaedic-Bioengineering</td>
</tr>
<tr>
<td>472</td>
<td>Waste Water Treatment</td>
</tr>
<tr>
<td>473</td>
<td>Contaminant Transport</td>
</tr>
<tr>
<td>480</td>
<td>Water Resources Management</td>
</tr>
<tr>
<td>486</td>
<td>Hydrology</td>
</tr>
<tr>
<td>493</td>
<td>Engineering in the Canadian North</td>
</tr>
<tr>
<td>496</td>
<td>Construction Engineering</td>
</tr>
</tbody>
</table>

- With the exception of CIV E 313 and CIV E 413, the offering of these courses is contingent upon sufficient demand and/or available teaching resources.

b) Social Sciences and Humanities Electives
Five courses in non-technical subjects, including the General Studies’ elective in the 1B term, must be taken. The marks obtained in these courses will be included in the calculation of term averages. These courses are organized on a Faculty basis and detailed in this Calendar under the section General Studies in the Faculty of Engineering.

O) Academic Program for Each Term

<table>
<thead>
<tr>
<th>Term 1A (Fall)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 110A, MATH 114, CH E 102, PHYS 115, GEN E 115</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Term 2A (Fall and Winter)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIV E 203, CIV E 204, CIV E 221, CIV E 223A, CIV E 224, CIV E 225, CIV E 292, CIV E 298, CIV E 291+</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Term 2B (Spring and Fall)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIV E 205, CIV E 222, CIV E 223B, CIV E 253, CIV E 280, CIV E 299; 1 social sciences or humanities elective. CIV E 291+</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Term 3A (Winter and Spring)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIV E 300, CIV E 303*, CIV E 342*, CIV E 353*. CIV E 375*, CIV E 398; 1 social sciences or humanities elective. Any one of the courses marked with * may be delayed to another term but must be taken before graduation and must be replaced with another technical course approved by the Assoc. Chairman. (Delaying such a course may deny the student an opportunity to take an advanced course in that subject area later).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Term 3B (Fall and Winter)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIV E 399; 4 technical electives; 1 social sciences or humanities elective. At least 1 of CIV E 313 and CIV E 413 must be taken before graduation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Term 4A (Spring and Fall)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIV E 400, CIV E 498; 4 technical electives. One social sciences or humanities elective to be taken in either 4A or 4B term; at least 1 of CIV E 313 and CIV E 413 must be taken before graduation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Term 4B (Winter)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIV E 491, CIV E 499; 4 technical electives; 1 social sciences and humanities elective, unless the required program is completed by the 4A term. A total of 11 courses are required in 4A and 4B.</td>
</tr>
</tbody>
</table>

+ 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 as electives. These courses are specified in this Calendar in the section "Engineering - Management Sciences". Note that M SCI 251 and M SCI 261 are equivalent to CIV E 224 and CIV E 292 respectively, for the purposes of this Option. The student must achieve a grade of at least 50% in each of the 8 courses and must obtain an average of 60% or more in these courses. A student who wishes to follow the Management Sciences Option must declare his or her intent before embarking on the 2B term and must obtain the approval of the Civil Engineering Department.

Computer Engineering

Note:
The Computer Engineering Program has not received approval of the Ontario Council of University Affairs. If approval is not received prior to September 1988, students applying for this program will be registered in Electrical Engineering with an Option in Computer Engineering.

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

Computer Engineering is a branch of engineering that deals with the design and development of computer systems and emphasizes such factors as functions, performance, cost, size, power requirements, reliability, maintainability and societal impact. Intrinsic to computer engineering is the concept of design as it applies to all aspects of a computer system (the hardware, the software and the algorithms used) and the application for which it is intended. As with engineers in other disciplines, the goal of computer engineers is implementation, here to build a computer system for an application environment.

The curriculum in Computer Engineering encompasses the study of mathematics, physics and basic engineering and computer science disciplines. This study is complemented by a thorough education in computer hardware and software.

After the Year 1 program in Engineering, the program in Computer Engineering consists of prescribed core courses in Years 2 and 3. In the fourth year the students must take a minimum of eight technical courses selected as set out below in the section on Technical Electives.

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

The normal recommended program shown below involves a course load (excluding seminars) of 5 or 6 courses per term. Laboratory exercises are compulsory where they form part of a course. The normal rules of the Co-operative program will apply. By special permission the number of Co-operative work terms may be reduced, but a student must complete at least 5 work terms (including that done in Year 1), unless admitted to advanced standing, as defined in the Calendar (see page 9:2).

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

Permission to carry more than the normal load in any one term normally will be given only if the student holds an A average in the previous term.

The promotion criteria will be as laid down in the Faculty rules (see page 9:3).

General Studies Electives

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

Academic Program 1986/87

Note

The laboratory hours are approximate indications of the average time the student will spend in the laboratory.

<table>
<thead>
<tr>
<th>Course</th>
<th>No.</th>
<th>Name</th>
<th>C</th>
<th>T</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term 1B, Winter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course</td>
<td>No.</td>
<td>Name</td>
<td>C</td>
<td>T</td>
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</tr>
<tr>
<td>Term 2A, Fall</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Course</td>
<td>No.</td>
<td>Name</td>
<td>C</td>
<td>T</td>
<td>L</td>
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</tbody>
</table>

The laboratory hours are approximate indications of the average time the student will spend in the laboratory.
### Course Requirements

#### Term 2B, Spring

<table>
<thead>
<tr>
<th>Course</th>
<th>No.</th>
<th>Name</th>
<th>C</th>
<th>T</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL E 202</td>
<td></td>
<td>Seminar</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 212</td>
<td></td>
<td>Advanced Calculus for Electrical Engineers 2</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EL E 224</td>
<td></td>
<td>Numerical Methods</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EL E 234</td>
<td></td>
<td>Microelectronic Circuits &amp; Devices I</td>
<td>3</td>
<td>1</td>
<td>3*</td>
</tr>
<tr>
<td>EL E 252</td>
<td></td>
<td>Data Structures</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EL E 253</td>
<td></td>
<td>Microprocessor Systems &amp; Interfacing</td>
<td>3</td>
<td>1</td>
<td>3*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>General Studies Elective</td>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Term 3A, Winter

<table>
<thead>
<tr>
<th>Course</th>
<th>No.</th>
<th>Name</th>
<th>C</th>
<th>T</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL E 301</td>
<td></td>
<td>Seminar</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EL E 316</td>
<td></td>
<td>Probability and Statistics</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EL E 333</td>
<td></td>
<td>Microelectronic Circuits &amp; Devices II</td>
<td>3</td>
<td>1</td>
<td>3*</td>
</tr>
<tr>
<td>EL E 342</td>
<td></td>
<td>Electrical Networks</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EL E 354</td>
<td></td>
<td>Real-time Operating Systems</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EL E 427</td>
<td></td>
<td>Digital Systems Engineering</td>
<td>2</td>
<td>1</td>
<td>3*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>General Studies Elective</td>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Term 3B, Fall (Not offered 1986-87)

<table>
<thead>
<tr>
<th>Course</th>
<th>No.</th>
<th>Name</th>
<th>C</th>
<th>T</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL E 302</td>
<td></td>
<td>Seminar</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EL E 307</td>
<td></td>
<td>Electromagnetic Fields and Forces</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EL E 318</td>
<td></td>
<td>Communications Systems</td>
<td>3</td>
<td>1</td>
<td>3*</td>
</tr>
<tr>
<td>EL E 355</td>
<td></td>
<td>Database Systems</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EL E 380</td>
<td></td>
<td>Systems and Control</td>
<td>3</td>
<td>1</td>
<td>3*</td>
</tr>
<tr>
<td>EL E 428</td>
<td></td>
<td>Computer Communications Networks</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>General Studies Elective</td>
<td>3</td>
<td></td>
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</tr>
</tbody>
</table>

#### Term 4A, Spring (Not offered 1986-87)

<table>
<thead>
<tr>
<th>Course</th>
<th>No.</th>
<th>Name</th>
<th>C</th>
<th>T</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL E 401</td>
<td></td>
<td>Seminar</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 Elective Area Courses Technical Elective</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>General Studies Elective**</td>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Term 4B, Winter (Not offered 1986-87)

<table>
<thead>
<tr>
<th>Course</th>
<th>No.</th>
<th>Name</th>
<th>C</th>
<th>T</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL E 402</td>
<td></td>
<td>Seminar</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 Elective Area Courses Technical Elective</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>General Studies Elective**</td>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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**Of the two General Studies Electives taken in 4th year, at least 1 must be a 2nd level course or higher. Students taking courses from group C in the program need the approval of the Undergraduate Officer.

### Technical Electives in Computer Engineering

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

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

The remaining two technical elective courses must be chosen from a list maintained by the Department.

#### Antennas and Microwaves

<table>
<thead>
<tr>
<th>Course</th>
<th>No.</th>
<th>Name</th>
<th>C</th>
<th>T</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL E 411</td>
<td></td>
<td>Digital Communications</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EL E 456</td>
<td></td>
<td>Software Engineering</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EL E 473</td>
<td></td>
<td>Microwave Engineering</td>
<td>2</td>
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#### Communications

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#### Control

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**Electronics Devices**

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

**Power Courses**

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<td>EL E 464</td>
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**Electrical Engineering**

The curriculum in Electrical Engineering is designed to teach those fundamental physical and engineering sciences which form the basis of the work of electrical engineers. After the Year 1 program in Engineering, the program in Electrical Engineering consists of prescribed core courses and a minimum of 8 technical electives (taken during the last 2 terms). These technical electives include the possibility of working on a design or research project. In addition, students must satisfy Faculty of Engineering general studies requirements by choosing suitable elective courses.

The normal recommended program shown below involves a course load (excluding seminars) of 5 or 6 courses per term. Laboratory exercises are compulsory where they form part of a course.

The normal rules of the Co-operative program will apply. By special permission the number of Co-operative work terms may be reduced, but a student must complete at least 5 work terms (including that done in Year 1), unless admitted to advanced standing, as defined in the Calendar (see page 9:2).

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 9:3).

**General Studies Electives**

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

**Options in Electrical Engineering**

The normal Electrical Engineering program shown has been designed to offer a well balanced and rewarding education. Students wishing to enrich their education may elect to take one of the four Options available. These Options are described below. Students should be aware that an Option may require additional courses, and may constrain the choice of elective courses.

**Computer Engineering Option**

This is a sequence of 8 courses designed to give Electrical Engineering students a greater training in software to augment their digital hardware capabilities. Two courses are part of the regular program. The other courses and the terms in which they are taken are:

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

In addition to these courses, 2 other computer science courses, chosen from a list, will be taken in the fourth year. Further details are made available at the beginning of the 2A term.

The successful completion of these courses results in a designation on the transcript “Option in Computer Engineering.”

**Management Sciences Option**

This is a sequence of 8 courses (see page 9:21) designed for those students with an interest in the management of technology. Further details are made available at the beginning of the 2A term.

The successful completion of these courses results in a designation on the transcript “Option in Management Sciences.”

**Mathematics Option**

This is a sequence of 8 courses (see page 9:10) designed to give students a broad background in either pure or applied mathematics. Further details are made available at the beginning of the 2A term.

The successful completion of these courses results in a designation on the transcript “Option in Mathematics.”
Physics Option
This is a sequence of 6 courses (see page 9:10) designed to give students an enriched background in the fundamentals of physical science. Further details are made available during the 1B term.

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

Academic Program 1986/87

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.

<table>
<thead>
<tr>
<th>Term 1B, Spring</th>
<th>Course No.</th>
<th>Name</th>
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<td>Sound, Noise and Electroacoustics</td>
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<td>High Voltage and Insulation Engineering</td>
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<td>Power Systems</td>
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<td>Multivariable Control Systems</td>
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<td>Computer Control Applications</td>
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<td>EL E 499B</td>
<td>Project</td>
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</table>

Any 600-level courses taken by students in their 4th year can only be counted toward the BASc. The combined Bachelor's - Master's program in Electrical Engineering has the same number of courses as the BASc program plus the MASc program.

Service Course
M E 2A EL E 209 Electrical Engineering 2

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

†General electives may be General Studies Electives, or if the General Studies requirements have been satisfied, Electrical Engineering technical electives or any course that is approved by the Undergraduate Officer. If two General Studies electives are taken in their 4th year, at least 1 must be a 2nd level course or higher. Students taking courses from group C in the program need the approval of the Undergraduate Officer.

Geological Engineering

Geological Engineering is an interdisciplinary program involving the Faculties of Engineering and Science and, in particular, the Departments of Civil Engineering and Earth Sciences. The program is administered by the Geological Engineering Board which consists of faculty from both departments.

Geological Engineering is concerned with the study of rocks and soil of an area to determine its surface and sub-surface structure, and the application of the results to the planning and construction of dams, buildings, highways, and the exploration and development of mineral deposits.

There are 4 areas of specialization within Geological Engineering:
1. geotechnical engineering and geohydrology
2. petroleum exploration and exploitation
3. mineral exploration and mining
4. applied geophysics

The program offered at Waterloo concentrates on the first area but courses are also available in the other areas of specialization.

Employment opportunities for Geological Engineers are available in the areas of petroleum geology, mining geology, building construction, water supply, geophysics, surveying, highway and airport construction, hydrology, coastal engineering and materials supply. Geological Engineering graduates with strength in the geotechnical area find their employment activities most closely associated with public works such as the investigation and design studies of tunnels, roads, railroads, air-strips, shorelines, ports, underground storage, and waste disposal facilities. An increasing amount of activity lies in groundwater studies and environmental impact studies, including hydrologic and geotechnical investigations associated with mining developments, geomechanical aspects of petroleum recovery, both conventional and unconventional such as tar sands development and in situ heavy-oil extraction.

The demand for the expertise offered by geological engineers is expanding into many of the resource-development areas that will probably continue to play a major role in the Canadian economy for many decades. Also, the geological engineer is increasing demand for works of a civil nature, such as tunnels, dams, landfills, and aspects of environmental engineering.

ACADEMIC PROGRAM

Term 2A, Fall
EARTH 231 Mineralogy
EARTH 235 Stratigraphy
CIV E 203 Statics
CIV E 204 Mechanics of Solids
CIV E 221 Calculus 2
Social Sciences & Humanities Elective.

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

Term 3A, Winter
CIV E 300 Civil Engineering Project
CIV E 353 Geotechnical Engineering
CIV E 292 Engineering Economics
EARTH 333 Sedimentology
EARTH 370 Economic Geology
EARTH 390 Field Methods
EARTH 438 Engineering Geology
Management Sciences

Introduction
The Department of Management Sciences, Faculty of Engineering, was established in 1969 as a graduate department and has subsequently extended its activities to undergraduate programs. The management sciences are concerned with the application of scientific methods in the resolution of complex problems facing management of both private and public sector organizations.

The present activities of the department are:
1. the pursuit of advanced research in selected fields of the management sciences,
2. the provision of post-graduate courses of instruction, including part-time studies in 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 2 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.

The Option in Management Sciences
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:

<table>
<thead>
<tr>
<th>Chemical Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civil Engineering</td>
</tr>
<tr>
<td>Computer Engineering</td>
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<tr>
<td>Electrical Engineering</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
</tr>
<tr>
<td>Systems Design</td>
</tr>
</tbody>
</table>

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 3 academic terms following the completion of the BASc.
For students wishing to take a Master of Business Administration at Wilfrid Laurier University, the successful completion of the Option in Management Sciences permits a student to complete the MBA program in twelve months instead of two years. The Option consists of 8 courses (see course descriptions in Chapter 16).

a) Probability and Decision Analysis
   M SCI 251 Probability and Statistics
   M SCI 452 Behavioural Decision Analysis

b) Economics
   M SCI 261 Managerial and Engineering Economics 1
   M SCI 461 Managerial and Engineering Economics 2

c) Operations Research
   M SCI 331 Operations Research 1 and
   M SCI 431 Operations Research 2 or
   M SCI 432 Introduction to Production Management

d) Organization Behaviour
   M SCI 211 Organizational Behaviour 1
   M SCI 311 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 8 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 of the 8 courses specified above.

In order to facilitate the taking of all 8 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 16.
Option in Management Sciences

<table>
<thead>
<tr>
<th></th>
<th>2A</th>
<th>2A</th>
<th>2B</th>
<th>2B</th>
<th>3A</th>
<th>3A</th>
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<th>3B</th>
<th>4A</th>
<th>4A</th>
<th>4B</th>
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<td>Fall</td>
<td>Winter</td>
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<tr>
<td>CHE A</td>
<td>CHE 220*</td>
<td>MSCI 211</td>
<td>CHE 380*</td>
<td>MSCI 301</td>
<td>MSCI 431</td>
<td>MSCI 311</td>
<td>MSCI 452</td>
<td>MSCI 311</td>
<td>MSCI 432</td>
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<tr>
<td>CHE B</td>
<td>CHE 220*</td>
<td>MSCI 211</td>
<td>CHE 382*</td>
<td>MSCI 301</td>
<td>MSCI 431</td>
<td>MSCI 311</td>
<td>MSCI 452</td>
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<td>CIVE A</td>
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<td>CIVE B</td>
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<td>ELE A</td>
<td>MSCI 251</td>
<td>MSCI 261</td>
<td>MSCI 331</td>
<td>MSCI 311</td>
<td>MSCI 432</td>
<td>MSCI 452</td>
<td>MSCI 432</td>
<td>MSCI 461</td>
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<tr>
<td>ME A</td>
<td>MSCI 251</td>
<td>MSCI 261</td>
<td>MSCI 331</td>
<td>MSCI 311</td>
<td>MSCI 432</td>
<td>MSCI 452</td>
<td>MSCI 432</td>
<td>MSCI 461</td>
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<tr>
<td>ME B</td>
<td>MSCI 251</td>
<td>MSCI 261</td>
<td>MSCI 331</td>
<td>See Note 3</td>
<td>MSCI 432</td>
<td>MSCI 452</td>
<td>MSCI 432</td>
<td>MSCI 461</td>
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<tr>
<td>SYDE 6*</td>
<td>SYDE 210*</td>
<td>MSCI 301</td>
<td>SYDE 311</td>
<td>MSCI 211</td>
<td>See Note 4</td>
<td>MSCI 301</td>
<td>MSCI 211</td>
<td>See Note 4</td>
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</tbody>
</table>

*Equivalent with MSCI 251
†Equivalent with MSCI 261
*This course may be taken as a substitute for MSCI 452,
†SYDE 131 (equivalent with MSCI 261) is taken in 1A

Notes:
1. MSCI 211 will also be offered every Winter to accommodate the increasing demand from other Faculties.
2. Students should take MSCI 431 in the fall and MSCI 461 in the winter or MSCI 461 in the fall and MSCI 432 in the winter.
3. Students should take MSCI 211 and MSCI 431 in the fall and MSCI 432, MSCI 311, MSCI 461 in the winter or MSCI 211 and MSCI 461 in the fall and MSCI 452, MSCI 311, MSCI 432 in the winter.
4. Systems Design students should take MSCI 461 and MSCI 431 in the fall and MSCI 311 in the winter or MSCI 461 and MSCI 311 in the fall and MSCI 432 in the winter. SYDE 411 is equivalent to MSCI 431.
5. Students wishing to apply for advanced standing in the WLU MBA program should take MSCI 432 instead of MSCI 431.
The scope of Mechanical Engineering is so wide and its services so universally needed as a basic part of all kinds of engineering work that the mechanical engineer is in demand in industries throughout Canada. Mechanical engineers are required in the field of power generation, where they deal with steam, diesel or other internal combustion engines, and with hydraulic or gas turbines; in the field of heating, ventilation and refrigeration; in the design, analysis, and production of machines and equipment, for example, safety equipment, material handling equipment, automobiles, locomotives, marine vessels, furnaces, boilers, pressure vessels, heat exchangers, motors, generators and machine tools. They are employed in industries whose function is concerned with manufacturing, steel production, mining, transportation, communications, oil refining, chemical manufacture, paper, sugar, textiles, aerospace, nuclear energy, natural gas production and transmission and construction. In the last few years, because of the need to develop alternative energy sources, mechanical engineers have taken a major role in the development of new methods of energy conversion. The undergraduate program in Mechanical Engineering is designed to provide the student with a firm grasp of the fundamentals of mathematics, physics and engineering; and also to provide some opportunity for specialization in the later years. The degree of BASc in Mechanical Engineering is accredited and permits registration as a Professional Engineer in the Association of Professional Engineers in almost any Canadian Province upon satisfaction of the work experience requirement and upon passing the Association exams in law and ethics.

The Mechanical Engineering undergraduate program contains a core of basic subjects that must be taken by all students. The first year is virtually common with Civil and Electrical Engineering. The second and third years provide courses in Mechanical Engineering and Electrical Engineering with further development in mathematics and physics. Opportunities for specialization exist during the fourth year, where a choice of elective courses arranged into different option areas is available. Non-technical (general studies) courses are included in each of the 4 years.

Each student is responsible for selecting his own program of electives, in keeping with his ultimate career objective after graduation. Each term, certain faculty members are designated to give advice to students and to approve their selection. It is anticipated, and indeed encouraged, that individual students should take a majority of their technical electives from one of the option areas. The Options are:

a) Fluid Mechanics and Thermodynamics Option
The courses in this Option deal with a broad range of applications of the principles of thermodynamics and fluid mechanics, with emphasis on topics of industrial significance, for example, combustion, energy conversion, internal flows with heat and mass transfer, turbomachinery, and external flows such as plumes in air and effluents in water.

b) Environmental (Geophysical) Fluid Dynamics Option
This Option is closely linked with Option (a), and involves application of the principles of fluid mechanics and thermodynamics to problems in the natural environment. It is intended for students interested in careers in air and water pollution control, oceanography, and related fields.

c) Machine Design and Solid Mechanics Option
The courses offered in this Option range from those which provide the mathematical and physical basis of the subject matter through to those which are largely applied in nature. Subjects treated are: mechanics (including vibrations); theories of elasticity, plasticity and fracture; machine design and design optimization.

d) Engineering Materials Option
This Option consists of a comprehensive series of courses in metallurgy, including heat treatment, casting, welding, cold and hot forming. Nonmetallic materials, including plastics and ceramics. Composites, such as fiberglass and sandwich structures are also considered.

e) Automation and Controls
The courses in this Option are designed to provide the student with an understanding of the principles and control of production processes, the application of computers to the manufacturing activity and the organization of production. Topics treated are: automation, metal forming, numerical control of machine tools, applications of fluid power and industrial noise control.

f) Mechanical Engineering Core with an Option in Management Sciences
A student may acquire a BASc in Mechanical Engineering with an Option in Management Sciences by taking, completing and passing 8 specific Management Science courses as electives (see elective course listing under Department of Management Sciences). Students interested in this option must carefully plan their choice of general studies courses very early in order to ensure that the general studies requirements will be met. (See note on following page, under elective courses).
A) Core Program

a) Credit Courses
M E 201 Advanced Calculus
M E 203 Ordinary Differential Equations
M E 212 Dynamics
M E 215 Structure and Properties of Materials
M E 219 Mechanics of Deformable Solids 1
M E 220 Mechanics of Deformable Solids 2
M E 250 Thermodynamics
M E 282 Introduction to Automation
M E 304 Numerical Analysis
M E 305 Partial Differential Equations
M E 321 Kinematics and Dynamics of Machines
M E 322 Mechanical Design 1
M E 330 Control of Properties of Materials
M E 340 Manufacturing Processes
M E 351 Fluid Mechanics 1
M E 353 Heat Transfer 1
M E 354 Thermodynamics 2
M E 360 Introduction to Control Systems
M E 362 Fluid Mechanics 2
M E 482 Mechanical Engineering Projects
M SCI 251 Probability and Statistics (Equivalent to M E 202)
M SCI 261 Managerial and Engineering Economics 1
EL E 269 Electrical Engineering 2

b) Non Credit Courses
M E 200 Introduction to Mechanical Engineering 1
M E 300 Introduction to Mechanical Engineering 2
M E 400 Introduction to Mechanical Engineering 3

B) Elective Courses

a) General Studies Electives
Students entering the program will take 6 General Studies electives in total in non-technical subjects. The marks obtained in these courses will be included in the calculation of term averages. These courses are organized on a Faculty basis and detailed in this Calendar under the section General Studies in the Faculty of Engineering.

b) Technical Electives
Nine technical elective courses are required in addition to the core courses listed above to fulfill the requirements of the Mechanical Engineering program. In the final year, a project course, ME 482, normally a two-term project course, may be taken as a technical elective in each of the 4A and 4B terms. The project requires the student to demonstrate initiative and assume responsibility. Each student is responsible for selecting his own program of electives, and project.

During the term, certain faculty members are designated to give advice to students and to approve their final selection by signing their pre-registration form. A student who has an unusual career goal in mind should discuss choices with one of the designated faculty members, since it is possible to combine courses from different Options, to take courses from other departments and in some circumstances take graduate-level courses. Students who are contemplating graduate study are particularly urged to discuss their plans with the designated faculty member. The designated faculty member must be convinced of the validity of the student's selection of electives. If the faculty member refuses to sign the pre-registration form the student must reconsider his or her selection or must discuss the choices with the Associate Chairman for Undergraduate Studies.

As a guide, typical lists of electives for the 5 Option areas available from within the Department of Mechanical Engineering are given below:

a) Fluid Mechanics and Thermodynamics Option:
M E 452 Energy Transfer in Buildings
M E 456 Heat Transfer 2
M E 459 Energy Conversion
M E 463 Tribology 1
M E 557 Combustion 1
M E 559 Finite Element Methods
M E 563 Turbomachines
M E 565 Gas Dynamics
M E 566 Fluid Mechanics 3
M E 568 Noise Analysis and Control
M E 569 Fluid Mechanics-Design Topics

b) Environmental Fluid Mechanics:
M E 469 Introduction to the Environmental Sciences
M E 559 Finite Element Methods
M E 566 Fluid Mechanics 3
M E 568 Noise Analysis and Control
M E 571 Air Pollution 1

c) Machine Design and Solid Mechanics Option
M E 423 Mechanical Design 2
M E 435 Industrial Metallurgy
M E 463 Tribology 1
M E 524 Advanced Dynamics and Stress Analysis in Design
M E 525 Mechanical Vibrations in Machines
M E 527 Mechanics of Deformable Solids 3
M E 544 Welding
M E 569 Finite Element Methods
M E 568 Noise Analysis and Control
M E 826 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 527  Mechanics of Deformable Solids 3
M E 531  Physical Metallurgy of Structures and Transformations
M E 534  Non-metallic Materials
M E 541  Deformation Processes
M E 543  Metal Casting Processes
M E 544  Welding
M E 559  Finite Element Methods

f) Mechanical Engineering Core with Option in Management Sciences
The Management Sciences Option consists of the following courses in Management Sciences in addition to the core Mechanical Engineering program. For further details see Department of Management Sciences.

1A (F) - none
1B (W,S) none
2A (F,W) M SCI 251†
2B (S,F) M SCI 261†
3A (W,S) none
3B (F,W) M SCI 331#
4A (S,F) M SCI 211*, M SCI 431#
4B (W) M SCI 452*, M SCI 311*, M SCI 461*

†course is part of existing Mechanical Engineering core
‡course can be taken in lieu of a Gen. Studies course in this term. General Studies requirements, however, must still be met.
*course is a General Studies course and is from the Group A group of courses.

Note:
In order to satisfy the General Studies requirements, the General studies electives in 1B and 2A must be from Group B, the Humanities, with one of these being an advanced level course. Alternatively, the Group B requirements could be satisfied by correspondence while on a work term.

The Mechanical Engineering curriculum structure is summarized in the following table:

### Table A - The Mechanical Engineering Undergraduate Program

<table>
<thead>
<tr>
<th>Term</th>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A (F)</td>
<td>GEN E 102, GEN E 116, MATH 110A, MATH 114, PHYS 115</td>
</tr>
<tr>
<td>1B (W,S)</td>
<td>GEN E 121, GEN E 124, MATH 110B, M E 126, PHYS 125, 1 GEN STUDIES ELECT</td>
</tr>
<tr>
<td>2A (F,W)</td>
<td>ME 200, M E 201, M E 202 (M SCI 251), M E 212, M E 219, EL E 269, 1 GEN STUDIES ELECT</td>
</tr>
<tr>
<td>2B (S,F)</td>
<td>M E 203, M E 215, M E 220, M E 250, M E 262, M SCI 261</td>
</tr>
<tr>
<td>3A (W,S)</td>
<td>ME 300, M E 304, M E 305, M E 321, M E 330, M E 351, M E 354</td>
</tr>
<tr>
<td>3B (F,W)</td>
<td>M E 322, M E 340, M E 353, M E 360, M E 362, 1 GEN STUDIES ELECT</td>
</tr>
<tr>
<td>4A (S,F)</td>
<td>M E 400, 4 TECH ELECT†, 2 GEN STUDIES ELECT</td>
</tr>
<tr>
<td>4B (W)</td>
<td>5 TECH ELECT†, 1 GEN STUDIES ELECT</td>
</tr>
</tbody>
</table>

*A technical elective may be substituted for the general studies elective in 3B with the combination of an extra general studies and one less technical elective in either 4A or 4B.

†A project course, ME 482, may be taken in the 4A and 4B terms as a technical elective for each of these terms.
Systems Design Engineering

Introduction
Effective solutions to problems involving both society and technology must be based on a broad systems point-of-view. Not only must the overall technical factors of these problems be carefully considered, but the economics, social, human and political parameters must be given equally careful attention. When large scale engineering problems are under study, few people can be knowledgeable of the complete span of factors and parameters which must be considered. For these cases, solutions must be arrived at by interdisciplinary teams where each member contributes his or her own special expertise. In order to work effectively on this team, each member needs to be aware of the fundamental systems and design aspects of the problem. The rapid growth and complexity of industry have, indeed, created unusual problems; however, underlying the complexities of modern civilization and technology are similarities which make it possible to approach problems in many diverse fields with essentially the same concepts, theories and techniques. Systems science has emerged as a scientific discipline for quantitative analysis, design and control of large classes of problems in engineering and social sciences.

The undergraduate program in Systems Design Engineering at Waterloo is a study of those basic skills required for system analysis, simulation, optimization and design. Numerous examples may be cited where these systems design fundamentals may be applied: transportation, engineering design, computer applications, water resources engineering, production, planning and scheduling, environmental pollution, education. Of course the importance of specialized expertise in these areas should not be minimized, but the skills usually work most effectively toward problem solutions when operating within an overall systems context.

The Engineering Profession
Systems Design Engineering is a unique engineering discipline which is formally accredited by the Association of Professional Engineers of the Province of Ontario (APEO). With two years of work experience beyond graduation (BASc), the Systems Design Engineer may apply for registration as a Professional Engineer. If a Masters degree (MASc) in Systems Design is also obtained only one year of work experience is required before application.

Each province within Canada has its own professional Engineering Association. The Canadian Accreditation Board (CAB) is a national organization that has representation from all of the Provincial Professional Engineering Associations. The CAB determines what types of courses must be contained in a university engineering program in order for the program to meet the standards of Canadian engineering. The Systems Design Engineering program satisfies the strict standards of the CAB and is therefore acknowledged as a fully qualified engineering program. In fact, the Department of Systems Design Engineering at the University of Waterloo is the only department of its kind in all of Canada.

The Systems Design Engineering program is specifically oriented towards developing graduates who can solve problems lying at the interface of technology and the human environment. Therefore, if you are technically oriented and also have a strong parallel interest in social and human problems, Systems Design Engineering may be the right program for you. The Department of Systems Design Engineering also offers programs leading to MASc and PhD degrees, and in the past many Systems Design Engineering students have gone on to successfully complete graduate degrees. The faculty members of the Department are involved in a wide spectrum of research activities such as conflict analysis, pattern recognition, ergonomics, computer engineering, and solar energy. Students who also wish to do research in one of these areas may start at the undergraduate level by entering the combined Bachelor-Masters program at the end of their 3rd academic term. In this way they will be able to complete a Masters degree within one year after receiving their Bachelor's degree.

The Systems Design Engineering program is quite challenging. It is not easy to acquire the tools of resolving the problems of complex systems. Moreover, these tools are becoming more and more sophisticated. Thus, the average student in Systems Design Engineering is expected to work at least 50 hours per week as he or she increases in awareness of the theories of human communication. makes progress in the areas of Systems Theory, Human Systems Engineering, and Socio-Economics Systems, and absorbs the implications of the tremendous growth of electronic computing systems.

Further information is available from:

Associate Chairman for Undergraduate Studies
Department of Systems Design Engineering
University of Waterloo
Waterloo, Ontario, N2L 3G1
(519) 885-1211 Ext. 3113

High School Liaison Officer
Department of Systems Design Engineering
University of Waterloo
Waterloo, Ontario, N2L 3G1
(519) 885-1211 Ext. 4024 or Ext. 2600

Footnotes
1BASc Bachelor of Applied Science
2MASc Master of Applied Science
3PhD Doctor of Philosophy
Employment Opportunities
Graduates of Systems Design Engineering will find employment opportunities in a number of diverse fields. To some extent, the technical option area chosen by the student in the third and fourth year determines more specifically what he or she does upon graduation. Some particular types of jobs which Systems Design engineers may be involved with include:
- analysis and optimization of engineering systems
- simulation and advanced computer applications
- process control and instrumentation
- operations research
- development of alternative energy sources
- design of man-machine interface
- control systems design
- socio-economic systems design
- data analysis and pattern recognition
- occupational health and safety
- product design, planning and management
- ergonomics
- resources management
- research and development

Those types of professional activities may fall within the domain of one or more engineering disciplines such as chemical, civil (e.g. structural, water resource and transportation systems), electrical (e.g. circuit design and microprocessor applications), mechanical (e.g. energy conversion and design of machines), environmental (e.g. environmental impact assessment and planning), industrial and human engineering.

Undergraduate Curriculum in Systems Design Engineering

The Undergraduate program in Systems Design Engineering encompasses a study of the basic skills required for systems analysis, simulation, optimization and design. In particular the first 3 years of the program are intended to provide each student with a broad background and capability in the areas of:
- applied mathematics
- engineering sciences and systems theory
- socio-economic systems
- human systems engineering
- computer systems and applications

Throughout these 3 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 3 years of the program are followed by one year in which the problem solving capabilities of the student are applied with emphasis in one particular area of technology. This provides the required background for a future year of advanced study to the MASc degree, or for a rewarding career in industry or government with the Bachelor’s degree (BASc).

Systems Design Engineering Undergraduate Core Curriculum
Listing by Terms

1A (Fall Term)
SY DE 101 Tutorial
SY DE 111 Calculus 1
SY DE 113 Linear Algebra
SY DE 121 Digital Computation
SY DE 131 Engineering Economics
SY DE 181 Introduction to Systems Design Engineering

1B (Spring Term)
SY DE 102 Tutorial
SY DE 112 Calculus 2
SY DE 122 Introduction to Computer Systems
SY DE 142 Introduction to Ergonomics
SY DE 182 Dynamics
SY DE 184 Introduction to Chemical Systems
1 General Studies Program Elective
Additionally there are Option programs called Management Sciences and Computer Engineering, offered in conjunction with the Management Sciences and Electrical Engineering Departments, respectively. Students who elect either of these Options will receive a final academic transcript from the University with a statement that the Option has been successfully completed.

It is also possible for a student to organize an Option to suit his or her own special requirements. This is done by choosing a set of technical elective courses which, if approved by the Associate Chairman of Systems Design Engineering, will constitute an individual technical Option for that student.

Each technical Option in Systems Design Engineering consists of a specified set of technical elective courses taken in the 3A, 3B, 4A and 4B terms. The third and fourth year curriculum is structured as shown:

### 3A (Spring Term)
- SY DE 301 Tutorial
- SY DE 311 Introduction to Optimization
- SY DE 321 Numerical Analysis & Computer Methods
- SY DE 353 Introduction to Linear Control Systems
- SY DE 381 Thermodynamics
- SY DE 391 Analogue Circuits and Systems Laboratory
- 1 Technical Elective

### 3B (Winter Term)
- SY DE 302 Tutorial
- SY DE 322 Computer Simulation of Systems
- SY DE 362 Systems Design Workshop 3
- SY DE 392 Control Systems Laboratory
- 1 General Studies Program Elective
- 2 Technical Electives

### 4A (Fall Term)
- SY DE 401 Tutorial
- SY DE 461 Systems Design Workshop 4
- 3 Technical Electives
- 2 General Studies Program Electives

### 4B (Winter Term)
- SY DE 402 Tutorial
- SY DE 462 Systems Design Workshop 5
- 3 Technical Electives
- 1 General Studies Program Elective

### SUMMARY OF THE SYSTEMS DESIGN ENGINEERING TECHNICAL OPTIONS

#### Design and Human Systems Option

The Design and Human Systems Option embraces in whole or in part a wide spectrum of "professional" areas known as human factors engineering, human engineering, ergonomics, occupational health and safety, biomedical engineering, and elements of various technical and non-technical disciplines such as aesthetics, perceptual psychology, marketing, mechanics, materials, etc.

However, the concentration within the Systems Design Engineering program is on the human problem to be solved rather than on one of these professional or discipline areas. Thus, courses will be selected, under supervision, to provide the knowledge and expertise required to define and solve problems arising at the interface between man and machine (artifact), or man and environment.
Problem areas chosen might include:
- design for extreme human environments
- design where anthropometric aspects are dominant
- design of instrumentation for human operators
- design problems associated with occupational health and safety in industry, transportation, etc.
- medical design problems involving engineering technology
- design of consumer products used in recreation and normal living
- design involving human engineering
- human aspects of engineering ecology
- design of human "micro-environments"
- problems of ergonomics and industrial hygiene

Socio-Economic Systems Option
When planning, designing and operating a large-scale engineering project the various interactions between the project and its social environment must be considered. For example, the James Bay hydroelectric project in Northern Quebec has had important economic, social and political consequences upon the population affected by the undertaking. The purpose of the socio-economic option is to equip the students with a specific set of tools and also a general philosophical approach for tackling socio-economic problems that Systems Design Engineers are often confronted with.

To familiarize the students as quickly as possible with socio-economics, an engineering economics course is given during the first term of classes. Fundamental mathematics courses such as probability and statistics are taken during the first 2 years and they form the foundation stones for socio-economic courses which are available in later terms. Techniques are taught for analyzing socio-economic situations by use of operations research, optimization, game theory, time series analysis and the social sciences. By selecting additional elective courses, students may pursue further topics in the social sciences and operations research. Furthermore, illustrative application problems are presented within each course so that the students may fully appreciate how these methods work in practice. Additional experience in studying the socio-economic aspects of engineering design may be obtained by doing workshop projects in this area.

Physical and Computer Systems Option
In this Option the student is provided an opportunity to study in some depth a unified approach of Physical Systems Theory to mathematical modelling, analysis, simulation and design of a variety of engineering systems such as electrical, mechanical, hydraulic, structural systems and their combinations. Essential concepts and tools from linear systems theory, transform methods, frequency and time domain modelling and analysis, control systems, graph theory and computer simulation techniques are given in the earlier years followed by technical electives dealing with such topics as large-scale systems, algorithms for computer-aided-analysis and design in the final years. Students may also take technical courses in specific areas in other departments.

The Department recognizes the tremendous growth and impact of electronic computing systems on technology and society. For those students concerned with the application of computers this Option provides several courses and opportunities to learn about computer hardware (structure of digital and analog computers, microcomputers and micro-processors), computer software (algorithmic, simulation and problem-oriented software), and principles of computer-aided design.

Option in Management Sciences
The Management Science Department of the Engineering Faculty has a course package available whereby a student from another Engineering Department, such as Systems Design Engineering, can obtain a background in Management Science in addition to the Engineering degree. The Management Sciences program for a Systems Design Engineering student consists of the following optional courses:

<table>
<thead>
<tr>
<th>Academic</th>
<th>Option in Management Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term</td>
<td></td>
</tr>
<tr>
<td>1A</td>
<td>F</td>
</tr>
<tr>
<td>1B</td>
<td>S</td>
</tr>
<tr>
<td>2A</td>
<td>W</td>
</tr>
<tr>
<td>2B</td>
<td>F</td>
</tr>
<tr>
<td>3A</td>
<td>SY DE 333 Applied Statistics</td>
</tr>
<tr>
<td>3B</td>
<td>M SCI 461 Managerial &amp; Engineering Economics 2</td>
</tr>
<tr>
<td>4A</td>
<td>SY DE 411 Probabilistic Modelling</td>
</tr>
<tr>
<td></td>
<td>M SCI 211 Organizational Behaviour 1</td>
</tr>
<tr>
<td></td>
<td>1 other Technical Electives.</td>
</tr>
<tr>
<td>4B</td>
<td>M SCI 311 Organizational Behaviour 2</td>
</tr>
<tr>
<td></td>
<td>3 other Technical Electives.</td>
</tr>
</tbody>
</table>

In order to successfully complete this option, students must obtain at least 50% in each of the option courses and an overall average in them of at least 60%.
Option in Computer Engineering

The aim of this option is to augment the Systems Design Engineering curriculum with technical elective courses from Systems Design Engineering, Electrical Engineering and Computer Science Departments so that students can acquire a strong background in both hardware and software aspects of computer systems. The focus in this option will be on software development, computer interface design and applications. The following is a recommended set of 8 courses for students specializing in this option area:

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Term</th>
<th>Option in Computer Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>1B</td>
<td>S</td>
<td></td>
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<tr>
<td>2A</td>
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<tr>
<td>2B</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>3A</td>
<td>S</td>
<td>CS 240 Programming Principles and Languages</td>
</tr>
<tr>
<td>3B</td>
<td>W</td>
<td>SY DE 352 Algorithms for Computer-Aided Systems Analysis</td>
</tr>
<tr>
<td>4A</td>
<td>F</td>
<td>SY DE 421 Computer Aided Design</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EL E 323 Digital Circuits &amp; Systems</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 other Technical Elective.</td>
</tr>
<tr>
<td>4B</td>
<td>W</td>
<td>EL E 427 Digital Systems Engineering</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 other Technical Elective.</td>
</tr>
</tbody>
</table>

The two technical elective courses in 4A/B should be in the option area. In selecting specific elective courses in 3A and 3B, students should pay attention to the prerequisite requirements of 4th year elective courses, especially in Computer Science and Electrical Engineering Departments.

In addition to the above elective courses, the students are required to take several courses as part of their core program. These courses substantially enhance and augment the capabilities of students in this area. These include:
- SY DE 121 Digital Computation
- SY DE 122 Introduction to Computer Systems
- SY DE 321 Numerical Analysis and Computer Methods
- SY DE 322 Computer Simulation of Systems
- SY DF 319 Digital Circuits and Systems Laboratory
- SY DE 391 Analog Circuits and Systems Laboratory
- SY DE 392 Control Systems Laboratory
- and workshop courses.

Special Individual Option

Some Systems Design Engineering students may wish to design their own Option program which consists of technical courses drawn from the wide variety of subjects taught at the University. Special Individual Options must be organized in conjunction with a faculty advisor in the Department of Systems Design Engineering by the 3A term and must be approved by the Associate Chairman for Undergraduate Studies of the Department.

As an example, a student who wishes to study water resources or transportation engineering could take some of the socio-economic courses from Systems Design in conjunction with the appropriate subjects from the Civil Engineering Department.

Note

Transitional graduate courses (numbered in the 500's) are available for credit to senior undergraduate students registered in departments other than Systems Design Engineering.
Faculty of Environmental Studies
Faculty of Environmental Studies

Introduction
The Faculty of Environmental Studies is composed of the Department of Geography, Department of Man-Environment Studies, School of Architecture and School of Urban and Regional Planning. As a whole and within these units, the Faculty concentrates on using diverse knowledge and methods from different disciplines to understand man, and both built and natural environments. The Faculty utilizes the best of traditional teaching methods combined with innovative techniques to explore the many contemporary issues in environmental studies.

Architecture and Urban and Regional Planning are professional schools and, therefore, are vocation oriented. Through the Faculty of Environmental Studies, they are integrated into the mainstream of the University's concern with man and his environment, through the 2 main thrusts of research and practical applications.

The academic departments, Geography and Man-Environment Studies 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 4 units. Faculty members in each School or Department participate in the programs of the other units. Interaction with other parts of the University is also fostered, and joint appointments of faculty members with other Faculties and Schools/Departments have been made. Students are not only free to, but are encouraged to, choose courses from across the whole University.

Environmental Studies
Faculty of Environmental Studies
Degrees

Degrees
The Faculty of Environmental Studies offers 2 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 programs with many other Departments in the University (see programs for other details).

Degrees may be obtained in the following program areas:

- **BES**: Pre-professional Architecture (3-1/3 years on rotating work/study co-operative scheme).
- **BArch**: Professional Architecture (2-2/3 years with co-operative work terms following completion of the BES Pre-professional Architecture).
- **BES**: Honours Geography (4 years).
- **BES**: Honours Co-operative Geography (4-2/8 years with rotating work/study terms).
- **BES**: General Geography (3 and 4 years).
- **BES**: Honours Man-Environment Studies (4 years).
- **BES**: Honours Co-operative Man-Environment Studies (4-2/3 years with rotating work/study terms).
- **BES**: Honours Urban and Regional Planning (4 years).
- **BES**: Honours Co-operative Urban and Regional Planning (4-1/3 years with rotating work/study terms).
- **MA**: Geography.
- **MA**: Regional Planning and Resource Development.
- **PhD**: Geography.
- **PhD**: Regional Planning and Resource Development.

The student should apply to the unit most suited to his/her interests. There is considerable freedom to transfer to other faculties after Year 1, depending upon the student's academic record and program.

Ease of transferring between the units of the Faculty of Environmental Studies varies. Transfer to the School of Urban and Regional Planning is not normally permitted above Year 2.

To be selected for the Dean's Honours List, full- and part-time students must attain a minimum cumulative overall average of at least 80% at the completion of each academic year.

The Faculty has several awards granted to students for meritorious performance, e.g. Dean's Honours List, Alumni Gold Medal, monetary prizes. Further information on this can be obtained from the office of the Associate Dean, Undergraduate Studies.
Admission

The admission categories, requirements and procedures for all programs are outlined in detail in Chapter 2 of this Calendar. The following points emphasize some of the admission requirements which relate specifically to programs in the Faculty of Environmental Studies.

Because of the increasing use of statistics and quantitative methods in environmental research it is recommended, but not required, that students present at least one Grade 13 or Ontario Academic Course credit in Mathematics or equivalent for admission to programs in Environmental Studies; Grade 13 or Ontario Academic Course credit in Geography or equivalent is similarly recommended for those applying to the Geography Department. For applicants to the School of Architecture, Functions and Relations, Calculus, Physics and English (Francais) or equivalent at the Ontario Grade 13 or Ontario Academic Course level are required.

Interviews

Students being seriously considered for admission to the 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 in the form of a précis will be required of applicants on the day of their scheduled interview. A portfolio of creative work must also be submitted at the time of the interview. Contact the School of Architecture for further details.

Transfer Credit

Generally transfer credit is given for courses in which a grade of 60% (C-) or better was obtained. Students transferring from other institutions may have their transferred courses count toward the University of Waterloo degree as determined by the admissions officer of the particular program. Marks obtained in these courses will not be included in the calculation of the student’s average.

Students transferring from Faculties within the University, or former University of Waterloo students returning after an absence, generally have the option of either transferring previous UW courses with 60% (C-) or better without including these in cumulative average or transferring all relevant courses passed and included in the cumulative average. The specific transfer credit policies vary with each program or Faculty and students are advised to refer to the program or Faculty sections in the Calendar for detailed regulations.

English Language Proficiency Requirement

The Faculty of Environmental Studies expects that students enrolled in any of its programs should be able to demonstrate competence in writing. Accordingly, all students newly admitted to the Faculty are required to write the English Language Proficiency Examination during their first term of registration (normally scheduled during registration week in September). Students may demonstrate their competence in writing by achieving a passing grade on this Examination as determined by the students’ Department/School. If students do not achieve a passing grade on this examination, they must successfully complete the assignments of the University of Waterloo Writing Clinic and/or by completing course work. The English Language Proficiency Requirement is recorded on students’ academic record as Arts 000 Y.

Examinations and Standings

The following regulations govern the practise of the Faculty of Environmental Studies in regard to final examinations, standing, and make-up examinations. These regulations also apply to part-time students and special programs. Further details concerning University Examination Regulations can be found in Chapter 1.

A maximum of 16 first year term courses will be counted towards a BES. For other requirements, see the program section for the Department/School.

Students should note that the Faculty of Environmental Studies operates under a "term course system", except in Architecture, in which student progress is measured by term courses successfully completed rather than by years. A term course is a course with a credit weight of 0.5. Students who have passed fewer than 10 term courses will be considered Year 1 students; those who have passed at least 10 but fewer than 20 will be considered Year 2 students; those with at least 20 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 from work during term are used in part in determining standing. At the discretion of the chairperson of the Department or the Director of the School concerned and of the Dean, a student may be barred from the final examination if the course requirements are not completed to the satisfaction of the instructor.
b) Failure to write an examination is ordinarily considered a failure to pass (F–). A student who defaults a final examination, except for a properly certified reason, shall have no make-up examination privileges and may be required to repeat the work in class. If a student fails to write for medical reasons, a Doctor's certificate covering the precise period of absence must be filed in the Registrar's Office within one week of the set examination date.

c) A student will be eligible for make-up examinations only when failure to pass is attributable to extraordinary circumstances. In addition, students:
1. must have attended a reasonable number of lectures in the course in which they propose to write, and must have satisfied all term work requirements;
2. must have secured the permission of the professor concerned.

2. Appeals
Appeals against Departments/Schools decisions are handled at 3 progressive levels:
1. Disputes between students and instructors should be fully discussed at that level;
2. Problems not resolved to either party’s satisfaction should be referred to the Department/School Undergraduate Affairs Committee;
3. Lack of mutual satisfaction at that level would involve the dispute being forwarded to the Associate Dean, Undergraduate Studies, for discussion with the Faculty Undergraduate Studies Committee.

3. Submission of Course Material
In situations where a student wishes to submit a body of material to satisfy the requirement of more than one course, the student must notify the instructors of both courses of his/her intention where the courses are concurrent so that they may each decide what is appropriate for their own course.

When one of the courses has been taken in a previous term, the current course instructor must be informed by the student of his/her intention of submitting the same course material. The current instructor has the final decision on the extent to which the material is allowed.

Failure of a student to comply with the above regulation constitutes an academic offence.

4. Standing
a) Standing in an individual subject is determined by combining the marks assigned for term work with those obtained in the final examination. For the purpose of grading, the University Grading System described in Chapter 1 will be used.

b) Except in Architecture, all courses taken from May 1984 to the present whether passed or failed are included in the cumulative overall and major averages except for repeated courses in which case only the latest course attempt and grade are included. The first grade will, however, remain on the student’s record. Students (except those in the School of Architecture) should note that their major average is determined by the cumulative average of grades assigned for all courses taken in the student’s major program including those with the Environmental Studies designation.

c) Students receiving an incomplete (INC), did not write (DNW), or no mark received (NMR) standing in any course will be allowed 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. The mark of "IP" or "In Progress" may be assigned temporarily to the first half of what is essentially a year course which is listed as two term courses (i.e. Plan 490A and 490B). The mark indicates that the course is "In Progress" and that when completed, a final grade will be assigned to both the 'A' and 'B' halves of the course (usually the same grade). The mark "IP" will automatically revert to F- after 8 months, if a final grade is not submitted.

d) To be considered in good standing in the Honours programs, a student must maintain a cumulative overall average of at least 65.0% and an average in the chosen field of specialization as specified in the regulations of the relevant Department/School. If an Honours program candidate’s average falls below the prescribed minimum, the individual can be given conditional standing for 2 consecutive academic terms if in the opinion of the School or Departmental Promotions Committee the person can attain Honours standing before graduation. If not, the student, upon request, may be considered as a candidate for a degree in the General Geography Program and the regulations in (e) below will apply.

e) To be considered in good standing in the General Geography programs, a student must maintain a cumulative overall average of at least 60.0% as well as an average of at least 65.0% in Geography. If at any time a student’s cumulative overall average falls below 60.0% or the average in the major subjects below 65.0%, the individual may be granted conditional status for 2 consecutive academic terms during which period he/she must obtain good standing or he/she will be asked to withdraw.

f) The only general programs in the Faculty are the General Geography programs. The BES program in the School of Architecture is a pre-professional program. A regular (full-time) student in the General Geography programs must in each
academic year enrol in 10 term courses. A regular student in the Honours programs must each year enrol in at least 10 term courses (unless otherwise specified in a departmental Honours program). Full-time students may be enrolled for additional or fewer courses only after obtaining the approval of the appropriate Undergraduate Officer.

g) Even while otherwise in good standing, a student who fails more than 4 term courses or the equivalent over the academic year or who, in the opinion of the School or Departmental Promotions Committee, is deemed not to be profiting from University studies may be required to withdraw regardless of his/her cumulative average.

h) If a student receives a "Required to Withdraw" or a "May Not Proceed" decision, he or she must withdraw from that program for 1 calendar year; that student is entitled to apply to any other program; if the reasons for withdrawal include disciplinary problems, a statement will be placed in the student's file.

i) Generally, students wishing to graduate with a University of Waterloo Bachelor of Environmental Studies (BES) undergraduate degree must spend a minimum of two years or their final year in residence (full-time on campus). Architecture students wishing to graduate with a University of Waterloo BES degree must spend the equivalent of four terms of full-time study in residence including the final two terms. Architecture students wishing to graduate with a University of Waterloo BArch degree must spend the last two terms in residence. This does not preclude special studies approved in advance. Architecture students who choose to undertake alternate studies to the Waterloo 3B term may not graduate with a BES (pre-professional) degree because of the residence requirements. Students who do not have a BES (pre-professional) degree from Waterloo and wish to return to continue studies here in 4th year will be considered as external applicants.

Environmental Studies

Academic Programs

The Calendar is designed to enable students to make a wise choice of the programs and courses while at the University of Waterloo. Students are encouraged to consult the Undergraduate Officer of the appropriate School or Department. The Secondary School Liaison Officer and the Assistant Registrar for Environmental Studies will also respond to written or personal inquiries.

Note: Environmental Studies students wishing to take courses where full enrolment might be expected, such as ENV S 200, should study their scheduling carefully to ensure that the courses can be fitted, at some time, into their undergraduate program.

Course and Program Changes

a) Students may add and drop courses before and during the first 2 weeks of classes in the term in which the courses begin.

b) After the 2 week periods, and before November 1, March 1, and July 1, a student may add courses only with the written permission of the course instructor and the appropriate undergraduate officer.

c) After the 2 week periods, and before November 1, March 1, and July 1, a student may drop courses only with the written permission of the appropriate undergraduate officer and after demonstrating that such a change is in the student's academic interest.

The mark of "IP" or "In Progress" may be assigned to the first half of what is essentially a year course which is listed as two term courses (i.e. PLAN 490A and 490B). The mark indicates that the course is "In Progress" and that when completed, a final grade will be assigned to both the 'a' and 'b' halves of the course (usually the same grade). The mark "IP" will automatically revert to F - after a specified period of time. When the second or 'b' half of such courses is dropped as a result of schedule change or withdrawal, the first half must be dropped.

d) All schedule changes at any time must be submitted to the designated department office.

e) Students are encouraged not to register for more courses than their programs require unless exceptional circumstances can be demonstrated.

f) Full-time students may reduce their programs below the specified minimum only upon the recommendation of the undergraduate officer of the major department.

g) Courses not dropped by the deadlines specified in c) will be graded and included in the calculation of the student's average.

Academic Programs

Students who have not determined the field or subject in which they wish to concentrate should study the Calendar carefully. After examining the suggested departmental program, the student should read the descriptions of individual courses in order to have a more comprehensive idea of what the content of any program would include. Students should consult their High School Guidance Officer, Chairperson or Undergraduate Officer of any University department, or the Registrar, by letter or in person for additional clarification and information.
Voluntary Withdrawals
Students may voluntarily withdraw from their program of study without incurring academic penalty, provided that the appropriate Notice of Withdrawal form is completed, received and signed by the Undergraduate Officer, no later than: November 1 (Fall Term), March 1 (Winter Term), July 1 (Spring Term). After these deadlines, students who withdraw will normally be held responsible for the term's courses in the sense that such courses will be recorded with a grade of "NMR" and subsequently will be recorded as failures. Students who voluntarily withdraw may be eligible for tuition fee and residence refunds depending on the effective date of withdrawal. (See the Calendar of Important Dates).

Correspondence Courses
Only in exceptional cases would correspondence courses be taken by a student during a term in which he or she was a full-time student on campus.

FACULTY OPTIONS
The Faculty of Environmental Studies offers 2 Faculty Options for students enrolled in Honours programs: 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 diploma.

Environmental and Resources Management Option
1. Required Courses (7 term courses)
ENV S 195 Introduction to Environmental Studies
ENV S 200 Field Ecology
ENV S 201 Introduction to Environmental and Planning 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 (Minimum of 3 term courses)
Techniques/Methods (Minimum of 2 term courses)
ENV S 277 Introduction to Environmental Research Methods
ENV S 278 Advanced Environmental Research Methods
ENV S 378 Applications of Computer Programming in Environmental Studies
PLAN 255 Planning Surveys and Analysis
PLAN 307 Social Survey Techniques in Planning
PLAN 319 Economics and Social Techniques for Regional Planning
GEOG 160 Introduction to Cartography and Analysis

GEOG 275 Introductory Air Photo Analysis and Remote Sensing
M ENV Environmental Methods & 250A/B Techniques
M ENV 338 Social Impact Assessment

Content Courses (Minimum of 1 term course)
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
ENV S 433 People in Natural Areas
ENV S 434 Advanced Park Planning and Management
GEOG 102 Introduction to Physical Geography
GEOG 201 Geomorphology and Soils
GEOG 206 Applied Climatology
GEOG 300 Geomorphology and the Southern Ontario Environment
GEOG 309 Physical Climatology
GEOG 310 Recreation Geography
GEOG 315 Agricultural Geography
GEOG 408 Atmospheric Resource Management
GEOG 414 Energy Resources Management
GEOG 461 Land Dereliction & Rehabilitation
PLAN 156 Introduction to Urban and Regional Planning Concepts

PLAN 256 Principles of Environmental Design
PLAN 370 Land Development Planning
M ENV 218 Canadian Energy Issues
M ENV 318 Soft Energy Paths in Canada
M ENV 337 Environmental Impact Assessment
M ENV 351 Organizations and Environmental Management
M ENV 418 Energy Research Seminar
ARCH 223 Human Ecology
ARCH 244 History of Gardens of Europe and Western Asia
ARCH 245 Survey of Contemporary Architecture

a) Other substitute courses may be taken with permission of the Associate Dean, Undergraduate Studies.

b) Students must take courses in the 2 categories outlined above.

c) A minimum of 10 term courses 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 term courses)

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 311 Regional Industrial Development
GEOG 350 Regional Urban Systems 1
PLAN 319 Economic and Social Techniques for Regional Planning

one of

PLAN 322 Canadian Regional Issues
or
GEOG 322 Geographical Study of Canada

Elective Courses (3 term courses minimum)

GEOG 203 Regional Geography
GEOG 315 Agricultural Geography
GEOG 349 The City as a System 1
GEOG 352 The Rural-Urban Fringe
GEOG 412 Geography of Manufacturing Firms and Industries
GEOG 450 Regional Urban Systems 2
GEOG 452 Problems of Rural Land Use
M ENV 220 Introduction to Environmental Economics
M ENV 320 Environmental Economics
M ENV 247 Urban Anthropology
M ENV 338 Social Impact Assessment
HIST 201X Canadian Urban History
PLAN 232 Rural Planning and Development
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
SOC 242 Industrial Sociology
ECON 333 Inter-regional Economics
ECON 335 Economic Development
ECON 343 Urban Economics

*Available to Planning Students only.

a) Other substitute courses may be taken with permission of the Associate Dean, Undergraduate Studies.
b) Students must take courses in the 2 categories outlined above.
c) A minimum of 10 term courses 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.

Courses in the Natural Resources - Ecology Theme

The following list of courses does not constitute a formal Option. Rather, it indicates possible courses which would allow a student to stress Natural Resources and Ecology in their undergraduate program. Students are encouraged to see the Associate Dean, Undergraduate Studies for further information.

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 Geomorphology and Soils
GEOG 208 Applied Climatology
GEOG 300 Geomorphology and the Southern Ontario Environment
GEOG 303 Physical Basis and Geography of Water
GEOG 309 Physical Climatology
GEOG 408 Atmospheric Resource Management
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 331 Environmental Issues in a Global Perspective
GEOG 356 Resource Management
GEOG 310 Recreation Geography
ENV S 310 Behavioural Studies
GEOG 414 Energy Resources Management
ENV S 417 Land Use History and Landscape Change 1
ENV S 418 Land Use History and Landscape Change 2
Management and Environmental Studies
Management is a major concern in environmental studies. Increasingly, students will be expected to have some management background or experience when they assume employment in the environmental field. Each of the academic programs in the Faculty of Environmental Studies provides various opportunities to gain this background and experience. Geography, for example, has a formal arrangement with the Management Studies program in the form of a Joint Honours program and a Management Studies Minor. All 4 units in the Faculty offer courses with an emphasis in management pertinent to their own fields of study. The Co-op education programs offer opportunities to gain experience in various aspects of management. Most programs in the Faculty of Environmental Studies provide some flexibility in undergraduate course requirements such that formal courses in aspects of management can be taken as electives. Courses which provide background in business and corporate practice and public administration include: Accounting, Managerial Finance, Taxation (all Economics), Managerial Economics, Organizational Behaviour (all Management Sciences), Industrial and Organizational Psychology, and Personnel Psychology (Psychology).

Students interested in pursuing an emphasis in management and environmental studies should consult the Undergraduate Officer of the program in which they are registered.

Legal Studies Option
The Legal Studies Option is open to students in the Faculty of Environmental Studies. While this Option is offered by the Faculty of Arts, certain additional courses are required of ES students if they wish to take the Option. ES students are required to take ENV S 201, ENV S 401, and ENV S 402 in addition to the courses required and suggested in the Legal Studies Option statement on page 15.8 of the Calendar. Students wishing to discuss the Legal Studies Option should contact Prof. Michael McDonald, Department of Philosophy, Faculty of Arts, or Mr. David Estrin, Department of Man-Environment Studies, Faculty of Environmental Studies.

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

Environmental Studies
Academic Programs
Architecture
University. Guidance about particular courses for different student career paths is available from the following faculty members who are knowledgeable in the social sciences: C. Knapper, T. Bunting, K. Izumi, B. Mitchell, G. Priddle, and E. Lerner.

As part of their undergraduate program, 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 4 programs in the Faculty of Environmental Studies.

School of Architecture
Nature of the Program
Architects organize spaces within and about buildings. They determine the shape a total building will take and how it is to be built. They design at a large scale, with an awareness of the demands of society. They design in detail with attention to the needs and aspirations of individuals and groups. They show understanding of structural technique, construction detail and the sound use of materials. They determine the way in which the building will be built and supervise the construction process.

Architecture is a vast spread of concerns about people and their surroundings, their history, cultures, resources, disciplines and contradictions. The School's primary concern is the development of design skills in architecture, and it stresses awareness of cultural background and existing environment.

The 5 year academic program in Architecture is intended to prepare the student to become an architect capable of practice within contemporary professional constraints and capable, too, of adaptation to a changing profession and to the society it serves.

The 5 years of architectural studies are made up of: a pre-professional, 3 year Bachelor of Environmental Studies program followed by a 2 year professional program of study for the Bachelor of Architecture degree. Both programs are on the Co-operative system (Chapter 5) which consists of alternating periods of academic study and practical work experience.
Degrees
The Pre-Professional Architecture program comprises 6 academic terms of study and 3 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 4 subsequent academic terms of study and 2 Co-operative work terms, each of 8 months duration, leading to the degree, Bachelor of Architecture (BArch).

Professional Recognition
The Ontario Association of Architects accepts the degree of BArch as fulfilling the academic requirements for registration to practise. Graduates wishing to proceed to registration are required to submit their credentials to the RAIC Certification Board for assessment. For further information concerning mandatory work experience and other requirements for registration contact the Registrar, O.A.A., 50 Park Road, Toronto, Ontario M4W 2N5. The Waterloo BArch Degree is recognized by the Commonwealth Association of Architects.

Non-Architecture Students
Students not enrolled in the School of Architecture may take any architectural course listed in the recommended core program (depending on availability of space) with the exception of courses in the theme area of Design. Prerequisites indicated in the course descriptions are primarily for Architectural students. For Non-Architectural students, prerequisite evaluation must be carried out by the respective instructors.

Bachelor of Environmental Studies
(Pre-Professional Architecture) Program
The purpose of the BES program is to educate future architects to an understanding of the beliefs and needs of the individual and of society, and to a willingness to take an active role in creating and improving the environment; to a clarification of the interaction of seemingly unrelated disciplines, and to know the principles and values that surround the creation of any artifact; to a comprehension of the fundamentals and design concepts, along with the 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 behavioural problems, (2) to provide the student with an opportunity to develop skill in using different “techniques” for analyzing and synthesizing problems in the physical environment; (3) 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.

Environmental Studies
Architecture

THEME AREA DESCRIPTIONS
Technology
Courses in this theme area give preparation leading to the application of mathematics, statistics and computer science as tools for analyzing quantitative and behavioural problems as prerequisites for ensuing studies; to develop an understanding of the qualities of materials and structural behaviour; to propose alternatives in structural engineering; and to perform independent mathematical checks on simple, statically determinate and indeterminate structures.

Ecology
Courses in this Theme Area prepare the student to understand the structure and function of Man in the pre-existing environment as an individual and as a social animal; to recognize and be critical of the human/physical complex and its management for desirable human goals and quality in the natural and man-made Environments.

Culture
Courses in cultural history give the student a critical and creative understanding of the basic ingredients of all creative work, recognizing the seemingly unrelated forces for change in the cultural history of man, and comprehending the present as part of the historical past. Open to any University student upon consent of instructor. No prerequisites are required for these courses except for Architecture students.

Design
The courses in design studio combine design fundamentals and design concepts, along with the opportunity to involve analysis and synthesis, professional and scientific insights, application of tools and methods for designing artifacts for man, and an awareness of the inherent physical characteristics and limitations of media and materials. The 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 behavioural problems, structures and mechanical systems, behaviour of man, and communications; (3) to provide the student with an opportunity to develop skill in using different "techniques" for analyzing and synthesizing problems in the physical environment; (4) to establish a relationship between faculty and students; (5) to provide a vehicle for persons from faculties of different disciplines and from outside of the University to discuss with students their problems and projects from different points of view.
Bachelor of Architecture Program
The Bachelor of Architecture program increases the emphasis on architectural design and professional aspects of architecture. There are opportunities for students to develop their own areas of interest, and the final 2 terms of the program are normally devoted to a design thesis.

The courses for the Bachelor of Architecture Program are intended to prepare the student to demonstrate professional skill in separating, organizing, and conceptualizing actual problems in the man-made environment in his/her role as an architect, alone and in a team; to synthesize mechanical, structural and functional systems into architectural expressions which adapt to social needs and aspirations of society, user, client and community, alone and with the help of others; to adapt his/her skills to (a) real world constraints; (b) to the evolution of social economic and technological changes, and (c) to influence change both in constraints and environmental problems and know the current methods and procedures in professional practice for defining and solving environmental problems; to organize patterns of behaviour which assure continuing development for professional competence and relevance at all times; and to pass the examination for registration as an architect if he/she aspires to become a practising professional.

Note
Students are expected to defray costs of materials in connection with studio projects. There is a $25.00 studio/course fee for each term.

See Recommended Core Program for course arrangement, page 10:11.
<table>
<thead>
<tr>
<th>Year/Term</th>
<th>Technology Theme Area</th>
<th>Ecology Theme Area</th>
<th>Culture Theme Area</th>
<th>Design Theme Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-A Fall</td>
<td>ARCH 112 Mathematics</td>
<td>ENV S 185 Introduction to Environmental Studies</td>
<td>ARCH 142 Iconography I (1 credit)</td>
<td>ARCH 192 Design Fundamentals (1.5 credits)</td>
</tr>
<tr>
<td>Sept-Dec</td>
<td>ARCH 171 Theories and Technologies of Building</td>
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</tr>
<tr>
<td><strong>TOTAL 4 cr</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1B Winter</td>
<td>CS 100 Introduction to Computer Usage</td>
<td>ARCH 143 Iconography II (1 credit)</td>
<td>ARCH 193 Design Fundamentals and Studio (1.6 credits)</td>
<td></td>
</tr>
<tr>
<td>Jan-Apr</td>
<td>ARCH 163 Statics and Structural Analysis</td>
<td>ARCH 172</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL 4 cr</strong></td>
<td>Building Construction I</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Off-Term Spring</td>
<td>A student is free to use the off-term as he wishes. The Department of Coordination (See Chapter 5) does not provide their normal services to arrange employment for students in this term.</td>
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<tr>
<td>May-Aug</td>
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<tr>
<td>2A Fall</td>
<td>ARCH 262 Strength of Materials</td>
<td>ARCH 246 Foundations of Europe (1 credit)</td>
<td>ARCH 292 Design Concepts and Studio (1.5 credits)</td>
<td></td>
</tr>
<tr>
<td>Sept-Dec</td>
<td>ARCH 266 Building Construction II</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL 4 cr</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Co-op Work Term 1 Co-op</td>
<td>For all Co-op terms, job interviews are arranged on campus during the preceding study term by the Department of Coordination, who maintain liaison with prospective employers. The experience a student may get during the work term may include: introduction to office procedures; assisting in design presentation and model building; minor drafting assignments.</td>
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<tr>
<td>Winter</td>
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<tr>
<td>Jan-Apr</td>
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</tr>
<tr>
<td>2B Spring</td>
<td>ARCH 276 Timber: Design, Structure and Construction</td>
<td>ARCH 224 An Introduction to Landscape Design</td>
<td>ARCH 247 Renaissance to Revolution (1 credit)</td>
<td>ARCH 293 Design Concepts and Studio (1.5 credits)</td>
</tr>
<tr>
<td>May-Aug</td>
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<tr>
<td><strong>TOTAL 4 cr</strong></td>
<td>FE</td>
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<tr>
<td>Co-op Work Term 2 Co-op</td>
<td>The type of experience a student may obtain in this term includes assisting in design presentation and model buildings; assisting in preparation and corrections to site plans, floor plans, and elevations, and on-site measurements.</td>
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<tr>
<td>Fall</td>
<td></td>
<td></td>
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<tr>
<td>Sept-Dec</td>
<td>ARCH 362 Steel: Design, Structure and Construction</td>
<td>ARCH 372</td>
<td>ARCH 392 Design Concepts and Studio (2 credits)</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL 3.5 cr</strong></td>
<td>Building Services I</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Co-op Work Term 3 Co-op</td>
<td>The type of experience a student may obtain in this term includes design research; detailed design developments; design presentation; assisting in preparation of site plans, floor plans, elevations, building cross-sections.</td>
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<tr>
<td>Spring</td>
<td></td>
<td></td>
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<tr>
<td>May-Aug</td>
<td>ARCH 363 Concrete: Design, Structure and Construction</td>
<td>ARCH 373</td>
<td>ARCH 393 Design Concepts and Studio (2 credits)</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL 3.5 cr</strong></td>
<td>Building Services II</td>
<td></td>
<td></td>
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<tr>
<td><strong>TOTAL 23 credits</strong></td>
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</tbody>
</table>
# Program for the Degree of Bachelor of Architecture

<table>
<thead>
<tr>
<th>Year/Term</th>
<th>Systems and Measures</th>
<th>Culture</th>
<th>Design</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theme Area</td>
<td>Theme Area</td>
<td>Theme Area</td>
</tr>
</tbody>
</table>

## Co-op Work Terms

- **4 & 5 Winter and Spring**: This period of 8 months may serve many objectives. A student after the first degree program has time in which he may travel and decide about his future goals before returning to the School for the second degree program. During that time a student may continue the Co-op terms wherein he obtains experience in design research; assisting in the development of conceptual designs and schematics, preparation of site plans and details, floor plans, elevations, cross-sections and standard details; assisting the site architect or construction superintendent.

<table>
<thead>
<tr>
<th>Term</th>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-A</td>
<td>446 Arch 446</td>
<td>Italian Urban History</td>
</tr>
<tr>
<td></td>
<td>492 Arch 492</td>
<td>Design Studio</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Term</th>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-B</td>
<td>452 Arch 452</td>
<td>Specifications</td>
</tr>
<tr>
<td></td>
<td>493 Arch 493</td>
<td>Design Studio</td>
</tr>
</tbody>
</table>

Total: 14 credits.

## Electives

- Students are permitted to study courses given by the University at large which are in the area of the student's individual interest, with the aim of providing better orientation and more interdisciplinary communications.

Free Elective Courses selected by the student without restrictions as long as the course is approved by Senate.

Note: Department approval is mandatory for a FE.
Additional Regulations, Examinations and Promotions

In order to proceed unconditionally from one term to the next in the BES and BArch programs, the student must satisfy each of the following requirements:

a) Maintain a minimum cumulative overall average of C – (60.0) calculated at the end of each term of study.

b) Pass the studio course.

c) Not fail* more than one half course or equivalent (excluding studio) in any single term.

A term of study refers to a particular 4 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 2 of the above requirements in a given term may be permitted to continue conditionally in the program as outlined in notes 1, 2, 3, 4 and 5.

- Promotions decisions for students who satisfy only 1 of these requirements in any given term will be made on an individual basis by the Promotions Committee.

- Students who satisfy 1 or none of the above requirements in a given term will normally receive the decision "Required to Withdraw."

- No supplemental examinations are given by the School of Architecture.

Notes

1. Cumulative Average

Students who fail to maintain the minimum cumulative overall average requirement but who satisfy the other 2 requirements will receive the academic decision "May not Proceed." At the discretion of the Promotions Committee such students must raise their cumulative average to a minimum of C – (60.0) by repeating the term or by repeating courses which are detrimental to their average and/or by taking approved elective courses before enrolling in the next higher level core or studio courses. The minimum cumulative average must be attained within the next calendar year. Failing this, the student will be required to withdraw. Failure to maintain the minimum cumulative average of C – (60.0) by the end of the next higher level term will result in the academic decision "Required to Withdraw."

2. Studio Courses

Students who fail a studio course (ARCH 192, 193, 292, 293, 392, 393, 492, 493, 592, 593) but who satisfy the other requirements will receive the academic decision "May not Proceed." Such students must repeat and pass the studio course. Failure to pass the studio in question on the second attempt will result in the academic decision "Required to Withdraw." Students may not register in any higher level studio course or core courses until the failed studio course is passed. Credit will be retained for courses passed in a term in which a studio course is failed.

3. Elective Courses

Students who fail more than one half elective course or equivalent in any single term (but who pass studio and maintain the minimum cumulative overall average) will receive the academic decision "Proceed on Probation." Failed elective courses or their equivalents must be repeated and passed by the end of the next term of study (which includes the higher level studio and core course(s)). Should the student fail more than one half course or equivalent in any term, the student will receive the academic decision "Required to Withdraw."

4. Core Courses

Students who fail 2 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 2 or more one-term courses or equivalent in the next term, the student will receive the academic decision "Required to Withdraw."

5. Conditional Status

Notwithstanding the provisions of Notes 1-4, students who have been granted conditional status in a previous term during the course of the BES (Preprofessional) program will be required to withdraw if at any subsequent time they fail to meet any one or more of the 3 basic requirements for unconditional promotion as stated in a, b, c, above.

Similarly, students who have been granted conditional status on one previous occasion during the course of the BArch program will be required to withdraw if at any subsequent time they fail to meet any one or more of the 3 basic requirements for unconditional promotion stated in a, b, c, above.

6. Course Loads

Normally students of the School are permitted to take only one more or one fewer half-courses than that prescribed for the particular year and term in which they are registered. Any further addition or reduction to the student’s program must be approved by the Undergraduate Officer of the School of Architecture.

7. Appeals

See Faculty procedure, p. 10:4.
Co-operative Programs
The Bachelor of Environmental Studies program includes 6 terms of study, 3 four-month co-operative work-terms and one "off-term." The subsequent Bachelor of Architecture program consists of 4 terms of academic study and 2 co-operative work-terms, of 6 months each. The work-terms must be approved by the Department of Co-ordination and Placement.

Note
The "off-term" in the Bachelor of Environmental Studies pre-professional program follows the first 2 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 charts in Chapter 5.

Objectives of the Work Term
The Co-operative work-terms are designed to provide the student with knowledge of present day practice in architecture and to develop within the student practical skills essential for the practicing architect today.

Work opportunities are developed in private architectural departments, and construction and development companies. Drafting abilities, methods of construction, division of sub trades, construction supervision, real problem solving, and the disciplines of time and money will be learned during the work terms.

At the completion of the work terms the student who has taken full advantage of the opportunities offered will have a thorough understanding of the current methods and procedures used in the design and construction of building, sufficient ability and adequate mature judgment to assume responsibility for any medium-sized building project.

Department of Geography

Nature of the Program
Geography is concerned with both the natural and man-made environment, studying how man has shaped it according to human need, how patterns of human activities are structured over space, and how these are influenced by environmental factors.

Geography is considered both a natural and social science and flourishes in an academic organization where the multi-disciplinary approach is emphasized. The Bachelor of Environmental Studies (BES) programs in Geography (Honours and General) provide students with considerable freedom to choose supporting electives from any department in the University. Students can develop programs to suit their particular interests (see Areas of Specialization, page 10:18). Joint Honours programs with a number of other departments are listed on page 10:17.

The 4-year Geography programs provide a sound, foundation in the discipline, and prepare the student for specialization at the graduate level in almost any aspect of Geography. The mandatory content courses include a series of integrated courses in both physical and human geography. In the Honours program, the fourth year includes a research project known as the Senior Honours Thesis.

Although the 4-year programs are broad in scope, students may concentrate their courses in 1 or more of the major areas of specialization available in the Department (page 10:18). Students in the Honours programs may also elect to take 1 of the Faculty Options (page 10:6). Students are also encouraged to consider a broadly based program without specialization.

The Honours Co-op program provides for alternate terms of practical work experience and academic study. Students are admitted only after first year on the basis of academic standing and interviews with the first work term being in the winter of the second year.
Co-op Geography students must normally follow the work and study-term sequence outlined on page 10:17. A work-term report is required upon completion of each work term and 4 of these must be approved for the Co-op degree. Inquiries for additional information regarding Co-operative studies should be directed to the Co-op Undergraduate Officer. Co-op students may transfer to the regular Honours Geography program at any time, if they are in good standing.

The 3-year General Geography program provides a liberal education in environmental studies, with less specialization in Geography than in the 4-year programs. This program can also be completed by correspondence. Upon successful completion, students taking the Geography program 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.

In all programs there is emphasis on both the development of theory and methodology and on the practical application of geographical concepts to the economic, social and political problems of Canada and other parts of the world. The "applied geography" aspects of the program are enhanced by the availability in the Faculty of elective courses in Architecture, Urban and Regional Planning and Man-Environment Studies. Graduating students acquire a variety of jobs in education, government, industry and planning agencies; more information on employment possibilities is provided in a Department of Geography publication, Jobs in Geography.

The Department of Geography offers both Master's (MA) and PhD graduate programs. At the graduate level course work and research are concentrated on a specific subfield of Geography. Areas of research specialization include applied physical geography, air photo interpretation and remote sensing, urban and economic geography, agricultural geography and rural development, regional planning and development, resources management. Canada and Europe.

Bachelor of Environmental Studies

(Geography Program)

A) THREE YEAR PROGRAM

Year 1
GEOG 101 Introduction to Human Geography
GEOG 102 Introduction to Physical Geography
GEOG 110 Introduction to the Field of Geography
GEOG 160 Introduction to Cartography and Map Analysis
and 1 of, but not more than 2 of:
GEOG 125R Introduction to the Third World
GEOG 126R Development in the Third World
GEOG 127 Regional Problems of Europe
ENV S 195 Introduction to Environmental Studies
Electives other than Geography (see notes below).

Year 2
ENV S 200 Field Ecology
GEOG 201 Geomorphology and Soils
GEOG 202 Economic and Urban Geography
1 of:
GEOG 208 Applied Climatology
GEOG 309 Physical Climatology
1 of:
GEOG 203 Regional Geography
GEOG 204 Soviet Union
GEOG 205 Africa
GEOG 220A World Regional Geography
GEOG 221 The United States.
and additional courses so that a student should have completed by the end of the second year 20 term courses including 1 English course from ENGL 109, 129R, 140R, 150, 209, 210.

Year 3
GEOG 361 The Nature of Geography
Additional courses so that a student will have completed at least 30 term courses.

Notes on Three Year Program

1. Minimum Required Credits

Total: 30 term courses. Geography, 12 term courses. Outside of Faculty of Environmental Studies: 8 term courses. All Environmental Studies courses are included in the cumulative Geography average but only 4 can be counted in meeting the minimum required credits of Geography courses.

2. Term Course Load

No more than 5 courses may be taken in a term without the approval of the Associate Chairman (Undergraduate Studies). Normally, approval for a 6th course will be considered only if the cumulative Geography average is B+ or higher.
3. Average Requirements
Students must maintain an overall cumulative average of 60% and a major cumulative average of 65%. All required courses must be passed.

4. Other Comments
See notes 4, 5, 6, and 7 on Four Year programs.

B) FOUR YEAR PROGRAMS (HONOURS REGULAR C0-OP, AND GENERAL)

Year 1
GEOG 101 Introduction to Human Geography
GEOG 102 Introduction to Physical Geography
GEOG 110 Introduction to the Field of Geography
GEOG 160 Introduction to Cartography and Map Analysis
and 1 of but not more than 2 of:
GEOG 125R Introduction to the Third World
GEOG 126R Development in the Third World
GEOG 127 Regional Problems of Europe
ENV S 196 Introduction to Environmental Studies

Electives other than Geography, 1 of which must be
ENGL 109, 129R, 140R, 150 taken in Year 1 or ENGL 209, 210 taken in Year 2.

Year 2
ENV S 200 Field Ecology
GEOG 201 Geomorphology and Soils
GEOG 202 Economic and Urban Geography
GEOG 275 Introductory Air Photo Analysis and Remote Sensing
ENV S 277 Introduction to Environmental Research Methods
ENV S 377 Advanced Environmental Research Methods

1 of:
GEOG 208 Applied Climatology
GEOG 309 Physical Climatology

1 of:
GEOG 203 Regional Geography
GEOG 204 Soviet Union
GEOG 205 Africa
GEOG 220A World Regional Geography
GEOG 221 The United States

If desired, 2 of the required courses above may be taken in Year 3.

Electives: see notes below.

Year 3
GEOG 381 The Nature of Geography
GEOG 391 Field Research

1 of:
GEOG 307 Social Survey Techniques
GEOG 316 Multivariate Statistics
GEOG 317 Nonparametric Statistics
GEOG 318 Spatial Analysis

Environmental Studies
Geography

GEOG 319 Economic and Social Techniques for Regional Planning
GEOG 360 Preparation of Maps and Illustrations
GEOG 375 Air Photo Interpretations
GEOG 376 Environmental Remote Sensing
ENV S 378 Applications of Computer Programming in Environmental Studies

Honours students take:
GEOG 390 Senior Honours Thesis Proposal

Electives: see notes below.

Year 4
Honours students take:
GEOG 490A/B
Honours students take:
GEOG 490B Senior Honours Thesis

All students choose:
Electives to fulfill degree requirements.
(See notes below).

Notes on Four-Year Programs

1. Minimum Required Credits
Total: 40 term courses. Geography: 20 term courses. Outside of Faculty of Environmental Studies: 10 term courses. Only 4 term courses designated Environmental Studies may be counted as Geography courses but all courses designated Environmental Studies are included in the cumulative Geography average.

2. Term Course Load
No more than 5 courses may be taken in a term without the approval of the Associate Chairman (Undergraduate Studies). Normally, approval for a 6th course will be considered only if the cumulative Geography average is B+ or higher.

3. Average Requirements
Students in the General program must maintain an overall cumulative average of 60.0, major cumulative average of 65.0. Students in the Honours programs must maintain an overall cumulative average of 65.0 and a major cumulative average of 70.0. All required courses must be passed.

4. Foreign Language Requirement
Students considering graduate work should take at least 2 term courses in a foreign language.

5. Secondary School Teaching
Students intending to teach in Secondary Schools should take at least 4 term courses of Regional Geography.
6. Equipment and Travel Costs
For some courses, extra fees may be required to defray heavy equipment/travel costs, e.g. GEOG 391 (Field Research). Statements on extra costs, where required, will be found with the course description.

7. Independent Study
Up to 3 independent study courses (GEOG 475A, B, C) may be taken. These can be taken in different terms or concentrated in fall term. Year 3 as part of an independent study term comprising GEOG 390, GEOG 391 and GEOG 475A, B, C.

8. Honours Co-operative Program
Students are admitted to the Co-op program only after the first year and enter their first work term in the winter of the second year. The Honours Co-op program has the same academic requirements as the Honours Regular program.

Co-op Course Scheduling Recommendations

| Year 1 | GEOG 101, 102, 110, 160, 275, ENV S 277 |
| Year 2 | Fall Term 2A |
|        | ENV S 200 and 377 |
|        | GEOG 201, or 1 of: GEOG 208, 309 |
|        | Electives, 1 of which must be ENGL 109, 128R, 140R, 150 taken in Year 1 or ENGL 208, 210 taken in spring term 2B |
| Winter Work Term 1 | Spring Term 2B |
|        | GEOG 201, or 1 of: GEOG 208, 309, 202, and 1 of: 203, 204, 205, 220A, 221 |
| Fall Work Term 2 | Year 3 |
| Winter Term 3A | GEOG 381 |
| Electives | Fall Term 3B |
| GEOG 390, 391 | Electives |
| Year 4 | Winter Work Term 4 |
| GEOG 400A | Electives |
| Spring Term 4A | Fall Work Term 5 |
| Winter Term 4B | GEOG 490B |

Joint Honours Programs
Joint Honours programs have been arranged between Geography and other disciplines in the University. Detailed programs have been worked out with Anthropology, Economics, English, French, German, History, Man-Environment Studies, Management Studies, Mathematics, Music, Political Science, Recreation, Russian, and Sociology. The programs “Geography with Canadian Studies,” “Geography with Biology” and “Geography with Earth Sciences” are not Joint Honours programs but Options. These programs lead to degrees in the Faculty in which the student is registered.

The Department of Geography is prepared to work out other programs for Honours students.

Geography core requirements in Joint programs are similar to those of the Geography Honours program but GEOG 110 is not required and equivalent courses in the home department to ENV S 277, 377 and GEOG 390 and GEOG 490A, B are accepted. If scheduling difficulties arise in meeting required courses, contact the Associate Chairman (Undergraduate Studies) in Geography for possible substitute courses.

Notes on Joint Honours Programs

1. Number of Credits
The minimum number of term courses in Geography for students registered in Joint Honours programs is 14.

2. Average Requirements
Geography students taking Joint Honours with another Department must achieve Honours standing as required by the Geography Department (65.0% overall, 70.0% in Geography). The average required in the second major is the minimum Honours standing set by that Department. Students in other Departments taking Joint Honours with Geography must achieve a cumulative average of 70.0% in Geography and Environmental Studies courses. Courses designated as “Environmental Studies” are included with Geography courses in the calculation of the Geography average.

3. Canadian Studies
Students choosing the program Geography with Canadian Studies are referred to the regulations of that program. In addition, the Department of Geography recommends that course selections include at least 6 courses from those listed for Areas of Specialization under Canadian Geography on page 10:18.
Areas of Specialization

Listed below are elective second, third and fourth year courses in Geography and other relevant courses in the Department's major areas of specialization. This is not a definitive list; students are encouraged to seek out other specialized courses that meet their needs.

Applied Physical Geography
GEOG 300 Geomorphology and the Southern Ontario Environment
GEOG 303 Geographical Hydrology
GEOG 309 Physical Climatology
GEOG 400 Climatic and Periglacial Morphology
GEOG 401 Glacial Geomorphology and Contemporary Applications
GEOG 405 Tropical Geomorphology
GEOG 407 Field and Laboratory Techniques in Geomorphology
GEOG 408 Atmospheric Resource Management
GEOG 409 Energy Balance Climatology
GEOG 451 Soils Geography
GEOG 461 Land Dereliction and Rehabilitation 1
GEOG 462 Land Dereliction and Rehabilitation 2
ARCH 224 An Introduction to Landscape Design
BIOL 250 Ecology
BIOL 450 Marine Biology
CIV E 353 Geotechnical Engineering 1
CIV E 493 Engineering in the Canadian North
EARTH 200 Applied Geophysics 1
EARTH 342 Geomorphology
EARTH 370 Economic Geology
EARTH 438 Engineering Geology
EARTH 439 Hydrogeology
EARTH 440 Quaternary Geology
SCI 220 Chemistry of Pollution
SCI 260 Environmental Geology
SCI 453 The Sea and Man's Effect Upon Them
SCI 454 The Inland Waters and Man's Effect Upon Them

Canadian Geography
GEOG 251 Cities in Canada
GEOG 300 Geomorphology, Southern Ontario Environment
GEOG 309 Physical Climatology
GEOG 311 Regional Industrial Development
GEOG 315 Agricultural Geography
GEOG 322 Geographical Study of Canada
GEOG 341 Historical Geography of Canada 1
GEOG 342 Historical Geography of Canada 2
GEOG 352 The Rural-Urban Fringe
GEOG 359 Geography of Energy
GEOG 422 Canada

plus other Canadian Content Courses (page 15:4).

Environmental Studies
Geography

Environmental and Resources Management
GEOG 303 Geographical Hydrology
GEOG 310 Recreation Geography
GEOG 315 Agricultural Geography
GEOG 352 The Rural-Urban Fringe
GEOG 356 Resources Management
GEOG 357 Conservation and Resource Management
GEOG 358 Water Planning and Management
GEOG 359 Geography of Energy
GEOG 406 Atmospheric Resource Management
GEOG 414 Energy Resources Management
GEOG 452 Problems of Rural Land Use
GEOG 461 Land Dereliction and Rehabilitation 1
GEOG 462 Land Dereliction and Rehabilitation 2

EARTH 370 Economic Geology
ECON 241 Cost Benefit Analysis and Project Evaluation
ECON 355 Economics of Energy and Natural Resources
ECON 451 Advanced Topics in Resource Economics
ENV S 201 Introduction to Environmental and Planning Law
ENV S 380/381 Environmental Studies Workshop
ENV S 401 Environmental Law
ENV S 402 Planning Law
ENV S 417 History of Landscape Change - 1
ENV S 418 History of Landscape Change - 2
ENV S 433 People in Natural Areas
ENV S 444 Land Evaluation and Resources Management
ENV S 500 Professional Development in Environmental Management

GEN E 351 Information Technology and Society
M ENV 218 Introduction to Canadian Energy Issues
M ENV 220 Introduction to Environmental Economics
M ENV 241 Introduction to Environmental and Social Impact Assessment
M ENV 318 Soft Energy Paths in Canada
M ENV 320 Environmental Economics (ECON 357)
M ENV 351 Organizations and Environmental Management
M ENV 418 Energy Research Seminar

PLAN 255 Planning Surveys and Analysis
PLAN 344 Recreation Planning
REC 210 Organization and Administration of Recreation Services
REC 230 Introduction to Outdoor Recreation
REC 301 Sociology of Leisure
REC 302 Travel and Tourism
Students wishing to concentrate on a particular world region should choose relevant courses from history, other social sciences and the languages. Students concentrating on Canada should consider doing the Option, Geography with Canadian Studies (see page 10:17).
An even more important goal of the programs offered by the Department is the development of abilities to think and to analyse which are not artificially constrained by conventional boundaries of academic disciplines. The importance of the ability to think and to analyse from a broad perspective derives from the recognition that the complex inter-related problems of the contemporary world and of the future will only be resolved through this type of approach. These problems require attention from people who not only have specialized technical abilities, but also have increased perspective, awareness and understanding. They must also have the ability to work effectively in co-operation with others and to take responsibility for the human, social, and environmental implications of the results.

The Man-Environment Studies programs do not concentrate on one technical or pre-professional field to meet specifications for particular jobs. Rather, by presenting a wide range of subjects and problems inherent in the theme of man-environment inter-relationships, the programs allow students to see for themselves what the needs of society are. Through selection of topics for study within required courses, through selection of electives, and through summer work experiences in the Regular program and work-term experiences in the Co-operative program, students can equip themselves for careers which will meet those societal needs.

Some graduates of the Department of Man-Environment Studies further enhance their qualifications 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 programs and as community organizers. Others who have graduated from Man-Environment Studies have gone on to post-graduate work in programs such as urban and metropolitan studies, natural resources administration, regional planning, environmental engineering, law, systems design, teacher training, adult education, and communications studies.

The Department is fortunate in having a multi-disciplinary faculty whose formal education and experience range over a number of disciplines in the natural sciences, social sciences and the fine arts. They bring to the program qualifications in such fields as agriculture, biology, communications, economics, geography, law, mathematics, physics, political science, and sociology, as well as a variety of experiences in such diverse areas as ecological research, economic studies, urban affairs, technology assessment, and work with various international organizations.
For the approach used in Man-Environment Studies, considerable academic innovation has been desirable. Besides lectures and labs, the program 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. Students in both the Regular and Co-operative Man-Environment Studies programs are encouraged to relate aspects of their academic program to summer or work-term employment. This employment may include involvement with community organizations, and self-generated activity, and students incorporate this experiential learning into the university-based educational process.

For many students a "theme" oriented program of this kind offers a more satisfying undergraduate education than traditional alternatives. Man-Environment Studies started at Waterloo in 1969 and as an undergraduate degree program it is unique in Canada although similar ones have become established in the United States, Europe and Australia. More information may be obtained from the Undergraduate Officer, Department of Man-Environment Studies.

Bachelor of Environmental Studies (Honours Man-Environment Studies)
The formal admission requirements of the program are listed beginning on page 2:2 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 programs should be able to demonstrate competence in writing. Accordingly, all students newly admitted to the Faculty are required to write the English Language Proficiency Examination during their first term of registration (normally scheduled during registration week in September). The English Language Proficiency Program is recorded on the student's academic record as Arts 000 Y. Because of the necessity of communicating research and project results, both in the program and in careers after graduation, ability in English is particularly important in Man-Environment Studies.

Applicants who have been out of school for a number of years are considered on their work experiences and interests in environmental studies as well as their past academic record.

Most required courses are taken in the first 2 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 or group project selected from a wide range of possible topics and problem areas.

The core requirements for years 3 and 4 are also project-oriented, comprising a "seminar-workshop" and senior honors 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 honors 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 program reflects the importance attached to having students develop increasingly sophisticated abilities for coping with situations that are inherently complex, value-laden, ambiguous and uncertain. Project-oriented learning provides the occasion to practise skills in problem definition, information and data gathering, analysis and synthesis of material, and presentation of results in a suitable format using the most appropriate communications media. Skills of this nature can be refined, adapted and applied in whatever context or situations students choose during and after their university years. An increasing number of students incorporate work with governmental agencies, community organizations and other groups into projects they select for their third and fourth year project assignments and, in a few cases, well-conceived and executed projects have led to employment in a variety of organizations.

Elective courses can be chosen from anywhere in the university and options start from the first year in the program. Faculty will advise on this, but essentially there are 5 possibilities, as follows:

1. The Honours Regular and Co-operative Programs
   Students take the required core program and whatever sets of elective courses they wish to round out their individual interests and skills.

2. Themes
   Students can specialize in 1 of 4 themes within the Department by taking the required core program and the identified electives for 1 of the 4 themes.
   a) Energy Management and Policy Analysis
   b) Environmental and Social Impact Analysis
   c) Natural Area Management
   d) International Development and Environmental Issues
A Joint Honours Degree
Students can elect to take a Joint Honours degree with another department, which will require fulfilling the core program of a second department as well as Man-Environment Studies.

A Minor
Students can elect to take a Minor with another department, which requires completion of 10 term courses in another department, as designated by that Department.

An Option
Students can elect to take one of the recognized Options involving choices among sets of courses all bearing on some area, theme or issue of interest. See, for example: Legal Studies, Management Studies, Administration.

In each case students should give careful consideration to their choices in terms of the educational goals and possible careers they may wish to pursue after obtaining a BES degree. They would also do well to seek information and advice on the kind of undergraduate courses favoured by graduate programs in which they may be interested.

The recommended course load is 5 term courses per term. Each student must have completed 40 term courses or the equivalent before graduation with a cumulative overall average of 65.0; a cumulative average of 70.0 must be maintained in M ENV/ENV S courses. There are several evaluation techniques used to determine grades.

Environmental Studies
Man-Environment Studies

Year 3
M ENV 390a/391a Seminar-Workshop (with consent of Faculty, 390B, 391B, may be taken in place of 390A, 391A.)
M ENV 396 Development of Environmental Thought 2
plus electives for a total of 5 term courses for the Fall term and 5 term courses for the Winter term.

Note: Students who would like additional flexibility in fourth year, such as being off campus for the year, MUST take M ENV 400 in third year.

Year 4
M ENV 400 Senior Honours Seminar
M ENV 490A/490B Senior Honours Assignment (with consent of Faculty, 491A/491B or 492A/492B may be taken in place of 490A/490B).
plus electives for a total of 10 term courses for the Fall/Winter Session.

The Honours Co-operative Program
Terms 1A, 1B, and 4A, 4B are the same as Years 1 and 4 respectively of the Regular program. During Fall term of Year 1, those interested may apply to enter the Co-operative program effective with the beginning of Term 1B. The remainder of the Co-operative program is as follows:

Term 2A
ENV S 200 Field Ecology
M ENV 290 Seminar-Workshop
plus electives for a total of 5 term courses. With consent of Undergraduate Officer, 200 may be taken in Term 3A or Term 3B.

Term 2B
M ENV 291 Seminar-Workshop
plus electives for a total of 5 term courses.

Term 3A
M ENV 390A Seminar-Workshop
M ENV 295 Development of Environmental Thought 1
plus electives for a total of 5 term courses

Term 3B
M ENV 391A Seminar-Workshop
M ENV 396 Development of Environmental Thought 2
plus electives for a total of 5 term courses.

Note 1
The arrangement of academic and work terms, and further information on Co-operative study generally, are given in Chapter 5 of the Calendar.
The Themes

a) Energy Management and Policy Analysis

Theme Director: J. Robinson

This theme is intended to introduce students to the broad range of environmental, social, political and economic factors affecting the development and implementation of energy policy and management. The program is as follows:

Year 1
Required: Regular Program

Year 2
Required: Regular Program
Theme Core:
M ENV 218 Canadian Energy Issues

Year 3
Required: Regular Program
Theme Core:
M ENV 318 Soft Energy Paths in Canada
Two of a recommended set
(see theme supervisor)

Year 4
Required: Regular Program
Theme Core:
M ENV 418 Group Energy Project

Choice of elective courses in economics, geography, planning and political science is recommended and should be discussed with the theme director.

b) Environmental and Social Impact Analysis

Theme Directors: R. Gibson, S. Lerner, G. Michalenko.

This theme is designed to prepare students to identify, analyse, manage and monitor the wide range of complex effects that human activities have on natural and social environments. In addition to the Man-Environment Studies core courses, the program involves the following theme core courses:

Year 1
Required: Regular Program

Year 2
Required: Regular Program
Theme Core:
M ENV 241 Introduction to Environmental and Social Impact Assessment

Year 3
Required: Regular Program
Theme Core:
M ENV 317 Environmental Impact Assessment
M ENV 338 Social Impact Assessment

Year 4
Required: Regular Program
Theme Core:
M ENV 445 Practicum in EIA-SIA

Choice of elective courses in the natural sciences, sociology, political science, economics, philosophy, and conflict resolution, should be discussed with the theme director.

c) Natural Area Management

Theme Director: G. Priddle

This theme has been developed for students aspiring to be professional managers of natural areas. The program is as follows:

Year 1
Required: Regular Program

Year 2
Required: Regular Program
Theme Core:

Year 3
Required: Regular Program
Theme Core:
M ENV 337 Environmental Impact Assessment
M ENV 338 Social Impact Assessment

Year 4
Required: Regular Program
Theme Core:
M ENV 434 Advanced Park Planning and Management

Choice of elective courses in economics, geography, planning and political science is recommended and should be discussed with the theme director.

d) International Development and Environmental Issues

Theme Director: S. Kumar

This theme is designed to prepare students in understanding development and environmental issues in a global perspective, with particular focus on Third World countries. In addition to areas related to energy, soil erosion and reforestation, water management, impact of technology and industrialization, etc. in developing countries, the role of Canadian organizations like CIDA, and UN organizations like UNESCO, FAO, UNEP will be presented. In addition to the Man-Environment Studies core courses, the program involves the following theme courses:

Year 1
Required: Regular Program

Year 2
Required: Regular Program
Theme Core:

Year 3
Required: Regular Program
Theme Core:

Year 4
Required: Regular Program
Theme Core:

Choice of elective courses in the natural sciences, sociology, political science, economics, philosophy, and conflict resolution, should be discussed with the theme director.
Year 1
Required: Regular Program

Year 2
Required: Regular Program
Theme Core:
M ENV 231 Environmental Issues in a Global Perspective

Year 3
Required: Regular Program
Theme Core:
M ENV 361 International Development and Communication Systems
A reading course may also be arranged. See Theme Director. There may also be a term-long field trip to the Indian subcontinent.

Year 4
Required: Regular Program
Theme Core:
Group International Development Project may be arranged. See Theme Director. There may also be a term-long field trip to the Indian subcontinent. See Theme Director. There is also the possibility of spending a term at a university in Australia as an exchange student. See G. Francis.

Joint Honours Programs
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.

Minor Programs
Students may concentrate study in an associated field to the extent it becomes a Minor (typically 10 term courses: consult the Minor Department) within Honours Man-Environment Studies. A Minor can be in any area such as Anthropology, Canadian Studies, Chemistry, Management Studies, Personnel and Administrative Studies, Psychology, etc.

Options
Students can elect to take one of the recognized Options within the Faculty of Environmental Studies or outside the Faculty in Legal Studies, Canadian Studies, Gerontology, Iberoamerican Studies, Management Studies, Peace and Conflict Studies, Studies in Personality and Religion or Women's Studies. Consult the Calendar under these headings for more information.

Environmental Studies
Man-Environment Studies
School of Urban and Regional Planning

School of Urban and Regional Planning

Bachelor of Environmental Studies (Honours Urban and Regional Planning Program)

Nature of the Program
The emphasis of the program is on planning as a process, conceived in broad terms to include policy making, research and decision making. The subject focus is regional; that is, the integrated planning of regions, large and small, includes urban-centred or core regions and rural components in which the policy emphasis is on environmental issues and other contexts typical of the Canadian scene, in which resource potentials are not yet realized, and where development issues and problems of human adjustment are in the forefront.

To implement this approach, the School of Urban and Regional Planning has gathered a team of faculty with diverse academic and practical planning experience.

The broad aim of the School is to prepare the student for active participation in the planning process. This approach gives equal emphasis to the 'why' and 'how' of planning and requires that a style be adopted that strives for a continuum between classroom and field experience, between planning studies and related disciplines, and between academic studies and future professional practice. Realizing this concept requires integration within the program of selected elements from Geography, social sciences and pure and applied sciences. For this purpose, the School of Urban and Regional Planning has been located in a Faculty with an interdisciplinary approach to a wide range of environmental issues.

The program gives a well-rounded preparation for a wide variety of professional or graduate work in urban planning, regional planning and resource development. Courses on the theory, methods and philosophy of planning provide an integrating framework. The student is also given an opportunity to pursue a special interest in economic, social, and ecological issues in planning, or in planning methodology. This is done through the selection of elective courses. Students are also encouraged to select Senior Honours Essay Topics from these special fields of interest.

The integration of practical work experience into the program is considered an important part of the educational process. Students will be brought into direct contact with the profession and will be exposed to problems typical of those encountered in practice, as well as being introduced to projects and operations far beyond the scope of any university laboratory.
The Honours Co-operative program provides for alternative terms of practical work experience and academic study. Students are admitted to this stream of study at the beginning of their second term of Year 2 on the basis of academic standing and interviews. The first work term is in the Spring following completion of second year. Co-op students normally follow the work and study-term sequence outlined on page 10:26. A work-term report is required upon completion of each work term and four of these must be graded as "satisfactory" in order to graduate. Inquiries regarding Co-operative studies should be directed to the School's Co-op Advisor, or the Department of Co-ordination and Placement.

The Regular program encourages students to actively seek work experience (internship) during the summer months of their second and third years. Because of the importance of effective communication, incoming students are expected to demonstrate proficiency in written English through the English Language Proficiency Examination offered by the English Department at the start of the fall term. If necessary, students will take the appropriate remedial work in addition to normal course and credit requirements. With an increased emphasis in the profession on quantitative techniques, it is highly 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 program.

Additional Information
The Planning programs are recognized by the Canadian Institute of Planners and an increasing number of employers as a satisfactory preparation for a wide range of careers.

Notes:
1. Course Loads
Students in the Planning School are normally expected to carry a minimum load of 12 term courses in each of the 4 years of the program. However, students interested in taking extra courses are free to take a 7 term course load in any given term without approval from the School; preregistration for more than 7 term courses may only be done with the Undergraduate Officer's approval. Students who have accumulated more than the required minimum number of term courses for proceeding into the next year of the program may elect to reduce the load and will be permitted to take a minimum of 10 term courses in any given academic year through Year 4.

All required courses should be taken in the year indicated.

Environmental Studies
Urban and Regional Planning

2. Admission to Year 2
It is possible to gain admission to Year 2. To enter Year 2 of the Honours Planning program, a student must obtain a minimum cumulative overall average of 65.0 and a 70.0 in Planning and Environmental Studies courses and must obtain credit standing in 12 term courses. In subsequent years, a student must maintain a cumulative, overall average of 65.0 as well as an average of 70.0 in Planning and Environmental Studies courses. Students admitted to Year 2 of the program will normally take PLAN 156 (instead of PLAN 100) in the Fall term.

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 program is automatic.

3. Joint Honours and Minors
Although the School does not share in Joint Honours programs, Planning students are encouraged to participate in the Minors offered by other Departments. Students choosing Minors in such programs as Canadian Studies, Political Science, and Management Studies are referred to the regulations of those programs. Planning students interested in an Economics Minor should consult the Department Undergraduate Manual for further details.

4. First-year Term Courses
No more than 16 first-year level term courses will be allowed toward the 48 required to graduate.

5. Readings and Research Course
A student wishing to register for a readings and research course (Planning 275, 475A/B) must first make arrangements with a Faculty member to provide the necessary supervision and guidance.

6. PLAN 307 may be taken in Year 2 or Year 3 provided that the ENV S 277 prerequisite has been met.

7. The School reserves the right to make changes to the curriculum as necessary. Please consult the School prior to registration.

8. Where a student in 2nd year selects 2 of: 232, 259 and 270 and then picks up the third option - that third course will be considered a second-year theme elective.

9. Where a student in 3rd year selects 2 of: 301, 357 and 330 and then picks up a third option - that third course will be considered a third-year theme elective.
10. Upper-Year Theme Courses
Regarding 2nd, 3rd, and 4th year theme courses, students are required to have 1 credit from Year 2, 2 credits from Year 3 and 1 credit from Year 4 by graduation. The order of the courses taken may be altered if necessary but not the number of credits.

A variety of items are covered in the Undergraduate Studies Policy Manual available from the Undergraduate Officer. Policy areas covered include: Admission, Courses, Examinations, English Language Proficiency Requirement, Records and Transfers, Registration, Appeals and Discipline, Academic Standing, Senior Honours Essay, and Leave of Absence. Students are expected to refer to this manual in all matters concerning academic conduct.

Co-op Course Scheduling and Sequencing

<table>
<thead>
<tr>
<th>YEAR 1</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ARTS 000,</td>
<td>PLAN 100 A and B, PLAN 159</td>
<td>Electives</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>YEAR 2</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Term 2A</td>
<td>ES 200, ES 271, PLAN 256A, PLAN 231</td>
<td>Electives</td>
</tr>
</tbody>
</table>

Winter Term 2B
PLAN 255, PLAN 250B and at least two of: PLAN 232, PLAN 259, PLAN 270
Electives

Spring Work Term 1

<table>
<thead>
<tr>
<th>YEAR 3</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Term 3A</td>
<td>PLAN 300A, PLAN 307 and at least one of: PLAN 301, PLAN 357, Electives</td>
<td></td>
</tr>
</tbody>
</table>

Winter Work Term 2

Spring Term 3B
PLAN 300B and at least one of: PLAN 330, PLAN 350
Electives

<table>
<thead>
<tr>
<th>YEAR 4</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Work Term 3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Winter Term 4A
PLAN 456A, PLAN 480A, PLAN 490A
Electives

Spring Work Term 4

Fall Term 4B
PLAN 456B, PLAN 480B, PLAN 490B
Electives

For complete listing of electives, see Department Undergraduate Manual.
### Honours Urban and Regional Planning Recommended Program (Regular and Co-op)

<table>
<thead>
<tr>
<th>YEAR 1 Required Planning Courses</th>
<th>Theme Elective Courses</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan 100A Introduction to Urban Planning Concepts and Techniques 1</td>
<td>One term course from each of the 8 categories in the list of Year 1 Theme Elective Courses (see below). Before making a final selection in these courses, students should check that prerequisites have been covered for courses which they might take in Years 2, 3, and 4.</td>
<td>Students may select other electives from any of the University Year 1 offerings – Required and Elective Courses together must total 12 term courses – all courses to be at the first year level.</td>
</tr>
<tr>
<td>PLAN 100B Introduction to Urban Planning Concepts and Techniques 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PLAN 159 Graphics for Planning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARTS 000 Y English Language Proficiency Exam</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Year 1 Theme Elective Courses**

**Theme Areas**

The following courses are examples of Theme Electives:

1. **BIOPHYSICAL**
   - BIOL 111 Introductory Biology
   - EARTH 121 Introductory Geology
   - GEOG 102 Introduction to Physical Geography

2. **PSYCHO-SOCIAL**
   - SOC 101 Introduction to Sociology

3. **ECONOMIC**
   - ACC 121 Understanding and Using Financial Accounting Information
   - ECON 101 Introduction to Microeconomics
   - ECON 102 Introduction to Macroeconomics

4. **POLITICS**
   - P SCI 101 Introduction to Politics
   - P SCI 102H Citizen Participation in Canada
   - P SCI 102M Contemporary Issues in Canadian Public Policy

5. **PHILOSOPHY**
   - HIST 105 The Meaning of Civilization
   - PHIL 130J Philosophy of Discontent
   - PHIL 145 Critical Thought
   - P SCI 102F Political Rights and Obligations

6. **METHODS**
   - CS 100 Introduction to Computer Usage
   - CS 102 Introduction to Computer Programming
   - ENGL 109 Introduction to Essay Writing
   - MATH 105 Mathematics

7. **THE ARTS**
   - ANTH 102B Anthropology Through Science Fiction
   - ARCH 194 Visual Interdisciplinary Language
   - ENGL 108 Themes of Literature (any one)

8. **OTHER THEMES**
   - ENV S 111 Introduction to the Study of the Future
   - ENV S 495 Introduction to Environmental Studies
   - GEOG 101 Introduction to Human Geography

*For a complete listing of Theme Electives, see Department Undergraduate Manual.*
### YEAR 2 Required Planning Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENV S 200</td>
<td>Field Ecology</td>
</tr>
<tr>
<td>ENV S 277</td>
<td>Introduction to Environmental Research Methods</td>
</tr>
<tr>
<td>ENV S 278</td>
<td>Advanced Environmental Research Methods</td>
</tr>
<tr>
<td>PLAN 231</td>
<td>Citizen Involvement</td>
</tr>
<tr>
<td>PLAN 255</td>
<td>Planning Surveys and Analysis.</td>
</tr>
<tr>
<td>PLAN 256A</td>
<td>Principles of Environmental Design 1</td>
</tr>
<tr>
<td>PLAN 256B</td>
<td>Principles of Environmental Design 2</td>
</tr>
</tbody>
</table>

#### Year 2 Theme Elective Courses

The following courses are examples of Theme Electives:

1. **URBAN THEME**
   - ARCH 223 Human Ecology
   - GEOG 225R Urbanization in the Third World
   - GEOG 251 Cities in Canada

2. **REGIONAL THEME**
   - GEOG 225R Urbanization in the Third World
   - PLAN 222 Canadian Regional Issues
   - PLAN 230 The Small Group in the Planning Process

3. **RURAL/RESOURCE THEME**
   - RIOI 250 Energy
   - M ENV 218 Canadian Energy Issues
   - SCI 250 Environment Geology

4. **ALL THEMES**
   - ENV S 201 Introduction to Environmental and Social Impact Assessment

For a complete listing of Theme Electives, see Department Undergraduate Manual.

#### Year 3 Required Planning Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
</table>

#### Year 3 Theme Elective Courses

The following courses are examples of Theme Electives:

1. **URBAN THEME**
   - ECON 343 Urban Economics
   - GEOG 349 The City as a System
   - PLAN 360 Technology in Urban and Regional Planning

2. **REGIONAL THEME**
   - GFOG 350 Regional Urban Systems
   - PLAN 319 Economic and Social Techniques for Regional Planning
   - PLAN 333 The Sociology of Regional Planning
3. RURAL/RESOURCE THEME
ECON 357 Environmental Economics
GEOG 315 Agricultural Geography
M ENV 320 Environmental Economics
M ENV 351 Organizations and Environmental Management

4. ALL THEMES
GEOG 352 The Rural-Urban Fringe of Canadian Studies
PLAN 316 Multivariate Statistics
PLAN 317 Nonparametric Statistics

For a complete listing of Theme Electives, see Department Undergraduate Manual.

<table>
<thead>
<tr>
<th>YEAR 4 Required Planning Courses</th>
<th>Theme Elective Courses</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLAN 456A Political and Administrative Processes in Urban and Regional Planning 1, PLAN 456B Political and Administrative Processes in Urban and Regional Planning 2, PLAN 480A, The Philosophy and Methodology of Urban and Regional Planning 1, PLAN 480B The Philosophy and Methodology of Urban and Regional Planning 2, PLAN 490A/PLAN 490B Senior Honours Essay (the equivalent of 4 term courses).</td>
<td>2 term courses from list of Fourth Year Theme Elective Courses (see below).</td>
<td>Required and Elective Courses together to total 12 term courses.</td>
</tr>
</tbody>
</table>

Year 4 Theme Elective Courses
The following courses are examples of Theme Electives:

1. URBAN THEME
   PLAN 414 Issues in Housing
   PLAN 420 Health, Environment and Planning
   REC 410 Planning of Recreation Facilities

2. REGIONAL THEME
   GEOG 412 Alternative Future Environments 2
   GEOG 450 City and Regional Systems
   PLAN 434 Planning with Native Peoples

3. RURAL/RESOURCE THEME
   ENV S 401 Environmental Law
   ENV S 411 Alternative Future Environments 1
   ENV S 417 Land Use History and Landscape Change 1

4. ALL THEMES
   ENV S 402 Planning Law
   P SCI 431 Canadian Public Policy
   PLAN 430 Social Policy Planning

For a complete listing of Theme Electives, see Department Undergraduate Manual.
Faculty of Human Kinetics and Leisure Studies
Faculty of Human Kinetics and Leisure Studies

The Faculty of Human Kinetics and Leisure Studies was officially formed in the Fall of 1972. This Faculty has gradually evolved from the School of Physical and Health Education (1966-67) and the School of Physical Education and Recreation (1968-72). Within this Faculty, the Department of Health Studies, the Department of Kinesiology, the Department of Recreation and Leisure Studies, and the Dance Group offer academic programs and conduct research.

The programs of the Faculty have developed rapidly in response to student needs and interests and to the changing needs and demands of society. Ten years ago a Regular stream was added to the Co-operative program to enable students who wanted the programs, but not the Co-operative aspects, to attend the University of Waterloo. At the same time elective courses were introduced into each Department making it possible for students to pursue in some depth a specific area of Kinesiology, Dance, Health Studies or Recreation and Leisure Studies in which they had a special interest. The future promises even greater opportunities for specialized study by the individual students.

Dance Program
The programs in Dance offer students the unique opportunity of studying dance from the perspectives of the humanities and the social sciences, as well as that of the performing arts. This orientation represents a marked departure from the strictly performance-oriented approach which is taken in most programs of Dance at universities in Canada and the United States. Career choices for graduates include positions as dance critics, choreographers, company managers, performers and teachers.

Health Studies Program
Students in the Health Studies program examine important health problems and their causes. Of primary interest are diseases in which behaviour is an important contributing cause, such as lung cancer and smoking or heart disease and diet. Also of interest are health problems which occur because people do not use preventative health-care services, such as periodic health examinations, vaccinations, and screening procedures, or because they do not comply with prescribed medical treatment.

Opportunities for employment exist in community and government health agencies, community and school health education, and other areas where an understanding of health and health behaviour is required. Graduates also pursue graduate studies in medicine, public health, health administration, environmental health, health education, and related fields.

Kinesiology Program
The Kinesiology program at Waterloo examines the how's and why's 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 and Leisure Studies Program
The academic program in Recreation and Leisure Studies has been designed to give each graduate the body of knowledge necessary to prepare for a professional position in the field of Recreation and Leisure Studies. Students completing the Honours Degree program can, in addition, complete course sequences resulting in a specialization in Cultural Recreation, Leisure and the Humanities, Outdoor Recreation and Parks, Tourism and Commercial Recreation, Urban and Municipal Recreation, Human Development and Therapeutic Recreation, and Management in Recreation and Leisure Services. Joint Honours Programs are available with Geography, Man-Environment Studies, Kinesiology, Psychology, Social Development Studies, Sociology, Music, and Dance.

Graduates of the Recreation and Leisure Studies Degree program are found in diverse settings, including hospitals, private agencies, municipalities, schools, national and provincial parks, youth agencies, and university graduate programs.

Degrees
Health Studies graduates receive an Honours Bachelor of Science degree. Kinesiology graduates receive either an Honours Bachelor of Science degree or a General Bachelor of Science degree. Recreation and Leisure Studies program graduates are awarded an Honours Bachelor of Arts degree. Those students who graduate from a Dance program receive an Honours Bachelor of Arts degree or a General Bachelor of Arts degree.
Graduates who have pursued their studies in a Co-operative program and who have successfully completed 4 work terms, 4 work reports, and who indeed do finish the Co-operative program, will have the words "Co-operative Program" added to their University diploma.

**Systems of Study**

**Co-operative System**

In the Co-operative system of study, after the first eight-month academic year, the student alternates four-month academic terms on campus with four-month terms of related work experience. Arrangements for work assignments are made through the Department of Co-ordination and Placement of the University which provides the liaison between the campus and the field situation. Students should refer to Chapter 5 of the Calendar for further details concerning the Co-operative program.

**Regular System**

In Regular programs students attend school during the Fall and Winter terms each year for 3 or 4 years.

**Admission**

The admission categories, requirements and procedures for all programs are outlined in detail in Chapter 2 of this Calendar. The following points emphasize some of the admission requirements which relate specifically to programs in the Faculty of Human Kinetics and Leisure Studies.

**Application from Ontario Secondary Schools**

Applicants to the Health Studies program are required to select a university-entrance level program which includes Chemistry and Biology. Applicants to the Kinesiology programs are required to include 1 Grade 13 or Ontario Academic Course credit from Algebra, Calculus, and Relations and Functions and 2 Grade 13 or Ontario Academic Course credits from Biology, Chemistry, and Physics.

**Advanced Standing**

Normally, students transferring to HKLS programs from other universities are granted credit for courses in which they have received a grade of C- or better. All transfer students will be required to complete at least the equivalent of 2 years of study at Waterloo (i.e. at least 22 term courses) regardless of the number of courses that are presented for transfer. Grades achieved in courses which are transferred are not used in the calculation of averages.

"One term of advanced work experience standing may be granted to students transferring into the third year of Co-operative programs in HKLS. Details are available from the Department of Co-ordination and Placement.

Students transferring to the Faculty of Human Kinetics and Leisure Studies from another University of Waterloo Faculty have two options with respect to the assignment of transfer credits. These options are:

**Option 1:** All courses, both passed and failed, taken in other Faculties at the University of Waterloo are transferred and are used in the calculation of cumulative and major averages.

**Option 2:** Only courses in which a grade of C-(60%) or better has been achieved will be transferred. These courses will not be used in the calculation of cumulative and overall averages.

**English Language Proficiency Requirement**

The Faculty of Human Kinetics and Leisure Studies feels that a student in any of the programs should be able to demonstrate competency in writing before qualifying for a degree. Therefore, all students entering an HKLS program must write the English Language Proficiency Examination (scheduled during registration week). A grade of 50% or better on the examination will satisfy the requirement. If a student fails the examination, the requirement can be satisfied by 1 of the following:

1. Sitting for the examination again and achieving a mark of 50%.
2. Successfully completing the assignments of the UW Writing Clinic.

This requirement normally must be met by the end of Year 2.

**Examinations and Standings**

1. **Final Examinations**
   a) In all courses each student is required to submit in such form and at such time as may be determined by the instructor, evidence of satisfactory participation in term work. The marks obtained for work during the term are used, in part, in determining standing. The ratio in which marks for term work and written examinations are combined is at the discretion of the individual departments. To pass a course, a student must obtain a minimum of D- in the combined term and examination marks. At the discretion of the
chairman of the department concerned and of the Dean, a student may be barred from the final examination if the course requirements are not completed to the satisfaction of the instructor. Some courses and/or instructors may not require final examinations. In such cases term work only will be used in determining a final grade.

b) Students absent from examinations, except for properly certified reasons, do not have make up privileges, and must repeat the entire course. If a student has a Doctor's certificate covering the precise period of absence, with legitimate medical grounds, it must be submitted to the Associate Dean for Undergraduate Affairs within one week of the scheduled examination.

c) All examinations which receive a failing grade are automatically re-read.

d) Examination results are issued to individual students by the Registrar. Appeals against faculty decisions made under these regulations should be made in writing to the Associate Chairman, Undergraduate Affairs, of the student's major department, within one month of publication of the official mark reports.

Additional regulations concerning examinations may be found in Chapter 1.

2. Standing

a) The Faculty has endorsed the letter grade system outlined in Chapter 1 of this Calendar.

b) Overall standing will be determined at the end of each academic year for Regular programs and upon completion of the B term for Co-operative programs by the cumulative average of all courses taken at the University while enrolled in the Faculty (whether passed or failed).

c) Students who have successfully completed fewer than 10 term courses will be considered Year 1; those who have successfully completed at least 10 term courses but fewer than 22 will be considered Year 2; those who have successfully completed at least 22 term courses but fewer than 32, Year 3; and those with 32 or more, Year 4.

d) It should be noted that all programs use the term-course system (see page 1.7 of this calendar for a description of this system). This means that courses with credit weight of .75 offered by other departments will only count as 1 term course. Similarly, courses with a credit weight of .25 will be considered as one-half of a term course.

e) Students who are readmitted after being required to withdraw may choose to have their average cleared. See page 11:3 regarding transfer credit options.

Human Kinetics and Leisure Studies
Examinations and Standings

The following cumulative averages are required to proceed in the programs of the Faculty:

<table>
<thead>
<tr>
<th>Program</th>
<th>Overall</th>
<th>Major</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kinesiology Honours</td>
<td>63</td>
<td>67</td>
</tr>
<tr>
<td>Health Studies Honours</td>
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<td>67</td>
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<tr>
<td>Kinesiology General</td>
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<td>Recreation Honours</td>
<td>65</td>
<td>70</td>
</tr>
<tr>
<td>Dance Honours</td>
<td>63</td>
<td>67</td>
</tr>
<tr>
<td>Dance General</td>
<td>60</td>
<td>63</td>
</tr>
</tbody>
</table>

Kinesiology, Health Studies and Dance students who receive a grade report with 1 of F, INC, DNW or NMR in any one academic year are placed on probation for the following academic year. Students enrolled in these programs who receive a grade report with 2 or more of any combination of the following: F, INC, DNW or NMR in any 1 academic year are designated as “May not proceed in the program.” Recreation and Leisure Studies students who receive 2 grades of F in one year are required to withdraw. Students in this program who receive a final grade of INC or NMR in any courses are placed in Conditional Standing. (The designation F takes into account all failing grades, i.e. F-, F, and F+.)

If a student clears his/her F, INC, NMR, and DNW grades prior to the next term or session, the decision on his/her grade report may be changed. After 8 months grades of INC, NMR, and DNW become grades of F--.

All grades awarded to a student are recorded on the transcript. If a student fails a course, then repeats the course and passes it, both courses are shown on the transcript and both marks are counted in the overall and/or major average. The same rule holds for a student who upgrades a course (e.g. from a D to a B) by taking the same course twice.

Students who are required to withdraw are eligible to apply for readmission only after one year's absence. It is recommended that during this absence students do some academic work (extension, correspondence, or community college study). Performance in such course work will be taken into consideration in assessing applications for readmission.

3. Honour Roll
To recognize outstanding academic achievement the Faculty has established the Faculty of Human Kinetics and Leisure Studies Honour Roll.

To be included on the Honour Roll, the student must achieve an 80.0% overall average and an 80.0% major average in the academic year in which the designation is given. A student with an INC, DNW, NMR or F on his record will not be included on the list.
4. Submission of Course Material
In situations where a student wishes to submit a body of material to satisfy the requirement of more than 1 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 1 of the courses has been taken in a previous term, the current course instructor must be informed by the student of his/her intention of submitting the same course material. The current instructor has the final decision on the extent to which the material is allowed.

Failure of a student to comply with the above regulations constitutes an academic offence.

Program Selection

Full-time students: All 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 programs: except in exceptional circumstances, an Honours program may not be taken on a completely part-time or reduced program basis.

All undergraduate honours degree programs in the Faculty of Human Kinetics and Leisure Studies must be successfully completed within 8 calendar years from the time the student first enters the program. Students may complete a segment of their program on a part-time basis but, normally, must successfully complete a minimum of 22 term courses while enrolled in full-time study (i.e. minimum of 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 1 year of advanced standing, the HKLS program must be completed in 7 years and in the case of students who have been granted the equivalent of 2 years of advanced standing, the HKLS program must be completed in 6 years. The Faculty of Human Kinetics and Leisure Studies does not encourage part-time studies but will allow a General degree to be pursued on a part-time or reduced-program basis subject to approval by the Associate Dean of Undergraduate Affairs and the department concerned. Normally, no first-year program for a full-time student may be reduced below the 10 courses minimum except in very exceptional circumstances.

Auditing a Course
It is the responsibility of the student to inform the course instructor at the beginning of the course that he or she would like to audit the course. The instructor and student may then form a contract outlining the particular auditing requirements for that course.

Letter of Permission Policy
A student may request permission to take a course(s) at another university for credit at Waterloo. A maximum of 10 term courses (or equivalent) can be obtained this way. The Associate Chairman may approve up to 5 term courses (or equivalent). Requests for approval for additional courses must go to the HKLS Undergraduate Affairs Committee. To obtain any approval the student must obtain a Letter of Permission Request form from the Registrar’s Office and provide the details of the course(s) to be taken, appropriate course descriptions and the reasons for the request. When approved and the appropriate fee paid, the Registrar’s Office will prepare the Letter of Permission and forward it to the student, the host university and the major department concerned.

It will be the student’s responsibility to ensure that an official transcript is sent to the Assistant Registrar, Faculty of Human Kinetics and Leisure Studies, Needles Hall, University of Waterloo, Waterloo, Ontario within two months of the completion of the course(s).

Note
The granting of any Letter of Permission request by the University of Waterloo does not necessarily ensure that the student will be able to enrol in the approved course at the other university. There may be restrictions on class enrollments, etc. at that institution. Students should contact that institution’s Registrar’s Office for procedural details.

Correspondence Courses
Correspondence courses are normally restricted to part-time students who are not able to attend classes on campus. Correspondence courses may, under some circumstances, be taken while on a work term. The Associate Chairman for Undergraduate Affairs is the only individual who can grant permission to enrol in a correspondence course. Permission must be granted before the student enrols in the course and/or the course commences.

Course and Program Changes
a) Up to the end of the first 2 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 2 weeks of classes any course may be dropped provided the course instructor initials the drop, and either the Associate Chairman or the Associate Dean for Undergraduate Affairs signs the registration form. This policy will permit course drops only up to November 1 in the Fall term, March 1 in Winter term and July 1 in Spring term. In the event that any of the above dates fall on a holiday or weekend, the final drop day will be the last school day prior to the listed date.
Students may withdraw from a program without an academic penalty up to November 1 in the Fall term, March 1 in the Winter term, and July 1 in the Spring term. In order to withdraw from a program (i.e. the University) a student must complete a standard Student Withdrawal form which is available in the Registrar's Office. This form must be signed by the appropriate Associate Chairman, Undergraduate Affairs.

Students should note the financial implications of dropping courses or withdrawing from programs (see page 3.3).

**Appeals**

Students who wish to appeal a grade received for a course should:

i) Contact the instructor associated with the course and attempt to resolve it within one month of the release of grades.

ii) If the student is not satisfied with the discussion, then a written appeal (HKLS Appeal forms can be picked up at each Associate Chairman’s Office) to the Associate Chairman, Undergraduate Affairs of the student’s home department can then be made. This appeal will be reviewed and a decision given by the Associate Chairman.

iii) An unfavourable ruling at the departmental level can be appealed in writing through the Associate Dean of the Faculty, to the HKLS Undergraduate Affairs Committee.

iv) An unfavourable ruling from the HKLS Undergraduate Affairs Committee can be appealed in writing to the Dean of the Faculty of HKLS.

v) An unfavourable ruling, from the Dean of HKLS can be appealed in writing to the Academic Vice President of the University.

**Academic Programs**

**Dance**

The unique Dance Program at the University of Waterloo enables students to pursue Dance as an entire field of both academic and applied study. The major perspective of Dance offered through the Bachelor of Arts degree program is Dance as a Theatre Art (encompassing Western and non-Western cultures and practices).

To provide the necessary knowledge for varying career interests, 2 different degree programs are offered: the Honours Bachelor of Arts and the General Bachelor of Arts. The General degree program comprises 3 years of study and is designed for students who are interested in acquiring an overall knowledge of the subject of Dance. The Honours degree program comprises 4 years of study with the opportunity to specialize in one of two areas of concentration.

**Areas of Concentration (AOC)**

The Historical-Cultural area focuses on classical and folk forms in the Western and non-Western world, with a view to understanding the role of dance in preserving and enhancing a multicultural society.

The other area of concentration deals with Developmental Foundations in Dance. This area examines the preparation of the dancer and artist within the context of the developmental process particularly during the critical years of childhood and adolescence, with a view to understanding and enhancing the generic base of the art product.

**Joint Honours Degrees**

Joint Honours degrees are available with History, Psychology, and Recreation and Leisure Studies. Requirements in the Joint Honours Programs vary and students should consult with the Undergraduate Officer in both departments regarding course sequences, course or credit requirements, minimum averages and required courses.

**Course Requirements**

To be eligible for the Honours BA degree in Dance, students must successfully complete 44 term courses, and maintain an overall cumulative average of 63% and a cumulative average of 67% in their Dance courses. To be eligible for the General BA degree, students must successfully complete 30 term courses and maintain a minimum overall cumulative average of 60% and a minimum cumulative average of 63% in their Dance courses.

**Honours Bachelor of Arts Degree Program**

A) Required Dance Courses

- DANCE 110, 111, 220, 230, 231, 233, 336, 410, 411
- 2 of DANCE 241, 341 or DANCE 242, 342
- 1 of DANCE 351, 353
- 4 of DANCE 221, 225, 325, 333 or DANCE 264, 366, 367, 484

B) Required Outside Courses

- 2 of MUSIC 100, 111 or MUSIC 150G, 151G;
- PSYCH 101, ANTH 102A; 2 of ENGL 100, 110, 140R, 141R, 150, 151, 210C; plus
- 6 courses in AOC

C) Dance Electives

- 6 term courses in Dance.

D) Other Electives

At least 5 of the 10 term course electives must be taken within the Faculty of Arts.
### Suggested Course Sequences

<table>
<thead>
<tr>
<th>Year</th>
<th>Course 1</th>
<th>Course 2</th>
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</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>DANCE 110</td>
<td>DANCE 111</td>
</tr>
<tr>
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<td>DANCE 230</td>
<td>DANCE 231</td>
</tr>
<tr>
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<td>MUSIC 100 or 150G</td>
<td>MUSIC 111 or 151G</td>
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<td>PSYCH 101</td>
<td>ANTH 102A</td>
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<td>Required ENGLISH</td>
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</table>

### General Bachelor of Arts Degree Program

**A)** Required Dance Courses

- DANCE 110, 111, 220, 230, 231, 233, 336
- 2 of DANCE 241, 341 or DANCE 242, 342
- 1 of DANCE 351, 353

**B)** Required Outside Courses

- 2 of MUSIC 100, 111 or MUSIC 150G, 151G
- PSYCH 101; ANTH 102A;
- 2 of ENGL 109, 110, 140R, 141R, 150, 151, 210C

**C)** DANCE Electives

- 5 term courses in DANCE

**D)** Other Electives

- At least 4 of the 9 term course electives must be taken within the Faculty of Arts.

### Suggested Course Sequences

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Course 1</th>
<th>Course 2</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>DANCE 110</td>
<td>DANCE 111</td>
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<tr>
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<td>DANCE 230</td>
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<td>ANTH 102A</td>
</tr>
<tr>
<td></td>
<td>DANCE Elective</td>
<td>DANCE Elective</td>
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</tbody>
</table>

### Technique Courses

Technique is a highly valuable tool for students in all areas of dance. Ballet, Modern and Folk Techniques are offered from beginning to advanced levels. Students may pursue these classes to the technical level of their interest and need. All technique courses have a credit weight of .25. Dance students may apply technique credits to the “Other Electives” section of their degree. Technique courses may not be taken for degree credit by Recreation and Leisure Studies students and Kinesiology students.

### Note

Students enrolled in the B.A. (Hons) should select courses appropriate to the Historical-Cultural or the Developmental Foundations area of concentration (AOC) in consultation with a faculty advisor.
Department of Health Studies

In Health Studies the knowledge from several traditional disciplines is combined and focused on the study of health and disease. Courses provide students with an understanding of (a) what diseases are, (b) their causes, (c) behavioural factors that contribute to disease, and (d) ways in which health behaviour can be changed.

The curriculum has 4 core areas:

1. Health Sciences - the scientific facts and principles pertinent to personal and community health. Specific subject areas include: (a) introduction to health sciences, (b) determinants of disease (epidemiology), (c) environmental health, (d) nutrition, and others.
2. Behavioural Sciences - introductions to psychology and sociology, determinants of health behaviour, and health behaviour modification.
3. Biological Sciences - the basic principles of biology, physiology and biochemistry.
4. Evaluation and Research - the principles of statistics and research design aimed at developing sufficient competencies to enable students to evaluate and interpret the findings of health-related research.

Students may apply for admission directly into the Honours Health Studies program, Co-op or Regular. In order to receive the honours BSc degree the student must successfully complete 44 term courses including the following requirements:

**Degree Requirements**

a) Required Health Studies Courses: (15)

b) Required Kinesiology Courses: (3)
   KIN 222, 317, 330

c) Required Courses from other departments: (9)
   BIOL 230, 233, 239
   CHEM 123, 124 (plus 123L, 124L)
   CS 316
   PSYCH 101; SOC 101

d) Restricted electives: (5)
   One of: HLTH 210, 407
   One of: ENGL 109 or 210 (recommended for Year 1 or 2)
   One of: PHIL 226, 258 (recommended for Year 4)
   Two of: BIOL 211, 240, 241, 330, 441, HLTH 302, 303

**Course Sequence**

<table>
<thead>
<tr>
<th>Year 1 (Co-op and Regular)</th>
<th>Fall</th>
<th>Winter</th>
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<tbody>
<tr>
<td>HLTH 140</td>
<td>HLTH 141</td>
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<td>SOC 101</td>
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<td>CHEM 123</td>
<td>CHEM 124</td>
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<td>CHEM 123L</td>
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<table>
<thead>
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<td>HLTH 245</td>
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<td>KIN 317</td>
<td>3 Electives</td>
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<td>1 Elective</td>
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<th>Year 3</th>
<th>Fall</th>
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<td>HLTH 341</td>
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<td>HLTH 349</td>
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<td>4 Electives</td>
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<td>CS 316</td>
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<th>Year 4</th>
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<tr>
<td>HLTH 431 or 433</td>
<td>HLTH 432 or elective</td>
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<tr>
<td>HLTH 442</td>
<td>HLTH 443</td>
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<td>3 Electives</td>
<td>HLTH 445</td>
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**Co-operative Programs**

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<tr>
<th>Year 2</th>
<th>2A (Fall)</th>
<th>2B (Spring)</th>
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<tr>
<td>HI TH 220</td>
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<tr>
<td>KIN 222, 317</td>
<td>HLTH 349</td>
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<tr>
<td>1 Elective</td>
<td>KIN 330</td>
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<td>BIOL 239</td>
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<th>Year 3</th>
<th>3A (Winter)</th>
<th>3B (Fall)</th>
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<td>HLTH 340</td>
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<td>HLTH 344</td>
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<td>CS 316</td>
<td>HLTH 442</td>
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<td>3 Electives</td>
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Year 4
4A (Spring) 4B (Winter)
HLTH 431 or elective HLTH 432 or elective
5 Electives HLTH 443
HLTH 445
2 Electives

Health Studies/Kinesiology
Kinesiology/Health Studies
Joint Honours Degree Program
There are significant numbers of students within Human Kinetics and Leisure Studies whose interests potentially encompass both the Kinesiology and Health Studies programs. The following Joint Honours program is offered through both the Regular and the Co-operative format of study to accommodate those students and to best prepare them for jobs that require backgrounds in both Kinesiology and Health Studies.

Degree Requirements for Joint Honours include:
A) 44 term courses including:
- Kinesiology required courses:
  KIN 102, 103, 200, 222, 252, 255, 300, 317, 321, 330, 335, 354, 431 or 433, 470.
- Health Studies required courses:
  HLTH 140, 141, 245, 341, 346, 349, 442, 445
- Outside Required:
  BIOL 230, 233, CHEM 123, 124 (plus 123L, 124L), CS 102, 316, MATH 106, PHYS 103, PHYS 105, PSYCH 101, SOC 101
- Electives:
  a) Kinesiology - 4 term courses chosen from those electives available in Kinesiology.
  b) Health Studies - 3 of HLTH 210, 340, 344, 346, 443, 1 of PHIL 226, 258.
  c) Free - 1 term course chosen from any department within the University.
*If 433 option taken, an additional elective presumably at the 4th-year level and approved by the student's advisor, is required.
B) An overall average and major average of 70% is required in the Joint Honours program.

Department of Kinesiology

Listed below are the course combinations leading to the Honours and General degrees in Kinesiology. Students are encouraged to make full use of the advisory system of the Department in planning their programs.

Degree Requirements
Honours Program
Successful completion of 44 term courses is necessary in order to obtain the Honours BSc degree in Kinesiology. The program must be completed in 8 years.

a) Required Kinesiology courses:
  KIN 102, 103, 200, 222, 252, 255, 300, 317, 321, 330, 335, 354, 431 or 433, 470.

b) Required courses from other departments:
  PHYS 103, PHYS 105, BIOL 230, BIOL 233, MATH 106, CS 102*, PSYCH 101, and SOC 101.
*Scientific or Data Analysis Division

Course Substitution
In the case of PHYS 103 and MATH 106 students may elect to take full-year courses in either subject in the appropriate department.

c) Kinesiology Electives: 10 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 12 term courses, 6 must be chosen from outside the Department of Kinesiology.

Students should choose electives in consultation with their Faculty advisor.

General Program
The General degree is offered on a regular basis only and may be taken by part-time study.

In order to receive the general BSc degree a student must successfully complete 40 term courses including the following requirements:

a) Required Kinesiology Courses:
  KIN 102, 103, 200, 222, 252, 255, 300, 317, 321, 330, 335, 354.

b) Required Courses from other departments:
  PHYS 103, PHYS 105, BIOL 230, BIOL 233, MATH 106, CS 102*, PSYCH 101, SOC 101.
*Scientific or Data Analysis Division

c) Kinesiology Electives:
  9 elective courses in Kinesiology.

d) Electives: Of the remaining 12 term courses 6 must be chosen from outside the Department of Kinesiology.
**Course Sequence**

**Honours and General Program**

<table>
<thead>
<tr>
<th>Year 1 (Common to Regular and Co-operative programs)</th>
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<tbody>
<tr>
<td><strong>Fall</strong></td>
<td><strong>Winter</strong></td>
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<tr>
<td>KIN 102</td>
<td>KIN 116 (if necessary)</td>
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<tr>
<td>KIN 103</td>
<td>KIN 255</td>
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<tr>
<td>BIOL 230</td>
<td>BIOL 233</td>
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<tr>
<td>MATH 106</td>
<td>PHYS 103</td>
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<tr>
<td>PSYCH 101</td>
<td>Elective*</td>
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*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 Program**

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<th>Year 2</th>
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<td><strong>Fall</strong></td>
<td><strong>Winter</strong></td>
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<tr>
<td>KIN 200</td>
<td>KIN 252</td>
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<tr>
<td>KIN 222</td>
<td>KIN 321</td>
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<tr>
<td>SOC 101</td>
<td>KIN 335</td>
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<td>PHYS 105</td>
<td>KIN 354</td>
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<td>Elective</td>
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**Year 3**

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<tr>
<td>KIN 300</td>
<td>KIN 330†</td>
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<tr>
<td>KIN 317</td>
<td>5 Electives</td>
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4 Electives

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<th><strong>Year 4</strong></th>
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<tr>
<td><strong>Fall</strong></td>
<td><strong>Winter</strong></td>
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<tr>
<td>KIN 431† or 433†</td>
<td>KIN 470†</td>
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<tr>
<td>5 Electives</td>
<td>5 Electives</td>
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**Co-operative Programs**

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<th>2A Fall</th>
<th>2B Spring</th>
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<td>KIN 222</td>
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<td>SOC 101</td>
<td>KIN 321</td>
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<tr>
<td>PHYS 105</td>
<td>KIN 335</td>
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<tr>
<td>Elective</td>
<td>KIN 330†</td>
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<tr>
<td>Elective</td>
<td>KIN 354</td>
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<tr>
<th>3A Winter</th>
<th>3B Fall</th>
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<tr>
<td>6 Electives</td>
<td>KIN 300</td>
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<tr>
<td>KIN 317</td>
<td>4 Electives</td>
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<th>4A Spring</th>
<th>4B Winter</th>
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<tr>
<td>KIN 431 or KIN 433</td>
<td>KIN 470†</td>
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<tr>
<td>5 Electives</td>
<td>5 Electives</td>
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**Note**

All students in Year 1 are Honours students.

Human Kinetics and Leisure Studies

Kinesiology

Recreation and Leisure Studies

Joint Honours Degrees

Joint Honours degrees with Recreation and Leisure Studies, Psychology, and Economics are available in addition to that with Health Studies (p. 11.8). Students should consult with the Undergraduate Officer in both departments regarding specific course sequences, course or credit requirements, and minimum averages.

Department of Recreation and Leisure Studies

The Recreation and Leisure Studies program contains a core of courses in leisure studies, research, and management. Recreation and Leisure Studies electives provide the student with the opportunity to specialize in an Area of Concentration which reflects a desired academic and career path.

Degree Requirements

A) Recreation courses (22):

1. **Required (12):**
   - REC 100, 210, 220, 230, 250, 270a, 301 or 305, 320, 371A, 429, 470, and 471.

2. **Recreation Electives (10):**
   - Each student must complete additional Recreation electives to meet the required total of 22 Recreation courses.

B) Courses outside the Department of Recreation and Leisure Studies:

1. **Required:**
   - PSYCH 101 and SOC 101
   - Any 2 sequential English courses: 109 & 110; or 140 & 141; or 150 & 151; or 209 & 210.
   - CS 100. Students with a background in CS, with the approval from the Undergraduate Chairman, may take CS 102 in its place.
   - Select 1 course from 4 of the following 7 categories (Restricted Electives):
     a) BUS 121W
     b) ECON 101
     c) A Fine Arts or Performing Arts course
     d) GEOG 101 or ENV S 195
     e) A Science Faculty course
     f) A Health Studies or Kinesiology course
     g) A Political Science or History course

2. **Non Recreation Electives:** (13)
### Course Sequence

#### Regular Program

**Year 2**
- **Fall**
  - REC 220, 301* 
  - 1 Restricted Elective
  - 1 or 2 Recreation Electives
  - 2 Non-Recreation Electives

- **Winter**
  - REC 270A
  - 2 Recreation Electives
  - 3 Non-Recreation Electives

**Year 3**
- **Fall**
  - REC 320, 371A
  - 1 Recreation Elective
  - 2 or 3 Recreation Electives
  - 2 Non-Recreation Electives

**Winter**
- REC 429, 470
  - 1 Recreation Elective
  - 2 Recreation Electives
  - 2 Non-Recreation Electives

#### Co-operative Program

**Year 2**
- **2A (Fall)**
  - REC 220, 301* 
  - 1 Restricted Elective
  - 1 or 2 Recreation Electives
  - 2 Non-Recreation Electives

- **2B (Spring)**
  - REC 270A
  - 3 Recreational Electives
  - 3 Non-Recreation Electives

**Year 3**
- **3A (Winter)**
  - REC 270A, 305* 
  - 1 or 2 Recreation Electives
  - 2 Non-Recreation Electives

- **3B (Fall)**
  - REC 320, 371a
  - 1 Recreation Elective
  - 2 Non-Recreation Electives

**Year 4**
- **4A (Spring)**
  - REC 429, 470
  - 1 Recreation Elective
  - 2 Recreation Electives
  - 2 Non-Recreation Electives

- **4B (Winter)**
  - REC 471
  - 2 Recreation Electives
  - 2 Non-Recreation Electives

*Students must take 1 of REC 301 or 305.

### Areas of Concentration

Students may choose Recreation and Leisure Studies electives from the following Areas of Concentration:

- Cultural Recreation
- Leisure and the Humanities
- Outdoor Recreation and Parks
- Tourism and Commercial Recreation
- Urban and Municipal Recreation
- Human Development and Therapeutic Recreation
- Management in Recreation and Leisure Services

### Joint Honours Degrees

Joint Honours degrees are available with Geography, Human Environment Studies, Kinesiology, Psychology, Social Development Studies, Sociology, Music, and Dance. Requirements in the Joint Honours programs vary and students should consult with the Undergraduate Officer in both Departments regarding course sequences, course or credit requirements, minimum averages and required courses.

All students must complete the Recreation core requirements. Further information concerning Joint Honours programs may be obtained from the Undergraduate Officer and the student undergraduate handbook.

### Options

An Option is a specified combination or grouping of courses which provides the student with another emphasis in a particular program.

Options are available with Business, Canadian Studies, Legal Studies, Public Administration, and Women’s Studies. For specific course requirements, consult with the Undergraduate Officer and the student undergraduate handbook.

### Minors

A Minor is a group of approved courses taken by an Honours student in a subject area outside of Recreation and Leisure Studies. Minors are available in most departments at Waterloo. Students interested in pursuing a Minor should consult with the department offering the Minor.
Independent Studies Program
Independent Studies

An Opportunity for the Individual to Develop an Independent Program of Study

Independent Studies is a small undergraduate program formerly known as Integrated Studies. The program serves students who wish to create their own, self-directed, plan of study. In many cases these plans of study include a perspective that goes beyond that of a single discipline. While Independent Studies is a degree program, most students find it necessary to partake of several terms of exploratory study prior to developing a degree plan. This is referred to as the "pre-degree phase". A plan of study may utilize the resources and services of the University such as faculty, courses, and library and it may call on resources of the community. Independent Studies maintains some resources of its own in the form of academic staff, a small reference library, audio-visual equipment, and, most significantly, other students.

In addition to the emphasis on self-directed learning, Independent Studies has a tradition of student involvement in program administration and management. Besides creating a strong sense of community, this involvement ensures student input in decisions which maintain an environment conducive to independent study. Thus, there is some expectation that students will become involved in the various decision-making bodies of the program. These include Operations Council, Executive Committee, Joint Committees such as Review and Evaluation and Admissions, and In-house Committees such as Student Projects and Seminar and Colloquia.

Academic Director

The Academic Director of Independent Studies is a University faculty member who is responsible for administration of the program. This person serves as a link between the program and the rest of the university community including the Academic Board. The Academic Director takes guidance from Operations Council, Executive Committee, Joint Committees and In-house Committees. The Academic Director provides students with administrative assistance and academic counselling for their programs of study.

Academic Staff

The Academic Staff of Independent Studies serve primarily as tutors and advisors to students. They are experienced in interdisciplinary studies and interested in alternative modes of teaching and learning. From experience in the university community they direct students to specialized areas of expertise and facilities. In addition, Academic Staff convey their own scholarly interests to students in the program through seminars, discussion groups, one-on-one exchanges, and written, oral, and/or audio-visual presentations. The following are summary sketches of the interests and activities of two Academic Staff.

Maurice Constant is an Adjunct Professor in the Department of Systems Design Engineering. As well, he has been teaching in the School of Architecture and is engaged in film projects with TV Ontario, the National Film Board and the IMAX Corporation. Areas of interest include: human communications (interpersonal, cross-cultural, mass media, man-machine systems); computer mediated human communication systems (Telidon, teleconferencing, automated office) and their impact on society; technology and society; computer graphics, computer animation and computer generated sound; design methodology, the analytic and creative processes; aesthetics and design; history and philosophy of science; systems theory (the behaviour of complex systems, biological, social, industrial, political, ecological); environmental perception; major exhibition design; film and TV production. He is available for seminars and discussions (group or personal). A major area of concern includes alternative educational systems and advances in educational technology (computer-aided learning, teleconferencing, etc.).

Dr. Anne Dagg has lectured in biology at universities for a number of years and has written about sixty books and scientific papers, many of them dealing with giraffe, camels, animal locomotion, Canadian wildlife, and the Canadian urban environment. While at Independent Studies she has been involved in seminars devoted to evolution (Darwinism, social Darwinism, Lysenko); the brain (anatomy and function); feminist writers and theorists (Christine de Pizan to Virginia Woolf); reproduction (physiology, societal attitudes); sociobiology (genetic bases of behaviour, culture as metabolism, science and religion, poverty and the third world); and creative writing in the continuing Writers' Workshop. She has worked with individuals on a variety of topics (locomotion of horses, tree identification, cultural effects of imprisonment, embryology, urban wildlife, etc.) and often helps students with the writing of their essays and reports. Her current personal interests include the Canadian north, women and the arts in Canada, and implications of science in society. She is happy to work with students on projects that interest them.
Approach to Resources
In designing their own studies, the students have access, not only to the Program’s resources, but also to those of the community and the University, including its full array of courses. They decide which resources they require and what approach they wish to pursue. The students often work on an individual basis with faculty or graduate students from the many university departments or with people within the Program. They may audit several courses and take some for credit, or perhaps take no courses at all. An interest in community affairs leads some students to involvement in such areas as the court system, mental retardation and development centres, public and alternative schools, and environmental groups, to name but a few. In addition, they are also free to pursue studies privately utilizing the library and other facilities.

The diverse interests and perspectives in the Program’s composition continually foster an enthusiastic exchange of information among the students and the Academic Staff. This activity has promoted a variety of seminars (for example, treatment of the nervous system, an examination of narrative structures through philosophy, art, literature and popular history, and women in literature) ongoing meetings such as the Writers’ Workshop and the dance group, and special films series.

Term-End Reviews
Students are encouraged to document the structure and pursuit of their studies as their programs develop. They are required to report each term on this development. It is suggested that they indicate the nature of their studies, resources used (personnel, facilities and materials) and provide a critical evaluation of their education term indicating particular achievements and difficulties. In addition, each term the student will submit a Term Plan outlining the objectives of the next term and activities and projects to be completed and/or started.

Length of Registration
Students in good standing may register in the Program for up to 8 terms, with a possible further 2 terms at the discretion of the Academic Board for those completing degree requirements. Registration beyond these terms will be at the discretion of the Executive Committee.

Degree Process
While students may take and receive grades for regular university courses, the degree awarded is not based on an accumulation of course credits, but on an evaluation made by the Academic Board and the appointed supervisors during a formal candidacy period. The Bachelor of Independent Studies (B.I.S.) degree is a three-year general bachelor degree. However, each degree program is evaluated on its own merits.

Independent Studies
Independent Program of Study
Examples of Individual Studies

Students who desire the degree and are ready for senior undergraduate work, present a written application to the Academic Board for Independent Studies documenting their level of achievement and their plans for their final degree period. The Board, consisting of faculty members of the University appointed by Senate, interviews the applicants to determine their preparedness for degree candidacy.

Accepted degree candidates then work under appointed supervisors (2 of whom must be members of this University’s faculty) for a minimum of 2 academic terms. During this time the candidates are required to present tangible evidence of their educational development to assist the supervisors with the evaluation of their total baccalaureate programs. At the end of this process the supervisors present letters of recommendation which serve as the basis for the Board’s degree recommendation and form part of the student’s academic transcript.

Current members of the Academic Board are: R.H. Holmes (Philosophy), Chairman; P.E. Bowers (Psychology); G.R. Francis (Man Environment); F. Mavaddat (Computer Science); G.F. Rabideau (Systems Design); N. Theorge, (Kinesiology); J. Vanderkooy (Physics).

Examples of Individual Studies
Cheryl’s program has followed the 2 major themes of clinical and community psychology. To achieve knowledge and skills for therapeutic work she completed 3 senior undergraduate courses in clinical psychology, a course in individual and group counselling, and a graduate psychology course in crisis intervention. In addition to completing practicums at the Interfaith Pastoral Counselling Centre in Cambridge and at a transition house for battered women in Kitchener, she observed group counselling sessions in the psychiatric ward of a local hospital, engaged in tutorials and independent studies in psychopathology, its clinical treatment and social bases, and undertook training in psychodrama.

Following the community psychology theme of her studies, she examined models of preventative mental health programs and program models and needs for mental health services for victims of natural and technological disasters. During a term as a visiting student at the University of Alberta, where she had earlier completed 2 years of course work in social sciences and humanities, she took 2 graduate courses in community development studying theories of development, social change and community development strategies. Her concluding terms in the program were devoted to the application of current research and theory to the phenomenon of victimization and its effects.
Eleven years after leaving Independent Studies (he was one of the original members), Steve returned to the Program to study computers in their capacity as writing machines. Through his work for a typesetting and graphic arts co-operative he has recognized that there would be many advantages to writers to produce typeset copy from computer text easily and cheaply. The Arts Computing Office and its UNIX system are primary resources for his study, as are other members of the Program who are involved in writing or using computers. The co-operative characteristic of Independent Studies strongly attracted him originally and that interest remains. He intends to involve himself in a number of Program activities such as discussions on the social impact of computers, including the changing nature of work, and computers and authoritarianism.

Richard took the standard premedical courses through the General Science program. He then enrolled in Independent Studies to broaden his personal and academic preparation for medical school by working in the areas of psychology and human anatomy. To prepare for a major research project in motor skill management for cerebral palsied children he completed a series of directed readings and reports. To acquaint himself with the neurological and motor systems of the human organism he completed self-directed studies in the gross anatomy of the upper and lower limbs and audited a Kinesiology course on the anatomy of the head and the neck. His major project in anatomy entailed dissecting, photographing, labeling and preparing descriptive text for approximately 20 brain specimens. Finally, working with a Psychology professor on the design of treatment programs for children with cerebral palsy, he prepared a research design, identified testing and reporting indices, prescribed treatment programs and reported statistical results.

Michelle’s studies have led her through engineering at both Toronto and Waterloo, and environmental issues, social change, community organization, and the history and philosophy of science and technology while in Independent Studies. All these and other areas held her interest but none of them seemed appropriate for her degree candidacy. While learning Gaelic in Cape Breton and recording some traditional Gaelic singers, she put together a program of study, with assistance from people in Celtic studies at St. Francis-Xavier University, which builds upon her lengthy interest in folk music, instrumental training, singing and the Celtic culture. Her studies, which include courses in Toronto, are being supervised by the chairman of Celtic Studies at the University of Toronto and one of Canada’s foremost authorities in folklore.

After graduating from the School of Experiential Education (SEE) in Toronto, Loralea spent 2 terms at McGill University studying anthropology. Feeling that she was reasonably equipped with a coherent foundation for future study but recognizing that her need for a degree of self-determination, an outlet for creative expression and a community in which to learn would not be met by a structured program, she entered Independent Studies. Her plans were to take some courses in anthropology, on either an audit or a credit basis, undertake an independent study of health and illness from an anthropological perspective and embark on a comprehensive study of the philosophy of feminism. This latter study includes: the various viewpoints within the ‘movement’, the evaluation of a new psychology and spirituality, the debates over the significance of Freud and the implications of Jungian theory, and the issue of the origins of women’s oppression.

Feeling that his interests were narrowing more than he desired, Jerry withdrew from an architecture program and spent the next few years at various jobs and projects including an architectural firm in Vancouver, a tutoring program in the Philadelphia inner city, and the Learning Resources Centre in Waterloo. Research for Woolwich Township on the designation of historic buildings led to the primary focus of his study within Independent Studies — the architectural preservation and rehabilitation of urban industrial buildings in the region of Waterloo. The first part of this study concentrates on the history of these buildings and government attitudes and policies toward them. The second part pursues ways in which these structures can be maintained. In keeping with his wish that his studies be diversified, his program also includes vocal music, language study (Dutch and German), and experience with children with special learning needs.

Tim graduated from Fanshawe College in radio-television arts. After working for 8 years as a producer-director and administrator for a community television station, he entered the Program to work in the area of men’s studies, focusing particularly on the creation and operation of groups for battering men. Through these groups, men are taught techniques to help them react positively to stress before it is manifested in violence. His studies include such topics as socialization, gender roles, power and control, men and feelings, and sexuality. As part of his program he is undertaking the research, writing and production of a major video documentary on men who batter.
After studying early childhood education at Centennial College and psychology/sociology at the University of Guelph, Kate entered Independent Studies to pursue her long-standing interest in music and education. Her work with students and a survey of historical and contemporary trends led her to develop a system of music education which, from the outset, relates technique, ear training, theory and composition to one another. Consistently her own musical education has included ongoing piano studies at Conrad Grebel College, conservatory requirements and studies in theory and composition. Further, as a result of an interest in compositional techniques and notation systems, she is examining the relationship between such elements as sight and sound and the implications of an overlap between the two. This theme is being explored through composition involving acoustic and electronic aspects combined with film, art and dance.

Frank chose to work in the field of artificial intelligence, the branch of computer science attempting to make computers perform tasks that require intelligence. His particular interest is the attempt to enable computers to generate a sequence of actions to solve problems. In preparation for this study he has taken a breadth of computer science courses, worked in a number of computer languages, completed a variety of work-term projects, and studied directly under the supervision of faculty in artificial intelligence. He is currently working in automatic plan formation concentrating on implementing a hierarchical planner in the Prolog programming language.

After studying at Ryerson Polytechnical Institute and then working for several years at the University of Waterloo, Darlene renewed her studies by registering in the University on a part-time basis. Her academic involvement, which included courses, workshops, seminars and independent study, emphasized learning and the learning process through an exploration of women’s studies and her own learning styles. She entered Independent Studies to apply her studies of the learning process to the education of women and computer technology. Since her research indicated a need to inform women of training and career opportunities, she eventually concentrated on 2 projects. The first resulted in a major paper, “Winding up Women’s Work: The Technological Productivity Push on Women’s Work”. The other project involved the preparation of a computer literacy curriculum which would help women perceive their personal and traditional forms of strength and enable them to overcome their fear of computers through the acquisition of computer concepts and ‘hands-on’ experience.

Dissatisfaction with his initial independent study in mathematics, particularly formal logic and geometry, led Dennis to an investigation of the philosophical issues dealing with perception and cognition. This thematic change was accompanied by a change of study method consisting of a full course load program at the University of Toronto. After a successful year there, he returned to the Program to begin his degree candidacy. Under the supervision of faculty from the University of Toronto’s Religious Studies Department and this University’s Philosophy Department he has undertaken a study of “the distinction and dialectical tension that inheres between theoretical consciousness and pre-theoretical consciousness between the world of science and the world of everyday common experience.”

When John reached a position of semi-retirement he entered the University to further his education and to launch a second career. After taking a couple of political science courses he transferred to Independent Studies “because the structured courses...do not entirely match my interests”. His principal concerns are in the area of energy. He has published many articles, served as the Canadian correspondent of World Solar Markets, published by the Financial Times of London, and is a member of the Kitchener Transit Advisory Committee and the Waterloo Waste Management Committee. He is currently confining most of his work to energy as it applies to prevailing and future conditions in Ontario, explored from political, environmental, social and business angles. His intention is to research the possibility of editing a newsletter targeted at business people in the energy field in Ontario.

Graduate Opportunities

The responsibility that students in this Program must assume for their studies ensures that graduates will possess a high level of organizational skills, self-discipline and motivation combined with their attested academic development. These capabilities have prepared them well for further endeavours and have proven advantageous in their search for employment. Graduates have been remarkably successful in building upon their degree programs to further their formal education. A sizeable number have gained graduate degrees, many on scholarship, from this and other Canadian universities and institutions as diverse as Columbia Teachers’ College, Massachusetts Institute of Technology, and Cambridge University. In addition many have completed professional training in law, education, medicine, business and other areas. Others have tailored their programs to prepare themselves to meet specific job requirements.
Admission Requirements

Students applying to the Program are required to complete the appropriate formal application form (See Chapter 2 of this Calendar), and submit academic transcripts from previous educational institutions. In addition, they must provide an autobiographical letter indicating:

1. their previous learning experience,
2. their reasons for wishing to enter Independent Studies, and
3. an indication of the type of exploration proposed.

Candidates are also encouraged to submit letters of reference assessing their ability to pursue their proposed programs.

All applicants residing within a reasonable distance of the University are then interviewed by the Admissions Committee. Decisions on the remaining applicants are made solely on the submitted material. Applicants with limited formal education are considered if they indicate an ability to handle university-level study.

Those interested in this alternative approach to university education are urged to visit the Program to meet with those currently involved in its operation. In addition, members of Independent Studies would be happy to visit schools or groups of students to discuss the Program.

For more information, including a copy of the current handbook, contact the Academic Director of the Independent Studies Program, at extension 2368, Room 1054, the Psychology, Anthropology and Sociology (PAS) Building or P. Burroughs, Registrar’s Office, Needles Hall.
Faculty of Mathematics
Faculty of Mathematics

Prior to 1967, Honours and General Mathematics programs were offered through the Faculties of Arts and Science. The continued growth and development of these programs led to the formation of the Faculty of Mathematics as a separate faculty in January, 1967. The Faculty consists of the Departments of Applied Mathematics, Combinatorics and Optimization, Computer Science, Pure Mathematics, Statistics and Actuarial Science, and a Division of Mathematics for Industry and Commerce. The degree Bachelor of Mathematics (BMath) is awarded upon successful completion of three-year Pass, four-year General and four-year Honours programs.

Honours programs are available in both the Regular (i.e. conventional September to April academic year) and Co-operative (i.e. alternating four-month academic and work terms) systems of study. The Co-operative system is described in detail in Chapter 5. The Pass and General programs are not available in the Co-operative system. Students interested in registering in the Faculty of Mathematics through St. Jerome's College have the opportunity to indicate their intention when they receive the package of materials sent by the University to acknowledge their application for admission.

The Faculty also offers graduate programs leading to the following degrees: Master of Mathematics (MMath), Master of Philosophy (MPhil) and Doctor of Philosophy (PhD). Detailed information is contained in the University of Waterloo Graduate Studies Calendar.

Brochures

The Faculty of Mathematics publishes a brochure specifically designed for Ontario high school students, as well as a number of pamphlets describing the Faculty's individual programs. Copies of these are available in school guidance offices, or on request from either the Mathematics Undergraduate Office or the Assistant Registrar, Faculty of Mathematics.

Admission

Current Admission Practices and Standards For Ontario Secondary School Applicants

The objective of any Admissions Committee is to admit the best qualified applicants. In the Faculty of Mathematics, since there are traditionally more qualified applicants than places available, the admissions process is basically a competition for these places.

Normally, an average of 75% or higher is required to ensure serious consideration for admission. Students with lower averages may be admitted, however, if there is evidence to indicate an exceptional aptitude and interest in Mathematics.

Obviously, when the Admissions Committee is making its decisions, high grades are important. Academic performance, in particular, represents the single most influential factor in the decision process, and generally speaking, if a student's Grade 13 or Ontario Academic Course marks are significantly higher relative to those of other applicants, the Admissions Committee will normally issue an Offer of Admission with only limited reference to other factors. For most applicants, however, the factors influencing the selection process include much more than simply grades from the senior year(s) of high school, and these other factors represent a very important part of the final decision process. The Faculty recognizes, for example, that many excellent candidates for admission have chosen to develop their talents simultaneously in both academic and extra-curricular pursuits, and we feel that it is essential that such students receive every possible consideration for admission. In addition to superior academic performance, the Faculty is looking for students whose activities indicate significant development as well-rounded individuals with potential for leadership. These factors are particularly important for students in Co-op programs, since they are required to present themselves in the most favourable light to potential employers for their Co-op work terms.

All applicants to the Faculty of Mathematics are provided with a Supplementary Information Form as part of the package of materials sent by the University to acknowledge their application for admission. It is most important that applicants return this completed form to ensure that the Admissions Committee can make an informed decision. The information provided on the form, in many instances, allows the Committee to differentiate between applicants whose marks are relatively comparable. As reflected by the nature of the questions on the Supplementary Information Form, the Admissions Committee takes a wide variety of factors into account during the selection process. (The major factors, considered in conjunction with the applicant's Grade 13 or Ontario Academic Course marks, are described in detail in the Faculty of Mathematics high school brochure.)

Admission as a Mature Student

Any student who has been away from formal education for more than 2 years and who does not possess the minimum requirements for admission may apply as a mature student. However, as a minimum, applicants should have covered the material in the 3 required Ontario Grade 13 or Ontario Academic Courses in mathematics (Calculus, Functions and Relations, Algebra), preferably through regular day school classes at a local high school, or alternatively through night school or summer school classes, or possibly by correspondence through the Correspondence Branch of the Ontario Ministry of Education. Applicants are also strongly encouraged to write the Descartes Mathematics Contest,
administered by the Faculty of Mathematics for students in their senior year(s) of high school, to enhance their chances of admission. (Further details about the Descartes Contest, and how you can arrange to write it, can be obtained by writing to: The Canadian Math Competition, c/o Faculty of Mathematics.) Each application will be considered on its own merits by the Admissions Committee. (See also Part-Time Studies on page 13.3.)

Advanced Standing

1. Applicants From Other University of Waterloo Faculties

Students in other University of Waterloo faculties who wish to apply for transfer to the Faculty of Mathematics may not preregister for a Mathematics program during the normal University preregistration period. Instead, students in this position are encouraged to preregister for their first-choice program within their own faculty and apply for a transfer to Mathematics following the guidelines below.

Transfer applications for on-campus studies in Mathematics are considered only for Honours programs, and normally only for September admission. Applicants should have high-quality academic records and have demonstrated that they can be successful in an Honours Mathematics program. Because of the traditional discrepancy between the high number of applicants and the limited number of positions available for advanced-standing transfers, the selection process for admission is a very competitive one. Normally, only students with consistent B+ grades or better in all previous post-secondary course work are seriously considered for admission.

Application forms will be available from the Registrar’s Office at the University of Waterloo, usually beginning in April each year. Completed application forms and all supporting documentation must be received by the Registrar’s Office no later than June 1 in order to guarantee consideration for September admission. All supporting documentation must include official transcripts from all previous academic institutions. To be guaranteed consideration for September admission, all supporting documentation must be received by the University no later than July 1.

3. Transfer Credits

Once students have been admitted to the Faculty of Mathematics, having transferred from outside or from within the University of Waterloo, they will normally be given transfer credit for relevant courses previously taken if (i) a mark of at least 60% or equivalent has been obtained, (ii) a mark of at least 50% has been obtained in a non-mathematics University of Waterloo course or in a University of Waterloo mathematics course specifically designed for mathematics students. A transfer failure will normally be assigned if a mark is less than 50%. Credit might not be granted for a course covering only part of the material contained in a corresponding UW course which is required of students registered in the Faculty of Mathematics. A maximum of 12 transfer half-credits per academic year previously taken will normally be given.

Students admitted with a previous Bachelor’s degree will normally be given a maximum of 12 non-math half-credits, with a possibility of exemptions (but not degree credit) in certain math courses.

Note

Students transferring from other post-secondary institutions or other University of Waterloo faculties must successfully complete at least 12 University of Waterloo mathematics half-credits chosen from those courses which may be taken for credit by a student in the Faculty of Mathematics.

4. Cumulative Averages

Grades in courses taken at the University of Waterloo prior to a student’s admission to the Faculty of Mathematics will normally be included in overall and mathematics cumulative averages if the courses are ones that a student registered in the Math Faculty might take for credit toward a BMath degree. Otherwise, the grades are considered only for transfer credit purposes and not included in averages.
Grades in courses taken at other institutions prior to a student's admission to the Math Faculty will not be included in cumulative averages.

5. Co-operative Programs
It is normally not possible to transfer into a Co-operative program beyond the second-year level. Students applying for transfer at the second-year level should normally have credit in courses equivalent to the first-year Calculus, Algebra, and Computer Science courses required of University of Waterloo mathematics students. Past experience has indicated that very few places in Co-operative programs are available at the second-year level for students applying from other institutions. Applicants in this category who cannot be admitted to a Co-operative program will be automatically considered for the Regular program.

Part-time Studies
Students wishing to work toward a BMath degree on a part-time basis must meet the Faculty's regular admission requirements.

Although mathematics (i.e. ACTSC, AM, C&O, CS, MATH, PMATH, STAT) courses are not normally offered in the evenings or on Saturdays, many part-time students take courses offered by the Faculty of Mathematics via the University of Waterloo Correspondence Program. (See Chapter 1 for more details of this program. A separate brochure is also available.) As well, a reasonable cross-section of non-math courses is available in the evenings, particularly during the Fall/Winter sessions.

The BMath Pass degree may be obtained entirely by part-time studies; the BMath General degree requires at least 2 complete terms on campus; the BMath Honours degree requires at least 4 complete terms on campus. (Please consult Footnote 8 on page 13:7 for a definition of "complete term." )

Applicants who do not meet the Faculty's regular admission requirements may be admitted as non-degree/post-degree part-time students at the discretion of the Admissions Committee. Admission as a non-degree/post-degree student does not carry any commitment from the University beyond permitting entry to the course(s) and term(s) specified at the time admission is granted. There is no guarantee of admission for subsequent terms, although repeat applications on a non-degree/post-degree basis are always considered and have rarely been refused in the past (especially applications to take UW correspondence courses where limited on-campus space is not a factor).

After completing some courses on a non-degree/post-degree basis, usually first-year Calculus and Algebra in the UW Correspondence Program, a student may re-apply for admission as a BMath degree candidate. No special application form is required; simply write to the Assistant Registrar, Faculty of Mathematics, in Needles Hall. The Admissions Committee will then review the applicant's past academic history, including performance in UW courses taken on a non-degree/post-degree basis, to make its decision. If the admission decision is favourable, any relevant courses taken on a non-degree/post-degree basis will be counted toward the BMath degree. Furthermore, any previous academic work completed prior to commencing UW studies will be assessed for possible transfer credit.

Admission to Specialized Programs in Mathematics
There are 3 admission categories for the Faculty of Mathematics: Co-op Mathematics (Chartered Accounting Option), Co-op Mathematics (except C.A.), and Regular Mathematics (Ontario Universities' Application Centre codes WN, WT and WM respectively). Once admitted, students identify with a specific program within the Faculty at different year levels, depending upon admission category and particular program of interest. The only students to be admitted to specialized Honours programs in first-year are Co-op students who wish to register in one of the following programs:

- Co-op Actuarial Science
- Co-op Applied Math With Engineering Electives
- Co-op Math/Chartered Accountancy
- Co-op Math/Management Accounting

Students in the above Co-op programs need to be explicitly identified in Year 1 because of the specialized nature of their work-term employment. All other students register in the Non-Specialist Faculty Honours program in Year 1. In subsequent years, beginning with Year 2, students may wish to enter a specialized program or choose to remain registered in the Non-Specialist Honours program.

For many specialized Honours programs, admission at the Year 2 level is normally automatic for students who have successfully completed Year 1. However, in the case of restricted enrolment programs, there is a formal admission process. Academic performance in first year and/or the results of personal interviews are normally the main criteria for admission to restricted enrolment programs.
Restricted Enrolment Mathematics Programs

At present, the restricted enrolment programs in the Faculty of Mathematics consist of the following:

- Co-op Math/Chartered Accountancy
- Co-op Teaching Option
- **All Computer Science Major Programs (Co-op and Regular)**

**At present the number of Co-op placement opportunities exceeds enrolment in the Teaching Option program. Students with an interest in teaching Mathematics and Computer Science are encouraged to pursue this goal by applying for this program.**

**Students who take a standard course load in first year (i.e. six courses per term) and successfully complete all twelve courses with math and overall averages in the low-70's can be reasonably confident of admission to CS Major status for their 2A term. Approximately 300 students are admitted to CS Major programs each year.**

In the foreseeable future, the Faculty does not expect that any of its programs not included in the above list will require a formal admission process beyond that involved with admission to the Faculty of Mathematics. However, because of limited resources and varying demands, it is always possible that occasions may arise when other specific programs within the Faculty are not able to accommodate all academically qualified applicants. Every effort will be made to avoid such situations and to provide acceptable alternatives, but the Faculty cannot guarantee in advance that any specific program will be free of enrolment restrictions.

Programs which have had to restrict enrolment, or appear likely to, will be identified, as far as possible, on an on-going basis, and every reasonable effort will be made to publicize such changes to students who may be affected. Related information will be made available through the Mathematics Faculty Undergraduate Office during (pre)registration periods. Students will be expected to take such information into account when planning their courses of study.

Applicants Holding Student Authorizations

A maximum of 5% of the available freshman seats in the Faculty of Mathematics is open to qualified applicants who hold Student Authorizations (visas). [Please note that this quota on foreign student enrolment does not apply to Permanent Residents in Canada (landed immigrants).] This same 5% quota applies to all restricted enrolment Mathematics undergraduate Honours programs for which formal admission occurs beyond Year 1 (e.g. Computer Science Major Programs). By this approach the Faculty hopes to preserve an appropriate international mix in its undergraduate student population while responding to the increasing demand for places from highly qualified Canadian students.

Mathematics

Admission

Academic Programs/

Degree Requirements

For complete information regarding the admission categories, requirements and procedures, consult Chapter 2 of this Calendar.

Fees, Financial Assistance

See Chapters 3 and 4.

Academic Programs/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 program is designed primarily for full-time on-campus students who wish to pursue in-depth studies in the Mathematical Sciences. The General program, on the other hand, is more suitable for students with a definite interest in mathematics but who prefer more latitude in the depth and breadth of their course selection. The General program is also intended primarily for full-time on-campus students. The Pass program, by comparison, is a relatively non-specialized course of study intended primarily for part-time students, usually studying in the correspondence format, who want to pursue a more general education and include a larger proportion of non-math courses in their program. The Pass and General programs are available only to students in the Regular system of study.

The Honours Program is more demanding than either the General or Pass program. In addition to requiring that the Honours (or Advanced Honours) versions of Faculty core courses be taken, the required number of credits for an Honours degree is greater than the number for either a General or Pass degree. Further, the BMath Honours program requires higher graduating averages than the BMath General and Pass programs.

All full-time on-campus Mathematics freshmen take a common core Honours program in Year 1, consisting of Algebra, Calculus, and Computer Science, plus 3 non-mathematics courses. This commonality of curriculum (which continues to a large extent into Year 2) permits considerable flexibility for students to change from one academic program to another within the Faculty of Mathematics. In fact, if non-mathematics courses are judiciously chosen, this flexibility for change can be extended to many programs in other faculties as well.

The following tables and accompanying descriptions outline in detail the common degree requirements and typical course load for each academic year (i.e. 2 four-month academic terms) of all undergraduate programs in the Faculty of Mathematics. Except where noted, Honours programs may be taken in either the Regular
or Co-operative system of study. The Pass and General programs, however, are available only in the Regular system. The academic requirements of corresponding Co-operative and Regular programs are identical.

Additional requirements for Co-op students are summarized in a booklet, *Regulations and Procedures for Co-operative Programs*, available from the Department of Coordination and Placement in Needles Hall.

Under the Math Faculty’s credit system, it is the student’s responsibility to be aware of all regulations pertaining to his or her program of study. When all requirements for the particular BMath degree being sought have been met, it is the student’s responsibility to submit an ‘Intention to Graduate Form’ to the Registrar’s Office.

**Mathematics**

**English Writing Skills Requirement**

BMath degree candidates with an initial registration in the Faculty of Mathematics of Fall/82 or later must satisfy the following Writing Skills Requirement, namely:

“A grade of 60% or better on the UW English Language Proficiency Exam, or a half-credit with a mark of C- or better in a term-course chosen from a list, approved by the Undergraduate Affairs Committee, and maintained by the Math Undergraduate Office. (The current list includes the following English courses: ENGL 109, 129R, 150 and 210A.)” The entry ARTS 000 will appear on both the Student Examination Report and the student’s transcript with a CR grade once the student has successfully completed the Writing Skills Requirement.

BMath degree candidates with an initial registration in the Faculty of Mathematics of Fall/80 or later, but still prior to Fall/82, must also satisfy this same Writing Skills Requirement, except that Co-op students in this category have the option of substituting 4 successful Co-op work reports to fulfill the requirement.

BMath degree candidates with an initial registration in the Faculty of Mathematics prior to Fall/80 are not required to satisfy a BMath Writing Skills Requirement.
Table 1 - (a) Degree Requirements

<table>
<thead>
<tr>
<th></th>
<th>Honours Program</th>
<th>General Program</th>
<th>Pass Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum total</td>
<td>44 or 48</td>
<td>42</td>
<td>32</td>
</tr>
<tr>
<td>Half-credits</td>
<td>(See Note 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum Math</td>
<td>24 to 30</td>
<td>24</td>
<td>12</td>
</tr>
<tr>
<td>Half-credits²</td>
<td>(See Note 3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum Non-math</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Half-credits³</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum Graduating Math Average</td>
<td>65%</td>
<td>60%</td>
<td>60%</td>
</tr>
<tr>
<td>Minimum Graduating Overall Average</td>
<td>65%</td>
<td>60%</td>
<td>60%</td>
</tr>
<tr>
<td>Maximum Course Attempts⁶ (or equivalent)</td>
<td>56 or 60 half-credits</td>
<td>54 half-credits</td>
<td>44 half-credits</td>
</tr>
<tr>
<td>Maximum Failures⁷ (or equivalent)</td>
<td>6 half-credits</td>
<td>8 half-credits</td>
<td>8 half-credits</td>
</tr>
<tr>
<td>Maximum Complete Terms Required⁸</td>
<td>4 or 8</td>
<td>2</td>
<td>none</td>
</tr>
<tr>
<td>(See Note 8)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Footnotes to Table 1(a)

1. All Honours BMath programs require a minimum total of 48 half-credits, except for Honours Pure Math, Joint Honours Pure Math with Statistics and Honours Teaching Option. These programs require a minimum total of 44 half-credits.

2. The term 'math half-credit' includes courses with prefixes ACTSC (Actuarial Science), AM (Applied Mathematics), C&O (Combinatorics and Optimization), CS (Computer Science), MATH (non-departmental faculty courses), PMATH (Pure Mathematics), and STAT (Statistics).

3. Most Honours BMath programs require a minimum of 30 math half-credits, with the following exceptions: Joint Honours programs with other faculties and the Math/Business Administration, Chartered Accountancy and Management Accounting Options require 24; Joint Honours Computer Science with Mathematics/Business Administration, Chartered Accountancy or Management Accounting, Honours Pure Math, Joint Honours Pure Math with Statistics and Honours Teaching Option require 26; the Computer Science-Information Systems Option requires 27 math half-credits. See program descriptions on the following pages.

4. Note: students transferring from other post-secondary institutions or other U of W faculties must successfully complete at least 12 University of Waterloo mathematics half-credits chosen from those courses which may be taken for credit by a student in the Faculty of Mathematics.

5. a) The term 'non-math half-credit' refers to courses offered by other faculties as well as those with the course prefix 'MATH'.

6. Both averages in i) and ii) exclude failures. If a passed course is repeated, only the better mark is considered. If a student successfully completes more than the minimum number of credits, the 'excess' ones with the lowest grades are excluded.

7. For the Honours Math/Accouting Options, students must also achieve an average of at least 70% in all the courses with prefix ACC which are explicitly required for their program.

8. Normally, the last day to ADD a course is 2 weeks after the official beginning of lectures. The last day to UNHOLD a course for students not carrying more than a 'standard' course load (5 for Pass or General, and usually 6 for Honours), is 4 weeks after the beginning of lectures. Students carrying more than a 'standard' course load may not normally DROP any courses later than 2 weeks after the beginning of lectures. These deadline dates apply only to Math Faculty students. All exceptions to these deadlines must be approved by the Standing and Promotions Committee.

9. 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. Students in Honours Pure Math, Joint Honours Pure Math with Statistics and Honours Teaching Option are normally limited to 56 half-credit course attempts if they wish to graduate with a total of 44 half-credits instead of 48. All other Honours BMath programs have a limit of 60 half-credit course attempts with a minimum total-credit requirement of 48 half-credits.

10. A complete term (i.e. 4 months) is normally one in which a student successfully completes at least 5 half-credits in courses of which at least 2 of which must be mathematics courses. All BMath Honours programs require 4 complete terms. Students in the Honours Teaching Option require an additional 4 terms of full-time registration in order to graduate with 44 half-credits. Students in Honours Pure Mathematics or Joint Honours Pure Mathematics with Statistics require an additional 4 terms in which 3 courses per term are passed in order to graduate with 44 half-credits.
### Table 1 - (b) Required Year 1 & 2 Faculty Core Courses/Typical Course Loads

<table>
<thead>
<tr>
<th>Year</th>
<th>Honours Program</th>
<th>General Program</th>
<th>Pass Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>MATH 130A/B; MATH 134A/B;</td>
<td>MATH 130A/B; MATH 134A/B;</td>
<td>MATH 130A/B; MATH 134A/B;</td>
</tr>
<tr>
<td></td>
<td>2 of CS 140, 180, 234, 235, 250; 6 non-math half-credits.</td>
<td>2 of CS 140, 180, 234, 235; 6 non-math half-credits.</td>
<td>2 of CS 140, 180, 234, 235; (See Note 3); 6 non-math half-credits.</td>
</tr>
<tr>
<td>Year 2</td>
<td>MATH 230A/B; MATH 234A/B;</td>
<td>MATH 230A/B; MATH 234A/B;</td>
<td>MATH 230A/B;</td>
</tr>
<tr>
<td></td>
<td>STAT 230/31; 2 math half-credits; 2 non-math half-credits; 2 additional half-credits.</td>
<td>STAT 230/31; 2 math half-credits; 2 non-math half-credits; 2 additional half-credits.</td>
<td>4 math half-credits; 3 non-math half-credits; 3 additional half-credits.</td>
</tr>
<tr>
<td>Year 3</td>
<td>6 or 8 math half-credits (depending on the particular program); 2 non-math half-credits; 2 additional half-credits.</td>
<td>6 or 8 math half-credits (depending on the particular program); 2 non-math half-credits; 2 additional half-credits.</td>
<td>6 or 8 math half-credits (depending on the particular program); 2 non-math half-credits; 2 additional half-credits.</td>
</tr>
<tr>
<td>Year 4</td>
<td>6 or 8 math half-credits (depending on the particular program); 2 non-math half-credits; 2 additional half-credits.</td>
<td>6 or 8 math half-credits (depending on the particular program); 2 non-math half-credits; 2 additional half-credits.</td>
<td>not applicable.</td>
</tr>
</tbody>
</table>

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1. Table 1(b) describes the general framework and required Year 1 and 2 Faculty core courses applicable to all programs in the Faculty of Mathematics. Further degree requirements and recommendations, which depend on a particular program, are described beginning on the next page.

2. The term 'math half-credit' includes courses with prefixes ACTSC (Actuarial Science), AM (Applied Mathematics), C&O (Combinatorics and Optimization), CS (Computer Science), MATH (non-departmental faculty courses), PMATH (Pure Mathematics), and STAT (Statistics). The term 'non-math half-credit' refers to courses offered by other faculties, as well as those with the course prefix MTHEL.

3. On-campus students normally take MATH 130A/B and 134A/B. However, in exceptional circumstances (for example, in the Correspondence program) Pass students may take MATH 113A/B (or 115A/B) and MATH 111A/B respectively in place of the foregoing courses.

4. Some flexibility exists to permit the scheduling of courses in a different manner than that shown in Table 1 (b); provided that course prerequisites have been met. In certain cases, substitutions among corresponding Advanced Honours, Honours, and General level courses may be made in the Faculty core. (See Section 4.1 on page 13.23.)
Department Honours Programs: Requirements and Recommendations

Except where noted Honours programs may be taken on either the Regular or Co-operative system of study. Academic requirements for corresponding Co-operative and Regular programs are identical.

Actuarial Science

The Department of Statistics and Actuarial Science offers courses and programs in Actuarial Science which is the application of mathematics and statistics to financial problems with particular emphasis on life insurance, casualty insurance, and employee benefit programs. The courses offered provide theoretical preparation for the first five examinations of the Society of Actuaries and the Casualty Actuarial Society and include studies of such subject areas as Mathematics of Finance, Life Contingencies, Risk Theory, and Casualty Ratemaking.

By carefully selecting their non-math courses, students can also gain valuable background knowledge in economics, finance, administration, and law.

Honours Actuarial Science

This program requires a total of 48 half-credits, including at least 12 non-math half-credits and 30 mathematics half-credits. These overall requirements must include the Faculty core courses outlined in Table 1 (b) on page 13:8 (with CS 140, 180 recommended in Year 1) and the following specific courses:

- ACTSC 231, 232, 331, 332, 431, 432;
- MTHEL 305A;
- 4 of ACTSC 335 (or C&O 370), AM 381, CS 337, MATH 332B (or PMATH 352), PMATH 331 (or 351A), 334 (or 344), STAT 330, 331;
- 2 of ACTSC 451, 452, 453, 454, 455, 456, 463;
- 2 additional 400-level math half-credits.

MTHEL 305A/B are 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 Programs within the Faculty of Mathematics” which begins on page 13:15.

Applied Mathematics

Applied Mathematics is motivated mathematics, or mathematics to a purpose. It reflects the belief that there exists a basic order and harmony in the physical world, which can be described by the logical structures of mathematics. Thus, it is no coincidence that some of the greatest mathematicians of the past were also leading mathematical physicists of their time.

This rich, classical tradition of Applied Mathematics is typified by the ongoing work in Theoretical and Fluid Mechanics, General Relativity, and Quantum Theory, at the interface between Mathematics and Theoretical Physics, and covering such diverse areas as the study of supersonic flow, the behaviour of ocean waves, the structure of space-time and cosmology, and the fundamental symmetry properties of the world of atoms and molecules. As scientists find out more and more about the mechanisms that make the world ‘tick’, we also find that more mathematics is necessary to systematize, digest, and take advantage of this wealth of knowledge in all scientific areas.

In their first two years, all Applied Mathematics students take the same core courses as other Mathematics students, in order to acquire a sound mathematical background. At the same time, since the application of analytical reasoning to a wide variety of problems is the essence of Applied Mathematics, there is room in the program for introductory courses in scientific disciplines which are heavy users of mathematics, such as Physics or Engineering. In the upper years, the focus is on courses more specifically related to their chosen area of specialization. It is our belief that graduates from any of our programs will find their career opportunities to be excellent and varied.


For those students who wish a strong emphasis on Physics, the Department offers the program “Honours Applied Mathematics with Physics Electives.”

Honours Applied Mathematics

This program requires a total of 48 half-credits, including at least 12 non-math half-credits and 30 mathematics half-credits. These overall requirements must include the Faculty core courses outlined in Table 1 (b) on page 13:8 (with CS 140 required in Year 1) and the following specific courses:
MATH 332B (or PMATH 352);
1 of CS 337, PMATH 331 (or 351A);
2 additional 400-level AM half-credits;
6 additional 300 or 400-level AM half-credits.
AM 260, 270 (or 280) are strongly recommended.
PMATH 304 (or 344) is recommended.
PHYS 121, 122 are recommended in Year 1.

Recommended elective courses for Honours Applied Mathematics with Physics Electives are; PHYS 121/122, 253/254, 263, 354, 363, 358/359, 441 and CHEM 123/124.

Joint Honours Applied Mathematics with Computer Science
This program requires a total of 48 half-credits, including at least 12 non-math half-credits and 30 mathematics half-credits. These overall requirements must include the Faculty core courses outlined in Table 1 (b) on page 13:8 (with CS 140 required in Year 1) and the following specific courses:

AM 371, 381, 391;
CS 236 (or 250);
CS 240, 340, 375;
C&O 230;
MATH 332B (or PMATH 352);
2 additional 400-level AM half-credits;
2 additional 400-level CS half-credits;
2 additional 300 or 400-level AM half-credits;
2 additional 300 or 400-level CS half-credits;
1 additional AM or CS half-credit at the 300 or 400 level.
PHYS 121, 122 are recommended in Year 1.
AM 260, 270 are strongly recommended.
PMATH 334 (or 344) is recommended.

Honours Applied Mathematics with Electives in Engineering (Co-operative only)
This program requires a total of 48 half-credits, including at least 12 non-math half-credits and 30 mathematics half-credits of which at least 6 must be 300 or 400-level AM half-credits, of which a minimum of 2 must be at the 400 level. These overall requirements must include the Faculty core courses outlined in Table 1 (b) on page 13:8 (with CS 140, 235 required in Year 1) and the following specific courses:

AM 260, 270 (or 280), 371, 381, 391, MATH 332B (or PMATH 352);
4 of AM 340, 362, 365, 360A, 380B, CS 334, 337, C&O 350, 370, PMATH 331 (or 351A), 334 (or 344), STAT 333, 371, 433;

Non-math courses required in Year 1:
Groups A, B, C require PHYS 121/122.
Groups D, E require PHYS 121, EL E 123 and 126.
Group F requires PHYS 121/122 and CH E 100/101.

Mathematics
Applied Mathematics
Combinatorics and Optimization

Non-math courses required in Years 2, 3 and 4:
1 course per term from the chosen Engineering Group.

Group A M E 219, 220;
4 from M E 351, 354,
CIV E 303, 403, 404, 406, 413, 414, 415.

Group B SY DE 252, 381; SY DE 281 and/or 543;

Group C M E 219, 250, 351;
3 of M E 353, 354, 452, 456, 459, 469, 557, 563.

Group D EL E 123, 126;

Group E EL E 123, 126, 261, 262, 371, 380;
1 of EL E 342, 463, 464, 465, 481, 482.

Optional Courses: CH E 232, 330, 332;
CHEM 26, 36.

Honours students in another department in the Faculty of Mathematics wishing a “Double Major” or a “Minor” in Applied Mathematics should consult the section “Combination Honours Programs within the Faculty of Mathematics” which begins on page 13:15.

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
This program requires a total of 48 half-credits, including at least 12 non-math half-credits and 30 mathematics half-credits. These overall requirements must include the Faculty core courses outlined in Table 1 (b) on page 13:8 and the following specific courses:

- MATH 332B (or PMATH 352);
- PMATH 334 (or 344);
- C&O 230, 350;
- 1 of CS 337, PMATH 331 (or 351A);
- 1 of C&O 330, 342;
- 1 of C&O 351, 367;
- 3 additional half-credits chosen from C&O 330, 331, 332, 343, 351, 367, 430 through 466;
- 2 additional 300 or 400-level math half-credits with a course prefix other than C&O;
- 1 additional 300 or 400-level math half-credit.

Joint Honours Combinatorics and Optimization with Computer Science
This program requires a total of 48 half-credits, including at least 12 non-math half-credits and 30 mathematics half-credits. These overall requirements must include the Faculty core courses outlined in Table 1 (b) on page 13:8 (including CS 140 in Year 1) and the following specific courses:

- PMATH 334 (or 344);
- C&O 230, 342, 350;
- CS 240, 250, 340;
- 1 of MATH 332B (or PMATH 352), PMATH 331 (or 351A);
- 3 of C&O 330, 331, 343, 351, 367, 430 through 466;
- 5 additional 300 or 400-level CS half-credits, which must include CS 375 or CS 466, and at least two of which are at the 400-level.

Honours students in another department in the Faculty of Mathematics wishing a “Double Major” or a “Minor” in Combinatorics and Optimization should consult the section “Combination Honours Programs within the Faculty of Mathematics” which begins on page 13:15.
Notes
1. Application Procedure
Students will apply for the Computer Science Major program of their choice when they preregister for their 2A term. Normally, only students whose all-inclusive math and overall averages from Year 1 are both at least 65% will be given serious consideration for admission. Because of resource limitations, however, fulfillment of the minimum 65% entrance average requirements will not guarantee students admission to the program of their choice, or indeed to any Computer Science Major program. If there are more applicants who meet the minimum 65% average requirements than there are positions available for Computer Science Major students, selection will be made on a competitive basis, according to criteria described above.

2. Late Admission
The possibility of admission to Computer Science Major programs at a level beyond 2A will not be completely eliminated. However, it is anticipated that such admissions, normally at the 3A level, will be relatively rare, and usually only when unexpectedly high attrition allows for new students in the programs.

3. Required Withdrawal
A student in a Computer Science Major program whose all-inclusive cumulative Overall or Math average at the end of any term is below 65% must ensure that both averages are at least 65% at the end of each subsequent academic term. Failure to re-establish and maintain these averages at a level of 65% or above will normally result in the student’s being required to withdraw from Computer Science. (Required withdrawal from Computer Science does not necessarily imply required withdrawal from Honours Mathematics nor does it disqualify a student from taking Computer Science courses in the non-specialist stream.)

4. Exclusions
Students who formally registered in Year 2 in the Faculty of Mathematics prior to the Spring 1983 term are not subject to Notes 1-3 above.

Honours Computer Science
This program requires a total of 48 half-credits, including at least 12 non-math half-credits and 30 mathematics half-credits. These overall requirements must include the Faculty core courses outlined in Table 1 (b) on page 13:8 (with CS 140 required in Year 1) and the following specific courses:

- CS 240, 250, 340, 354, 360, 375, 448, 482;
- 4 additional 400-level CS half-credits;
- C&O 230;
- 4 math half-credits chosen from the following group of courses: **C&O 342, 360, 370, CS 350, 369, STAT 331, 332, 333, 371; ACC 121, 122, BUS 111W, 121W, 352W, 481W, 491W, ECON 101, 102, M SCI 211, 311, 432, MTHEL 100.

**Or any 300 or 400-level Honours math half-credits, with prefix other than CS, which require 1 of this group as a prerequisite.

Courses labelled BUS are offered by Wilfrid Laurier’s School of Business and Economics. They are described by title on pages 13:18.

Joint Honours Computer Science with Mathematics/Business Administration, Chartered Accountancy or Management Accounting Options
These programs require a total of 48 half-credits, including at least 26 mathematics half-credits. These overall requirements must include the Faculty core courses outlined in Table 1 (b) on page 13:8 (with CS 140, 180 required in Year 1) and the specific courses listed below.

- C&O 230;
- CS 240, 250, 340, 354, 360, 375, 448, 482; STAT 331;
- Two of CS 350, 369, 440-490;
- Two of AM 380A (or PMATH 380A), C&O 342, 350, 367, 370, 454, STAT 332, 333, 355, 443. **
All specified non-math courses in the Honours Mathematics/Business Administration, Chartered Accountancy and Management Accounting Options (see page 13:18).

Joint Honours Applied Math with Computer Science
This program is described with Applied Mathematics programs on page 13:10.

Joint Honours Combinatorics and Optimization with Computer Science
This program is described with Combinatorics and Optimization programs on page 13:11.

Joint Honours Pure Mathematics with Computer Science
This program is described with Pure Mathematics programs on page 13:14.

Joint Honours Statistics with Computer Science
This program is described with Statistics programs on page 13:15.

Notes
1. Honours students in another department in the Faculty of Mathematics wishing a "Double Major" or a "Minor" in Computer Science should consult the section "Combination Honours Programs within the Faculty of Mathematics" which begins on page 13:15.

2. Honours students in faculties other than Mathematics wishing a "Minor" in Computer Science should consult the section "Combination Honours Programs Leading to a Degree with Another Faculty" described on page 13:20.

Operations Research
Operations research is the field of mathematics that deals with the problems of management in business and government. It involves constructing mathematical models of complex real world situations and then applying sophisticated techniques to these models in order to make optimal, or near optimal, decisions. The 3 major components of the discipline of operations research are: optimization, statistics and computer science.

The Honours program in Operations Research, which is administered by the Division of Mathematics for Industry and Commerce in conjunction with the Department of Combinatorics and Optimization, combines a solid foundation in mathematics with special sequences of elective courses in economics, business and management science. The mathematics portion of the program includes linear programming, modelling, scheduling, game theory, forecasting, decision theory and computer simulation.

In Canada, employers of Operations Research graduates are found in manufacturing, distribution and retail companies, mining, transportation, banking, health services, education, and government agencies. Students proceeding to a Master's of Business Administration degree (MBA) will find that a degree in mathematics, emphasizing operations research, together with relevant work-term experience, is an excellent preparation for a rewarding career.

Honours Operations Research
This program requires a total of 48 half-credits, including at least 12 non-math half-credits and 30 mathematics half-credits of which at least 4 must be 400-level math half-credits. These overall requirements must include the Faculty core courses outlined in Table 1 (b) on page 13:8 (with CS 140, 160 required in Year 1) and the following specific courses:

1 of AM 361, MATH 332B (or PMATH 332), PMATH 334 (or 344);
C&O 350, 351, 370;
CS 234, 337, 437;
STAT 331, 333, 371, 443;
4 of C&O 342, 367, 450 through 466, CS 334, 432,
STAT 332, 335, 430, 433;
2 of ACC 121, 122, ECON 101, 102, M SCI 461;
M SCI 211/311, or PSYCH 101/333, or SOC 101/242;
2 of ACC 371, BUS 352W, M SCI 432.

(BUS 352W is offered by Wilfrid Laurier's School of Business and Economics. It is described by title on page 13:18.)

Students enrolled in a Double Honours program in Computer Science and Operations Research must replace the Computer Science courses listed above with the equivalent courses required by Honours Computer Science Major students.
Pure Mathematics

Pure Mathematics may be studied for the satisfaction it provides, as well as for its potential to be useful. A mastery of such subjects as algebra, analysis and geometry is essential, not only to prospective algebraists, analysts and geometers, but also to those who have applications to the basic sciences or technology in mind. Thus, the programs of the Department are designed for students who relish mathematics, as well as for those who wish to get a solid foundation with a view to applying their knowledge.

Some graduates of Pure Mathematics do go out into industry. Others enter the field of education, from primary to advanced levels. A good number commit themselves to research, either in Pure Mathematics itself, or in some other scientific field. We hope to impart in our students the abilities to think clearly, and to educate themselves, so that they may succeed in their fields of endeavour.

The special interests of the Department include algebra (groups, rings, representation theory, lattices, universal algebra, linear algebra), analysis (integration theory, real and complex functions, functional analysis, operator theory, non-linear problems), geometry (algebraic topology, homotopy, differential geometry), number theory (primes, Diophantine approximation), functional equations (with applications to information theory, probability, engineering, science and social science), logic and foundations (model theory, consistency, recursive functions).

The Department offers 3 programs: Honours Pure Mathematics, Joint Honours Pure Mathematics with Computer Science and Joint Honours Pure Mathematics with Statistics. For all 3 programs, MATH 2448 is strongly recommended.

A more detailed description of the Department and its programs may be found in the Pure Mathematics Undergraduate Handbook, available upon request.

Honours Pure Mathematics

This program requires a total of 44 half-credits, including at least 12 non-math half-credits and 26 mathematics half-credits. These overall requirements must include the Faculty core courses outlined in Table 1 (b) on page 13:8 and the following specific courses:

C&O 230;
PMATH 344, 351A/B, 352, 367;
1 of PMATH 451, 452, 453;
1 of PMATH 441, 445, 446, 447;
3 additional 400-level PMATH half-credits other than PMATH 430A;
2 additional 400-level math half-credits.

Note

In order to graduate from this program, a student must have 4 complete terms plus 4 additional terms in which at least 3 courses per term are passed. A standard course load in Years 3 and 4 for students in this program is 5 courses per term.

Joint Honours Pure Mathematics with Computer Science

This program requires a total of 48 half-credits, including at least 12 non-math half-credits and 30 mathematics half-credits. These overall requirements must include the Faculty core courses outlined in Table 1 (b) on page 13:8 (with CS 140 required in Year 1) and the following specific courses:

C&O 230;
CS 240, 250, 340, 360, 376;
PMATH 344, 351A/B, 352;
1, of C&O 342, PMATH 367, 380A, 380B, 452;
2 additional 400-level CS half-credits;
1 additional 300 or 400-level CS half-credit;
2 additional 400-level PMATH half-credits other than PMATH 430A;
2 additional 400-level PMATH, or 300 or 400-level CS, half-credits.

Joint Honours Pure Mathematics with Statistics

This program requires a total of 44 half-credits, including at least 12 non-math half-credits and 26 mathematics half-credits. These overall requirements must include the Faculty core courses outlined in Table 1 (b) on page 13:8 and the following specific courses:

PMATH 344, 351A/B, 352, 451;
STAT 330, 331, 332, 333, 430;
1 of STAT 433, 450;
2 additional 400-level PMATH half-credits other than PMATH 430A;
1 additional PMATH half-credit.

Note

In order to graduate from this program, a student must have 4 complete terms plus 4 additional terms in which at least 3 courses per term are passed. A standard course load in Years 3 and 4 for students in this program is 5 courses per term.

Honours students in another department in the Faculty of Mathematics wishing a "Double Major" or a "Minor" in Pure Mathematics should consult the section "Combination Honours Programs within the Faculty of Mathematics" on page 13:15.
Statistics

Statistics is the branch of modern applied mathematics which deals with the collection and analysis of data. Statistical methods are extensively used in Biology, Medicine, Health Sciences, Agriculture, Business, Economics, Engineering, and many other fields. Claims based on statistical arguments appear daily in the press, and it is difficult to assess these intelligently without some knowledge of statistical methods.

The statistician's first job is to determine what data to collect, and how to collect it so that it will be without bias or distortion. These problems are dealt with in the Design of Experiments and Sample Surveys. Statistical Inference is concerned with inferring what the population is like on the basis of a small amount of data (the sample). The link between population and sample is provided by Probability Theory, which forms an important part of the Statistics curriculum. Often the purpose of collecting data is to assist in reaching a decision, so the field of Decision Theory is also a part of Statistics.

Many other areas of pure and applied mathematics find applications in Statistics. Calculus and linear algebra are used extensively in the undergraduate program; abstract algebra, combinatorics, difference and differential equations, analysis, and measure theory are required in more advanced work. Most statistical analyses involve the computer, so a good background in computing is highly desirable.

Honours Statistics

This program requires a total of 48 half-credits, including at least 12 non-math half-credits and 30 mathematics half-credits. These overall requirements must include the Faculty core courses outlined in Table 1 (b) on page 13:8 and the following specific courses:

- STAT 330, 331, 332, 333, 430, 450;
- 4 of ACTSC 431, 432, AM 371, 391, 391, C&O 330, 350, CS 337, MATH 332B (or PMATH 352), PMATH 331 (or 351A), 334 (or 344), 351B, 452;
- 2 additional 300 or 400-level STAT half-credits;
- 4 additional 300 or 400-level math half-credits.

Joint Honours Statistics with Computer Science

This program requires a total of 48 half-credits, including at least 12 non-math half-credits and 30 mathematics half-credits. These overall requirements must include the Faculty core courses outlined in Table 1 (b) on page 13:8 (with CS 140 required in Year 1) and the following specific courses:

- STAT 330, 331, 332, 333, 430;
- C&O 230;
- CS 240, 250, 340, 375;
- 1 of AM 371, 381, 391, C&O 330, 350, MATH 332B (or PMATH 352), PMATH 331 (or 351A), 334 (or 344);
- 2 additional 400-level CS half-credits;
- 2 additional 300 or 400-level CS half-credits;
- 2 additional 300 or 400-level STAT half-credits.

Joint Honours Pure Mathematics with Statistics

This program is described with Pure Mathematics programs on page 13:14.

Honours students in another department in the Faculty of Mathematics wishing a "Double Major" or a "Minor" in Statistics should consult the section "Combination Honours Programs within the Faculty of Mathematics" which begins below.

Combination Honours Programs within the Faculty of Mathematics

Double Honours 'X' and 'Y' Programs

All Honours requirements for both areas 'X' and 'Y' must be satisfied. 'X' and 'Y' refer to any 2 of Actuarial Science, Applied Mathematics, Combinatorics and Optimization, Computer Science, Math/Teaching Option, Operations Research, Pure Mathematics, and Statistics (with the exception that the combination Combinatorics and Optimization and Operations Research is not an officially recognized Double-Honours Program).

Honours 'X' with 'Y' Minor Programs

All Honours requirements for area 'X' and the specific requirements designated below for area 'Y' must be satisfied. 'X' refers to any one of Actuarial Science, Applied Mathematics, Combinatorics and Optimization, Computer Science, Math/Teaching Option, Operations Research, Pure Mathematics, and Statistics.

'Y' Minor Requirements

Actuarial Science:

- ACTSC 231, 232, 331, 332, MTHEL 305A;
- 1 of ACTSC 431, 433;
- 1 additional ACTSC half-credit.

Applied Mathematics:

- AM 270, 340, 371, 381, 391;
- 2 additional 300 or 400-level AM half-credits.

Combinatorics & Optimization:

- C&O 230, 350;
- 1 of C&O 330, 342;
- 2 additional half-credits chosen from C&O 330, 331, 342, 343, 351, 367, 430 through 466.

Computer Science:

- CS 140, 234, 236;
- 6 additional CS half-credits.
**Pure Mathematics:**
PMATH 344, 351A, 352;  
1 of PMATH 351B, 360, 367, 452;  
2 additional 300 or 400-level PMATH half-credits.

**Statistics:**
STAT 331, 332, 333;  
2 additional 300 or 400-level STAT half-credits.

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**Combination Honours Programs with other Faculties leading to the BMath Degree**

In the descriptions below, 'X' refers to any one of Actuarial Science, Applied Mathematics, Combinatorics and Optimization, Computer Science, Math/Teaching Option, Operations Research, Pure Mathematics, Statistics. 'Z' refers to a discipline in a faculty other than Mathematics.

**Joint Honours Programs 'X' and 'Z'**

All Honours requirements for area 'X' and the set of requirements for area 'Z' designated below must be satisfied. Note that the number of 'math half-credits' required may be reduced from 30 to 24, provided that such a reduction does not make it impossible to satisfy all Honours requirements of area 'X'. In addition to meeting the Graduating Average requirements of the Faculty of Mathematics, students in these programs must also satisfy the Honours average requirements specified by area 'Z'.

| **Anthropology** | At least 14 term courses in Anthropology. ANTH courses must include:  
a) 101, 201, 202, 260, 300, 330;  
b) 102A or 102B;  
c) 103 or 283 or 290;  
d) one 400-level term course;  
e) 499A and B (the Anthropology Honours Essay) is recommended but is optional if an Honours Essay is written in the joint discipline. |
| **Economics** | 101, 102, 201, 202, 231, 301, 302, 311, 321, 401, 402, 421, 422,  
1 additional Economics half-credit. |
| **English** | 16 English Major half-credits as outlined under "Joint Honours Programs" on page 8:19. |
| **French** | 16 term credits in French as outlined under "French Joint Honours Program" on page 8:22. |
| **Geography** | A minimum of 14 term courses (or equivalent) in Geography (up to 4 term courses designated Environmental Studies may be counted for credit as Geography courses). Required courses are: GEOG 101, 102, 160, 201, 202, 1 of 208 or 309, 275, 381;  
ENV S 200; 1 of GEOG 203, 204, 205, 220, 221; 1 of GEOG 125R, 126R, 127, ENV S 105A or 105B. |
| **German** | A minimum of 16 half-credits in German, including 1 of the following pairs: 101/102, 105/106, 111/112, 121/122; 151/152 in Year 1; and 4 half-credits in German in each of Years 2, 3, 4. |
| **Music** | At least 16 term courses in Music, including: MUSIC 100; at least 3 of MUSIC 253, 254, 353, 354; at least 3 of MUSIC 250, 251, 370, 371; 9 additional Music term courses of which at least 6 must be above the 100 level; an honours seminar in Music. As well, participation in at least 6 terms of Music Ensemble is required.  
In addition, students must demonstrate competence on one instrument (or voice) equal to Grade 10 standing at the Royal Conservatory of Music in Toronto. Normally this is attained through taking Music Studio courses - MUSIC 266/267, 366/367. |
| **Philosophy** | 221, 258, 322, 359, 380, 381, 384, 385, 440A/B;  
4 additional term credits in Philosophy. |
| **Psychology** | Students must complete the equivalent of 14 term courses in Psychology, and an Honours thesis in one of the disciplines. The required course selection is detailed under "Joint Honours Programs" on page 8:33. |
| **Russian** | A minimum of 16 half-credits in Russian, including RUSS 101/102 in Year 1 and 4 half-credits in Russian in each of Years 2, 3, 4. |
| **Sociology** | 101, 280, 321, 322, 405, 406;  
The equivalent of 7 term courses of electives in Sociology plus 499 A/B or the equivalent of 9 term courses of electives in Sociology plus the equivalent of 499 A/B in the related department. |
Honours 'X' with 'Z' Minor
All Honours requirements for area 'X' ('X' as defined earlier in this section) and a set of 10 half-credits prescribed by discipline 'Z' (where 'Z' can be any departamental area, not necessarily restricted to the disciplines mentioned above) in a faculty other than Mathematics which chooses to make a 'Minor' designation available to Math Faculty students, must be satisfied. The minimum average required in these 10 half-credits is determined by area 'Z'.

BMath Transcripts
BMath transcripts include explicit mention of no more than 2 areas of study in the academic program section.

Note
Combination Honours Programs leading to a degree in another faculty (i.e. not BMath) are described on page 13:20.

Non-Departmental Honours, General and Pass Programs: Requirements and Recommendations
Except where noted, Honours Programs may be taken on either the Regular or Co-operative system of study. Academic requirements for corresponding Co-operative and Regular programs are identical. Pass and General Programs are available only in the Regular system.

Faculty Honours, General and Pass Programs:
Honours Mathematics: Non-Specialist Program
The purpose of this program is to provide students in the Faculty of Mathematics with breadth of studies at the Honours level rather than the specialization offered by departmental Honours programs. Further, it permits a student to defer a decision as to specialization or affiliation with a particular department or option within the Faculty.

Students taking this program will be prepared either for careers in the applications of mathematics or for graduate studies. By choosing appropriate courses, a student should be eligible to proceed from this program to graduate work in any area of mathematics.

This program requires a total of 48 half-credits, including at least 12 non-math half-credits and 30 mathematics half-credits. These overall requirements must include the Faculty core courses outlined in Table 1 (b) on page 13:8 (with CS 140 required in Year 1) and the following specific courses:
AM 260*, 270*, 340*;
C&O 230, 270*, 350*;
CS 234*, 235*, 334*;
MATH 332B (or PMATH 352);
PMATH 331 (or 361A);
STAT 331*;
1 of AM 444, C&O 330, PMATH 334 (or 344), STAT 430;
2 additional 300 or 400-level math half-credits;
4 additional 400-level math half-credits with 300-level prerequisites (see Note 2 below).

Notes
1. In individual cases, the sequences indicated by (*) may be replaced by alternative sequences in the same subject area (at the same or higher level) at the discretion of the department concerned.
2. Students in the Non-Specialist Faculty Honours program may not pursue a Minor designation or Joint/Double Honours program within the Faculty of Mathematics. However, they are encouraged to pursue a Minor or Joint Honours program with an academic area in another faculty. Two of the 400-level math half-credits may be replaced by 400-level half-credits in the non-math Minor or second Major area.

General Mathematics (Regular Only)
Students enrolled in the General Math/Business Administration options are not covered by the degree requirements described in this section. Requirements and recommendations for this Option follow this section.

The degree requirements outlined below apply only to students who entered Year 3 in the Faculty of Mathematics in September, 1984 or later. Students who entered Year 3 prior to this time should consult the Mathematics Undergraduate Office to determine the degree requirements that apply to them.

This program requires a total of 42 half-credits, including at least 12 non-math half-credits and 24 mathematics half-credits. These overall requirements must include the Faculty core courses outlined in Table 1 (b) on page 13:8 and the following specific courses:
MATH 322A/B, 324;
1 of ACTSC 335, CS 337 (or 375), C&O 350, AM 444;
8 additional math half-credits which may not include more than 2 half-credits with the same course prefix (ACTSC, AM, C&O, MATH, PMATH, STAT). [See Note 1 following.]
Notes

1. Students are advised to select these 8 additional math half-credits from the recommended lists below. (The courses listed are only recommendations from the Faculty. Other math courses may be chosen to satisfy the "coursebreadth" requirement, provided they are at the 200-level or above.)

   ACTSC 221, 222, 337;
   AM 260, 270, 340, 380A/B, 444;
   C&O 220, 270, 350, 370, 371, 380, 382;
   CS 234, 236, 330, 334, 336, 337, 430, 432, 435, 437, 438;
   PMATH 340, 360, 380A/B, 430A/B;
   STAT 321, 322.

2. There are no restrictions as to course prefix for any math courses taken beyond the 24 explicitly required math half-credits.

Pass Mathematics (Regular only)

This program requires a total of 32 half-credits, including at least 12 non-math half-credits and 12 mathematics half-credits. These overall requirements must include the Faculty core courses outlined in Table 1 (b) on page 13-8.

Mathematics/Business Administration, Chartered Accountancy and Management Accounting Options

The constantly increasing complexity of business organizations has created a demand for persons trained in analyzing business and accounting problems from a mathematical point of view. The Faculty of Mathematics, in co-operation with the Division of Mathematics for Industry and Commerce, the School of Business and Economics at Wilfrid Laurier University, the Departments of Economics and Management Sciences, and the Accounting Group at Waterloo offers 3 unique programs combining Mathematics with Business Administration, Chartered Accountancy, and Management Accounting. Each of these is designed so that students gain an appreciation for the applications of mathematics to commerce and gain experience in areas such as banking, marketing, production control, accounting, auditing, etc. All 3 Options are available at the Honours level in both the Regular and Cooperative systems of study. The Business Administration Option is available at the General level but only in the Regular system of study.

The Chartered Accountancy and Management Accounting Options are offered in co-operation with the Institute of Chartered Accountants of Ontario and the Society of Management Accountants of Ontario, respectively. Graduates of the Chartered Accountancy Option will normally have completed all formal university course work required by the Institute. The other principal requirements for the CA designation include 2 or 3 years work experience in public accounting and successful completion of the National Institute’s Uniform Final Examinations. The Management Accounting Option is structured so that successful completion of the program normally qualifies a student for 12 FIA exemptions and also to write 3 of the Society’s 6 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 normally able to complete all Institute or Society requirements in as little as 1 year after graduation. Graduates of the Regular program are frequently able to complete all such requirements in as little as 2 years after graduation.

Note

In the requirements and recommendations which follow, courses with prefix BUS are offered by Wilfrid Laurier’s School of Business and Economics. These courses are:

- BUS 111W - Introduction to Business Organization
- BUS 121W - Functional Areas of the Organization
- BUS 352W - Marketing I
- BUS 362W - Marketing II
- BUS 454W - Personnel Management
- BUS 481W - Business Policy
- BUS 491W - Management Policy

The WLU Academic Calendar should be consulted for complete course descriptions.

Honours Mathematics/Business Administration, Chartered Accountancy, Management Accounting Options

These programs require a total of 48 half-credits, including at least 24 mathematics half-credits. These overall requirements must include the Faculty core courses outlined in Table 1 (b) on page 13-8 (with CS 140, 180 required in Year 1) and the specific courses listed below.

On entering Year 3, students must specify 1 of the following packages a), b), c):

a) Information Systems Package
   CS 234, 330, 438, STAT 331;
   CS 432 or 434;
   2 of AM 380A (or PMATH 380A),
   C&O 350, 367, 370, 454;
   1 of STAT 332, 333, 335, 443;
   2 additional 300 or 400-level CS half-credits;
   2 additional math half-credits.
b) **Optimization Package**
C&O 350, 351, 370, 454, CS 330, 438, STAT 331;
2 of C&O 367, 450, 452, 456, 459, 464, 466;
1 of STAT 332, 333, 335, 443;
2 additional math half-credits

c) **Statistics Package**
STAT 331, 332, 371, 443, CS 330, 438;
2 of C&O 350, 367, 370, 454;
3 additional 300 or 400-level STAT half-credits
chosen in consultation with the Statistics Undergraduate Officer;
2 additional math half-credits.

ACTSC 221 (or 231) and C&O 270 are recommended for all 3 packages.

The non-math half-credits required (together with the terms in which these courses are normally taken) are given in the table below.

<table>
<thead>
<tr>
<th>Math/Bus. Admin.</th>
<th>Math/Accounting Options</th>
</tr>
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<tbody>
<tr>
<td>Term Option</td>
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<tr>
<td>1A ACC 121, BUS 111W, ECON 101</td>
<td>ACC 101, BUS 111W, ECON 101</td>
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<tr>
<td>1B ACC 122, BUS 121W, ECON 102</td>
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<tr>
<td>2A BUS 352W, MTHEL 100</td>
<td>ACC 291, MTHEL 100</td>
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<tr>
<td>2B BUS 362W</td>
<td>ACC 291, M SCI 211 (See Note 3)</td>
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<tr>
<td>3A ACC 371, M SCI 211</td>
<td>ACC 351, 371, 392</td>
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<td>ACC 372, 381</td>
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<td>4A BUS 454W, 481W</td>
<td>ACC 382, 461, 491</td>
</tr>
<tr>
<td>4B BUS 491W, M SCI 432</td>
<td>ACC 462 (See Note 1)</td>
</tr>
</tbody>
</table>

**Notes**

1. ACC 401, 453 are strongly recommended in terms 4A/B of the Accounting Options.

2. In addition to the 65% Math and Overall Graduation Average requirements for an Honours BMATH degree, students in the Honours Math/Accounting Options must also achieve an average of at least 70% in all of the courses with the prefix ACC which are explicitly required for their program.

3. The explicitly required non-math half-credits for the Math/Chartered Accountancy and Management Accounting Options are identical except for M SCI 211 which is required only in the Management Accounting Option.

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**Mathematics/Teaching Option**

The Co-operative Mathematics Teaching Option is an integrated program offered jointly by the Faculty of Mathematics at the University of Waterloo and the Faculty of Education at the University of Western Ontario. This program combines an academic program in mathematics, teaching experience in secondary schools, and professional training, with the graduate fully qualified as a secondary school mathematics teacher in Ontario.

Students interested in the program should enrol in any one of the Mathematics Faculty's non-teaching Co-operative Programs in Year 1, and will be considered for admission to the Teaching Option in Year 2 on the basis of 2 interviews and satisfactory academic and work-term performance.

Work-term arrangements in this Option differ from other Co-operative programs because of the nature of the program. (Consult the Work-Study Sequence Chart on page 5:3.) Details concerning this and the Faculty of Education component are available from the Academic Advisors or the Co-ordinator for this Option.

**Honours Mathematics Teaching Option**

This program requires a total of 44 half-credits, including at least 12 non-math half-credits and 26 mathematics half-credits. Of these 26 mathematics half-credits, students are encouraged to gain as much mathematical breadth as possible.

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**General Mathematics/Business Administration Option (Regular only)**

This program requires a total of 42 half-credits, including at least 24 mathematics half-credits. These overall requirements must include the Faculty core courses outlined in Table 1 (b) on page 13:8 (with CS 140, 180 required in Year 1) and the following specific courses:

2 of CS 235, 330, 438; ACTSC 221;
2 of C&O 270, 350, 367, 370;
1 of STAT 321 (See Note below), 322

The non-math half-credits required (together with the terms in which these courses are normally taken) are stated in the corresponding table for Honours students.

**Note**

STAT 321 is required by the Society of Management Accountants but not for the BMATH degree.
In years three and four the normal course load is five courses per term. To qualify for a BMath degree one must be enrolled as a full-time student for eight terms.

These overall requirements must include the Faculty core courses outlined in Table 1 (b) on page 13:8 and the following specific courses:

C&O 230;
MATH 332B (or PMATH 352);
PMATH 331 (or PMATH 351A);
PMATH 334 (or PMATH 344);

One course from each of the following 5 groups:

a) AM 270, 280, 340;
b) C&O 270, 380, 480, 481;
c) CS 330, 334, 335, 337;
d) PMATH 340, 360, 430A;
e) ACTSC 221, STAT 331, 332, 333;

The minimum number of 300 or 400 level math half-credits required is 12.

MTHEL 206A, SOC 207G;
Recommended non-mathematics courses include PSYCH 212, 213, PHIL 311, 312, and MTHEL 102.

Notes

1. Successful completion of the academic requirements of any other departmental honours program in the Faculty of Mathematics will be accepted as a replacement for the requirements listed above. (Since 3B and 4B courses are not normally offered in the Spring term, it will be difficult to satisfy this alternative.)

2. The Bachelor of Education requirements are completed during a 4-month academic term at the Faculty of Education in London. This term occurs after all other components of the program have been completed.

3. The selection of courses required to satisfy the BMath Teaching Option must include at least 4 half-credits in 1 of the following subject disciplines: Biology, Chemistry, Computer Science, Environmental Studies, General Science, Physical Education, or Physics. These 4 half-credits will fulfill the Ministry of Education’s requirement for a second teaching subject.

4. It is recommended that students choosing Computer Science as the second teaching subject select CS 410, 180, 234, 235. Additional courses of value are CS 432 and 437.

Mathematics

Mathematics/Teaching Option
Combination Honours Programs

Combination Honours Programs Leading to a Degree with Another Faculty

Joint Honours Programs

Joint Honours programs exist between the Faculty of Mathematics and any one of the following departments: Economics, French, Geography, German, Man-Environment Studies, Philosophy, Psychology, Russian, Sociology.

The Faculty of Mathematics course requirements for each of these Joint Honours programs are the same, consisting of a total of 14 math half-credits with a minimum average of 65%. These overall requirements must include the following specific courses:

MATH 130A/B, 134A/B, 230A/B, 234A/B;
STAT 230, 231;
2 of CS 100, 102, 234, 235;
2 additional math half-credits which qualify for BMath degree credit.

Students wishing to specialize in one area of mathematics should consult the Undergraduate Officer of the appropriate department in the Faculty of Mathematics for advice in selecting their math half-credits.

Minor in Mathematics

A ‘Minor in Mathematics’ is available for Honours students in other faculties. This Minor requires a total of 10 math half-credits with a minimum average of 65%. These overall requirements must include the following specific courses:

MATH 130A/B, 134A/B;
STAT 220, 221;
2 of CS 100, 202, 234, 235;
2 additional math half-credits which qualify for BMath degree credit.

Minor in Computer Science

A ‘Minor in Computer Science’ is available for Honours students in faculties other than Mathematics. This Minor requires a total of 10 half-credits, with a minimum average of 65%, which must consist of:

a half-credit Calculus course;
a half-credit Algebra course;
CS 102 or equivalent;
CS 234, 235;
5 of CS 330, 334, 335, 337, 430, 432, 435, 437, 438.
Division of Mathematics for Industry and Commerce

The Division is a unit within the Faculty of Mathematics which deals with those activities that relate closely to business and industry. The Division manages 5 programs related to industry and commerce within the Faculty of Mathematics:

1) Operations Research
2) Computer Science/Information Systems
3) Mathematics/Management Accounting
4) Mathematics/Chartered Accountancy
5) Mathematics/Business Administration

In addition, the Division serves as a focal point for contact between faculty members and the industrial and commercial sector.

Members of the Division are drawn from existing departments within the Faculty of Mathematics, as well as other groups on campus which are involved with these programs. There is representation from the University's Department of Coordination and Placement, from the accounting profession, and from other areas of business and commerce.

Centre for Information Theory

The Centre for Information Theory was created by the Senate of the University of Waterloo on September 15, 1980. It consists of members of the Engineering, Mathematics, and Science Faculties who are teaching and doing research in Information Theory.

Members of the Centre work on the algebraic, combinatorial, non-probabilistic, probabilistic and mixed theories of information and their applications to coding, cryptography, economics, engineering, forecasting, optimization, physics, pattern recognition, picture processing, and system designs. The Centre organizes a Seminar and Lecture Series on Information Theory and publishes Research Reports.

There are several graduate and undergraduate courses on Information Theory and Coding taught by members of the Centre in the areas mentioned above. The specific courses are listed in the Calendar under the appropriate departments.

Recognition of Academic Excellence

1. DEAN'S HONOURS LIST

To recognize outstanding academic achievement each term, the designation "Dean's Honours List" will be awarded to undergraduate Mathematics students in an Honours program whose term averages (both math and overall) are at least 85%, based on all courses taken that term. Only students carrying at least a standard course load in the term will be eligible for the Dean's Honours List. (A standard course load is defined as 2.50 credits for Year 3 and 4 students in Honours Pure Math, Joint Honours Pure Math with Statistics, and Honours Teaching Option; 3.00 credits for all other Honours students.) This designation will be reflected on end-of-term grade reports and official university transcripts.

Those with outstanding academic records throughout their undergraduate careers who qualify for a BMath Honours degree will "Graduate on the Dean's Honours List" if their cumulative averages (both math and overall) are at least 85%, based on all courses taken. In addition to an appropriate notation on their official university transcript, those who "Graduate on the Dean's Honours List" will have their names displayed in gold in the Math Faculty Colloquium Room (MC 5158).

2. ALUMNI GOLD MEDALLIST

An Alumni Gold Medal is presented annually (usually at the Spring Convocation) to recognize the academic excellence of the Faculty's most outstanding undergraduate student.

3. K.D. FRYER GOLD MEDAL

The K.D. Fryer Gold Medal is presented annually at Fall Convocation to a graduating student who best exemplifies academic excellence and good student citizenship.
Faculty Policies

1. UNDERGRADUATE STANDINGS AND PROMOTIONS COMMITTEE

Membership, Duties, Operating Procedures
The Committee consists of the Dean, Associate Dean for Undergraduate Studies, Assistant Dean (External Programs), the Assistant Registrar, Faculty of Mathematics (who serves as the Committee's Secretary), the Academic Advisors for each of the Faculty's undergraduate programs, a representative of St. Jerome's College, the Director of Undergraduate Affairs, the Mathematics Program Administrator of the Department of Co-ordination and Placement and other non-voting persons.

The main purposes of the Committee are to administer the rules and regulations pertaining to undergraduate studies in the Faculty, to make recommendations on student performance before end-of-term grade reports are issued to students by the Registrar, and to consider all requests for special consideration or appeals in matters within its jurisdiction.

Exceptions to normal Faculty policies under the jurisdiction of the Standings and Promotions Committee may be authorized only by that Committee. All such requests must be made in writing to the Assistant Registrar, Faculty of Mathematics, Needles Hall. At its meetings the Committee carefully deliberates all petitions and requests, and when special circumstances justify making an exception to existing rules, the Committee grants the request. It is often useful for students to discuss their circumstances with an Undergraduate Advisor before making a formal request to the Committee. Committee meetings are normally scheduled every other week.

2. PROMOTIONAL POLICIES

2.1 Required Withdrawal from Co-op
Students will be required to withdraw from a Co-operative Mathematics program if they fall into one or more of the following categories:

i) They have been required to withdraw from an Honours Mathematics program.

ii) They have failed to meet minimum requirements on work terms and/or work reports.

2.2 Required Withdrawal from Honours
Students will normally be required to withdraw from an Honours Mathematics program if they fall into one or more of the following categories:

i) They have accumulated more than 8 half-credit failures in total.

Mathematics
Faculty Policies

ii) They have accumulated 4 or more half-credit failures during any 2 consecutive full-time academic terms (including failures obtained in any part-time terms interspersed between the 2 full-time terms in question).

iii) At the end of their first 2 full-time terms of registration (or by the time they have accumulated 12 half-course attempts, whichever comes first), they have failed to complete successfully 8 half-credits, with an average on these 8 half-credits of at least 60%.

Students who have been required to withdraw as Honours BMath degree candidates will be permitted to register in a BMath Pass or General program, provided their records do not meet any of the criteria for 'Required Withdrawal from Mathematics' (see Section 2.3 below). Students allowed to continue their studies in Pass or General will not normally be permitted to take an Honours-level mathematics course when there is a corresponding General-level course available (e.g. MATH 220A rather than MATH 230A).

2.3 Required Withdrawal from Mathematics
Students will normally be required to withdraw from the Faculty of Mathematics if they fall into one or more of the following categories:

i) The have accumulated more than 8 half-credit failures in total.

ii) They have accumulated 6 or more half-credit failures during any 2 consecutive full-time academic terms (including failures obtained in any part-time terms interspersed between the 2 full-time terms in question).

iii) They have failed to satisfy all requirements for a BMath Pass degree by the end of the first term in which they have accumulated 44 or more half-course attempts.

iv) In the opinion of the Standings and Promotions Committee, they are unlikely to profit from further study in the Faculty of Mathematics.

Students who have been required to withdraw from the Faculty of Mathematics will not normally be re-admitted to a degree program in Mathematics at any point in the future. However, at the time a Required-To-Withdraw decision is given, the Standings and Promotions Committee will review the student's academic record to date. If, at the end of any term prior to the term when withdrawal is being required, the student would have qualified for a lesser BMath degree, the student will be granted that lesser degree, even though he/she is not being permitted to pursue his/her studies in the Faculty of Mathematics toward a higher degree.
2.4 Exceeding Maximum Course Attempts/Failures
A student who, at the end of a specific term, has accumulated all the requirements for a particular degree, but has simultaneously exceeded the maximum number of failures or course attempts permitted for the degree in question will not normally be granted the degree. In some cases, depending upon the circumstances, the student might be eligible for a lesser degree. (See the last paragraph in Section 2.3 above.) In other circumstances, however, it is quite possible that the student would be required to withdraw from the Faculty with no degree.

3. GRADING POLICIES

3.1 Grade Designations/Averages
In addition to marks from the numerical scale 0-100, the designations INC (Incomplete course work, no credit granted), AEG (Aegrotat, credit granted due to illness), CH (Credit granted), NMR (no mark reported) and DNW (Did not write examination, no credit granted) may be used from time to time.

Courses recorded as AEG or CR will count as credits but have no numerical grade for average purposes. Those recorded as INC, NCR, NMR and DNW will count as failures for the purpose of course-attempt and failure counts. If a student abandons a course and does not write the final examination, some instructors may elect to submit a numerical grade based upon term work, with a zero mark included for the examination, rather than submitting a DNW grade for the course. Students considering such action are advised to determine their instructor’s intentions prior to making any final decision to abandon the course. INC, NMR, DNW count as zeros in the calculation of averages.

A student who receives an INC grade designation has up to 8 months (2 terms) to complete the appropriate course work. If, after 8 months, the course work is not completed, then the INC is automatically converted to a DNW grade designation.

3.2 Grade Appeals
Any math student wishing to appeal a grade may do so by contacting the Assistant Registrar, Faculty of Mathematics, in Needles Hall, and requesting a grade appeal form. The grade appeal form must be completed and returned to the Registrar’s Office along with $5.00 per grade appeal (which is refunded if the grade is raised). Such an appeal must be submitted normally within one month of the official release of that term’s grades. Please note, however, that a grade may be lowered if a re-examination leads to the discovery of an earlier error not in the student’s favour.

4. POLICIES RE: COURSES

4.1 Corresponding Advanced/Honours/General Level Courses
All new on-campus admissions to the Faculty of Mathematics take first-year Calculus and Algebra at the Honours level (MATH 130A/B, MATH 134A/B), or at the Advanced Honours level (MATH 140A/B, MATH 144A/B). The Advanced Honours level courses are intended for exceptionally gifted students in an Honours program. A student pursuing an Honours degree may substitute the corresponding Advanced Honours level course(s) for any required Honours level course(s).

After completing first year of an Honours program, a student pursuing a Pass or General degree may substitute the corresponding Honours level course(s) for any required General level course(s), unless the student has been required by the Standings and Promotions Committee to transfer from an Honours program to General or Pass. In this case, the student must enrol in General level courses.

4.2 Course Upgrading
A student who takes the General version of a course instead of the Honours version (e.g. MATH 220A instead of 230A), but later decides to pursue an Honours degree, may petition the Standings and Promotions Committee for special consideration. In the past, in a few rare instances where the academic record of the student in question was of very high calibre, the Committee has permitted the student to count the General course toward an Honours degree. In other cases, the Committee may permit the student to write a special final examination in the Honours course without submitting all the written work normally required during the term. In such cases the grade obtained will be treated in the same manner as if the student had registered in the Honours course and obtained that final mark. Otherwise, the student must formally retake the course at the Honours level.

4.3 Failed Courses
The minimum passing mark in all courses is 50%. If a student fails a course, he/she may either retake the same course (and this will be the case if the course is required for the degree being sought) or replace it by another course. The failed course remains a permanent part of the student’s record at the University, regardless of whether he/she passes the same course on a subsequent attempt, and it is included in course-attempt and failure counts. However, the failing grade will not be included in the Graduating Averages required for the degree in question (see Footnote 5 with Table 1 (a) on page 137). Note that supplemental examinations are not available for students in the Faculty of Mathematics.
4.4 Repeated Courses
A student may not normally retake a passed course more than once in an attempt to improve the grade. Both attempts will be included in the student’s quota of course attempts, but the course will be included only once in credit counts and may be counted at most once in the Graduating Averages required for the degree in question (see Footnote 5 with Table 1 (a) on page 13.7).

4.5 No Credit/Overlap Courses
Some courses offered within the University may not normally be taken for credit toward a BMath degree. The content of such courses has usually been designed with the academic needs and background of students in faculties other than Mathematics in mind.

Other courses offered by various departments throughout the University sometimes deal with similar subject matter. In such instances, at most one entry from a group of ‘overlapping’ courses may count for credit toward a BMath degree. Lists of such courses are published annually by the Mathematics Undergraduate Office. It is the student’s responsibility to be aware of the contents of these lists.

4.6 Correspondence Courses
The Correspondence Program at the University of Waterloo offers a large variety of courses each term for part-time students. The Mathematics Faculty feels that the Correspondence Program 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 toward the beginning of the following February. For this reason, the Mathematics Faculty has adopted a policy whereby a student with less than a 70% all inclusive 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 a BMath Honours degree. It is the intent of this policy to require that all such degree requirements be satisfied entirely by on-campus courses. Any additional courses, whether mathematics or non-mathematics, may be taken on a part-time basis by Correspondence for Honours degree credit.

The policy outlined in the preceding paragraph does not apply to BMath Pass and General degrees. Students may elect to take explicitly stated course requirements by Correspondence, whenever they are offered in this mode, to count for BMath Pass or General degree credit. Most of the explicitly required Math courses for a BMath Pass degree are available by Correspondence. BMath General students must take all of first-year Algebra, Calculus and Computer Science on campus (because the required versions of these courses are not offered by Correspondence), but they may elect to take some, or all, of their remaining required courses by Correspondence when they are not studying on campus.

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 1 half-credit course, unless they have written support from their employer to take 2 half-credit courses.) Interested students are encouraged to discuss Correspondence course selections with their Faculty Advisor, but the actual paperwork to preregister for Correspondence courses involves completely separate application forms available in the Correspondence Program Office.

4.7 Courses at Other Universities
(Letters of Permission)
Students in good academic standing (i.e. at least 60% cumulative all-inclusive overall average) are normally permitted to take non-math courses at other universities on a part-time basis during terms off campus, provided the courses are not explicitly required for their particular program. These non-math courses may count as credits toward a Bachelor of Mathematics degree at Waterloo. However, only under very special circumstances will math students be permitted to take mathematics courses (i.e. MATH, CS, STAT, etc.) or required non-math courses at other institutions to count toward their Waterloo degree requirements. Students wishing to take courses at other universities must apply to the Standings and Promotions Committee for permission by completing a special “Letter of Permission” form available from the Registrar’s Office. Please note that permission must be obtained before taking each course. The Committee will not normally approve a course taken elsewhere for Waterloo degree credit if prior approval has not been obtained.

All courses taken on a Letter of Permission will be recorded on Math Faculty Student Examination Reports with a grade of ‘CR’ (credit) or ‘NCR’ (no credit) as appropriate. As a result, the grades for such courses will be excluded from the calculation of averages used to determine eligibility for graduation with a BMath degree (see Footnote 5 with Table 1 (a))
on page 137). Note that, while on a work-term, Co-op students are normally limited to 1 half-credit course, unless they have written support from their employer to take 2 half-credit courses.

Care should be exercised in the selection of courses to be taken on a Letter of Permission to eliminate unnecessary duplication in course material covered and to ensure adequate preparation for subsequent courses the student is planning to take in future years at the University of Waterloo.

Once the Faculty has approved a request to take a course on a Letter of Permission, the student will be held responsible for it. It will be his/her responsibility to ensure that an official transcript from the host institution is sent to the UW Registrar’s Office within 2 months of the completion of the course. Otherwise, a grade of NCR (which counts as a failure) will be automatically submitted. Any changes a student wishes to make to an authorized Letter of Permission must be approved by the Standings and Promotions Committee.

There is a non-refundable fee for processing each request for a Letter of Permission. (Only one host institution may be indicated on each request.) If replacement courses are requested because the host institution has cancelled or closed a course which has already been approved to be taken on a Letter of Permission, there will be no additional charge for this service.

4.8 Dropping/Adding Courses

Normally, the last day to ADD a course is 2 weeks after the official beginning of lectures. The last day to DROP a course for students not carrying more than a standard course load (5 for Pass or General, and usually 6 for Honours), is 4 weeks after the beginning of lectures. Students carrying more than a standard course load may not normally DROP any courses later than 2 weeks after the beginning of lectures. (These deadline dates apply only to Math Faculty students.) All exceptions to these deadlines must be approved by the Standings and Promotions Committee. Complete withdrawal from a Mathematics program without academic penalty is discussed in Section 5.6 on page 13:27.

Since OSAP assistance is partially based upon the course load in which a student is enrolled, course drop/adds during the term can affect a student’s initial entitlement. Students who wish to drop below 3 half credit courses per term should first consult with the Student Awards Office staff in Needles Hall. In some cases, such action could have a significant effect on their OSAP entitlement.

A course attempt refers to a course registration not formally cancelled with the Registrar’s Office before the drop deadline in the term in which the course is taken. A course attempt not successfully completed constitutes a course failure.

Mathematics
Faculty Policies

5. MISCELLANEOUS POLICIES

5.1 Special Co-op Regulations

i) Co-op Degree Requirements

Co-operative mathematics students are expected to follow the normal alternating academic/work-term sequence appropriate to their program from admission through to graduation. For most students admitted at the 1A level, this sequence will normally involve 8 academic terms and 6 work terms. (For students admitted beyond the 1A level, the normal numbers of academic and work terms will be adjusted accordingly.)

To be eligible for a Co-op degree, a student must normally have successfully completed all academic degree requirements, written at least 4 satisfactory work reports, followed an approved academic/work-term sequence and successfully completed at least 5 satisfactory work terms. (For students admitted beyond the Year 1 level, and for all students in the Math/Teaching Option and Math/Chartered Accountancy Option, 4 satisfactory work terms may suffice.) Any work terms completed following a student’s last academic registration will not be counted toward the minimum satisfactory work-term requirement for graduation.

Co-op mathematics students, who have not completed their Honours degree requirements at the termination of their approved academic/work-term sequence, will be eligible for a Regular BMath General (or Pass) degree if they have satisfied the appropriate degree requirements. Being granted such a degree will not disqualify these students from being able to upgrade to an Honours (or General) degree. However, if they wish to obtain a Co-op degree, they will normally have to satisfy the appropriate Honours degree requirements within 1 further calendar year after the termination of their approved academic/work-term sequence. After 1 year, they will be eligible only for a Regular degree.

ii) Re-arranging Academic/Work-term Sequences

Student requests to re-arrange academic/work-term sequences must be directed to the Standings and Promotions Committee on special forms available from the Registrar’s Office, Department of Co-ordination, and Mathematics Undergraduate Office.

Such requests will normally be approved if all of criteria 1-6 listed below are met. Students who alter their academic/work-term sequence, without first obtaining written approval from the Standings and Promotions Committee, may be required to withdraw from the Co-op program.

1. The request does not reduce the number of work terms remaining for the student at the time of the request.
2. The request does not involve more than 2 consecutive academic terms or 2 consecutive work terms.
3. There is no obvious indication that the new sequence requested will result in serious course selection difficulties for the student.

4. The student's academic performance to date is of sufficiently high calibre that he/she should not suffer academically from being off campus for any eight-month work term which might be involved in the request.

5. The student's employer supports the request in writing (if appropriate).

6. The request is properly documented.

Before making a formal request to the Standings and Promotions Committee to rearrange an academic/work-term sequence, it is often advantageous for the student to discuss the situation with a Co-ordinator and Faculty Advisor. If the request is approved by the Standings and Promotions Committee, it is the student's responsibility to deal with any timetabling difficulties which may arise and to make any necessary preregistration arrangements for subsequent terms.

iii) Course Load

While registered for an academic term, Co-op students are expected to maintain a full-time course load of 3 or more half-credits, unless they are within 1 or 2 half-credits of fulfilling the academic degree requirements for their program. While on a work term, Co-op students are normally limited to 1 half-credit course, unless they have written support from their employer to take 2 half-credit courses.

5.2 Course Load, Part/Full-Time

All Pass and General students are restricted to preregistering for a maximum of 2.50 credits per term; Honours students are restricted to preregistering for a maximum of 3.00 credits per term. With permission from a Faculty Advisor, Honours students may add an extra course during the ADD period. Pass and General students may not normally add extra courses beyond the 2.50 preregistration maximum.

During their first term of registration in the Faculty of Mathematics, only students with exceptional academic backgrounds are eligible to take extra courses.

In subsequent terms, addition of extra courses will normally be restricted to Honours 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 extra courses in the previous term and had both averages at least 70% in those courses, he/she will normally 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).

Mathematics

Faculty Policies

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 Range</th>
<th>Registration</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Year:</td>
<td>0 ≤ N ≤ 10</td>
<td>Full-time</td>
</tr>
<tr>
<td>Second Year:</td>
<td>10 ≤ N ≤ 20</td>
<td>Part-time/Full-time</td>
</tr>
<tr>
<td>Third Year:</td>
<td>20 ≤ N ≤ 32</td>
<td>Part-time/Full-time</td>
</tr>
<tr>
<td>Fourth Year:</td>
<td>32 ≤ N</td>
<td>Part-time/Full-time</td>
</tr>
</tbody>
</table>

A student registering for 1 or 2 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 2 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 programs).

5.3 Registration of Regular Students in Spring Terms

Students in the Regular program normally take courses during the Fall and Winter terms. They may also register, on a part-time or full-time basis during the Spring (May-August) or Summer (July-August) term. However, there are no Math Faculty course offerings in the Summer term and those in the Spring term are planned primarily for Co-op students.

Because of resource limitations, it may not always be possible to allow Regular students universal access to Math Faculty course offerings in the Spring term. First priority for access in particular courses in the Spring term will always be given to Co-op students.

Co-op students normally preregister for Spring courses at the beginning of the preceding November. Regular students may preregister in early February. By that time, the extent of the demand by Co-op students for Spring courses will be known and departments will be in a better position to determine which courses will be available to Regular students. (A list of such courses will be available for February preregistration.) If subsequent preregistration requests from Regular students should exceed the space available in the non-restricted courses, it may not be possible to accommodate all Regular students in the courses in question.

5.4 Course Prerequisites

At any time prior to the completion of lectures, if it is discovered that a student is taking a course offered by the Faculty of Mathematics without having previously successfully completed all the course prerequisites stated in the University Undergraduate Calendar, the student is subject to having his/her preregistration/registration in that course purged from university records. Such purging may be done at the request of the course instructor, the department offering the course, and/or the Faculty of Mathematics, but not without the consent of the instructor.
5.5 Illness or Incapacity

Normally, failure to write a required final examination in any course in which a student is officially registered, or failure to complete such a course for some other reason, will result in a DNW, NMR or INC grade being recorded for the course. All of these grades are considered as failures for the purpose of course-attempt and failure counts and count as zeros in average calculations.

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

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

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

5.6 Voluntary Withdrawal

The normal deadline date for Math undergraduate students to withdraw from the Faculty of Mathematics without academic penalty is 4 weeks after the beginning of lectures in a given term. However, exceptions will normally be made for 1A students who have never previously been registered at a degree-granting post-secondary institution. Such students will normally be permitted to withdraw without academic penalty as late as the last official day of lectures for their 1A term. (A special ‘Withdrawal Form’, available from the Registrar’s Office, must be completed.) A student who withdraws late will normally be held responsible for that term’s courses in the sense that such courses will be permanently recorded with grades of DNW and will subsequently be counted as course attempts and failures. Students in this category may still be eligible for tuition and residence fee rebates, depending of course, upon the date of withdrawal.

A student who has been admitted as a BMath degree candidate and subsequently withdraws without academic penalty prior to completing at least one term of study must request re-admission in order to register for a subsequent term. Such requests will be considered by the Faculty Admissions Committee in competition with other new applicants for admission at that time. (Note: the Faculty of Mathematics does not normally offer admission for the Winter or Spring terms.)

5.7 ‘Inactive’ Status/Re-Admission

A BMath degree candidate who has been ‘inactive’ for more than 4 consecutive academic terms must apply for re-admission by writing to the Assistant Registrar, Faculty of Mathematics, in Needles Hall. A resume covering the ‘inactive’ period, including official transcripts from any post-secondary institutions attended, must accompany the letter requesting re-admission. If the student is re-admitted, he/she will normally be subject to Faculty policies in effect at the time of re-admission.

(‘Inactive’ is taken to mean that the student has not been registered at the University of Waterloo, or on an approved Letter of Permission as a BMath degree candidate.)

6. BMATH WRITING SKILLS REQUIREMENT

BMath degree candidates with an initial registration in the Faculty of Mathematics of Fall/82 or later must satisfy the following Writing Skills Requirement:

“A grade of 60% or better on the UW English Language Proficiency Exam or a half-credit with a mark of C- or better in a term-course chosen from a list approved by the Undergraduate Affairs Committee and maintained by the Math Undergraduate Office. (The current list includes the following English courses: ENGL 109, 129R, 150 and 210A.)” The entry ARTS 000 will appear on both the Student Examination Report and the student’s transcript with a CR grade once the student has successfully completed the Writing Skills Requirement.

BMath degree candidates with an initial registration in the Faculty of Mathematics of Fall/80 or later, but still prior to Fall/82, must also satisfy this same writing skills requirement, except that Co-op students in this category have the option of substituting 4 successful Co-op work reports to fulfill the requirement.

BMath degree candidates with an initial registration in the Faculty of Mathematics prior to Fall/80 are not required to satisfy a BMath Writing Skills Requirement.

7. “AREAS OF STUDY” ON TRANSCRIPTS

BMath transcripts include explicit mention of no more than 2 areas of study in the academic program section.
Faculty of Science
Faculty of Science

The first students were enrolled in the Faculty of Science in the Fall of 1959. There are now approximately 2100 undergraduate full-time students and approximately 260 graduate students taking programs within the faculty.

The Faculty of Science consists of four departments: Biology, Chemistry, Earth Sciences and Physics, and the School of Optometry.

Degrees

The degree of Bachelor of Science (BSc) is awarded on the successful completion of the three-year general and four-year honours programs. The degree Doctor of Optometry (OD) is awarded on the successful completion of a four-year professional program.

Programs

Biochemistry, Biology, Chemistry, Earth Sciences and Physics programs are available on both the regular and co-operative system of study. In the co-operative system the students alternate four-month study terms on campus with four-month work terms in industry, business or government, in an area related to their studies.

The Faculty of Science also offers an Honours Science and Business Program and an Honours BSc in Psychology in co-ordination with the Department of Psychology. A three-year Liberal Science (Science for the Generalist) program is also offered.

Graduate programs leading to the degrees of MSc and PhD are discussed in the University of Waterloo Graduate Studies calendar.

Upgrading of BSc Degree

Normally a student may not upgrade a General BSc or its equivalent to a Waterloo Honours BSc. However, from time to time such conversion privileges may be allowed in exceptional cases on the recommendation of the department(s) concerned and with the approval of the Examinations and Standings Committee.

Rulings of the Committee in any particular case on the conditions to be met for such conversion may include time limits.

Science

Admission

Admission

The admission categories, requirements and procedures for all programs are outlined in Chapter 2 of this Calendar.

Transfer Students

Students may be accepted for transfer from other programs in the University or from other universities. Their programs will be evaluated in terms of the number of credits allowed and the number remaining for a degree. Normally transfer students will be required to complete a minimum of 50% of the course work while registered in the Faculty of Science. Credits will be transferred without a cumulative average and only for relevant courses with a 60% or better mark.

Co-operative Students

Students applying to transfer to Co-operative programs in the Faculty of Science will not normally be admitted above the Year 2 Term B level.

Admission as a Mature Student

Applicants are normally required to obtain standing in at least 1 Grade 13 or Ontario Academic Course in Mathematics and 1 in Science or their equivalent in order to have the proper background for first-year University courses in these areas. To discuss admissibility, applicants are advised to contact the Assistant Registrar, Faculty of Science.

English Language Proficiency Requirements

All Faculty of Science students entering degree programs must write the English Language Proficiency Examination (scheduled during registration week). They must achieve a passing grade of 50% or successfully complete the writing assignments of the University of Waterloo Writing Clinic in order to fulfill degree requirements.
Examinations and Standings

The following regulations govern the practice of the Faculty of Science in regard to final examinations, standing and make-up examinations. These regulations also apply to part-time students and special programs. Further details concerning University Examination Regulations can be found in Chapter 1.

Students should note that the Faculty of Science normally operates under a "credit-weight system" in which student progress is measured by credits successfully completed rather than by years. The only exceptions to this are Honours Earth Sciences programs. These programs follow the term course system. Students who have passed fewer than 5 credits successfully will be considered Year 1 students; those with at least 5 but fewer than 10, Year 2; those with at least 10 but fewer than 15, Year 3; and those with 15 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 marks.
   b) Final examinations are held in December, April, or August. The time normally allowed for each examination is 3 hours.
   c) In all courses each student is required to submit, in such form and at such time as may be determined by the instructor, evidence of satisfactory participation in term work. The marks obtained for work during term are used, in part, in determining standing. The ratio in which marks for term work and written examinations are combined is at the discretion of the individual departments. To pass a course, a student must obtain a minimum of 50% in the combined term and examination marks. Some courses and/or instructors may not require final examinations; in such cases term work only will be used in determining a final grade.
   d) Failure to write an examination is considered a failure to pass. A student who fails 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 1 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 1 course passed towards the total necessary for graduation. Students in good standing will not normally repeat courses they have passed.
   f) No course or its equivalent may be repeated more than once.
   g) All examinations which receive a failing grade are automatically re-read.
   h) Make-up examination privileges may be granted to students in good standing where failure to pass is attributable to extraordinary circumstances, especially medical or health-related problems. The student must have satisfied all term-work requirements in the course and must have the permission of the Examinations and Standings Committee.

2. Co-operative Program Evaluation
   Students in Co-operative programs will be evaluated by the rules shown, modified where necessary to suit their special needs. In particular:
   a) Evaluation in Year 1 will be made at the end of term 1B on the entire year's work. Those not meeting requirements of their program will be transferred to the General program (Regular system) in good standing, if possible. Such students may also apply for admission to the Liberal Science program.
   b) Assessment will be made on a term by term basis during Years 2 and 3. Terms 4A and 4B will normally be assessed as a unit at the end of the 4B term when both terms are taken consecutively from September to April. Normally a student may take no more than 2 upper year terms on a part-time or reduced program basis and must have special permission from the Department to do so.
   c) A student is expected to follow the work-term sequence from the point of entry, subject to the minimum requirements for graduation within the individual programs.
      The minimum number of work-terms required is normally 4.
      The minimum number of satisfactory work reports is normally 4.

3. Standing
   Grades
   Marks in individual courses will be reported as numerical marks on the scale 0 to 100. A mark of 50 or better is necessary to pass and receive credit for a course. For Science students, any grade of less than 32 will be recorded on the marks report and permanent transcript but for averaging purposes a grade of 32 will be used, equivalent to the weighting factor for the F- on the common system.
Grade Appeals
Any student wishing to appeal a course grade should submit a formal written appeal either through the Registrar's Office or the Science Undergraduate Affairs Office. Appeal forms are available in both locations.

Normally a formal appeal must be submitted within one month of the official release of the term's grades.

Conditional Standing
A student who marginally fails to meet the required standards of any program will be placed on conditional standing for one term only. During this period the student must regain standing in that program or withdraw from it. Conditional standing will be granted only once in any particular program.

Required to Withdraw
Students will normally be required to withdraw if they do not fulfill the academic requirements of the program they are enrolled in or if they are unlikely to profit from further study in the opinion of the Examinations and Standings Committee.

Students who have been "required to withdraw" from the Faculty of Science may not apply for readmission for at least 2 academic terms.

After 2 terms have elapsed, a formal application may be submitted to the Registrar's Office. Applicants must include a typewritten statement along with their application outlining why they are now likely to succeed.

Readmission is not automatic. All such applicants will be assessed in competition with new applicants and on the probability of their future success.

Readmission when granted will be with conditional standing.

Terminology
INC (either term work, lab work, examination, etc., are incomplete). A course for which the grade designation INC has been given must be completed within 2 terms of taking the course or the INC automatically becomes a mark of 32. If a graduating student has an INC, it will be recorded as 32 on the transcript. Students should not re-register in an INC course. They should see the instructor to arrange completion of the course.

AEG (aegrotat) signifies the student's work or examination was incomplete because of illness and the instructor felt the student should receive credit for the course but a numerical mark could not be set.

CR - Credit granted where performance was satisfactory but no specific mark is given and AEG is not acceptable.

NCR - Credit is not granted where performance was unsatisfactory but no specific mark is given.

DNW - Final examination not written in a course that has not been dropped officially whether the course has been attended or not.

AEG or CR will count as a course passed towards the total necessary but will not count in the overall average.

Unless there are medical or other extenuating circumstances, a DNW will be weighted for averaging purposes as a mark of 32 (equivalent to F- on the common grading system) in determining standing.

"Attempt" is a course completed, whether passed or failed or recorded as INC or DNW. Courses dropped before the official deadline are not considered as attempts and do not appear on the transcript.

Overall standing will be determined at the end of a term or a year by the cumulative average of all courses taken while in the Faculty of Science at any time (whether passed or failed).

Course
A course may refer to a lecture course, a laboratory course, or a lecture-laboratory course which includes both lecture and laboratory.

Laboratory courses are designated by the letter L following the course number.

Participation courses in Dance, Fine Arts, Drama and Music are considered to be laboratory courses.

Credit
Credits are assigned for lecture and laboratory courses as designated in the course descriptions (also see chapter 16).

Dean's Honours List
The Faculty of Science has a Dean's Honours List to recognize outstanding academic achievement.

To be eligible students must have completed Year 1 or Year 2, 3, or 4 of an Honours Program. They must have a cumulative average and an overall average for the completed year of at least 80%, have carried a full course load, and not have an INC, DNW or failed course.

The award will be noted on the student's transcript, and the student will receive a congratulatory letter from the Dean.

Alumni Gold Medalist
An Alumni Gold Medal is presented annually (usually at Spring Convocation) to a student who has demonstrated outstanding academic performance on completion of an undergraduate program.
Program and Course Selection

Students entering first year in the Faculty of Science are enrolled in a common year. Students in Year 1 Co-operative Biology, Biochemistry, Chemistry, Earth Sciences and Physics are labelled as such but all other students are officially in Year 1 Regular Science. Essentially the same courses are available to all first year students and students may enter Year 2 programs in Science provided they have taken the necessary courses in Year 1, have achieved the necessary passing average, and enrolment restrictions allow it.

1. First Year Programs (Regular and Co-operative)
The normal minimum course load for a full-time student in Year 1 Science is 5 lecture courses plus required labs per term. At least 2 of these must be lecture credits from the Year 1 offerings in 2 different disciplines from the Faculty of Science.

Students are encouraged to select an Arts elective (preferably English or Psychology). Students whose secondary school Grade 13 average was 70% or better may select 6 lecture-courses if they wish. It is recommended that students intending to take an Honours Physics program enrol in six lecture-courses. Courses should be chosen either with a specific Year 2 goal in mind or to cover many Year 2 programs. The required and recommended Year 1 selections for Year 2 Honours programs and Optometry can be found in the table on page 14.7.

2. Course and Program Changes
   a) Students may "add or drop" courses during the first 2 weeks of the Fall, Winter and Spring terms upon having the appropriate change form completed.
   b) Courses may be dropped after the normal 2 weeks change period with adequate cause but not after November 1, March 1 or July 1 for Fall, Winter and Spring courses. The permission of the instructor and the appropriate undergraduate officer or the Associate Dean must be obtained.
   Courses which have not been dropped officially will receive a DNW grade.
   c) Students may not drop a laboratory course without written clearance from the lab supervisor (faculty member or senior demonstrator). Students not checking out of such courses remain liable for the full value of the locker kit issued to them.
   d) Students may withdraw from the University as late as the official course drop date without penalty on their record. If however, a student chooses to withdraw to avoid a number of failures, he or she will likely be disqualified for readmission.
   e) Students may “add or drop” courses during the first 2 weeks of the Fall, Winter and Spring terms upon having the appropriate change form completed.
   f) Courses may be dropped after the normal 2 weeks change period with adequate cause but not after November 1, March 1 or July 1 for Fall, Winter and Spring courses. The permission of the instructor and the appropriate undergraduate officer or the Associate Dean must be obtained.

3. Eligibility for Courses
   Students must ensure they have the appropriate course prerequisites and where applicable corequisites stated in the course descriptions in the calendar.

4. Overlap courses
   Where substantial overlap exists between two courses credit will be granted for only one.
   Since some Science departments offer both Honours and General equivalent courses it is the student’s responsibility not to duplicate subject matter. Credit will only be given for one of such overlapping courses (e.g. CHEM 265 or 264; PHYS 111, 112 or 121, 122).
   This rule also applies to courses offered by various departments throughout the University which sometimes deal with similar subject matter (e.g. STAT 204 or PSYCH 200).

5. Correspondence Courses
   Only in exceptional cases should correspondence courses be taken by students in a term in which they are full-time students. Regular and Co-op students during their terms off-campus may take Correspondence courses on a part-time basis. Only in exceptional cases can Honours students take a core-course by Correspondence and they cannot take a Correspondence course in order to reduce course-load in a term in which they are a full-time student.

6. Letters of Permission
   Students in good academic standing and whose total number of transfer credits is less than the maximum permitted may be allowed to take an elective course at another university during a term off-campus to count as credit towards their degree.
   A student wishing to do so must complete the Letter of Permission form available at the Registrar’s Office and have it authorized by the Associate Dean or an appropriate Undergraduate Officer.
   A course taken on a letter of permission will be given credit with no grade assigned as long as the mark obtained is 60% or better.

7. Audit
   The Faculty of Science does not record nor recognize audits for students in Science or any other Faculty.

8. Enrollment in a Graduate Course
   A student may obtain credit toward a graduate degree in the Faculty of Science for normally not more than a one term graduate course taken during the fourth year of an undergraduate program provided this course is not used for credit toward his undergraduate degree. Prior approval of the Faculty Graduate Studies Committee must be obtained for students wishing to do so.
Credit for the graduate course toward a graduate degree will not be given unless the student attains an "A" average in his/her major subjects in the fourth year.

9. Reduced Program
Only in exceptional circumstances may an Honours program be taken on a completely part-time or reduced program basis; at least 2 of the upper 3 years must be taken on a full-time (full program) basis, 1 of which must be Year 4, and no student may spend more than 5 years of full-time study (or its equivalent) for an Honours degree.

A student in good standing who "stops out" of an Honours Program for more than a year must have departmental approval before returning to that program.

Only in exceptional circumstances may a first year program for a full-time student be reduced below the 5 lecture-course minimum.

Teacher Certification in Ontario
The Ontario Teacher's Certificate may be granted by the Ministry of Education after the successful completion of a program taken at an approved Ontario Faculty of Education. The Faculties of Education require that applicants hold an acceptable University degree (BA or BSc or equivalent, 3- or 4-year General or Honours).

Those students interested in seeking admission to a Faculty of Education should contact the appropriate university.

Future Regulations
Normally, students will be given advanced warning of changes in regulations but the Faculty reserves the right to make changes without notice where necessary.
### Science Program and Course Selection

**Year 1 Science Program Selections Leading to Year 2 Honours Programs and Optometry**

#### Regular Programs

<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><strong>Biology (see Note 4)</strong></td>
<td>Two 200-level term courses in BIOL, CHEM 123/124 and 123L/124L, CS 102.</td>
<td>PHYS 111/112, or MATH 113A/B, EARTH 121/122.</td>
</tr>
<tr>
<td><strong>Biochemistry (see Note 4)</strong></td>
<td>Two 200-level term courses in BIOL, MATH 113A/B, CHEM 125/126 and 123L/124L, a first year Physics credit with labs, CS 102.</td>
<td></td>
</tr>
<tr>
<td><strong>Biology and Man-Environment Studies (see Note 4)</strong></td>
<td>Two 200-level term courses in BIOL, 2 term courses in M ENV, CHEM 123/124 and 123L/124L, CS 102.</td>
<td></td>
</tr>
<tr>
<td><strong>Chemistry (see Note 4)</strong></td>
<td>CHEM 125/126 and 123L/124L, MATH 113A/B, PHYS 121/122 and 121L/122L, CS 102.</td>
<td></td>
</tr>
<tr>
<td><strong>Chemistry and Man Environment (see Note 4)</strong></td>
<td>CHEM 125/126 and 123L/124L, M ENV 100, 101, 150, 151; BIOL - two 200-level courses; MATH 113A/B, CS 102, ENV S 195.</td>
<td></td>
</tr>
<tr>
<td><strong>Chemistry with Options</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) <strong>Chemistry (Environmental Studies Option) (see Note 4)</strong></td>
<td>CHEM 125/126 and 123L/124L, MATH 113A/B, PHYS 121/122 and 121L/122L, CS 102.</td>
<td>BIOL 111/112, or two 200-level term courses in Biology, EARTH 121/122, ENV S 195.</td>
</tr>
<tr>
<td>b) <strong>Chemistry (Mathematics Option) (see Note 4)</strong></td>
<td>CHEM 125/126 and 123L/124L, MATH 115A/B, PHYS 121/122, and 121L/122L, MATH 114, CS 102.</td>
<td></td>
</tr>
<tr>
<td>c) <strong>Chemistry (Physics Option) (see Note 4)</strong></td>
<td>CHEM 125/126 and 123L/124L, MATH 115A/B, PHYS 121/122, and 121L/122L, CS 102, MATH 111A/134B.</td>
<td></td>
</tr>
<tr>
<td><strong>Earth Sciences (see Note 4)</strong></td>
<td>EARTH 121/122, CHEM 123/124 and 123L/124L, PHYS 121/122 and 121L/122L, CS 102, MATH 113A/B, 1 unrestricted term course.</td>
<td></td>
</tr>
<tr>
<td><strong>Earth Sciences (Geography Option) (see Note 4)</strong></td>
<td>EARTH 121/122, CHEM 123/124 and 123L/124L, GEOG 101/102, CS 102, Either PHYS 111/112 and 111L/112L or BIOL 111/112 or equivalent elective.</td>
<td></td>
</tr>
</tbody>
</table>
# Year 1 Science Program Selections Leading to Year 2 Honours Programs and Optometry

## Regular Programs

<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><strong>Optometry</strong> (consult page 14:31 for full list of prerequisites for admission to Optometry)</td>
<td>MATH 113A/B, BIOL 230 and 211, CHEM 126U124 and 123L124L, PHYS 121/122 and 121U122L, PSYCH 101.</td>
<td>PSYCH 102(A-G) or SOC 101.</td>
</tr>
<tr>
<td><strong>Physics</strong> (see Notes 1 and 4)</td>
<td>MATH 115A/B or MATH 113A/R, MATH 134A/R or MATH 111A/B; PHYS 121/122; PHYS 121U122L.</td>
<td>CS 102, CHEM 123/124 and 123L124L, CHEM 125J126 and 123U124L, MATH 113A/B, PSYCH 101/102(A-G).</td>
</tr>
<tr>
<td><strong>Psychology</strong></td>
<td>Two 200-level term courses in BIOL, CHEM 123/124 and 123L124L, PHYS 111/112, 111U112L or 121U122L and 121U122L, MATH 113A/B, PSYCH 101/102(A-G).</td>
<td></td>
</tr>
<tr>
<td><strong>Honours Science and Business</strong> (see Notes 4 and 5)</td>
<td>2.0 Science lecture-credits from the Year 1 offerings in CHEM, EARTH, and PHYS; BIOL 230 and 233, MATH 113A/B, BUS 111W, BUS 121W, CS 102, MATH 111B.</td>
<td></td>
</tr>
<tr>
<td><strong>General Science &amp; Honours Science non-major</strong> (see Note 4)</td>
<td>2.0 Science lecture-credits from the courses offered to Year 1 students in Biology, Chemistry, Earth Sciences &amp; Physics. A SCI 260-series course for Liberal Science (Science for the Generalist) program (see Note 3).</td>
<td>MATH 113A/B, CS 102.</td>
</tr>
</tbody>
</table>

## Co-operative Programs

<table>
<thead>
<tr>
<th>Major Field of Study</th>
<th>Required Courses in Year 1</th>
<th>Recommended Electives in Year 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Applied Chemistry</strong> (see Notes 2 and 4)</td>
<td>CHEM 125J126 and 123L124L, MATH 115A/B, PHYS 121/122 and 121U122L, CS 102.</td>
<td></td>
</tr>
<tr>
<td><strong>Applied Physics</strong> (see Notes 1, 2 and 4)</td>
<td>MATH 115A/B, MATH 134A/B, PHYS 121/122, PHYS 121U122L.</td>
<td>CS 102, CHEM 123/124 and 123L124L, CHEM 125J126 and 123U124L, MATH 113A/B, PSYCH 101/102(A-G).</td>
</tr>
<tr>
<td><strong>Applied Physics (Geophysics Option)</strong> (see Notes 1, 2 and 4)</td>
<td>MATH 114, 115A/B, PHYS 121/122 and 121U122L, CHEM 123/124 and 123L124L, CS 102, EARTH 121/122.</td>
<td></td>
</tr>
<tr>
<td><strong>Applied Earth Sciences (Geology Option)</strong> (see Note 4)</td>
<td>EARTH 121/122, CHEM 123/124 and 123L124L, PHYS 121/122 and 121U122L, CS 102, MATH 113A/B.</td>
<td></td>
</tr>
<tr>
<td><strong>Applied Earth Sciences (Geophysics Option)</strong> (see Note 4)</td>
<td>EARTH 121/122, MATH 113A/B or MATH 115A/B, PHYS 121/122 and 121U122L, CHEM 123/124 and 123L124L, CS 102, MATH 114 or 111B.</td>
<td></td>
</tr>
<tr>
<td><strong>Co-operative Biology</strong> (see Notes 2 and 4)</td>
<td>Three or four 200-level term courses in BIOL, CHEM 123/124 and 123L124L, MATH 113A/B, PHYS 121/122 and 121U122L, CS 102.</td>
<td>PHYS 111/112, EARTH 121/122.</td>
</tr>
<tr>
<td><strong>Co-operative Biochemistry</strong> (see Notes 2 and 4)</td>
<td>Three or four 200-level term courses in BIOL, CHEM 125J126 and 123L124L, MATH 113A/B, MATH 111A/B, PHYS 121/122 and 121U122L.</td>
<td></td>
</tr>
</tbody>
</table>

**Note 1**

Co-op Physics students and those planning to enter in Honours Physics in Year 2 are advised to select MATH 130A/B instead of MATH 113A/B or 115A/B if they have more than an 80% average, and may select MATH 111 instead of MATH 134 if they have less than an 80% average in Grade 12 Mathematics and Physics.

Students wishing a Biophysics Option with the Honours Physics program are advised to include BIOL 111/112 in their program.

Students wishing a Biophysics Option with 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 with the Honours Physics program are advised to select ECON 101/102.

Students wishing an elective program with EL E with the Honours Physics program are advised to select GEN E 115 (Fall term) and CS 102 (Winter term).

Students wishing to proceed in a Theoretical Physics program are advised to take a computing course in Year 1.

**Note 2**

Students in the Co-operative Biology, Biochemistry, Chemistry, and Physics programs have 2 methods of taking Year 1: (a) 2 terms in a row "3-stream" (September-October) or (b) fall term on campus "4-stream" (September-December), winter term at work (January-April) and spring term on campus (April-August).

**Note 3**

Students considering entering Liberal Science (Science for generalists) program should select a SCI 260-series course in their Winter term.

**Note 4**

CS 100 must be taken before CS 102 by students with no computing background from high school.

**Note 5**

Students needing CS 100 in the Fall must delay CS 102 to the Winter (1B) and reschedule their MATH 111B to Year 2B and MATH 100 to 1A.
Academic Programs and Degree Requirements

General Programs

3 YEAR GENERAL PROGRAM

The 3-Year general program allows students to specialize to a limited extent in a particular subject area or to pursue a broad range of Science subjects. However, students graduate with the “General Science” degree with no area of specialization designated.

Students who have completed Year 2 or 3 of the 3-Year program with credit in the required courses are qualified to apply for admission to medical school in Ontario. Students who have passed the first year of the program with appropriate choice of courses are qualified to apply for admission to a dental school.

Students must maintain an overall cumulative average of 55% and an overall average of 55% in all Science courses to be able to continue in Years 2 and 3 of the General Science program.

In order to graduate with a 3-Year General degree, the following requirements must be met:

1) Successful completion of 15.0 credits with a cumulative overall average of 55% and 55% in all Science courses. Of the 15.0 credits:
   a) 14.0 must be lecture credits;
   b) at least 7.5 must be Science credits, and 2.0 of these must be lecture credits from the Year 1 offerings in 2 different disciplines;
   c) at least 7.5 must be at or above the 200-level;
   d) at least 1.0 credit must be in Math.

2) No more than 3.0 SCI credits may be applied to the 3-Year general degree.

3) No more than 5.0 failed credits will be allowed.

4) A minimum of 3.0 lecture credits must be obtained per academic year, with no more than 2.0 failed credits allowed.

In addition, normally no more than 7.0 credits can be from any one department (for example, 7.0 Biology credits, or 7.0 English credits). Students are encouraged to take at least 2.0 credits from non-science areas, such as Arts or Math.

Normally, 5.0 lecture credits per year are taken.

Year 1

5.0 lecture credits, exclusive of laboratory credits. At least 2.0 credits must be chosen from the following list:
   a) BIOL 111/112, or two 200-level term courses;
   b) EARTH 121/122;
   c) CHEM 123/124 + labs;
   d) PHYS 111/112 or PHYS 121/122 + labs.

It is recommended that the required Math credit be taken in Year 1.
Admission to, and continuance in, the Liberal Science program requires a cumulative overall average of 60%, and 60% in all Science courses. Students required to withdraw from Honours Degree programs may apply for admission, but admission is not automatic and is granted on consideration of individual cases. No student will receive the degree from this program without spending one academic year leading to that degree enrolled in the program. A normal course load is 2.5 lecture credits per term plus any associated lab credits.

In order to graduate with a Liberal Science degree, the following requirements must be met:

1) Successful completion of 15.0 credits exclusive of lab credits with a cumulative average of 60%, including:
   a) 2.5 credits in Core Courses (numbered SCI 260 to 268)
   b) SCI 269 (0.5)
   c) 1.0 credit in Mathematics
   d) 2.0 credits in Year 1 offerings of two Science disciplines
   e) 2.0 credits in sequences of two courses beyond Year 1, in two Science disciplines
   f) 3.0 credits in languages, humanities or social science courses

2) Apart from the required SCI courses, no more than 1.0 credit in SCI courses may be applied to the degree.

3) Students will be required to withdraw from the program upon failing 2.0 credits in an academic year, or 3.0 credits overall.

4) Students must apply for admission to the program, and spend at least one successful academic year in it, obtaining good standing.

5) Students admitted to this program must choose courses aimed at fulfilling these program requirements, and may not substitute courses aimed at gaining or regaining admission to some other program.

The following is a list of courses from which students are advised to choose:

**Year 1 Offerings**

- BIOL 230, 233
- CHEM 123, 123L, 124, 124L
- EARTH 121, 122
- PHYS 111, 111L, 112, 112L or 121, 121L, 122, 122L

**Upper Year Sequences** (suggested sequences joined by + signs)

- BIOL 201 + 202, 210 + 211, 220 + 221, 240 + 241, 337 + 338
- CHEM 212 or 218 + 312 or 313, 237 + 332 or 333, 266 + 267, 356 + 357 with the appropriate lab course: CHEM 314L, 237L, 266L, 356L respectively

**Science Academic Programs and Degree Requirements**

- EARTH 231 + either 221, 232, or 238, 235 + 238, 236 + 238
- PHYS 226 + 246, 250 + 251, 301 + 302, 368 + 369, 380 + 381 with appropriate lab courses

Students are explicitly excluded from:

- BIOL 301 and 400-level courses not listed below
- CHEM 400-level courses except by permission of instructor
- EARTH 260 and 400-level courses
- PHYS 400-level courses except by permission of instructor

**Suggested additional Upper Year courses:**

- BIOL 239, 250, all other 300-level courses, 420, 424, 441, 443, 444, 448, 449, 450, 456, 457, 460, 461, 473
- CHEM any other 200- or 300-level courses subject to prerequisites and antirequisites
- EARTH 331, 332, 333, 336, 342, 345, 370
- PHYS any other 200- or 300-level courses subject to prerequisites and antirequisites
- SCI 250, 255, 355, 453, 454, 462

**Honours Programs**

The Faculty of Science offers two different types of Honours degrees — the Honours Science programs, and the Honours Major programs.

**Minors with Honours Programs**

A Minor in each of the 4 disciplines, Biology, Chemistry, Earth Sciences and Physics is available to Honours students in another faculty. See individual departmental sections for further information about the requirements.

**A. HONOURS SCIENCE PROGRAMS**

The Honours Science program allows students to study science in greater depth than permitted in the General Science program, but without as intense a degree of specialization as required in the more specialized programs such as Honours Biology, Honours Chemistry, etc. Students desiring a somewhat broader background in the Sciences might find this program more suitable than the more traditional specialized programs. However, students contemplating graduate study in the traditional disciplines following their undergraduate studies are advised to pursue the more specialized Honours programs.

There are 5 programs available that will lead to the degree of Bachelor of Science (Honours Science) plus an Honours Science and Business program. All are conducted through the regular system of study, and they all begin at the Year 2 level. They are:
Program 1: Non-specialized (see below).
Program 2: Biology specialization (see pg 14:17).
Program 3: Chemistry specialization (see pg 14:23).
Program 4: Earth Sciences specialization (see pg 14:26).
Program 5: Physics specialization (see pg 14:29).
Honours Science and Business (see below).

Honours Science (Non-Specialized) — Program 1
Admission to, and continuance in, Honours Science Program 1 requires a cumulative overall average of 60% and a cumulative average of 60% in all Faculty of Science courses.

In order to graduate in the Honours Science (non-specialized) program, the following requirements must be met:
1) Successful completion of 22.0 credits, exclusive of Year 1 lab credits, with a cumulative overall average of 60%, and a cumulative average of 60% in all Faculty of Science courses. Of the 22.0 credits that are required:
   a) at least 20.0 must be lecture credits;
   b) at least 14.0 credits must be Faculty of Science credits, of which 10.0 must be at or above the 200 level, and at least 5.0 of them other than any SCI credits must be at the 300- or 400-level.
2) At least 1.0 credit must be in Math.
3) No more than 5.0 failed credits are allowed.
4) No more than 3.0 SCI credits may be applied to the program.
5) A student must have been enrolled full-time in 2 out of 3 years, one of which must be either Year 2 or 3, and the other must be Year 4. Year 4 of the program must be taken at the University of Waterloo.

Year 1
5.0 lecture credits, exclusive of laboratory credits must be obtained, of which 2.0 must be chosen from the following list:
   a) BIOL 111/112, or two 200-level courses;
   b) CHEM 123/124 plus labs;
   c) EARTH 121/122;
   d) PHYS 111/112, or PHYS 121/122 plus labs.

Years 2, 3 and 4
Normally, 4.0 Science credits plus 2.0 others are taken in Year 2 and 3; in Year 4, 4.0 Science credits plus 1.0 other are taken.

Honours Science and Business
As high technology plays an increasingly greater role in society, there will be a growing need for graduates who have a competence in the combined disciplines of science and business. The knowledge and skills which will be required by managers have never been greater. The modern manager must have a knowledge of finance, economics, accounting, marketing, organizational behaviour to name a few areas as well as the quantitative methods so deeply ingrained in the scientific method. A quantitative overview of science and acquired skills in the scientific method will be extremely useful in identifying and solving problems in the increasingly technology-oriented business world. Collection and efficient handling of relevant data are crucial in the decision-making process.

For those students leaning towards administration in industry, the following program is recommended. The business, economics, accounting, finance and mathematics courses required in this program mirror some of the courses taken in graduate MBA programs. Credit for some of these courses may be allowed by some of the admitting universities offering MBA degrees.

Admission to, and continuance in, Honours Science & Business requires a cumulative average of 65% in both Science and non-Science courses.

In order to graduate in the Honours Science and Business program the following requirements must be met:
1) Successful completion of 24.0 credits, with a cumulative average of 65% in both Science courses and non-Science courses.
   a) Of the 24.0 credits required,
      a) at least 12.0 credits must be Faculty of Science credits;
      b) the 5.0 credits from Groups A and B must be included in the 12.0 credits; providing an introductory background in Biology, Chemistry, Earth Sciences and Physics;
      c) 7.0 of the 12.0 credits must be selected from Group C. Of these at least 2.0 must be at the 300 or 400 level and no more than 4.0 may be taken from any particular discipline. Consult the undergraduate officer in the particular discipline regarding the appropriateness of a given sequence of courses.
2) No more than 5.0 failed credits are allowed.
3) A student must have been enrolled full-time in 2 out of 3 years, one of which must be either Year 2 or 3, and the other must be Year 4. Year 4 of the program must be taken at the University of Waterloo.
Honours Science and Business
Advisor: Prof. R. Aziz

Year 1

<table>
<thead>
<tr>
<th>Term</th>
<th>Courses and Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>BUS 111W (0.5) MATH 113A (0.5) CS 100 or elective (0.5) 1.0 Science lecture credit from Group A (with lab courses where specified)</td>
</tr>
<tr>
<td>Winter</td>
<td>BUS 121W (0.5) MATH 113B (0.5) CS 102 (0.5) 1.0 Science lecture credit from Group B (with lab courses where specified)</td>
</tr>
</tbody>
</table>

*Students with no computer literacy should take CS 100 before 102

Year 2

<table>
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<tr>
<th>Term</th>
<th>Courses and Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>MTHEL 100 (0.5) ECON 101 (0.5) ACC 121 (0.5) 1.0 Science lecture credit from Group A (with lab course where specified) Group C Science elective (0.5)</td>
</tr>
<tr>
<td>Winter</td>
<td>MATH 111B (0.5) ACC 122 (0.5) ECON 102 (0.5) 1.0 Science lecture credit from Group B (with lab course where specified) Group C Science elective (0.5)</td>
</tr>
</tbody>
</table>

Year 3

<table>
<thead>
<tr>
<th>Term</th>
<th>Courses and Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>BUS 352W (0.5) M SCI 211 (0.5) ACC 221 (0.5) Group C Science electives (1.5)</td>
</tr>
<tr>
<td>Winter</td>
<td>BUS 362W (0.5) M SCI 332 (0.5) CS 330 (0.5) Group C Science elective (0.5)</td>
</tr>
</tbody>
</table>

Year 4

<table>
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<tr>
<th>Term</th>
<th>Courses and Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>BUS 454W (0.5) BUS 481W (0.5) ACC 372 (0.5) Group C Science electives (1.5)</td>
</tr>
<tr>
<td>Winter</td>
<td>BUS 491W (0.5) ACC 372L (0.5) M SCI 333 (0.5) Group C Science elective (1.5)</td>
</tr>
</tbody>
</table>

Departmental Programs

Biology

The following programs are offered in the Biology department:

Honours Major Programs
Regular:
- Honours Biology
- Honours Biochemistry
- Honours Biochemistry (Biotechnology Option)
- Honours Biology & Man-Environment Studies
Co-operative:
Honours Co-operative Biology
Honours Co-operative Biochemistry
Honours Co-operative Biochemistry (Biotechnology Option)

Honours Science Program 2 (with specialization in Biology)

Minor in Biology

HONOURS MAJOR PROGRAMS - REGULAR

Honours Biology
Admission to, and continuance in, Honours Biology requires a cumulative average of 60% and a cumulative average of 65% in all Biology courses.
In order to graduate in the Honours Biology program, the following requirements must be met:

1) Successful completion of 23.0 credits.
2) At least a 0.75 credit in Biochemistry and a 0.75 credit in Organic Chemistry beyond Year 1;
3) By the end of Year 2, students must have completed CS 102;
4) A student must have been enrolled full-time in 2 out of 3 years, one of which must be either Year 2 or 3, and the other must be Year 4. Year 4 of the program must be taken at the University of Waterloo;
5) Mandatory courses as listed below.

Also, any student who fails a Biology course during second or third year will not be permitted to continue in the program unless reinstated by the department.

Year 1
1) 1.0 (or 1.5) Biology credits from the following: BIOL 210, 211, 220, 221, 230, 233, 239, 240, 241, 250;
2) CHEM 123 and 123L, and CHEM 124 and 124L;
3) 6 (or 5) electives (2.5 - 3.0 credits)

Year 2
Students entering Year 2 must take:
1) 4.0 (or 3.5) Biology credits from the following: BIOL 210, 211, 220, 221, 230, 233, 239, 240, 241, 250;
2) CHEM 266 and 266L, and CHEM 237 and 237L;
3) STAT 202;
4) 1 (or 2) electives (0.5 - 1.0 credit)

Year 3
Students entering Year 3 must take:
1) At least 4.0 credits from the 300-level BIOL courses (excluding BIOL 301);
2) 4 electives (2.0 credits), BIOL 461 is available to students in Year 3 or Year 4. (Chemistry courses and PHYS 301 are recommended).

Honours Biochemistry
Program Advisors: Professors L.J. Brubacher, Chemistry and J.C. Carlson, Biology
This program allows specialization in either biochemistry with a chemical emphasis, or biochemistry with a physiological or microbiological emphasis. The program is also available on the Co-operative system of study.

Professional Standing
The program in Biochemistry fulfills the academic requirements for professional membership in the Chemical Institute of Canada.

Admission to, and continuance in, Honours Biochemistry requires a cumulative average of 60% and a cumulative average of 60% in Chemistry courses and 65% in Biology courses.

In order to graduate in the Honours Biochemistry program, the following requirements must be met:

1) Successful completion of 23.5 credits (including all required labs in Chemistry and Physics).
2) A student must have been enrolled full-time in 2 out of 3 years, one of which must be either Year 2 or 3, and the other must be Year 4. Year 4 of the program must be taken at the University of Waterloo;
3) Mandatory courses as listed below.

Note:
Students who plan to take one or more of the Chemical Engineering electives in Year 4 of the Biotechnology option, should take the pre-requisite MATH 215 or MATH 216 in Year 2 or Year 3.

Year 1
1) 1.0 Biology credit from: BIOL 210, 211, 220, 221, 230, 233, 239, 240, 241, 250;
2) CHEM 125 and 125L, and CHEM 126 and 126L;
3) PHYS 121/122 and 121L/122L or 111/112 and 111L/112L;
4) MATH 113A/B;
5) CS 102;
6) Elective (0.5 credit)

Year 2
Fall:
1) 0.5 credit from: BIOL 210, 220, 230, 240, 250;
2) CHEM 125 and 125L, and 126 and 126L
3) PHYS 121/122 and 121L/122L or 111/112 and 111L/112L;
4) MATH 113A/B;
5) CS 102;
6) Elective (0.5 credit)

Winter:
1) 1.0 credit from: BIOL 211, 221, 233, 239, 241;
2) CHEM 221, 221L, 237, 237L*, 265, 265L.
*may be taken in Year 3
Year 3
Fall:
1) 1.0 credit from: BIOL 316, 323, 324, 327, 330, 336, 337, 342, 350;
2) CHEM 332, 356, 368, 368L.
Winter:
1) 1.0 credit from BIOL 311, 315, 331, 333, 335, 338, 344, 356;
2) CHEM 333, 334L, 356L, 357, 357L.
3) 1 elective (0.5)
Note:
BIOL 461 is available to students in Year 3 or Year 4.

Year 4
Fall:
1) 1.5 credits from: 400-level BIOL courses, CHEM 432, 435, 452 or 492A*
2) CHEM 312, 464.
Winter:
1) 2.0 credits from: 400-level BIOL courses, CHEM 419, 433, 434, 492B*
2) 1 elective (0.5)
*Students electing CHEM 492A/B must earn 5.5 credits in Year 4.

Honours Biology and Man-Environment Studies
Admission to, and continuance in, Honours Biology and Man-Environment Studies requires an overall cumulative average of 60% with a cumulative average of 70% in the Faculty of Environment Studies courses, and a cumulative average of 65% in Biology courses.

In order to graduate in the Honours Biology and Man-Environment Studies program, the following requirements must be met:
1) Successful completion of 23.0 credits.
2) Of the 23.0 credits required, 7.5 credits beyond Year 1 must be in Biology, and 6.0 credits beyond Year 1 must be in Man-Environment, or equivalent;
3) STAT 202;
4) CHEM-123/123L, CHEM 124/124L, CHEM 266/266L and CHEM 237/237L;
5) Students must have been enrolled full-time in 2 out of 3 years, one of which must be either Year 2 or 3, and the other must be Year 4. Year 4 of the program must be taken at the University of Waterloo.

Contact Professor W.G. Dixon, Biology, for further details.

HONOURS MAJOR PROGRAMS - CO-OPERATIVE PROGRAMS

Honours Co-operative Biology
The University of Waterloo offers a Co-operative Biology program designed to equip the graduating student with 2 years of work-related experience as well as a degree in Honours Biology. Applicants for Co-op Biology must fulfill the normal admission requirements for the Faculty of Science. The program has academic and work-terms scheduled as shown in Chapter 5.

During the work terms, students are assessed on their performance and are also required to write work reports. The program is aimed at making the student competitive in the job market without precluding entry into graduate school.

Admission to, and continuance in, Honours Co-operative Biology requires a cumulative average of 60% and a cumulative average of 65% in all Biology courses.

In order to graduate in the Honours Co-operative Biology program, the following requirements must be met:
1) Successful completion of 23.0 credits.
2) By the end of Year 2B, students must have completed the 10 introductory Biology courses at the 200 level, and CS 102;
3) Four satisfactory work-term reports.
4) Mandatory courses as listed below.

Note to All 1A Students
BIOL 230 is recommended for first year. BIOL 240 should be taken before BIOL 241.

Note to All 1B Students
Students should be aware that BIOL 239 and 239 must be taken during either the Winter or Spring Terms in even-numbered years and BIOL 211, 221 and 241 must be taken during either the Winter or Spring Terms in odd-numbered years.

Stream B
(Students who take Year 1B during Winter Term)

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1A</td>
<td>Year 1B</td>
<td>Winter Term</td>
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<tr>
<td>BIOL 230</td>
<td>BIOL - 1.0</td>
<td>BIOL - 1.0</td>
</tr>
<tr>
<td>BIOL 240</td>
<td>or 1.5</td>
<td>or 1.5</td>
</tr>
<tr>
<td>CHEM 123/123L</td>
<td>200-level</td>
<td>200-level</td>
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<tr>
<td>CHEM 124/124L</td>
<td>credits.</td>
<td>credits.</td>
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<tr>
<td>Electives - 1.0</td>
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<tr>
<td>STAT 202</td>
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<tr>
<td>Elective (0.5)</td>
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<tr>
<td>Year 2A</td>
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</tr>
<tr>
<td>BIOL - 1.5</td>
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<tr>
<td>200-level</td>
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<td>Electives -</td>
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<tr>
<td>200-level</td>
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<tr>
<td>Electives -</td>
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<tr>
<td>200-level</td>
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<td>Year 3A</td>
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<td>BIOL - 2.0</td>
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<td>300-level</td>
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<td>Year 3B</td>
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<td>BIOL - 2</td>
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<td>300-level</td>
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<td>Elective (1.0)</td>
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</table>

*Biochemistry courses are recommended.*
### Stream 4

(Students who take Year 1B during Spring Term)

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<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
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<tbody>
<tr>
<td>Year 1A</td>
<td>BIOL 230</td>
<td>BIOL 1.0 or 1.5</td>
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<tr>
<td>BIOL 240</td>
<td>CHEM 123/123L</td>
<td>200-level credits.</td>
</tr>
<tr>
<td>Electives 1.0 credits.</td>
<td>Electives - 1.0 or 0.5 credits.</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Work Term</th>
<th>Year 2A</th>
<th>BIOL - 1.0 or 1.5</th>
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<tbody>
<tr>
<td>Work Term</td>
<td>200-level credits.</td>
<td>CHEM 266/266L.</td>
</tr>
<tr>
<td>Year 2A</td>
<td>CHEM 228</td>
<td>Electives - 1.0 or 0.5 credits.</td>
</tr>
</tbody>
</table>

| Year 3A | BIOL - 2.0 300-level credits. |
|---------| Electives - 1.0 credit. |

| Work Term | Year 3B | BIOL - 2.0 300-level credits. |
|-----------|---------| Electives - 1.0 credit. |
| (CHEM 267 and CHEM 333 are recommended.) |

### Stream 4 and Stream 8

<table>
<thead>
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<th>Fall</th>
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<tr>
<td>Year 4A</td>
<td>BIOL - 1.5 400-level credits</td>
<td>BIOL - 1.5 400-level</td>
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<td>BIOL 240</td>
<td>Electives - 1.0 credit.</td>
<td>Electives - 1.0 credit.</td>
</tr>
<tr>
<td>(Biochemistry courses are recommended.)</td>
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</table>

Since some fourth-year courses are offered in alternate years only, Biology major students are advised to plan their third- and fourth-year courses simultaneously.

**Note:**
Some 400-level Biology courses may be taken in the 3rd year.

### Honours Co-operative Biochemistry

**Program Advisors:** Professors L.J. Brubacher, Chemistry and J.C. Carlson, Biology.
This program allows specialization in either biochemistry with a chemical emphasis, or biochemistry with a physiological or microbiological emphasis. The program is also available on the Regular system of study.

**Professional Standing**
The program in Biochemistry fulfills the academic requirements for professional membership in the Chemical Institute of Canada.

Admission to, and continuance in, Honours Co-operative Biochemistry requires a cumulative average of 60%, a cumulative average of 60% in Chemistry courses, and a cumulative average of 65% in Biology courses.

In order to graduate in the Honours Co-operative Biochemistry program, the following requirements must be met:

1. Successful completion of 23.5 credits (including all required labs in Chemistry and Physics).
2. By the end of Year 2B, students must have completed BIOL 230, 233, 239, 240 and 241.
3. Four satisfactory work-term reports.

**Notes:**

1. Students should be aware that BIOL 233 and 239 must be taken during either the Winter or Spring Terms in even-numbered years and BIOL 241 must be taken during either the Winter or Spring Terms in odd-numbered years. Students entering in the Fall of odd-numbered years will take the same courses as listed below but in a slightly different sequence.

2. Students who plan to take one or more of the Chemical Engineering electives in Year 4 of the Biotechnology option, should take the pre-requisite MATH 215 or MATH 216 in Year 2 or Year 3.

### Stream 8

(Students who take Year 1D in Winter Term)

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### Science

**Biology**

14:15
### Science

#### Biology

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*Students electing CHEM 492 must earn 5.5 credits in Year 4.

### Honours Co-operative Biochemistry (Biotechnology Option)

**Program advisors:** Professors L.J. Brubacher, Chemistry and J.C. Carlson, Biology

The first two years of this program coincide with the Honours Co-operative Biochemistry programs for streams 4 and 8. The Biotechnology option comes into effect in Year 3. Although this option is set up in co-operative format, it is also available for regular students.

**Note:**

*Students who plan to take one or more of the Chemical Engineering electives in Year 4, should take the pre-requisite MATH 215 or MATH 216 in Year 2 or Year 3.*

#### Stream 8

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#### Stream 4

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Notes:
1) Recommended electives:
   BIOL 432, 434, 481
   CHEM 560, 561, 563 (one of MATH 215 or 216 must be taken as a pre-requisite).
   CHEM 419, 432, 433, 434, 435
2) Students may prepare in writing some variation in this program for approval by the Biology and
   Chemistry undergraduate advisors to accommodate their special interest.

HONOURS SCIENCE PROGRAM 2 (WITH SPECIALIZATION IN BIOLOGY)
Admission to, and continuance in, Honours Science -
Program 2 requires an overall cumulative average of
60% and a cumulative average of 65% in Biology
courses.

In order to graduate in the Honours Science
program, with specialization in Biology, the following
requirements must be met:
1) Successful completion of 23.0 credits.
   Of the 23.0 credits that are required:
   a) at least 20.0 must be lecture credits;
   b) at least 14.0 must be Faculty of Science credits;
2) at least 0.75 credit of biochemistry and 0.75 of
   organic chemistry beyond Year 1;
3) 1.0 credit in Math is required, of which 0.5 must be
   CS 102.
4) No more than 3.0 SCI credits may be applied to
   the program.
5) A student must have been enrolled full-time in 2
   out of 3 years, one of which must be either Year 2
   or 3, and the other must be Year 4. Year 4 of the
   program must be taken at the University of
   Waterloo.
6) Mandatory courses as listed below.

Year 1
1) 1.0 credit from the following: BIOL 210, 211, 220,
   221, 230, 233, 239, 240, 241, 250;
2) CHEM 123/123L and CHEM 124/124L;
3) CS 102;
4) Electives (2.5).

Year 2
1) 3.0 credits from BIOL 210, 211, 220, 221, 230, 233,
   239, 240, 241, 250;
2) CHEM 266/266L and 237/237L;
3) Electives (2.0).

Year 3
1) 3.0 credits from BIOL 311, 315, 316, 323, 324, 327,
   330, 331, 333, 335, 336, 337, 338, 342, 344, 350,
   356;
2) 1.0 credit in Science,
3) Electives (2.0).

Science
Biology
Chemistry

Note:
BIOL 461 is available to students in Year 3 or Year 4.

Year 4
1) 4.0 Science credits at least 2.0 of which are
   Biology credits from the 400-level or the list of
   300-level courses above;
2) Electives (1.0).

MINOR IN BIOLOGY
In order to graduate with a Minor in Biology, the
following requirements must be met:

1) Successful completion of 5.0 Biology credits, at
   least 2.5 of which must be at the third or fourth
   year level. A minimum average of 65% is required
   in BIOL courses.

Chemistry
The following programs are offered in the Chemistry
department:

Honours Major Programs
Regular:
Honours Biochemistry - (see page 14.13)
Honours Biochemistry, Biotechnology Option - (see
page 14.16)
Honours Chemistry
Honours Chemistry and Man-Environment Studies
Honours Chemistry (with Options)
   a) Environmental Studies Option
   b) Mathematics Option
   c) Physics Option
   d) Thesis Option

Co-operative:
Honours Co-operative Biochemistry - (see page 14.15)
Honours Co-operative Biochemistry, Biotechnology
Option - (see page 14.16)
Honours Co-operative Applied Chemistry
Thesis Option (available for any Co-operative program)

Honours Chemistry (Thesis Option)
Remaining option programs are explained on page
14:21.

Program Advisor: Professor G.E. Toogood
Students who have achieved an average of 80% in all
Chemistry courses, and 80% over all courses taken,
may request to complete their degrees with a reduced
course load and an increased research load.
Admission is by interview after completion of Year 2 in
any Honours Chemistry program, regular or
co-operative.

Program
Years 1 and 2: as at present in any Honours
Chemistry program

Years 3 and 4: CHEM 355, 368 and one of 312/313,
plus research courses. CHEM 392A/B and 495A/B.
Student performance is assessed by an advisory committee at the end of each academic term. Assessment is based on research-related activities (70%) and general knowledge of chemistry (30%), and a satisfactory performance in each category will be required.

Honours Science – Program 3 (with specialization in Chemistry)

Minor in Chemistry

Program Flexibility for Excellent Students
An excellent student in second or third year in any Honours Chemistry program, co-operative or regular, may propose a variation in the schedule of courses required for the degree. Proposals are entertained at the end of each term from students who have a cumulative Chemistry average of 80% and a cumulative average over all courses of 80%. Academic performance is reviewed each term by an advisory committee.

Professional Standing
The Honours Major programs fulfill the academic requirements for professional membership in the Chemical Institute of Canada.

Note to all Honours Chemistry Students:
Honours Chemistry students (all programs) may not elect to take these General program courses for degree credit:
CHEM 218, 219, 266, 267, 366

Electives
The following chart outlines proposed offerings of technical electives with Chemistry content from which Honours students should choose their required electives.
### Technical Electives with Chemistry Content

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### (b) Electives Relevant to Industrial Employment

Students contemplating careers in industry should consider some of these subjects and courses:

| Statistics | STAT 204, 304 | Writing | SCI 209, ENG 210 |
| Environment | M ENV 320 | Law | P SCI 201, 292, ENV 301, ACC 231 |
| Management Science | M SCI 211 | Business (WLU) | BUS 352, 362, 382, 383 |
| Economics | ECON 101, 102, 201, 202 | Accounting | ACC 121, 122 |
| Computing | CS 235, 234, GEN E 121 | Microprocessors | EL E 222, 323, 427, PHYS 353 |
|            |            | Critical Thinking | PHIL 145 |

### Notes:
- Asterisk (*) indicates recommendation for Applied Chemistry students.
- Dagger (†) indicates special permission required from the Associate Chairman for Undergraduate Studies in the Chemical Engineering Department.
- ‡ indicates strong recommendation for all Chemistry major students.
HONOURS MAJOR PROGRAMS – REGULAR

Honours Biochemistry
(see page 14.13)

Honours Biochemistry, Biotechnology Option
(see page 14.16)

Honours Chemistry
Program Advisor: Professor G.E. Toogood
Admission to, and continuance in, Honours Chemistry requires a cumulative average of 60% and a cumulative average of 60% in non-elective lecture courses each term.

In order to graduate with an Honours Chemistry degree, the following requirements must be met:
1) Successful completion of 24.75 credits including 5.75 lab credits.
2) In Years 3 and 4, students must choose four 400-level term courses (other than CHEM 407) and 2 term lecture courses at any level from the list of Technical electives with Chemistry content (see page 14.19);
3) Failure of more than 1 course in the field of specialization will result in the requirement to withdraw from the program;
4) Students must have been enrolled full-time in Year 4, and in either Year 2 or 3. Year 4 of the program must be taken at the University of Waterloo;
5) Mandatory courses as listed below.

Year 1
Students entering Year 1 must take:
Fall:
1) CHEM 125/123L
2) PHYS 121/121L
3) MATH 113A
4) CS 102 (Fall or Winter)
5) Electives (1.0 or 0.5)

Winter:
1) CHEM 126/124L
2) PHYS 122/122L
3) MATH 113B
4) Electives (1.0 or 0.5)

Year 2
Students entering Year 2 must take:
Fall:
1) CHEM 10, 220, 220L, 254, 264
2) MATH 215
3) PHYS 249, 249L

Winter:
1) CHEM 10, 212, 221/221L, 255, 265/265L
2) Elective (0.5)

Year 3
Students entering Year 3 must take:
Fall:
1) CHEM 10, 312, 314L, 355/355L, 368/368L
2) 2 electives (1.0)

Winter:
1) CHEM 10, 313, 315L, 358/358L
2) 3 electives (1.5)

Year 4
Students entering Year 4 must take:
1) CHEM 10, 492A/B (1.5)
2) 8 electives (4.0)

Honours Chemistry and Man-Environment Studies
Program Advisors: Professors G.E. Toogood (Chemistry) and S.C. Lerner (Man-Environment Studies)
Admission to, and continuance in, Honours Chemistry and Man-Environment Studies requires an overall cumulative average of 60% and a cumulative average of 60% in the non-elective lecture courses each term. A 70% average is required in all Faculty of Environmental Studies courses.

In order to graduate with an Honours Chemistry and Man-Environment Studies degree, the following requirements must be met:
1) Successful completion of 23.75 approved credits including 4.25 lab credits;
2) The student must have been enrolled full-time in Year 4 and in either Year 2 or 3. Year 4 must be taken at the University of Waterloo;
3) Mandatory courses as listed below.

Year 1
1) CHEM 125/126, 123L/124L
2) M ENV 100, 101, 150, 151
3) BIOL – two 200-level courses
4) MATH 115A/B
5) CS 102
6) ENV S 195 (0.5)

Upper Years
1) CHEM – 7.5 lecture credits including CHEM 212, 220, 221, 237, 264, 265, 356, 357, 368, and 3.0 lecture credits from appropriate 300- and 400-level courses in the Chemistry Department.
2.25 laboratory credits: CHEM 220L, 221L, 237L, 265L, 356L, 357L, 368L
2) M ENV – 12 courses (to be selected in consultation with the Department of Man-Environment Studies)
3) MATH 215
4) STAT 202
5) CHEM 492A/B or M ENV 490A/B.
Honours Chemistry (with Options)

A) HONOURS CHEMISTRY (ENVIRONMENTAL STUDIES OPTION)

Program Advisor: Professor G.E. Toogood

This program supplements the Honours Chemistry core with courses to familiarize the student with legal, economic and social aspects of environmental control and resource management.

Admission to, and continuance in, Honours Chemistry (Environmental Studies Option) requires an overall cumulative average of 60%. In addition, a 60% average must be obtained in all non-elective lecture courses each term. A 70% average is required in all Environmental Studies courses.

In order to graduate with an Honours Chemistry (Environmental Studies Option) degree, the following requirements must be met:

1) Successful completion of 24.0 credits including 5.0 lab credits;
2) 4.0 credits from the Environmental Studies Option course list (or courses approved by the Undergraduate Dean of Environmental Studies);
3) Failure of more than 1 course in the field of specialization will result in the requirement to withdraw from the program;
4) Students must have been enrolled full-time in Year 4, and in either Year 2 or 3. Year 4 of the program must be taken at the University of Waterloo;
5) Mandatory courses as listed below.

ENVIRONMENTAL STUDIES OPTION COURSE LIST

Students must take ENV S 195.

In addition, 3.5 credits must be selected from both portions of the list below:

Legal, Economic and Social Aspects
ENV S 201, 202, 401, 411
M ENV 320
PLAN 158, 222, 319

Resource Management
ENV S 200
GEOG 301, 303, 356, 357, 358, 359, 414
SCI 350

Year 1

Students must take the same courses as stated in the Honours Chemistry program.

Year 2

Students must take the same courses as stated in the Honours Chemistry program (page 14.20)

Year 3

Students entering Year 3 must take:

Fall:
1) CHEM 10, 312, 314L, 356L, 368/368L
2) STAT 204
3) 1 Elective (0.5)

Winter:
1) CHEM 10, 313, 357/357L
2) STAT 304
3) 2 electives (1.0)

Year 4

Students entering Year 4 must take:
1) CHEM 10, 419, 492A/B
2) ENV S 201
3) 2.0 CHEM credits. (CHEM 237/237L, 311, 320, 321L, 420, 452 and 455 are recommended)
4) 4 electives (2.0)

B) HONOURS CHEMISTRY (MATHEMATICS OPTION)

Program Advisor: Professor F.R. McCourt

This program combines the Honours Chemistry core with an enriched background in mathematics. It is suitable preparation for work in Theoretical Chemistry or Chemical Physics, or for the student whose interests and abilities lie in a mathematical direction.

Students wishing to follow this program on the Co-operative system of study should first speak to Professor McCourt and to Mr. R.A. Pullin of the Co-ordination Department.

Admission to, and continuance in, Honours Chemistry (Mathematics Option) requires an overall cumulative average of 60%. In addition, a 60% average must be obtained each term in all non-elective lecture courses. A 60% average is required in all Mathematics courses.

In order to graduate with an Honours Chemistry (Mathematics Option) degree, the following requirements must be met:

1) Successful completion of 23.75 credits including 4.75 lab credits;
2) Failure of more than 1 course in the field of specialization will result in the student being required to withdraw from the program;
3) The student must have been enrolled full-time in Year 4, and in either Year 2 or Year 3. Year 4 must be taken at the University of Waterloo;
4) Mandatory courses as listed below.

Year 1

Students entering Year 1 must take:

Fall:
1) CHEM 125/123L
2) PHYS 121/121L
3) MATH 115A, 114
4) CS 102

Winter:
1) CHEM 126/124L
2) PHYS 122/122L
3) MATH 115B
4) Electives (1.0)
Year 2
Students entering Year 2 must take:
Fall:
1) CHEM 10, 220/220L, 254, 264
2) 1 Elective (0.5)
3) PHYS 249/249L
Winter:
1) CHEM 10, 212, 221/221L, 255, 265/265L
2) MATH 210

Year 3
Students entering Year 3 must take:
Fall:
1) CHEM 10, 312, 314L, 355/355L
2) MATH 216
3) CS 234
4) 1 Elective (0.5)
Winter:
1) CHEM 10, 358/358L
2) MATH 322B
3) PHYS 359, 365
4) 1 Elective (0.5)

Year 4
Students entering Year 4 must take:
1) CHEM 10, 492A/B (1.5)
2) 3 Chemistry Electives (1.5) mainly from 400-level courses
3) 3 Mathematics Electives (1.5) from 300- or 400-level courses
4) 2 other Electives (1.0)

C) HONOURS CHEMISTRY (PHYSICS OPTION)
Program Advisor: Professor G. Scoles
This program combines the Honours Chemistry core with courses in physics. It is suitable preparation for work in Physical Chemistry or Chemical Physics, or for students whose interests divide between the two disciplines.

Students wishing to follow this program on the Co-operative system of study should first speak to Professor Scoles and to Mr. R.A. Pullin of the Co-ordination Department.

Admission to, and continuance in, Honours Chemistry (Physics Option) requires an overall cumulative average of 60%. In addition, a 60% average must be obtained in all non-elective lecture courses each term. A 60% average is required in all Physics courses.

In order to graduate with an Honours Chemistry (Physics Option) degree, the following requirements must be met:
1) Successful completion of 24.0 credits including 5.0 lab credits;
2) Failure of more than 1 course in the field of specialization will result in the requirement to withdraw from the program;
3) Students must have been enrolled full-time in Year 4, and in either Year 2 or 3. Year 4 of the program must be taken at the University of Waterloo;
4) Mandatory courses as listed below.

Year 1
Students entering Year 1 must take:
Fall:
1) CHEM 125/123L
2) PHYS 121/121L
3) MATH 115A, 111A
4) CS 102
Winter:
1) CHEM 126/124L
2) PHYS 122/122L
3) MATH 115B
4) Electives (1.0)

Year 2
Students entering Year 2 must take:
Fall:
1) CHEM 10, 212, 220/220L, 254
2) PHYS 256/256L
3) MATH 216
Winter:
1) CHEM 10, 221/221L, 255
2) PHYS 253/253L, 263
3) MATH 210

Year 3
Students entering Year 3 must take:
Fall:
1) CHEM 10, 264, 312, 355/355L
2) PHYS 352/352L
3) 1 Elective (0.5)
Winter:
1) CHEM 10, 265/265L, 358/358L
2) PHYS 359
3) 2 Electives (1.0)

Year 4
Students entering Year 4 must take:
1) CHEM 10, 492A/B (1.5)
2) PHYS 434, 454
3) 3 Chemistry electives (1.5), and 2 Physics electives (1.0) (courses other than Chemistry and Physics, such as Chemical Engineering, Mathematics, or Applied Mathematics, may be acceptable, but permission must be given by the Undergraduate Officer)
4) 1 other elective (0.5) (suggested electives include PHYS 353/353L, 363, 432, 441 and 445).

D) HONOURS CHEMISTRY (THESIS OPTION)
Refer to page 14:17 for details.
HONOURS MAJOR PROGRAMS - CO-OPERATIVE

Honours Co-operative Biochemistry
(see page 1:15)

Honours Co-operative Biochemistry, Biotechnology Option
(see page 1:16)

Honours Co-operative Applied Chemistry
Program Advisor: Professor G.E. Toogood

This program, which offers the Honours Chemistry courses integrated with 5 four-month work terms, extends over 5 years instead of 4. Information about the Co-operative system and the Co-ordination 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.

Admission to, and continuance in, Honours Co-operative Applied Chemistry requires an overall cumulative average of 60%. In addition, students must achieve a 60% average in the non-elective lecture courses each term.

In order to graduate with an Honours Co-operative Applied Chemistry degree, the following requirements must be met:

1) Successful completion of 24.75 credits including 5.75 lab credits.
2) In Years 3 and 4, students must choose four 400-level term courses (other than CHEM 407) and 2 term lecture courses at any level from the list of Technical Electives with Chemistry Content (see page 14:19);
3) Failure of more than 1 course in the field of specialization will result in the requirement to withdraw from the program;
4) Successful completion of a minimum of 4 work terms, and submission of a minimum of 4 satisfactory work reports;
5) Mandatory courses as listed below.

Stream 4

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Stream 8

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HONOURS SCIENCE PROGRAM 3 (WITH SPECIALIZATION IN CHEMISTRY)

Admission to, and continuance in, Honours Science - Program 3 requires an overall cumulative average of 60%, and a cumulative average of 60% in all Chemistry courses.

In order to graduate with an Honours Science - Program 3 degree, the following requirements must be met:

1) Successful completion of 23.0 credits, including at least 20.0 lecture credits and 14.0 credits in the Faculty of Science;
2) At least 0.5 lab credit and 1.0 lecture credit in each of the following areas of Chemistry: Analytical, Inorganic, Organic, Physical. Wherever possible, the laboratory chosen should accompany the appropriate lecture-course;
3) No more than 5.0 failed credits are allowed;
4) No more than 3.0 SCI credits may be applied to the program;
5) Students must have been enrolled full-time in Year 4, and in either Year 2 or 3. Year 4 of the program must be taken at the University of Waterloo;
6) Mandatory courses as listed below.
Year 1
PHYS 111/112 & 111L/112L or PHYS 121/122 & 121L/122L; CHEM 123/124 or 125/126, 123L/124L;
MATH 113A/B, CS 102; 3 Electives (1.5)

Year 2
Students entering Year 2 must take:
1) 3.0 Chemistry lecture credits, at least 2.0 of which must be chosen from: CHEM 212, 220, 221, 254, 255, 264, 265;
2) 1.0 lecture credit chosen from Physics, Biology or Earth Sciences courses;
3) 2 Electives (1.0)
4) CHEM 10.

Year 3
Students entering Year 3 must take:
1) 3.0 Chemistry lecture credits at the 300-level or higher;
2) 1.0 lecture credit chosen from Physics, Biology or Earth Sciences courses;
3) 2 Electives (1.0);
4) CHEM 10.

Year 4
1) 2.0 Chemistry credits at 300-level or higher (at least 1.0 at 400-level)
2) 2.0 lecture credits from Biology, Chemistry, Earth Sciences or Physics
3) 2 Electives (1.0)
4) CHEM 10

MINOR IN CHEMISTRY
In order to graduate with a Minor in Chemistry the following requirements must be met:
1) The following courses must be taken, with a minimum cumulative average of 60% in these courses:
   a) CHEM 123/124 or 125-126, and CHEM 123L/124L;
   b) a minimum of 3.5 lecture credits from 200-level or higher Chemistry courses, of which a minimum of 1.0 lecture credit must be from 300- or 400-level Chemistry courses;
   c) 0.5 lab credits beyond Year 1 appropriate to the lecture credits chosen.

Earth Sciences
The following programs are offered in the Earth Sciences department:

Honours Major Programs

\begin{itemize}
\item Regular:
\item Honours Earth Sciences/Geology Option
\item Honours Earth Sciences/Geography Option
\end{itemize}

Honours Science Program 4 (with a specialization in Earth Sciences)

The first 4 programs provide academic preparation for students intending to pursue careers as professional geologists. Honours Science, with a specialization in Earth Sciences, provides a less intense specialization in Earth Sciences and is intended primarily for those wanting a geological background for careers in other areas, e.g. teaching business management, civic administration, finance, specialized sales, agriculture, etc.

HONOURS MAJOR PROGRAMS
Admission to, and continuance in, all Earth Sciences Honours Major Programs requires an overall cumulative average of 60%, and a cumulative major average of 65%.

In order to graduate in any of the 4 Honours Major Programs, the following requirements must be met:
1) Successful completion of 42 one-term courses (plus additional Year 1 and 2 labs).
2) In Year 1 and 2, science courses must be taken with the lab if an optional lab is available;
3) Failure of more than 1 course in the field of specialization will result in the requirement to withdraw from the program;
4) Mandatory courses as listed under the specific programs.

A breakdown of course-type groupings for each program is provided on the next page:
Upon approval from the Undergraduate Officer, a student may take 6 term courses from (2) above, to allow freedom to take courses in the Faculties of Mathematics, Engineering, or Science.

Honours Earth Sciences/Geography Option

In addition to the requirements for all Honours Major programs listed on page 14:24, Honours Earth Sciences/Geography Option students must meet the following requirements:

1) In addition to the 42 term courses required for credit, 2 field courses must be taken;
2) Students must maintain a 70% average in all Geography courses.

Geography Electives:

In selecting 200-, 300-, and 400-level Geography courses, 5 term courses from 1 or more of the following sequences should be chosen:

Cartography Sequence
GEOG 180, 380, 403, 404
Air Photo-Remote Sensing Sequence
GEOG 275, 375, 470, 471
Resource Management Sequence
GEOG 303, 356, 357, 358, 359, 414, 461

Year 1
EARTH 121/122, CHEM 123/124 and 123L/124L, PHYS 121/122 and 121L/122L, CS 102, MATH 113A/B, 1 Elective.

Year 2
Students entering Year 2 must take:
1) EARTH 221, 231, 232, 235, 236, 238, 260;
2) ENGL 210;
3) 2 electives

Year 3
Students entering Year 3 must take:
1) EARTH 331, 332, 333, 336, 342, 345, 355, 370, 390
2) 4 electives

Year 4
Students entering Year 4 must take:
1) EARTH 427, 490;
2) 7 term courses from: EARTH 421, 432, 433, 434, 435, 436, 437, 438, 439, 440, 456, 460, 470;
3) 2 electives, not from Earth Sciences.

Honours Major Programs - Regular

Honours Earth Sciences/Geology Option

Year 1
EARTH 121/122, CHEM 123/124 and 123L/124L, PHYS 121/122 and 121L/122L, CS 102, MATH 113A/B, 1 Elective.

Year 2
Students entering Year 2 must take:
1) EARTH 221, 231, 232, 235, 236, 238, 260;
2) ENGL 210;
3) 2 electives

Year 3
Students entering Year 3 must take:
1) EARTH 331, 332, 333, 336, 342, 345, 355, 370, 390
2) 4 electives

Year 4
Students entering Year 4 must take:
1) EARTH 427, 490;
2) 7 term courses from: EARTH 421, 432, 433, 434, 435, 436, 437, 438, 439, 440, 456, 460, 470;
3) 2 electives, not from Earth Sciences.
CO-OPERATIVE APPLIED EARTH SCIENCES

For both of the Co-operative Applied Earth Sciences programs offered, a good academic training, as well as considerable practical experience is gained.

Work term reports must be submitted within 3 weeks of the first day of lectures of the following academic term. Normally a work-term report must be prepared during a student’s first work-term. Two satisfactory reports must have been received before the student commences work-term 3B. Four satisfactory reports must have been received by academic term 4A. See Chapter 5 for further information regarding the Co-operative system of study, and page 5.3 for the Co-op chart outlining the normal progression for Co-operative Earth Sciences students.

Transfer to a regular Honours program will be permitted if all requirements of the Co-op program have been met up to the time of the transfer.

Co-operative Applied Earth Sciences/Geology Option

Year 1
EARTH 121/122, CHEM 123/124 and 123L/124L, PHYS 121/122 and 121L/122L, CS 102, MATH 113A/B, 1 elective.

Year 2
2A students must take:
1) EARTH 231, 235, 260;
2) 1 elective

2B students must take:
1) EARTH 221, 232, 236;
2) ENGL 210;
3) 1 elective

Year 3
3A students must take:
1) EARTH 332, 333, 345, 370, 390;
2) 2 electives

3B students must take:
1) EARTH 331, 336, 342, 355;
2) 2 electives

Year 4
Identical to the regular program in Honours Earth Sciences (see page 14:25).

Co-operative Applied Earth Sciences/Geophysics Option

This Co-op program supplements the core Geology courses with courses from Physics and Mathematics. It aims to graduate earth scientists with a good background for geophysical exploration.

Required courses in Mathematics and Physics are:
Math 114 (or Math 111B), Math 115A/B; Math 213A/B; Physics 121/121L, 122/122L; Physics 253/253L.

In addition, 4 half-credit courses from Physics, Mathematics or Computer Science, at the 200 level or higher, must be completed.

Year 1
EARTH 121/122, PHYS 121/122 and 121L/122L, CHEM 123/124 and 123L/124L, CS 102, MATH 115A/B, 114 or 111B.

Year 2
2A students must take:
1) EARTH 231, 235, 260;
2) MATH 213A;
3) ENGL 210;
4) 1 elective from PHYS, MATH or CS.

2B students must take:
1) EARTH 221, 232, 238;
2) MATH 213B;
3) PHYS 253/253L;

Year 3
3A students must take:
1) EARTH 332, 333, 360A or 460 (given alternate years), 370, 390;
2) 1 unrestricted elective

3B students must take:
1) EARTH 236, 331, 355;
2) 3 electives from PHYS, MATH or CS

Year 4
Students entering Year 4 must take:
1) EARTH 360A or 460 (given alternate years), 427, 461, 490;
2) 3 electives from PHYS, MATH or CS.
3) an additional 5 EARTH term courses from 300- or 400 level courses.

HONOURS SCIENCE Program 4 (WITH SPECIALIZATION IN EARTH SCIENCES)

Admission to, and continuance in, Honours Science - Program 4 requires an overall cumulative average of 60%, and a cumulative average of 65% in all Earth Sciences courses.

In order to graduate in the Honours Science program, with a specialization in Earth Sciences, the following requirements must be met:

1) Successful completion of 42 one-term courses.
   a) 20 must be EARTH courses;
   b) 8 must be other Science courses (excluding SCI courses);
   c) 3 must be from Computer Science and Mathematics;
   d) 3 must be from Arts
   e) 8 are unrestricted electives.
2) Failure of more than 1 course in the field of specialization will result in the requirement to withdraw from the program.
3) No more than 3.0 SCI credits may be applied to the program;
4) Students must have been enrolled full-time in 2 out of 3 years, one of which must be either Year 2 or 3, and the other must be Year 4. Year 4 of the program must be taken at the University of Waterloo.
5) Mandatory courses as listed below.

Year 1
Students entering Year 1 must take a total of 10 term courses, which must include:
1) EARTH 121/122;
2) CHEM 123/124 and 123U/124L;
3) PHYS 111/112 and 111L/112L, or two 100- or 200-level BIOL term courses;
4) MATH 113A/B;
5) CS 102

Year 2
Students entering Year 2 must take a total of 10 term courses, which must include:
1) EARTH 221, 231, 232, 235, 236, 238;
2) ENGL 210;
3) 2 other Science term courses

Year 3
Students entering Year 3 must take a total of 12 term courses, which must include:
1) 6 or 8 term courses from: EARTH 260, 331, 332, 333, 336, 342, 345, 355, 360A or 360B, 370;
2) 2 other Science term courses;
3) 2 or 1 Arts term courses.

Year 4
Students entering Year 4 must take a total of 10 term courses, which must include:
1) EARTH 427, plus 3 to 5 term courses from EARTH 300- or 400-level courses.

MINOR IN EARTH SCIENCES
In order to graduate with a Minor in Earth Sciences, the following requirements must be met:
1) Successful completion of 5.0 credits in Earth Sciences, with a cumulative average of 65% in all EARTH courses.
2) The required credits must include:
   a) EARTH 121/122 in Year 1;
   b) 2.0 credits from: EARTH 221, 231, 232, 235, 236, 238 in Year 2;
   c) 1.5 or 1.0 credits from: EARTH 331, 332, 333, 336, 342, 345, 355, 360A, 368, 369, 370 in Year 3;
   d) 0.5 or 1.0 credits from: EARTH 421, 432, 433, 434, 435, 438, 439, 440, 470 in Year 4.

Science
Earth Sciences
Physics

Physics

The following programs are offered in the Physics department:

Honours Major Programs
   Regular:
   Honours Physics
   Honours Physics (Geophysics Option)
   Co-operative:
   Honours Co-op Applied Physics
   Honours Co-op Applied Physics (Geophysics Option)

Honours Science Program 5 (with a specialization in Physics)

Minor in Physics

HONOURS MAJOR PROGRAMS - REGULAR

Honours Physics
The Honours program is in the form of a core of required courses, plus appropriate electives. By careful selection of electives, students can deepen their knowledge of experimental or theoretical physics, or obtain a background in another subject (e.g. Astronomy, Geophysics, Chemistry, Mathematics, Computing, Business Administration). Examples of possible elective programs are available in the office of the undergraduate advisors.

Admission to, and continuance in, Honours Physics requires an overall cumulative average of 60% and a 60% Physics average each year.

In order to graduate with an Honours Physics degree, the following requirements must be met:
1) Successful completion of 19.0 lecture credits plus 2.0 physics lab credits.
2) Mandatory courses as listed below.

Students entering Year 1 must take:
   Fall:
   1) PHYS 121/121L
   2) MATH 115A or 113A
   3) MATH 111A or 134A
   4) Electives (1.0)
   Winter:
   1) PHYS 122/122L
   2) MATH 115B or 113B
   3) MATH 111B or 134B
   4) Electives (1.0)
Year 2
Students entering Year 2 must take:
Fall:
1) PHYS 10, 254, 256/258L
2) MATH 213A, 216
3) 1 Elective (0.5)
Winter:
1) PHYS 10, 253/253L, 263
2) MATH 213B
3) 2 Electives (1.0)

Year 3
Students entering Year 3 must take:
Fall:
1) PHYS 10, 354, 358, 360A, 364
2) 1 Elective (0.5)
3) 1 Elective lab (0.25)
Winter:
1) PHYS 10, 359, 360B, 363, 365
2) 1 Elective (0.5)
3) 1 Elective lab (0.25)

Year 4
Students entering Year 4 must take a total of 5.0 credits, which must include the following:
1) PHYS 10, 434, 441, 455, 433 or 437A, plus an additional PHYS elective. PHYS 454 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 Physics (Geophysics Option)
In order to graduate with an Honours Physics (Geophysics Option) degree, the academic requirements listed on page 14:29 under Honours Co-op Applied Physics (Geophysics Option) must be met.

Elective Programs
The "Core plus elective" structure of the Honours Physics program allows a great many combinations of courses to be taken. Commonly taken combinations of courses which emphasize various aspects of physics such as experimental physics, theoretical physics, biophysics, astrophysics, as well as physics in combination with such studies as Business Administration, Computing, Electrical Engineering, are kept on file in the office of the undergraduate advisor. Students may obtain a copy on request. All such programs are subject to timetable restrictions.

Science
Physics

HONOURS MAJOR PROGRAMS — CO-OPERATIVE
Applied Physics is an Honours program in the form of a core of required courses plus appropriate electives. The electives available in the second, third, and fourth years allow students to strengthen complementary areas of interest whether in some specific field in physics or in some other subject area.

Through the Co-operative part of the program, Applied Physics students have the opportunity of exposure to practical research and development situations in Government and industry. Work opportunities, which are available on a competitive basis, are co-ordinated to complement the student's course work and interest where possible. Many work-term experiences, especially in the upper years, provide the student with a deeper insight into the meaning and methods of research as well as an incentive to develop course work. Such experience provides a contribution to the development of a scientist which cannot be learned in lecture courses, and helps prepare an individual to apply a fundamental physics background to the solution of practical problems.

Further information about the Co-operative work terms and the Co-ordination Department can be found in Chapter 5.

Options
There are 2 main options in the Co-op Physics program. The first option is Honours Co-op Applied Physics with emphasis on such topics as Solid State, Biophysics, Chemistry and Physics, Physics with Computing, Physics with Business Administration, Physics with Electrical Engineering, etc. All are based on the common core of courses as outlined below. Typical examples of several combinations of courses, which supplement the core, are kept on file in the office of the undergraduate advisor, from whom copies are available. The second option is in Geophysics. It is offered as a combination of Physics and Earth Science courses with work terms following the scheme of the Co-op Earth Science program, and is detailed separately below.

Honours Co-op Applied Physics
Admission to, and continuance in, Honours Co-op Applied Physics requires an overall cumulative average of 60% and a 60% Physics average in Year 1 and in each subsequent term; in order to graduate with an Honours Co-op Applied Physics degree, the following requirements must be met:
1) Successful completion of 19.0 lecture credits plus 2.0 physics lab credits.
2) Mandatory courses as listed below.
Year 1
Students entering Year 1 must take:
1A Fall:
1) PHYS 121/121L
2) MATH 115A, 111A or 134A
3) Electives (1.0)
1R Winter or Spring:
1) PHYS 122/122L
2) MATH 115B, 111B or 134B
3) Electives (1.0)

Year 2
Students entering Year 2 must take:
2A (Fall):
1) MATH 213A or 230A
2) MATH 216 or AM 260
3) PHYS 10, 254, 256/256L
4) 1 Elective (0.5)
2B (Spring):
1) MATH 213B or 230B
2) PHYS 10, 253/253L, 263
3) 2 electives (1.0)

Year 3
Students entering Year 3 must take:
3A (Spring):
1) PHYS 10, 354, 356, 360A, 364
2) 1 Elective (0.5), and 1 Elective lab (0.25)
3B (Winter):
1) PHYS 350, 360B, 363, 365
2) 1 Elective (0.5), and 1 Elective lab (0.25)

Year 4
Students entering Year 4 must take a total of 5.0 credits, which must include the following:
4A & B (Fall & Winter):
1) PHYS 10, 434, 441, 455
2) 1 of PHYS 433 or 437A is recommended.
PHYS 454 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)
Admission to, and continuance in, Honours Co-op Applied Physics (Geophysics Option) requires an overall cumulative average of 60% and a 60% Physics average in Year 1 and in each subsequent term.
In order to graduate with an Honours Co-op Applied Physics (Geophysics Option) degree, the following requirements must be met:
1) Successful completion of 20.5 lecture credits, plus 2.0 physics lab credits.
2) Mandatory courses as listed below.

Science
Physics

Year 1
Students entering Year 1 must take:
1A (Fall):
1) PHYS 121/121L
2) CHEM 123/123L
3) EARTH 121
4) MATH 114, 115A
1R (Winter or Spring):
1) PHYS 122/122L
2) CHEM 124/124L
3) EARTH 122
4) CS 102
5) MATH 115B

Year 2
Students entering Year 2 must take:
2A (Fall):
1) PHYS 10, 254, 256/256L
2) MATH 213A, 216
3) EARTH 231, 260
2B (Spring):
1) PHYS 10, 253/253L, 263
2) MATH 213B
3) EARTH 232, 238

Year 3
Students entering Year 3 must take:
3A (Winter):
1) PHYS 10, 259/259L, 363, 365, 360B
2) EARTH 369, 370
3B (Fall):
1) PHYS 10, 354, 358, 364
2) EARTH 235, 368

Year 4
Students entering Year 4 must take:
4A & B (Fall & Winter):
1) PHYS 10, 352/352L*, 353/353L*, 441, 433, 443, 455
2) EARTH 460, 461
*PHYS 352/352L, 353/353L may be replaced by PHYS 464, 465

HONOURS SCIENCE PROGRAM 5 (WITH A SPECIALIZATION IN PHYSICS)
Admission to, and continuance in, Honours Science - Program 5 requires an overall cumulative average of 60%, and a Physics average of 60%.
In order to graduate in the Honours Science program, with a specialization in Physics, the following requirements must be met:
1) Successful completion of 22.0 credits. Of the 22.0 credits that are required, 14.0 must be Faculty of Science credits;
2) No more than 5.0 failed credits will be allowed;
3) No more than 3.0 SCI credits may be applied to the program;
4) Students must have been enrolled full-time in 2 out of 3 years, one of which must be either Year 2 or 3, and the other must be Year 4. Year 4 of the program must be taken at the University of Waterloo:
5) Mandatory courses as listed below.

Year 1
Students entering Year 1 must take:
Fall:
1) PHYS 121/121L
2) MATH 115A or 113A
3) MATH 111A or 134A
4) Electives (1.0)
Winter:
1) PHYS 122/122L
2) MATH 115B or 113B
3) MATH 111B or 134B
4) Electives (1.0)

Year 2
Students entering Year 2 must take:
1) PHYS 253/253L, 254, 256/256L, 263
2) MATH 213A/B, 216, or equivalent

Years 3 & 4
Students in Years 3 & 4 must take:
1) At least 2.5 lecture credits of Honours Physics core courses at the 300- or 400-level and an additional 3.5 lecture credits of Physics courses at the 300- or 400-level, of which PHYS 354 and 455 must be included.

Note:
PHYS 433 may be used in lieu of a Physics lecture credit, but not as a core lecture credit.

MINOR IN PHYSICS
In order to obtain a Minor in Physics, the following requirements must be met:
1) Successful completion of 4.5 lecture credits and 1.0 lab credit, with a minimum average of 60% in all Physics courses attempted:
2) Lecture credits must include: PHYS 121/122, 253, 226/246 or 256, 324/325 or 263/354;
3) Lab credits must include: PHYS 121L/122L, and 0.5 credits of Year 2 labs.

Honours Psychology
The BSc Psychology program is designed for students intending to pursue graduate studies in the neurosciences or professional training in medicine (specialization in neurology, psychiatry or pediatrics, for example) or even veterinary science. It provides students with a background in natural sciences sufficient to understand the physical, chemical and biological aspects of sensory processes, neural transmission and higher mental functions.

Admission to, and continuance in, Honours Psychology requires a cumulative average of 60% in the Faculty of Science courses and a cumulative average of 75% in the Psychology courses.

In order to graduate with an Honours Psychology degree, the following requirements must be met:
1) Successful completion of 23.0 credits.
2) In Years 2, 3 and 4, a total of 5.0 Science credits, including no more than 2.0 SCI credits.
3) Of the above 5.0 Science credits, at least 2.0 must be at the 300- or 400-level, exclusive of SCI credits.

Year 1
Two 200-level term courses in BIOL; CHEM 123/124; 123L/124L; PHYS 111/112, 111L/112L or PHYS 121/122, 121L/122L; MATH 113A/B; PSYCH 101/102 (one of A-G)

Year 2
Students entering Year 2 must take the following:
1) PSYCH 291 and 292
2) one of: PSYCH 203, 206, 207, 261, 271
3) one of: PSYCH 211, 253, 355, 357
4) 2 PSYCH Electives (1.0)
5) 4 Science Electives (2.0)
6) 2 unspecified Electives (1.0)

Year 3
Students entering Year 3 must take the following:
1) PSYCH 391
2) 2 of: PSYCH 392, 393, 394, 395, 396, 397, 398
3) one of: PSYCH 203, 206, 207, 261, 271
4) one of: PSYCH 211, 253, 355, 357
5) 1 PSYCH Elective (0.5)
6) 4 Science Electives (2.0)
7) 2 unspecified Electives (1.0)

Year 4
Students entering Year 4 must take the following:
1) PSYCH 499A/B (1.0)
2) 2 PSYCH Electives (1.0)
3) 2 Science Electives (1.0)
4) 4 unspecified Electives (2.0)
Optometry Program

The School of Optometry of the Faculty of Science offers a 4-year professional program leading to the degree of Doctor of Optometry. It is the only School of Optometry in Canada offering a program with English as the language of instruction. The immediate purpose of the program is to qualify men and women for the practice of optometry. Graduates are eligible to apply for registration as optometrists in the province of their choice. The program provides students with a background in general science and specialized knowledge in visual science so that they may follow a career in optometric research and teaching if they so desire. A two-year Diploma of Residency program, designed for persons with the O.D. degree who wish to improve and extend their clinical skills is available. Graduate programs in Physiological Optics leading to the Master of Science degree and the Doctor of Philosophy degree are also available.

‡As with other health care professions, graduates in optometry must hold the certificate of the licensing body of the province in which they choose to practise.

REQUIREMENTS FOR ADMISSION

Citizenship

Applications are accepted from candidates who are Canadian citizens or from legal residents of Canada who have held Permanent Resident status for at least 12 months prior to the registration day of the Fall term. Proof of Permanent Resident status must accompany the application. In special circumstances a limited number of foreign students (1 or 2) may be admitted, i.e. those on student authorization.

Prerequisites

Applicants should satisfy the Admissions Committee that they are well-prepared academically for entry to the School of Optometry. A good background in Science and Mathematics is required and the disciplines of Biology/Zoology, Calculus, Chemistry, Physics and Psychology should be represented. At the University of Waterloo the following program or equivalent is recommended to students planning to apply to the first professional year: BIOL 230/230L, Cell Biology; BIOL 211, Vertebrate Zoology; CHEM 123/123L Chemical Reactions, Equilibria and Kinetics; CHEM 124/124L, Introductory Organic Chemistry; PHYS 121/122, 121L/122L, General Physics; (students without Grade 13 Physics must take PHYS 111/112 and PHYS 111L/112L, MATH 113A/B, Calculus; PSYCH 101, Introductory Psychology. The above mentioned courses represent the minimum requirements for admission to the School of Optometry. The following courses represent a second year program of recommended courses: BIOL 201, Human Anatomy; BIOL 202, Histology, Embryology; BIOL 240, Fundamentals of Microbiology; CHEM 266/266L, Organic Chemistry; CHEM 237/237L, Biochemistry; PHYS 246/246L, Physical Optics; PSYCH 200 or 292, or STAT 202, Statistics. Laboratory courses must be completed where given.

Admission Test

It is recommended but not required, that applicants take the Optometry College Admission Test (OCAT). Details of this test can be obtained from the Psychological Corporation, 7500 Old Oak Boulevard, Cleveland, OH 44130. USA.

The Admissions Committee will also consider applications from superior students who have completed other academic programs. In the event that applications from such students are successful, they may be expected to remedy specific deficiencies either during the summer preceding admission or during the regular professional program.

Selection Factors

All applicants should note that enrolment in the first professional year is limited to 60 and that in 1985 there were approximately 400 applications for those places. Consequently, neither acceptance to nor successful completion of the pre-professional program can guarantee admission to the first professional year. Applicants are selected on a competitive basis considering scholarship, interest, motivation, general qualifications for the profession and recommendations. While admissions of well qualified applicants are made from all the provinces, prospective students are advised that some preferential consideration must be given to Ontario residents. Preferential consideration is also given to applicants completing their pre-professional program at the University of Waterloo, but applicants to Year 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, New Brunswick, Prince Edward Island and Saskatchewan have entered into an agreement with the province of Ontario and the University of Waterloo regarding admission of applicants to the School of Optometry from those provinces. Under the terms of the agreement, the School of Optometry will accept in the first professional year, 7 applicants who are residents of Alberta, 9 applicants who are residents of Manitoba, 3 applicants who are residents of Saskatchewan, 1
resident of New Brunswick and resident every 3 years from P.E.I. In each year arrangements will be made to provide an opportunity for applicants from Alberta, Manitoba and Saskatchewan to be interviewed in their home provinces. Applicants from the 5 provinces must meet the same admission criteria as other applicants. The location of the university where studies have been undertaken is not a criterion in the selection of these applicants. Additional information may be obtained from the Admissions Office of the School of Optometry.

Application Procedures
Students enrolled at the University of Waterloo make application to the Optometry program by completing an application for internal transfer form obtained from the Admissions Office at the School of Optometry. Graduates of the University of Waterloo or persons who were at one time registered at the University of Waterloo in any type of program also apply by completing this form. In the winter term an interview with the admissions committee will be arranged for the student. Students who have completed the pre-professional program at another university must apply through the Ontario Universities Application Centre (OUAC). Such applicants should obtain the appropriate OUAC application form from the Registrar of the University of Waterloo. These forms will not ordinarily be available from the Registrar prior to September 15, 1986. The completed OUAC form should reach the Registrar at Waterloo by the deadline of February 28. After the OUAC form has been processed the applicant will receive a supplementary application package from the Registrar of the University of Waterloo, due in March. This will contain details on required transcripts, letters of reference and the curriculum vitae. The exact due date will be stated in this package. The deadline for receipt of academic transcripts is June 15.

Students granted admission to the first professional year who have taken courses equivalent to those required in the professional program may apply for exemptions from these courses immediately after acceptance into the program. Details on the policy of exemptions may be obtained by writing to the Admissions Office of the School.

Admission to Advanced Standing
Applications are not ordinarily accepted to a year more advanced than the first professional year. However, graduates from certain Commonwealth Universities who are licensed to practise optometry in their country of origin may in certain instances be admitted to a more advanced level in a program leading to the O.U. degree. For more information write: The Admissions Office, School of Optometry.

Science
Optometry

Note
Interviews with the Admissions Officer of the School are required in the case of applicants in certain categories before any application can be processed. These categories include:

1. Applicants with undergraduate or graduate training who have not completed prerequisites for the pre-professional program and who are considering a "make-up" year.
2. Applicants considering a "make-up" year to repeat courses for the purpose of raising grades.
3. Applicants who are engaged at present in another vocation such as teaching, engineering, research, etc., and who may find it necessary to terminate employment before the admission decision had been made.

Appointments for interviews can be made by phone or letter to the Admissions Officer of the School of Optometry.

Academic Course Requirements
In the Optometry program an overall 60% average as well as a 60% average in the courses of the major subject must be obtained each academic year. In the Optometry program a student who fails to demonstrate clinical competence as evidenced by a failing grade in a clinical course will not be allowed to continue in the program.

Year 1
Students entering Year 1 must take the following:

Fall term:
1) OPTOM 100, 104, 105, 106, 109;
2) BIOL 301A.

Winter term:
1) OPTOM 111, 114, 115, 116;
2) BIOL 301B.

Year 2
Students entering Year 2 must take the following:

Fall term:
1) OPTOM 241, 242, 244, 245, 246, 261.

Winter term:
1) OPTOM 251, 252, 254, 255, 274.

Year 3
Students entering Year 3 must take the following:

Fall term:

Winter term:
Year 4
Students entering Year 4 must take the following:

Fall term:
1) OPTOM 440, 442, 448, 449, 468, 480;
2) OPTOM 441 or PSYCH 357*.

Winter term:
1) OPTOM 448, 452, 459, 490, 499 (A-E);
2) OPTOM 451 or 1 elective (0.5)*.

*Students with a particular interest in and an aptitude for research in physiological optics may substitute OPTOM 441/451 for PSYCH 357 and the winter term elective. A student is required to complete one or the other of these alternatives. STAT 202 or equivalent is recommended for OPTOM 441/451.
Interdisciplinary Options

Students in many General or Honours programs may select a specified group of courses from a number of disciplines to form a specified group of courses from a number of disciplines to form an Interdisciplinary Option or Minor which will be designated on the diploma. Interdisciplinary Options or Minors are composed of courses selected from different disciplines which have a common focus on a particular theme or area of study.

For example, a student enrolled in Honours French might select courses in the Canadian Studies Option, or a student in Honours Biology might wish to take the Gerontology Minor.

Students should note that, in most cases, courses for an Option would be selected after Year 1. The 11 Interdisciplinary Options now available are described below:

- Canadian Studies
- Gerontology
- Iberoamerican Studies
- Legal Studies
- Management Studies
- Middle East Studies
- Peace and Conflict Studies
- Personnel and Administrative Studies
- Society, Technology and Values
- Studies in Personality and Religion
- Women’s Studies
Canadian Studies

(Participating Faculty members are listed in Chapter 16.)

The Option in Canadian Studies

The Canadian Studies Option allows students to gain a broad insight into the nature of Canadian culture and society in 3 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 Program Centre at St. Paul's United College.

The General and Honours Option in Canadian Studies

Students in Anthropology, Economics, English, French, Geography, History, Man Environment Studies, 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 1

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 and CDN ST 101 in the first year. Otherwise, students should proceed with the usual first year program set out by their Faculty.

Once students have declared their home discipline among 1 of the 10 listed above, then they can also choose the option in Canadian Studies. Those taking a 3-year General degree can select 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 complete the fourth year.

Year 2

CDN ST 201/202 given at the Canadian Studies Program Centre at St. Paul's College.

2 term courses in the home discipline chosen from courses dealing specifically with Canada.

2 term courses chosen from outside the home discipline. These courses deal specifically with Canada and are to be selected from the list of approved courses which follows.

The equivalent of 4 term courses chosen to meet the Honours requirement in the home discipline.

Interdisciplinary Options

Canadian Studies

Year 3

CDN ST 301/302 given at the Canadian Studies Program Centre at St. Paul's College.

2 term courses in the home discipline chosen from courses dealing specifically with Canada.

2 term courses chosen from outside the home discipline. These courses deal specifically with Canada and are to be selected from the list of approved courses which follows.

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 4

CDN ST 400A/B offered at the Canadian Studies Program Centre at St. Paul's College.

2 term courses chosen from outside the home discipline. These courses deal specifically with Canada and are to be selected from the list of approved courses which follows.

The equivalent of 4 term courses chosen to meet the Honours requirement in the home discipline.

Double Honours and Canadian Studies

It is possible to take a Joint Honours program and also take the Canadian Studies Option. In this case, students take 2 term 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.

The Minor in Canadian Studies

Honours students may Minor in Canadian Studies regardless of their faculty or department. To do so, they must put together a package equivalent of 10 term courses. Students take the CDN ST core courses 201/202 and 301/302. They also take the equivalent of 6 term courses from the approved list of courses which follows.
### 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 230**: Indians of Canada
- **ANTH 233**: Inuit & Eskimo Cultures
- **ANTH 241**: The Contemporary Canadian Indian Scene
- **ANTH 322**: Prehistoric Man in the Great Lakes Area
- **ANTH 377**: Early Man in the New World
- **ANTH 499**: Honours Essay

#### Economics
- **ECON 101**: Introduction to Micro-economics
- **ECON 102**: Introduction to Macro-economics
- **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 364**: Contemporary Canadian Problems

#### English
- **ENGL 205R**: The Canadian Short Story
- **ENGL 214**: Themes in Canadian Literature
- **ENGL 215**: Canadian Regional Literature
- **ENGL 313**: Canadian Literature to 1920
- **ENGL 314**: Canadian Poetry Since 1920
- **ENGL 315**: Canadian Prose Since 1920
- **ENGL 316**: Canadian Drama
- **ENGL 415**: Major Canadian Writers
- **ENGL 405A/B**: Senior Honours Essay Canadian Literature Option

#### Environmental Studies
- **ENVS 195**: Introduction to Environmental Studies
- **ENVS 201**: Introduction to Environmental and Planning Law
- **ENVS 401**: Environmental Law
- **ENVS 402**: Planning Law
- **ENVS 417**: Land Use History and Landscape Change 1
- **ENVS 418**: Land Use History and Landscape Change 2
- **ENVS 433**: People in Natural Areas

#### Interdisciplinary Options

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<td>HIST 322</td>
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</table>
HIST 325  History of Canadian Indians to 1870's
HIST 360  Ontario History to Confederation
HIST 387  Ontario History Since Confederation
HIST 403X Senior Seminar: Canadian History

Man-Environment Studies
M ENV 218  Introduction to Canadian Energy Issues
M ENV 241  Introduction to Environmental and Social Impact Assessment
M ENV 318  Soft Energy Paths in Canada
M ENV 337  Environmental Impact Assessment
M ENV 385  Technology/Lifestyles for a Conserving Society

Political Science
P SCI 102C Politics in Action
P SCI 102H Citizen Participation in Canada
P SCI 102M Contemporary Issues in Canadian Public Policy
P SCI 260A Canadian Government and Politics 1/2
P SCI 260B Canadian Government and Politics 1/2
P SCI 291 The Canadian Legal Process
P SCI 292 Issues in Canadian Criminal Law
P SCI 331 Public Administration 1
P SCI 332 Public Administration 2
P SCI 333 Administrative Law
P SCI 342 Politics in Quebec
P SCI 343 Canadian Municipal Government
P SCI 344 The Politics of Local Government
P SCI 351 Comparative Federal Systems
P SCI 352 Comparative Legislative Systems
P SCI 363 Canadian Constitutional Law
P SCI 429 The State and Economic Life
P SCI 431 Canadian Public Policy
P SCI 435 The Politics of Canadian Resource Development
P SCI 442 Politics in Ontario
P SCI 461 Problems in Canadian Politics 1
P SCI 462 Problems in Canadian Politics 2
P SCI 473 Voting Behaviour
P SCI 475 Political Socialization
P SCI 476 Research Seminar in Political Behaviour
P SCI 486 Middle Powers and World Politics

Sociology
SOC 101 Introduction to Sociology
SOC 102 Social Problems
SOC 103 Canadian Society
SOC 120R Fundamentals of Sociology
SOC 200 Marriage and the Family
SOC 206 Sex Roles
SOC 209 Family Origin & Personal Identity
SOC 214 Social Inequality
SOC 223 Deviance: Perspectives and Processes
SOC 224 Law and Order
SOC 227 Crime and Society
SOC 242 Industrial Sociology

Interdisciplinary Options
Canadian Studies

SOC 248 Health, Illness and Society
SOC 252 Migration and Society
SOC 253 Population in Canadian Society
SOC 256 Ethnic and Racial Relations
SOC 267 Sociology of the Contemporary University
SOC 342 Sociology of Industrial Relations
SOC 343 Sociology of Health Care

Urban and Regional Planning
PLAN 156 Introduction to Urban and Regional Planning Concepts
PLAN 222 Canadian Regional Issues
PLAN 231 Citizen Involvement, Planning and Social Change
PLAN 255 Planning Surveys and Analysis
PLAN 330 Urban Social Planning
PLAN 333 The Sociology of Regional Planning
PLAN 344 Principles of Recreation Planning
PLAN 370 Land Development Planning
ENV S 201 Introduction to Environmental and Planning Law
ENV S 401 Environmental Law
ENV S 402 Planning Law
ENV S 417 Land Use History and Landscape Change 1
ENV S 418 Land Use History and Landscape Change 2
PLAN 414 Housing Policies
PLAN 430 Social Policy Planning

Principal Canadian Content Courses Offered by Other Arts Departments

Fine Arts
FINE 219 Canadian Art
FINE 316 Canadian Native Art
FINE 318 Canadian Ethnic and Traditional Arts

Music
MUSIC 280 Canadian Music

Philosophy
PHIL 225 Social and Political Philosophy: Canadian Problems

Psychology
PSYCH 212 Educational Psychology
PSYCH 454 Senior Seminar in Educational Psychology

Religious Studies
RS 264 Religion in the Canadian Experience
RS 265 Unity and Diversity in Canadian Religion
RS 268B Religious Perspectives in Contemporary Canadian Literature
RS 315 Canadian Native Religions
RS 316 Canadian Native Religious Traditions
Interdisciplinary O$tfons
Gerontology

The Area of Gerontology

In recent years there has been an increased interest in the older person and in the aging process. An important reason for this interest is the recent growth in the proportion of older people in the population of many countries, including Canada. A host of concerns has been raised by the changing age structure of the Canadian population, which can be addressed properly only by examining carefully the aging process and the circumstances of the older person — the field of study known as Gerontology.

Gerontology involves a number of disciplines. Biologists investigate, for example, the changes at the molecular, cellular and organismal level that take place over time, with a view to possible modification. Gerontologists trained in fields such as Psychology, Sociology, Health Studies and Environmental Studies focus on other age-related changes in individual and population aging. To illustrate, Psychologists examine the changes with age in psychological functions (perception, thinking, learning) whereas Sociologists are interested in reciprocal relationships between the aging person and society. Similarly, those with a background in Environmental Studies direct their attention to the impact of the environment on aging.

The University of Waterloo Program in Gerontology

The introduction of a multidisciplinary Gerontology program is intended to provide a focus to aging studies at Waterloo. The program of courses offered has two components: a Minor in Gerontology and a Certificate in Gerontology. The latter component may be of particular interest to part-time, mature students. In addition, some graduate studies and research are carried out within the program.

The Minor and the Certificate represent multidisciplinary programs, combining courses from a variety of departments such as Biology, Psychology, Sociology and Statistics. These programs are intended to enhance students' understanding of aging processes and to prepare students for careers in those professions which deal with the care of the elderly or in other relevant professions. The programs provide professional development to those already working in these areas, and raise the awareness of the non-specialist for this important, emerging area of study and concern.

The Minor program is open to students pursuing an Honours degree at the University of Waterloo in any discipline who wish to obtain some specialization in Gerontology.

Interdisciplinary Options
Gerontology

The Certificate program is available to those who would like some training in Gerontology but are not interested in completing all the requirements of an undergraduate degree. It is also available to those who have already completed an undergraduate degree but would like to obtain a better understanding of aging phenomena.

The program of study for the Minor and for the Certificate consists of a selection of 5 required and 5 optional courses.

Academic Requirements for the Minor

1. Students must be in an Honours Program at the University of Waterloo.
2. Successful completion of 5 core courses, including the Multidisciplinary Seminar and, in addition, successful completion of 5 courses selected with the approval of the program committee from the list of optional or core courses.
3. An overall minimum average of 65% in the 10 academic courses.

Core Courses (5 to be completed)

GERON 255/SCI 255 The Biology of Aging
GERON 400 Multidisciplinary Seminar on Aging
GERON 402/MTHEL 402B Epidemiology of Aging
KIN 352/SOC 344 Sociology of Aging
PSYCH 217 Aging and Basic Psychological Processes
PSYCH 218 Aging, Death and Dying
SOC 247 Sociology of Aging

Optional Courses

GERON 401A/B Directed Studies in Special Topics
GERON 403/MTHEL 402A Topics in Mathematical Aspects of the Medical Sciences

ANTH 404 Human Development in a Cross-Cultural Perspective: Human Development, Aging and Death
BIOL 433 Stress Physiology and Aging in Plants
CS 316 Introduction to Statistical Problem Solving by Computer
ECON 353 Population Economics
HLTH 245 Community Health
HLTH 410 Growth, Development and Aging
HLTH 472 Special Topics: Aging, Immunity and Health
ISS 350D Adult Life Crises and Events
OPTOM 449 Community Health Optometry
OPTOM 452B Special Populations
PHIL 203 Philosophical Perspectives on Death
PHIL 226 Ethics and the Life Sciences
Interdisciplinary Options
Iberoamerican Studies

PHYS 480 Radiation Biophysics
PLAN 414/416 Housing Policies
PLAN 420 Health, Environment and Planning
REC 361 Aging and Leisure
RS 271 Personality and Religion
SOC 248 Health, Illness and Society
SOC 343 Sociology of Health Care
SOC WK 367R Social Work with the Elderly

An approved course in Statistics

Further Information
Enquiries are encouraged and additional information can be obtained by writing or calling:
The Director (W.F. Forbes)
The University of Waterloo Program in Gerontology
PAS Building: Room 3010
Ext. 3468

or any members of the Committee
Science: J.C. Carlson, Biology
          B2-252A (ext. 2664)
          N.H. Charness, Psychology
          PAS 4055 (ext. 3313)
          H.S. Coblentz
          ES1-331 (ext. 3909)
          B.D. McPherson, Kinesiology
          RMH 1114 (ext. 3950)
          P. Naas
          St. Jerome's College
          STJ 114 (ext. 6593)

Iberoamerican Studies

Assistant Professor, Acting Co-ordinator of Iberoamerican Studies
B. Thalman, BA (DePauw), MA, PhD (Ohio State)

Members of the Iberoamerican Studies Advisory Committee

Assistant Professors
J.E. Cuenca, LIC (Madrid), MA (Western Michigan), PhD (Toronto)
J.A. Teichman, BA, MA, PhD (Toronto)
B. Thalman, BA (DePauw), MA, PhD (Ohio State)

The Iberoamerican Studies Option is an interdisciplinary program designed for students in any faculty of the University who have an interest in the Spanish- and Portuguese-speaking world, both in Latin America and in the mother countries, Spain and Portugal. The courses listed below are taught by instructors with research in the area or by those whose interests are in or moving towards that direction. The Iberoamerican content may be total or partial depending on the discipline and instructor. All courses are regular 0.5 credit courses and count towards fulfillment of requirements for graduation.

Requirements
Students must complete 10 term courses from those listed below, of which at least 6 term courses must be selected from disciplines other than the student's Honours program. To graduate with the Iberoamerican Studies Option indicated on the diploma, students must have an overall average of 65% in the Iberoamerican Studies Option courses.

Courses

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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tr>
<td>P SCI 102F</td>
<td>Politics in the Third World</td>
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<td>P SCI 350A</td>
<td>Politics of the Developing Areas 1</td>
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<tr>
<td>P SCI 350B</td>
<td>Politics of the Developing Areas 2</td>
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<tr>
<td>P SCI 433</td>
<td>Public Policy and Underdevelopment in the Third World</td>
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<tr>
<td>P SCI 453</td>
<td>Comparative Politics of Latin America 1</td>
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<td>P SCI 454</td>
<td>Comparative Politics II</td>
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<tr>
<td>SPAN 217</td>
<td>Spanish American Civilization 1</td>
</tr>
<tr>
<td>SPAN 218</td>
<td>Spanish American Civilization 2</td>
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<tr>
<td>SPAN 227</td>
<td>Survey of Spanish American Literature 1</td>
</tr>
<tr>
<td>SPAN 228</td>
<td>Survey of Spanish American Literature 2</td>
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</tbody>
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Legal Studies

The Legal Studies Committee

Associate Professor, Committee Chairman and Undergraduate Advisor
M.F. McDonald, BA, (Toronto), MA, PhD (Pittsburgh)

Professors
D.W. Hoffman, BSA, MSA (Toronto), PhD (Waterloo), PAG, MCIP
D.C. Mackenzie, BA, MA, PhD (Princeton)

Associate Professors
C.G. Brunk, BA (Wheaton), MA, PhD (Northwestern)
D. Estrin, CR, BA (Western Ontario), MA, PhD (St. Louis) J

Assistant Professors
R.P. Wuustenvroft, BA, PhD (Alberta)

Lecturer
S.P. Gunz, BA, LLB (Sydney), MBA (Manchester)

Legal Studies is an Interdisciplinary Option that focuses on law primarily from a multidisciplinary perspective. Given the centrality of law to most human institutions and values, a great deal of attention has been paid to law by scholars working in a wide variety of disciplines including Accounting, Actuarial Sciences, History, Philosophy, Political Science, Sociology, Economics, and Environmental Studies. Students are invited to join in these scholarly investigations. The liberal arts orientation of this program emphasizes the student’s development of broadly based critical and creative intellectual skills, clarity and facility in the communication of ideas, and humane values in this examination of law as a major feature of social life. In this regard it should be noted that Legal Studies is not intended as either a necessary or a sufficient preparation for law school.

Requirements

The courses in this option are divided into 3 sections. The first consists of broadly based courses in accounting, actuarial sciences, accounting, actuarial sciences, history, philosophy, political science, sociology, economics, and environmental studies. Students are invited to join in these scholarly investigations. The liberal arts orientation of this program emphasizes the student’s development of broadly based critical and creative intellectual skills, clarity and facility in the communication of ideas, and humane values in this examination of law as a major feature of social life. In this regard it should be noted that Legal Studies is not intended as either a necessary or a sufficient preparation for law school.

Interdisciplinary Options
Legal Studies

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 2 term courses from courses in this section that fit their General or Honours program. Students are strongly urged to 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 program. Students must complete 4 year-course equivalents of designated Legal Studies courses from the appropriate sections. An overall average of 65% in these courses is necessary to graduate with the Legal Studies Option.

Courses

Section 1

Students are required to complete successfully all of the following courses:

- HIST 210 History of Law, 0.5
- PHIL 327A Philosophy of Law Part 1, 0.5
- PSCI 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. Students in the Faculty of Environmental Studies must take ENV S 201, 401, and 402 plus one other course in Section 2.

- ACC 231 Business Law, 0.5
- ACTSC 458 Insurance Law, 0.5
- FNV S 201 Introduction to Environmental & Planning Law, 0.5
- ENV S 401 Environmental Law, 0.5
- ENV S 402 Planning Law, 0.5
- HIST 102M Law and Society in the Middle Ages: 500-1400, 0.5
- HIST 329 The History of Anglo-American Law, 0.5
- ISS 350E Family Law and Social Work, 0.5
- PHIL 327B Philosophy of Law - Part 2, 0.5
- PSCI 291 The Canadian Legal Process, 0.5
- PSCI 333 Administrative Law (in 1980/81 offered as PSCI 392), 0.5
- PSCI 363 Canadian Constitutional Law (in 1980/81 offered as PSCI 392), 0.5
- SOC 224 Law and Order: Regulating Deviance, 0.5
- SOC 227 Crime and Society, 0.5
- SOC 228 Corrections, 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:

ACC 461 Taxation 1, 0.5
ACC 462 Taxation 2, 0.5
HIST 211 British History to 1603, 0.5
HIST 212 British History Since 1603, 0.5
PACS 202 Peace & Conflict Studies 2, 0.5
PHIL 215 Professional Ethics, 0.5
PHIL 226 Ethics & 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 & Politics, 0.5
SOC 222 Juvenile Delinquency, 0.5
SOC 223 Deviance: Perspectives & Processes, 0.5
SOC 329 Crime as Business, 0.5
Total credits in Section 3: 1.0.

Management Studies

Management Studies is a Minor program that can be taken in conjunction with many existing Honours Majors. The course is designed to provide a vehicle which allows a student who has pursued an Honours Major in a theoretical or specialized academic discipline, to focus such a background by completing a series of courses in those academic disciplines which provide the theoretical background for much of current management practice.

Management and management decision making have become much more complex in the past 2 decades with decisions needing to be based more on research and knowledge rather than intuition and experience. In order to gain maximum advantage of courses in the Management Studies program, it is necessary for students to have skills in algebra and calculus.

Management Studies provides a background which would be useful in many entry level management jobs, and offers a basis for further education in management.

Management studies should be of particular interest to students who see their future in tasks involving problem solving, the design of systems, or operations analysis.

Required Courses
1. All of the courses listed below:
   ECON 101
   M SCI 211 or PSYCH 333
   ACC 121 and 131
   CS course compatible with Major program
   BUS 352 (WLU)
   ENGL 210 or SCI 209
   STAT 210, or a Statistics course as required for Major

2. Three of the courses listed below, but only one in each category.

   Categories Courses
   Accounting ACC 122
   Economics ECON 102
   Management ACC 132
   Computers An additional CS course
   Organizational Behaviour M SCI 311 or PSYCH 339
   Decision Making PHIL 216 or M SCI 452
   Personnel PAS 200
   Psychology PSYCH 253, 254
   Sociology SOC 242, 243, 310, 336, 340, 342

Only two courses in the Major field may be counted for the Minor. This does not include Statistics.

More information on this program is available from the Course Director, E.S. Lucy, at ext. 4551.

Middle East Studies

Director of Middle East Studies
Daniel J. Sahas, BA (Athens), STM (Indianapolis), PhD (Hartford)

(Participating Faculty members are listed in Chapter 16).

The Middle East has played a vital role in the history of the world for millennia. Its past and present civilizations, languages, religions, cultures and scientific accomplishments have penetrated and become integral parts of Western civilization and culture. The Middle East continues to be a significant factor in world events today. For these reasons, the study of the Middle East remains an important and valuable academic activity.

The University of Waterloo and Wilfrid Laurier University have co-operated in the creation of this Middle East Studies Option. It provides, in an organized way, a listing of all courses with Middle East content in both Universities; however, if a course at one institution is substantially the same as that at the other, credit will only be allowed for one of the two courses.

Students will normally enter the program in their second year, although appropriate courses taken during year one can be applied to the Middle East Studies Option. Before preregistration each Spring, students should consult with the Director in their University and with the Department involved to determine which courses will be available during the coming year.
Requirements

1. This option may be taken in combination with any general or honors program.

2. Eight term courses are required for this option. They are to be distributed as follows:
   a) Middle East Studies 200
   b) Middle East Studies 301
   c) Middle East Studies 302
   d) At least 3 term course equivalents from the CORE LIST described below
   e) At least 2 term course equivalents from the APPROVED LIST described below.

   Other courses, which are not listed below, may be acceptable under special circumstances. Students should consult with the Middle East Studies Director before preregistering to check whether a particular unlisted course is acceptable in the Middle East Studies Option.

3. To meet the graduation requirements a student must maintain a minimum of 65% (UW) or GPA5 (WLU) average overall in the Option.

Required Middle East Studies Courses

MES 200 Introduction to Middle East Studies
MES 301 Seminar in Middle East Studies
MES 302 Directed Studies in the Middle East

Core List of Middle East Studies Courses

University of Waterloo
HIST 226 The Middle East Conflict
HIST 237 Ancient Civilization I
P SCI 488 The Arab-Israeli Conflict
R S 100B Religions of the West
R S 100E Biblical Studies I
R S 450A Study Term Abroad (1986-87, in Israel)

Wilfrid Laurier University
R&C 107 Roots of Western Religions I
R&C 108 Roots of Western Religions, II
R&C 200 Introduction to the Bible: Old Testament
R&C 202 Archaeological Field Seminar
R&C 300 History and Culture of Ancient Mesopotamia
R&C 309 History and Culture of Ancient Egypt and Asia Minor

Approved List of Middle East Studies Courses

University of Waterloo
C CIV 101 Colossus - the Major Figures of Ancient Greece
C CIV 201 Ancient Greek Society
C CIV 202 Ancient Roman Society
C CIV 251 Greek History
C CIV 252 Roman History
C CIV 292 Social Problems in Antiquity

Interdisciplinary Options

Middle East Studies

C CIV 301 Ancient Myth and Religion I
C CIV 302 Ancient Myth and Religion II
ENGL 202A The Bible and Literature 1
ENGL 202B The Bible and Literature 2
FINE 110 Introduction to World Art I
FINE 218 Western Religious Art
GRK 372 Herodotus
HIST 210X History of Law
R S 100F Biblical Studies II
R S 203 Wisdom Literature in the Old Testament
R S 205 The Hebrew Prophets
R S 206 Modern Study of Jesus
R S 208 Parables of Jesus
R S 209 The Apostle Paul: Life and Letters
R S 216 Islam
R S 217 Judaism
R S 310 The Sacred Book of Islam
R S 318 Islam and Christianity
R S 334 Islamic Theology, Philosophy and Mysticism

Wilfrid Laurier University
ARCH 203 Archaeology of the Ancient Near East
ARCH 302 Archaeology of the Holy Land
ARCH 310 Archaeology of the Early Christian Era
CLASS 101 The Greek World
CLASS 102 Roman Civilization
CLASS 205 Greek & Roman Mythology
CLASS 214 Greek Art and Archaeology
CLASS 215 Roman Art and Archaeology
CLASS 218 Women in Greece and Rome
CLASS 225 History of Ancient Greece
CLASS 226 History of Ancient Rome
CLASS 255 Greek & Roman Mythology
CLASS 327 Hellenistic Art and Architecture
CLASS 331 The Art and Architecture of Imperial Rome
FINE 230 Christian Images in Art History
R&C 201 Introduction to the Bible: New Testament
R&C 207 Jesus of Nazareth
R&C 213 The Religious Heritage of Islam
R&C 219 Varieties of Early Christianity
R&C 300 Christianity in the Graeco-Roman World
R&C 301 Life and Letters of Paul
R&C 305 Judaism in the Graeco-Roman Period
R&C 307 Parables of Jesus
R&C 343 Hebrew Prophetic Movement
R&C 344 Apocalypticism: Memories of the Future
R&C 345 The Search for Selfhood in the Psalms
R&C 346 Religion and the Crises of Daily Life: Wisdom Literature of the Old Testament
Middle East Content Courses

Note: The following courses have some Middle East content; however, they may NOT, at present, fulfill the requirements of the Middle East Studies Option. They are listed here as an additional resource for students interested in the Middle East.

University of Waterloo
ANTH 221 Prehistoric Archaeology: Old World II
ANTH 321 Recent Prehistory in the Old World
C CIV 371 Christianity and the Roman Empire I
GRK 100A Introductory Ancient Greek I
GRK 231 Intermediate Greek I: The World of Heroes
R S 106A New Testament Greek I
R S 106B New Testament Greek II
R S 261 Women and the Great Religions
R S 305A/B Intermediate New Testament Greek

Wilfrid Laurier University
R&C 140 Elementary Biblical Hebrew
R&C 206 Intermediate Biblical Hebrew
R&C 456 Introductory Aramaic
SPAN 203/253 Spanish Civilization I

Peace and Conflict Studies

(Participating Faculty members are listed in Chapter 16.)

Peace and Conflict Studies (PACS) is an interdisciplinary program of study which may be chosen by students in conjunction with a major in some other department. It provides a course of study for those who have a special interest in the causes and conditions of international, intergroup, or interpersonal conflict, and in approaches to conflict resolution or management. The PACS Option is especially appropriate for those considering careers in conflict resolution occupations (e.g., social work, community development, public administration, law and corrections, education, or politics). The program is administered by Conrad Grebel College in cooperation 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 3 different Options open to students participating in the PACS program: 1) General Program, 2) Honours, and 3) Minor. Successful completion of either of the first 2 permits the student to add the subtitle (Peace and Conflict Studies) to the name of the degree earned.

All students in the PACS program will take the PACS Core Courses (described fully in Chapter 16) as well as a specified number of “PACS Content Courses” (listed below) offered by their own and other departments. In every case students must fulfill all the requirements for the major in their own department.

1. The General Arts Degree (Peace and Conflict Studies)

In addition to fulfilling the requirements for the major (normally including at least 10 term courses in the major field), the general arts student must meet the following PACS requirements:

a) PACS 201, 202, 301, and 302.

b) 6 term courses chosen from the PACS Content Courses offered by either the department in which the student majors, or any other departments (see below).

The General Arts degree Option in Peace and Conflict Studies is available to those majoring in any department in the Faculty of Arts, including non-participating Departments.

2. Honours Program (Peace and Conflict Studies)

Students may choose straight or joint honours in any of the participating departments. Students are granted, upon completion of a 44 term-course program (46 term courses if joint honours), an Honours BA or BES in their subject areas with the subtitle Peace and Conflict Studies.

In addition to fulfilling the degree requirements in the Major Department, students must meet the following PACS requirements in their 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) 6 term courses chosen from among the PACS Content Courses offered by the student’s department (8 term courses if joint honours). These courses may also be used to meet the department’s honours requirements if approved as such by the department.

c) 3 term courses chosen from among the PACS Content Courses offered in any department. (Students should use their first year to take lower-level prerequisites for PACS Content Courses in those departments where they have special interests.)
3. Honours Minor in Peace and Conflict Studies
A Minor in PACS is available to students pursuing an Honours degree in any faculty (including non-Arts faculties). The Minor consists of 10 term courses chosen from among the courses approved for PACS credit in any department, and must include PACS 201, 202, 301, and 302.

Peace and Conflict Studies Content
Courses Offered by Participating Departments

The following PACS-related courses are offered by the participating departments under their own designations. Many of the 300- and 400-level courses have specific prerequisites. Students planning to pursue study in these upper level courses should use their electives wisely to ensure that the prerequisites for these courses are met. Additions or deletions may occur from time to time. Please consult the PACS undergraduate officer for more information. Full course descriptions are found in Chapter 16.

History
HIST 102C The Origins of Wars in the 20th Century
HIST 102D From Nationalism to Totalitarianism
HIST 102E Canada and War in the 20th Century
HIST 102K Conflict in the Caribbean and Central America
HIST 208 The Cold War: American-Russian Relations Since November, 1917
HIST 217 Irish History: The Nineteenth and Twentieth Century
HIST 225 History of Modern Revolutions
HIST 226 The Middle East Conflict
HIST 230 Church and State in Modern Latin America
HIST 232 Revolutions in Latin America
HIST 245 Ethnic and Cultural Minorities in Canada
HIST 247 Mennonite History
HIST 346 Mennonite History: Canadian Issues
HIST 348 Radical Reformation

Interdisciplinary PACS
PACS 230 The Politics of Nonviolence
PACS 250 The Nuclear Crisis
PACS 271 Introduction to Peace Research 1
PACS 272 Introduction to Peace Research 2
PACS 350 Canada and the Nuclear Crisis
PACS 398/399 Directed Readings in Peace and Conflict Studies

Interdisciplinary Options
Peace and Conflict Studies

Man-Environment Studies
M ENV 231 Environmental Issues in Global Perspective
M ENV 241 Social Change
M ENV 337 Environmental Impact Assessment
M ENV 338 Social Impact Assessment
M ENV 361 Contemporary Media of Communication
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 Conflict, Contract and Choice
PHIL 327A Philosophy of Law 1
PHIL 327B Philosophy of Law 2
PHIL 329 War, Peace, and Justice
PHIL 422 Political Philosophy 1
PHIL 423 Political Philosophy 2

Political Science
P SCI 101A Introduction to Politics
P SCI 102A Imperialism and International Relations
P SCI 102K Mass Political Violence
P SCI 225 Political Theory 1
P SCI 226 Political Theory 2
P SCI 281 International Politics 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
P SCI 479 Violence in the Political Process
P SCI 481 Research Seminar on World Politics
P SCI 483 Power Politics and World Order Studies
P SCI 484 Contemporary Strategies: Theories and Policies
P SCI 486 Middle Powers and World Politics
P SCI 489 Arab-Israeli Conflict

Psychology
PSYCH 254 Interpersonal Relations
PSYCH 316 Moral Development
PSYCH 333 Industrial Psychology
PSYCH 353 Aggression and Social Conflict
PSYCH 354 Interpersonal Processes in Critical Situations

Religious Studies
R S 253 The Bible and Peace
R S 254 War and Peace in Christian Theology
R S 256 Justice, Peace and Development
R S 274 Religious Approaches to Personal Crises
Personnel and Administrative Studies is a Minor program that can be taken in conjunction with many existing Honours Majors. The program is designed to provide a broad interdisciplinary exposure to those academic disciplines which provide the theoretical background for current management practice. The program should be of interest to those students who wish to pursue further education in management, or to those who plan to begin a management or administrative career at the entry level immediately after university.

This Minor program assumes that students will develop, in depth, an interest in a major academic field or course of study and then focus this interest toward their personal career development through pursuing a Personnel and Administrative Studies course. The PAS Minor may be combined with a cooperative program in order to obtain work experience in this field.

The program of study consists of 12 half-course credits that may be completed at any point in the 4 year term, plus a course in statistics. Many honours programs require a statistics course, and these are acceptable.

The courses encompass several central themes. First, analytical techniques are stressed. These "functional" tools have become increasingly important in administrative and business settings. Second, there is a strong emphasis on human resources. This focus is provided by courses in Political Science, Psychology, Management Science and Sociology. The third content area is concerned with the application of economic theory to the administrative role. Finally, there are 2 "core" courses in Personnel Administration. Students are encouraged to enrol in these courses in their second and third years of study. The 2 courses have a practical orientation and provide an integrative perspective on the topic area.

Program

A. Analytical Techniques
   - Computer Science: CS 100 or 102.
   - Statistics: MATH 102 or equivalent course within the student’s Honours program.
   - Accounting: ACC 121.

B. Human Resources
   - Public Administration: PSCI 331, 332
   - Personnel and Industrial Psychology: PSYCH 339, and PSYCH 333 or MSCI 211.
   - Industrial Sociology: SOC 242 or MSCI 311.

C. Economic Factors
   - Microeconomics: ECON 101
   - Management: ACC 131, 132.

D. PAS Core Courses
   - Personnel Administration: PAS 200
   - Issues in Personnel Administration: PAS 300

More information on this program is available from the Course Director, F. S. Lucy, at ext. 4551.

Society, Technology and Values

Rapid development of new technologies in communications, bio-technology, robotics, and so on, has been matched in recent years by burgeoning research and public discussion focusing on the human context of science and technology. Of special concern are the changes to Canadian life that accompany implementation of these new technologies. The STV Option provides an opportunity to explore the wide range of social and personal issues associated with technological advances.

The STV Option consists of six courses. Three of these (STV 100, STV 200, and STV 400) are core courses required of all students enrolled in the Option. The remaining three are chosen from a list of courses which are grouped as "packages" that relate to the STV theme. Normally, students choose their three courses from one package but, with permission of the Program Board, the three courses may be chosen from more than one package. These courses are normally taken after having completed STV 100.
The following are illustrative themes that guide selection of the courses for the various packages:

- Values and Ethics
- Technological Issues in War and Peace
- History of Technology
- Impact Assessment Studies
- Economic and Management Issues
- Technology and Artistic Expression

A sample package in Values and Ethics might include three of the following courses:

- GEN E 351 Information Technology and Society
- GEN E 412 Ethics and the Engineering Profession
- M ENV 380 Technology/Lifestyles for a Conserver Society
- PHIL 205 Science, Technology and Society
- PHIL 215 Professional and Business Ethics
- PHIL 216 Rational Behaviour and Decision Making
- RS 260 Issues in Science, Technology and Religion
- SCI 263 Interactions of Science and Society
- SOC 232 Technology and Social Change

Responsibility for identifying the courses in each package (the courses that address the above-mentioned themes) rests with the Program Board. Selection of the courses is made in consultation with students who enrol in STV 100 and who have registered for the STV Option. This permits ensuring that the selected courses are actually being offered during the terms when they are required and also that the program requirements are responsive to the special needs and backgrounds of individual students.

The STV Option is open to undergraduate students in all Faculties of the University. It is administered by the Centre for Society, Technology and Values.

**Course Requirements**

- Core courses (all 3 are to be completed)
  - STV 100 Society, Technology and Values: An Introduction
  - STV 200 Society, Technology and Values: Projects Course
  - STV 400 Society, Technology and Values: A Senior Project

- Optional courses (3 courses from one of the theme packages, as indicated above)

For additional information, please write or call:
Ann Dunnet, Administrative Assistant
Centre for Society, Technology and Values
Room 301, E.S.1
Extension 6215

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**Interdisciplinary Options**

Society, Technology and Values

Studies in Personality and Religion

---

**Program Board**

L. Haworth (Director of CSTV)
G. Atkinson, Faculty of Science
R. Cohen, Faculty of Mathematics
J. Goyder, Faculty of Arts
R. Legge, St. Paul’s College
S. Lerner, Faculty of Environmental Studies
(Secretary)
S. Smith, Faculty of Human Kinetics and Leisure Studies
B. Wills, Faculty of Engineering

---

**Studies in Personality and Religion (SIPAR)**

**Chairman & Director of the Program**

R.D. Legge, BA (Transylvania), STB (Harvard), PhD (McMaster)

**Members of the SIPAR Advisory Committee**

Professor

H.J. Fallding, BA, BSc, MA (Sydney), PhD (Australian National), FRCS

Associate Professors

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J.M. Cornell, BA, MS, PhD (Washington)
A.L. Evans, BA (Toronto), BD (Emmanuel), STM (McGill), DMin (Andover-Newton)
F.C. Gerardin, MA (College St. Dominique, France), BD, STM (McGill), PhD (Hartford Seminar Foundation)
J.R. Horne, BA, MA (Western Ontario), BTh (Huron) PhD (Columbia)

Studies in Personality and Religion (SIPAR) is an interdisciplinary program which may be chosen by students in conjunction with a major in any department. It provides a course of study for those who have a special interest in the relationship between religious growth and human development. The SIPAR Option is also appropriate for those considering careers in the ministry or other social service oriented vocations. The program is administered by St. Paul’s College, in co-operation with an advisory committee representing 4 departments in the University of Waterloo – Philosophy, Psychology, Religious Studies and Sociology.
The Core Course Curriculum
The core courses provide an introduction to the field of Studies in Personality and Religion. These courses give the student a base of knowledge, a familiarity with the subject and an understanding of the concepts involved.

There are 4 term courses in the core program; Psychology of Religion in Historical Perspective (ARTS 202P) provides an historical survey of theories on the relationship between personality and religion; Psychology of Religion (RS 270) examines the variety of religious experience from a psychological point of view; Personality and Religion (RS 271) examines personality theory and its relationship to religious development and growth; Seminar on Selected Topics in Personality and Religion (ARTS 302P) involves the study of how the disciplines of philosophy, sociology, and religious studies have come to know and understand human behaviour.

Options
There are 2 different options open to students participating in the SIPAR program. The first is open to students in a General program; the second, to students in an Honours program only.

1. General Program
A SIPAR Option may be earned by students in a General program majoring in one of the sponsoring disciplines. Courses are to include ARTS 202P, RS 270 and RS 271 plus 3 other SIPAR designated courses outside of the major field. The subtitle "Studies in Personality and Religion" would be designated on the degree. In every case, students must fulfill all the requirements for the Major in their own departments.

2. Honours Minor in Personality and Religion
A Minor in SIPAR is available to students pursuing an Honours degree in any faculty (including non-Arts faculties). This Minor consists of 10 term courses chosen from among the courses approved for SIPAR credit in any participating department, and must include the SIPAR Core Courses, ARTS 202P, RS 270, RS 271, ARTS 302P.

Note:
Each of the participating departments has designated certain course offerings as Studies in Personality and Religion content courses. Many of the 300- and 400-level courses have specific prerequisites. Students planning to pursue studies in these upper-level courses should use their elective courses wisely to ensure that the prerequisites for these courses are met.
Women's Studies

Director of Women's Studies
Lindsay Dorney, B.A. (Louisville), M.A. (Louisville)

In the last 15 years women have been the focus of major research projects, particularly in the humanities and social sciences. Questions on topics such as social expectations for women, medical, philosophical and religious assumptions of female capacities, women's self-perception, women's biological role and vocational place have been raised, and the many answers have been intensely debated.

Because this relatively recent focus in research has become such an important component of contemporary scholarship, the University of Waterloo and Wilfrid Laurier University co-operate in the staffing and teaching of courses in this field of study. Students may take courses at either University to fulfill requirements for the Option. However, if a course at one institution is substantially the same as that at the other, credit will be allowed for only 1 of the 2 courses. All such courses are identified by an asterisk in the following list.

Students will normally enter the program in their second year, although appropriate courses taken during year 1 can be applied to the Women's Studies Option. To register in the Option, simply indicate "Women's Studies Option" on the registration form. Before pre-registration each spring, students should consult with the Women's Studies Director and with the Department involved to determine which courses will be available in the coming academic year.

Women's Studies Core Courses

- English 108E (UW) or Women in Literature
- English 225 (WLU) The Woman Writer: Theory and Practice
- History 248 (WLU) History of the Sexes
- Philosophy 202 (UW) Philosophy of Women
- Psychology 235 (UW) Scientific Perspectives on Gender & Sex
- Sociology 233 (WLU) Sociology of Women

Women's Studies Approved Courses

- Anthropology 350 Sex Roles in Anthropology (equivalent to WLU Classics 218)
- Classical Civilization 292 Social Problems in Antiquity (equivalent to WLU Classics 218)
- Economics 353 Population Economics
- English 108E Women Writers of the 20th Century
- French 491 French Women Writers
- History 202X The Individual and the Family in History
- Philosophy 201 Love
- Philosophy 202 Philosophy of Women
- Philosophy 220 Moral Issues
- Philosophy 302 Modern Feminism

Interdisciplinary Options

Women's Studies

Requirements

1. This Option may be taken in combination with any General or Honours program.
2. Ten term courses are required for this Option. They are to be distributed as follows:
   a) W S 200
   b) W S 300 (prerequisite. W S 200 or permission of the Director or Co-ordinator)
   c) At least 3 courses from the Core List of courses.
   d) At least 5 courses from the Approved List of Women's Studies courses. When a department offers a special topics course which is relevant to the Women's Studies program, it may be counted toward the Option. Students should consult the Director of Women's Studies before preregistering to ascertain what special topics courses will be offered and to ensure that they are meeting the requirements for the Option.
   e) In exceptional cases a course from the Approved List may be substituted for a Core Course with the permission of the University of Waterloo-Wilfrid Laurier University Committee on Women's Studies.
3. To meet the graduation requirements a student must have a minimum average of 65% in the ten courses in the Option.
Political Science 476 Research Seminar in Political Behaviour
Psychology 235 Scientific Perspectives on Gender & Sex
Psychology 236 A Psychological Analysis of Human Sexuality
Religious Studies 236 Human Sexuality and Christian Morality
Religious Studies 261 Women and the Great Religions
Religious Studies 290D Women and the Church
Sociology 206* Gender Roles (equivalent to WLU Sociology 234)
Spanish 387 Women in Spanish American Literature

Special Topics Courses
Anthropology 404 Human Development in a Cross-Cultural Perspective
Women's Studies 365 Special Topics
(The above courses are described fully in Chapter 16.)

Wilfrid Laurier University
Anthropology 317 Psychological Anthropology
Classics 205 Greek and Roman Mythology
Classics 218* Women in Greece and Rome (equivalent to UW CIV 252)
English 225* The Woman Writer: Theory and Practice (equivalent to UW English 108E)
English 226 Women in Fiction
Fine Arts 301A History of Art – Women in Art
Fine Arts 301E History of Art – Women Artists
History 248 History of the Sexes up to the Industrial Revolution
History 249 History of the Sexes from the Industrial Revolution to the Present
Philosophy 249 Consciousness and Gender
Religion and Culture 103 Love and Its Myths
Religion and Culture 104 Evil and Its Symbols
Religion and Culture 346 Religion and the Crisis of Daily Life
Religion and Culture 348 Dynamic Psychology of Religion
Social Welfare 200 Canadian Social Welfare Programs
Sociology 201 Sociology of the Family
Sociology 206R Comparative Society: Comparative Canadian Family
Sociology 233 Sociology of Women
Sociology 234* Sociology of Sex Roles (equivalent to UW Sociology 206)
Special Topics To be announced

Courses with an * have an equivalent course at the other university and are not available for credit to students who already have credit for that course.

Other Women's Studies Content Courses
(These courses are not available for credit toward the Women's Studies Option.)

BIOL 447 History of Biology
C CIV 201 Ancient Greek Society
C CIV 202 Ancient Roman Society
CS 492 The Social Implications of Computing
DANCE 110 Introduction to the World of Dance
DANCE 233 A History of Modern Dance
ECON 351 Labour Economics
ENGL 211 The Novel 1
ENGL 212 The Novel 2
ENGL 316 Canadian Drama
ENGL 336 Creative Writing
ENGL 415 Major Canadian Writers
FINE 255R Film as Social Criticism
FINE 316 Canadian Native Art
FR 273 Aspects of Quebec Culture
HIST 213X Modern Western Popular Culture
HIST 252X Europe in the Nineteenth Century
HIST 254X Canadian History: The National Period
ITAL 396 Special Topics/Directed Readings
M ENV 241 Social Change
P SCI 272 Political Behaviour 2
P SCI 344 The Politics of Local Government
P SCI 475 Political Socialization
PSYCH 214 Psychology of Adolescence
PSYCH 253 Social Psychology
PSYCH 311 Behaviour and Development of Human Infants
PSYCH 316 Moral Development
PSYCH 331 Individual Differences
PSYCH 364F Cross-Cultural Psychology
R S 256 Sex, Evolution and Social Behaviour
SCI 252 Current Ethical Issues
SCI 400A Biology and Society
SCI 400B The History of Science 1
SOC 243 The History of Science 2
SOC 252 Occupational Sociology
Course Description Information

Each course description begins with a line of coding as shown in the sample below. The course numbers are prefixed by a course or subject abbreviation. The terms offered, number of hours per week, type of instruction and "credit weight" are displayed. For some courses, information concerning terms offered and type of instruction was not available at the time of publication.

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

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

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

Sample Course Description

<table>
<thead>
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<th>Term(s) Offered</th>
<th>Type of instruction and Number of hours/wk</th>
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Course Name — Applied Probability


Extra information about course requirements

Prereq: STAT 230

Terminology

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<td>Seminar</td>
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<td>Reading course</td>
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<td></td>
<td>Corequisite</td>
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<td>Practicum</td>
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* For term courses with credit weights other than 0.5, students should consult their faculty advisor regarding how such courses are counted for degree credit in their particular program.
### Course Abbreviations

<table>
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<tr>
<th>Course Name</th>
<th>Course Abbreviation</th>
<th>Course Name</th>
<th>Course Abbreviation</th>
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<td>C.CIV</td>
<td>Optometry</td>
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<td>C &amp; O</td>
<td>Peace and Conflict Studies</td>
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<td>Women's Studies</td>
<td>W S</td>
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</tbody>
</table>
Accounting Group

Professor, Chairman
J.R. Hanna, BComm (McMaster), MBA, PhD (Michigan), CA, FCA

Associate Professor, Associate Chairman, Undergraduate Officer
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Professor, Graduate Officer
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J.B. Whitney, BA, MA (Western Ontario), PhD (Trinity)

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B.G. Gaber, BA (Wilfrid Laurier), MS, PhD (Wisconsin), CA
E.F. Kirzner, BA, MBA (Toronto)
A. Macnaughton, BA (Wilfrid Laurier), PhD (British Columbia)
G.W. Russell, BComm, MBA (McMaster), CMA

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D.B. Kennedy, BMath (Waterloo), MBA (McMaster), CMA

Adjunct Lecturers
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R.P. Bish, CA
A.H. Headam, MBA (Wilfrid Laurier), FCA
M.R. Longworth, BBA (Western Ontario), CA
P.A. Lubka, BBA (Wilfrid Laurier), CMA
R.W. Thiesberger, BA (Wilfrid Laurier), CA

Faculty Members of Accounting holding cross appointments to:

1 Statistics
2 Management Sciences
3 Economics
4 Statistics

Accounting Advisory Council
Members
The Accounting Advisory Council was established in 1983 to provide liaison between the Accounting Group and senior representatives from business, government and public accounting practice. Council meetings are normally held three times a year.

Mr. J.W. Adams, Chairman, Emco Limited
Mr. M. Baroni, Director of Finance, Johnson & Johnson Baby Products
Mr. J.C. Baute, Vice-President of Finance and Administration, Consumers Glass Company Limited
Mr. S.S. Bergstein, Bergstein & Monrose
Mr. J.T. Black, Chairman and Chief Executive Officer, The Molson Companies Limited
Mr. W.F. Bradford, Deputy-Chairman, Bank of Montreal
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Mr. D.E. Carre, Vice-President of Finance, Allen-Bradley Canada Limited
Ms. M. Courtey, Thorne Riddell
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Mr. J.P. Duffy, Partner, Dunwoody & Company
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Mr. G.C. Fowler, Partner, Peat, Marwick, Mitchell & Company
Mr. S.J. Gaston, Audit Partner, Price Waterhouse
Mr. J.L. Goodfellow, Touche Ross & Co.

Mr. R.G. Harris, Executive Partner, Deloitte Haskins & Sells
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Mr. M. Raymond, Comptroller General of Canada, Treasury Board
Mr. I.L. Rosen, Partner, Rosen, Eznin, Ugus & Company
Ms. N.B. Shoff, Partner, Arthur Andersen & Company
Ms. E.B. Sim, General Manager and Vice President, Chicopee Manufacturing Limited
Mr. J.W. Sinclair, President and Chief Executive Officer, Moore Corporation Limited
Mr. J.A. Stacey, Partner, Deloitte, Haskins & Sells
Mr. R.H. Stapleton, Finance Executive, Mutual Life Assurance Company of Canada
Mr. J.E. Stibbe, President, Children's Hospital of Buffalo
Mr. T.R. Turnbull, Managing Partner, Ernst & Whinney
Mr. W.T. Walker, Senior Partner, Peat, Marwick, Mitchell & Company
Mr. O.D. Weymen, Assistant Deputy Minister of Finance
Course Descriptions

Introductory Notes

1. The Accounting Group is experiencing tremendous demand for its courses beyond available resources. Thus, accessibility to Accounting courses cannot be guaranteed to all students. Accounting courses numbered 100 and higher are normally restricted to students who require these courses as part of their undergraduate program. If space permits, students in good standing in an Honours program may be admitted, subject to prerequisite requirements.

2. Students who fail to preregister may be unable to take a particular course in the term chosen.

3. The minimum grade required to satisfy a prerequisite for courses labelled ACC is C.

4. Students may only repeat courses labelled ACC in which they have a grade of D+ or less.

5. Students may not take both ACC 101 and ACC 121 for credit.

ACC 101 F 3C,1T 0.5
Introductory Accounting 1
An introduction to the principles and practices underlying the historical-cost income determination model. Restricted to students required by their program to take ACC 101, or to students registered in ECON 101 and ACC 131.

ACC 121 F 3C,1T 0.5
Understanding and Using Financial Accounting Information
This course is designed for non-accounting majors to help them understand and analyze financial statements.

ACC 131/132 W,S,F 3C 0.50.5
Management 1/2
The functional areas of business: finance, personnel administration, production, marketing and accounting are examined within differing organizational structures. Coverage also includes study of the principles of effective management and the financial system in Canada as a source of corporate capital.

Prereq: ACC 131 is a prerequisite for ACC 132.

ACC 231 F 3C 0.5
Business Law
Particular attention is given to the law relating to contracts and business organizations. Other areas of study include sources of law, the judicial process, real and personal property, torts, agency, credit, and negotiable instruments.

ACC 281 F 3C 0.5
Introductory Managerial Accounting
An introduction to the principles and practices of managerial accounting.

Prereq: ACC 101

ACC 291 F,W,S 3C,1T 0.5
Financial Accounting 1
A first course in intermediate financial accounting dealing with the theory and practice of financial statement preparation and reporting. The emphasis will be on asset valuation and the related impact on income measurement.

Prereq: ACC 281

ACC 341 F 3C 0.5
Computer Applications in Business
An introduction to the operation of mainframe and microcomputer systems. Emphasis will be placed on software packages that have particular application to accounting transaction processing and financial planning.

Prereq: Registration in Year 3 of any Faculty of Arts Accounting program

ACC 351 F,W 3C 0.5
Auditing 1
An examination of the auditing process, including elements of effective control structures, concepts of evidence, ethical conduct, legal and statutory requirements and elements of audit strategy.

Prereq: ACC 291

ACC 371 F,W,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 221 and ACC 291 or permission of Accounting Group

ACC 372 F,W,S 3C 0.5
Managerial Finance 2
The theoretical concepts examined in Accounting 371 will be applied within the context of the Canadian economy. Topics examined will include interest rate determination, capital markets, and risk/return characteristics of financing alternatives.

Prereq: ACC 371

ACC 381 F,W,S 3C 0.5
Managerial Accounting 1
The development and use of accounting information in performing the managerial functions of planning, controlling, and decision making. Emphasis is on analysis of costs rather than on the procedural aspects of costing systems.

Prereq: ACC 291 and a course in Statistics

ACC 382 F,S 3C 0.5
Managerial Accounting 2
Consideration of more complex topics in management planning and control. Emphasis is on cost accumulation systems, performance evaluations, control models and applications of quantitative methods to management accounting.

Prereq: ACC 381

ACC 392 F,S 3C 0.5
Accounting 9
Consideration of more complex topics in management planning and control. Emphasis is on cost accumulation systems, performance evaluations, control models and applications of quantitative methods to management accounting.

Prereq: ACC 381

ACC 401 W 3C 0.5
Accounting Theory
A review of accounting theory as a background for applying underlying concepts to current accounting problems. Emphasis is on current literature, with a major term paper required.

Prereq: ACC 382 and 371

ACC 415 W 0.5
Special Topics
Admission by consent of instructor.
ACC 432 0.5
Communicating Accounting Information for Decision Making
This course runs over the winter and spring terms. The first half stresses interpersonal communications and covers such topics as communications in the workplace and negotiating skills. The second half concerns formal presentation skills with emphasis on those skills that are necessary for the professional accountant.

ACC 441 F 3C 0.5
Accounting Information Systems
Investigates the concepts and principles of management information systems. Concentration is on the role of accounting information in the planning/decision-making process and the design and implementation of accounting information systems.
Prereq: ACC 361

ACC 443 F 3C 0.5
Models for Decision Making
This course deals with modelling as an approach to problem solving and decision making. Problems of credibility, verification and implementation of models are considered and illustrated by application to problems encountered in management and accounting.
This course is part of an integrated, professionally accredited sequence of courses open only to students by permission of the Accounting Group.

ACC 451 S 3C 0.5
Auditing 2
An examination of the elements of audit strategy and their interrelationships, including financial assertions, types and sources of audit assurance, and types and strengths of evidence-gathering procedures.
This course is part of an integrated, professionally accredited sequence of courses open only to students by permission of the Accounting Group.

ACC 453 W 3C 0.5
Computer Control and Audit
The evaluation of controls in a computerized environment, the impact of the computer on the audit approach and the utilization of the computer in conducting audit testing are considered.
Prereq: ACC 441

ACC 461 F.S 3C 0.5
Taxation 1
A course in the interpretation in application of the major provisions of the Income Tax Act through an analysis of court decisions, Revenue Canada's publications, and practical problem situations.
Prereq: ACC 362 or permission of Accounting Group

ACC 462 W 3C 0.5
Taxation 2
A continuation of ACC 461
Prereq: ACC 461

ACC 463 F 3C 0.5
Taxation 3
A course which integrates the topics covered in ACC 401 and 402 for individual and corporate tax planning through a study of trusts, partnerships, corporate reorganizations and estate planning.
Prereq: ACC 462
This course is part of an integrated, professionally accredited sequence of courses open only to students by permission of Accounting Group.

ACC 471 W 3C 0.5
Investments
The objective of this course is to introduce the student to concepts of investment selection, purchase and management. The student should obtain a knowledge of security markets and the risk/return characteristics of forms of investment.
Prereq: ACC 371

ACC 491 F.S 3C 0.5
Financial Accounting 3
An advanced accounting course considering specific problems of accounting for the corporate entity, such as business combinations, intercorporate investments, consolidated financial statements, accounting for foreign operations and foreign currency transactions, and segment reporting.
Prereq: ACC 292

Department of Anthropology

Associate Professor, Chairman of the Department
T.S. Abler, BA (Northwestern), MS (Wisconsin-Milwaukee), PhD (Toronto)

Professor
S.M. Weaver, BA, MA, PhD (Toronto)

Associate Professors
D.R. Counts, BS (S.W. Texas State College), MA (Kentucky), PhD (Southern Illinois)
Wm. D. Haas, BA (Texas Christian), MA (New Mexico), PhD (Michigan)
M. Shimpo, BA (International Christian, Japan) MA, PhD (British Columbia) J

Assistant Professors
M.H. Hill, BA (Washington), MA (Washington State), PhD (Southern Illinois)
A.C. Zeller, BSc (Trent), MA, PhD (Toronto)

Research Assistant Professors
C. Ellis, BA (Waterloo), MA (McMaster), PhD (Simon Fraser), SSHRC Post Doctoral Fellow
M.C. Redman, BA (Goucher), MA, PhD (McMaster)

Faculty Members of Anthropology holding cross and/or joint appointments to:
Urban and Regional Planning
J refers to faculty member at St. Jerome's College

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

ANTH 101 F.W 3C 0.5
Human and Cultural Evolution
An overview of Physical Anthropology and Archaeology. Lectures on living and fossil primates, the fossil evidence for the origins and development of man, modern races, and archaeological evidence for the origins and development of culture.
ANTH 330 F 3C 0.5
Cultural Ecology
An examination of the relationships among environment, technology, society, and culture. The increasing levels of complexity will be considered in the context of hunting and foraging bands, horticultural tribes and chiefdoms, pastoral tribes and agricultural pastoral tribes and agricultural people. 
Prereq: Full credit in Anthropology or consent of the instructor

ANTH 345 W 0.5
Special Topics in Anthropology
Directed independent research.
Prereq: Permission of instructor

ANTH 365 F 2C,1L 0.5
Fossil Hominids
A detailed examination of the fossil evidence for human evolution with particular emphasis on interpretation and reconstuction.
Prereq: ANTH 280 or permission of the instructor

ANTH 372 S 3C 0.5
Archaeological Research
Supervised research in field or laboratory studies and analysis in archaeology.
Prereq: ANTH 270. Offered concurrently with ANTH 271

ANTH 420 F 3C 0.5
Social and Cultural Change
An analysis of contemporary thought on culture contact and cultural evolution. The concepts to be explored might include integration, assimilation, conflict, nativistic reactions, and general and specific evolution.
Prereq: One credit in socio-cultural anthropology.

ANTH 450 W 3C,1L 0.5
Human Adaptation and Evolution
An examination of the Principles of Variation in human evolution past and present. This will include the development of the genus Homo, adaptation of modern populations to heat, cold, attitude and stress, and the continuing microevolutionary development of humans.
Prereq: ANTH 280

ANTH 498A/B F,W 0.5/0.5
Reading in Anthropology
Guided reading in a selected portion of the anthropological literature.
Prereq: Anthropology Major or Honours student and permission of the instructor

ANTH 495/497 F,W,S 0.5/0.5
Reading in Anthropology
Guided reading in a selected portion of the anthropological literature.
Prereq: Anthropology Major or Honours student and permission of the instructor

COURSES NOT OFFERED 1996-97
ANTH 220 Prehistoric Archaeology: Old World I
ANTH 221 Prehistoric Archaeology: Old World II
ANTH 222 Archaeology of Foodways: Gatherers and Hunters
ANTH 233 Inuit and Eskimo Cultures
ANTH 241 The Contemporary Canadian Indian Scene
ANTH 250 Regional Studies in Archaeology
ANTH 283 Phonology for Non-Linguists
ANTH 285 Descriptive Grammar 1 - Morphology
ANTH 320 Pleistocene Prehistory in the Old World
ANTH 350 Sex Roles in Anthropology
ANTH 370 Ethnographic Field Methods
ANTH 373 Archaeological Reporting
ANTH 377 Early Cultures of the New World
ANTH 380 Reading in Anthropology
ANTH 404 Human Development in a Cross-Cultural Perspective
ANTH 440 Honours Seminar
ANTH 451 The Formative Years of Cultural Theory
ANTH 452 Contemporary Cultural Theory

School of Architecture

Associate Professor, Director
L.W. Richards, BArch (Manitoba), MArch (Yale), OAA, MRAIC

Assistant Professor, Associate Director
R.E. Haldenby, BES, BArch (Waterloo), Recipient of the Distinguished Teacher Award

Assistant Professor, Undergraduate Officer
D. McKay, BArch (Toronto)

Professors
L.A. Cummings,1 AB (Washington), AM (Missouri), PhD (Washington), Recipient of the OCUFA (Ontario) Teaching Award
R.H. Simc, AA Home Dip (London), RIBA, MRAIC
F.H. Watts, AA Dip (London), MLA (Harvard), RIBA, MRAIC

Associate Professors
A. Iseney, BArch (Cascjua), MArch (North Dakota State)
M. Eflitt, National Diploma in Design (High Wycombe)
B.R. Hunt, AA Dip (London), RIBA, MRAIC
D.B. McIntyre, BArch (Toronto), MRAIC
R.M. Schuster,2 BS, MS (North Dakota State), PhD (Iowa State), PEng
J.C. Somfay, BArch (New South Wales), MArch (Toronto), OAA
F. Thompson, BArch, MArch (Toronto), MRAIC
R. Wiljer, BA (Waterloo), MA (Ottawa)

Assistant Professors
O. Dutt, BA (Punjab), BSc (London), MS (Wisconsin), PhD (Waterloo), PEng
L. Pignatti, BArch (Rome), MArch (Toronto)
I. Seebomm, BEng, MEng, MEng (McGill), MArch (Berkeley), OAA, PEng
R. Sliwka, Dip (Huddersfield), MArch and UDesign (Washington), RIBA

Adjunct Faculty
B. Boigun, BArch (Toronto)
M. Brisson, BES (Manitoba), BArch Honors (Toronto), OAA, MRAIC
J. Greenwood, BES, MA (Waterloo), PhD (Toronto)
E. Gustave, BArch, MArch (Toronto), MRAIC
R. Keenberg, BFAED (Pratt), RCA
W. Lamb, BArch (McGill), MRAIC
D. Mertins, BArch Honors (Toronto)
Course Descriptions

Architectural Studies

Courses not offered in the current academic year are listed at the end of this section.

COURSES FOR BACHELOR OF ENVIRONMENTAL STUDIES (PRE-PROFESSIONAL ARCHITECTURE)

ARCH 112 F 3C, 2L 0.5
Mathematics in Architecture
The application of mathematics to architecture through such studies as analytical and constructive geometry, trigonometry, algebra, differential and integral calculus, functions and matrices.

ARCH 142 F 4C, 2L 1.0
Iconography 1: Conventions
Selected 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 1 or 2 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 centered on ancient life to initiate the student into the stream of cultural history and the complex problems of what the artist is, the quality of the human existence, culture, environment, as well as the working of the icon from raw state of perceived image to its function as an expressive symbol in poetry, music, dance, architecture and other works of art; a study of modern work in comparison to an ancient achievement.

Prereq: ARCH 142

ARCH 163 W 1C, 2L 0.5
Statics and Structural Analysis
Fundamental concepts of mechanics and structures, as related to architectural design, study of loading conditions, forces, moments, systems of forces, conditions of equilibrium for 2 and 3 dimensional structures, centre of gravity of loads and areas, bar forces in trusses, simple frame analysis, friction, moment of inertia.

Prereq: ARCH 112

ARCH 171 F 3C, 0.5
Theories and Technologies of Building
Introduction to applications of technology in the design and construction of buildings. Organized as a series of case studies concentrating on the last three centuries, it addresses, among other themes, the emergence of new structural methods and materials, the evolution of environmental control, the rationalization of building assembly, and the invention of the modern urban infrastructure.

Prereq: Consent of instructor
ARCH 172 W 2C,2L 0.5
Building Construction I
An introduction of the fundamentals of building construction, in terms of materials, technical aspects of the making and design of buildings, basic building science and environmental concerns. Emphasis will be placed on soils, foundations, masonry construction and wood frame construction.

ARCH 174/175 0.5 each
Experimental Courses
These courses offer a vehicle for introducing additional electives to the program on a short-term basis, and for developing future permanent courses.
Prereq: Consent of instructor

ARCH 192 F 1T,1S,14std. 1.5
Design Fundamentals and Workshop Design Studio
Development of the means to appreciate art and science of building; introduction to a history of architecture; introduction to the study of theories of architecture; development of skills in graphic communication; introduction to a study of building structure, construction, and materials; promotion and encouragement of the theory and practice of design. Field trip (1 week).
Prereq: Architecture students only

ARCH 193 W 11,1S,14std. 1.5
Design Fundamentals and Studio
Reinforcement and development of the ARCH 192 program, but with emphasis upon the application of design methods and practice to specific architectural problems.
Prereq: ARCH 192

ARCH 194 W 2C 0.5
Visual Interdisciplinary Language
Theory and practice of visual form based on formative processes and hierarchical 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 213 F 2C,2L 0.5
Computer Generated Design I
An overview of the use of computers and computer graphics in architectural design. The course includes design exercises using graphics software.
Prereq: CS 100 or consent of instructor

ARCH 224 S 2C,2std 0.5
An Introduction to Landscape Design
An introduction to the design of landscape with emphasis upon the architectural attributes of plants and lawns.
Prereq: ARCH 192, 193, 292 or consent of instructor

ARCH 244 F 2C,2D 0.5
History of Gardens of Europe and Western Asia
The study of gardens as works of art reconciling man with his world. Gardens of Europe and Western Asia are studied as responses to specific human needs, the stress and aspirations of an age, and to the climate and landscape of the land in which they were created.
Prereq: Consent of instructor

ARCH 245 W,S 1C,2L 0.5
Survey of Contemporary Architecture
Beginning with the formative years of modern architecture, the course will examine buildings and theories of representative architects and designers, documenting the development of architectural ideas in Europe and elsewhere.
Prereq: Consent of instructor

ARCH 246 F 4C,2L 1.0
Foundations of Europe: Sense of Periods and Styles
Recognition of patterns of life and concepts of order and conduct, models of the universe and other, moving metaphors and myths by means of study of the thoughts, acts, art, architecture, technology, literature, music and town design of the West from the break-up of the Roman Empire until the Renaissance. Field trips to museums, concerts in Toronto, Detroit or Buffalo.
Prereq: ARCH 143 or consent of instructor

ARCH 247 S 4C,2L 1.0
Renaissance to Revolution: Sense of Periods and Styles
Analysis of the various styles emerging out of provincial and international Gothic, especially Italian use of classical modes, the spread of this "renaissance" mode, leading to consideration of the Mannerist, the Baroque, the Rococo, the Neoclassical, investigation of the course of men's attitudes from humanism, nationalism, and Reformation through the Enlightenment until the French Revolu-

ARCH 252 F,W,S 0.5
Creative Problem Solving
Development of creative skills through group behaviour in problem solving sessions by developing a clear understanding of each participant's own creative thought processes; increasing his/her ability to consciously and deliber-

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 266 F 3C 0.5
Building Construction II
The study of more advanced aspects of building construction dealing with the design and technological aspects of building structure: reinforced concrete, precast concrete, and steel framing, building envelope: cladding principles, window walls, roofing and glazing; and interior finish selection and interface with mechanical and electrical systems.
Prereq: ARCH 172 or consent of instructor

ARCH 274/275 0.5 each
Experimental Courses
These courses offer a vehicle for introducing additional electives to the program on a short-term basis, and for developing future permanent courses.
Prereq: Consent of instructor

ARCH 276 S 2C,2L 0.5
Timber: Design, Structure and Construction
Architectural case studies are used to examine conceptual development, structural design, building process and the selection of structural timber systems. Topics such as flexural, compression and truss members; connections; and glulam construction are studied using calculations, design aids, rules of thumb and the latest CSA design standards.
Prereq: ARCH 262
ARCH 346 F (Rome) 2C,2S 0.5
Italian Renaissance Architecture
Architecture and urban design from the early 15th to the early 17th century in central and northern Italy. Special attention is paid to the development of theory and its relation to architectural practice. In addition to the works of the major figures of the period, typical relationships between buildings and their urban and natural contexts are considered.
Prereq: Registration in ARCH 492 or consent of instructor

ARCH 349A/B/C S 4C,T 0.5
Topics in Cultural History
Research into various topics including architectural history, theory, practice, and pedagogy but exploring the means of study (the human mind, the preconceptions, the tools of searching, ordering of findings, ways of presentation of the results of reflection). Guest lecturers, field trips, and private consultants will diversify the common studies. Because the topics will shift, it is possible to enroll in the course more than once.
Prereq: Consent of instructor after an interview and inventory
The letter designation allows this course to be taken more than once for credit.

ARCH 362 W 2C,2L 0.5
Steel: Design, Structure and Construction
Architectural case studies are used to examine conceptual development, structural design, building process and the selection of structural steel systems. Topics such as tension, flexural and compression members; and connections are studied using calculations, design aids, rules of thumb and the latest CSA design standards.
Prereq: ARCH 262

ARCH 363 F 2C,2L 0.5
Concrete: Design Structure and Construction
Architectural case studies are used to examine conceptual development, structural design, building process and the selection of structural concrete systems. Topics such as flexural (rectangular, T-Beams, and one-way slabs) and compression members; footing and retaining walls; non-reinforced and reinforced masonry walls are studied using calculations, design aids, rules of thumb and the latest CSA design standards.
Prereq: ARCH 262

ARCH 371 F 2C,1wkshp 0.5
Designing and Building with Solar Energy
Instruction in the basics of solar technology, including principles of climatic design, solar basics, efficient building layout design, solar systems design, heat loss/gain calculations, and simple computer simulation of the designed systems.
Prereq: Consent of instructor (ability to figure heat calculations, basic knowledge of solar building)

ARCH 372 F 2C,2L 0.5
Building Services I
The course focuses on the air and water systems of buildings and is aimed at developing knowledge and skills appropriate to architectural practice. Subjects covered include environmental parameters, heating and cooling loads, energy conserving design, the selection of heating, ventilating and air conditioning systems, plumbing systems, and fire protection criteria and systems, with reference to building codes and standards.
Coreq: ARCH 362 or consent of instructor

ARCH 373 F 2C,2L 0.5
Building Services II
A study of services in buildings, covering electrical distribution, vertical transportation, lighting and acoustics. The course also addresses exterior applications, site planning and district services, and a survey of urban infrastructures.
Coreq: ARCH 363 or consent of instructor

ARCH 374/375 0.5 each
Experimental Courses
These courses offer a vehicle for introducing additional electives to the program on a short term basis, and for developing future permanent courses.
Prereq: Consent of instructor

ARCH 384/385 F,W 0.5 each
Architectural Research
This offers a student an opportunity for independent research into architectural problems not offered in the regular curriculum. It allows guided exploration of a specific architectural problem area, or appropriate complexity to the particular term.
Prereq: Approval of (in house) UGAC
and manifest change: politics, warfare, economics, social structure, the arts and more especially the factors that induce space and time. These include the constants upon the structure of public and private life of the present day. In Italy the influences from antiquity to the present. Acts of design in architecture, urban form and landscape related to political, cultural and spiritual authority of Rome. Comparison drawn between the image of the city, represented in literature and art, and the material facts of the place. Field trips, lectures.

Prereq: ARCH 293

ARCH 392 F 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: ARCH 293

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 the patterns of interaction and predicting the influence on physical form involving other disciplines; projects to explore the techniques and design with others at the city or community scale.

Prereq: ARCH 293

COURSES FOR BACHELOR OF ARCHITECTURE

ARCH 445 F/W 2C,2D 0.5
The Practice of Criticism in Creative Design
The application of critical thought will be exercised regularly through oral and written assignments on a wide range of designed human experience; secondarily, there will be reading assignments to facilitate the practice of criticism through a broadening knowledge of critical theory and its relationship to culture.

Prereq: Consent of instructor

ARCH 446 F (Rome) 2C,2S 0.5
Italian Urban History
The course provides a survey of the history of settlement and urban form on the Italian peninsula from antiquity to the present day. In it the influences upon the structure of public and private space are outlined for each historical period. These include the constants such as geography and climate, but more especially the factors that induce and manifest change: politics, warfare, economics, social structure, the arts and the arts.

Prereq: Registration in ARCH 492 or consent of instructor

ARCH 448 F (Rome) 2C,2S 0.5
Rome and the Campagna
History of settlement and building in Rome and the surrounding area from antiquity to the present. Acts of design in architecture, urban form and landscape related to political, cultural and spiritual authority of Rome. Comparison drawn between the image of the city, represented in literature and art, and the material facts of the place. Field trips, lecture.

Prereq: Registration in ARCH 492 or consent of instructor

ARCH 452 W,S 2C 0.5
Specifications
Architectural working drawings and specifications; bidding requirements; general conditions; general requirements trade divisions; reference and source material; assembly and reproduction; structural, mechanical and electrical consultants.

Prereq: BES standing or consent of instructor

ARCH 474/475 0.5 each
Experimental Courses
These courses offer a vehicle for introducing additional electives to the program on a short-term basis, and for developing future permanent courses.

Prereq: Consent of instructor

ARCH 484/485 F,W 3R 0.5 each
Architectural Research
This offers a student an opportunity for independent research into architectural problems not offered in the regular curriculum. It allows guided exploration of a specific architectural problem area, of appropriate complexity to the particular level. Thus considerable emphasis is placed on both theory and development of design solutions.

Prereq: Approval of (in house) UGAC

ARCH 492/493 F,W,S 3C,18std 2.0
Design Studio
The intent of these courses is to develop skills and gain experience in architectural design through the application of design and analysis techniques to complex building types. This is approached through a series of design projects aimed at the exploration of generative factors in the definition of built form. Projects are related to existing contexts and respond to current concerns of architectural theory and practice. Both individual and group work are included. Fall term held in Rome or Waterloo.

Prereq: ARCH 293 for 492 and 492 for 493

ARCH 499 W,S 0.0
Fifth Year Thesis Proposal
Architecture students are responsible for developing a satisfactory thesis proposal prior to and as a pre-requisite of the 5A Design Studio. The completion of this requirement will be indicated as a mark of 'c' for the course on the student's academic record. The thesis proposal will be developed independently by the student between the 4B and 5A terms and will be reviewed and assessed by the 5A studio instructor.

Prereq: ARCH 493

ARCH 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 574/575 0.5 each
Experimental Courses
These courses offer a vehicle for introducing additional electives to the program on a short-term basis, and for developing future permanent courses.

Prereq: Consent of instructor

ARCH 584/585 W,S 3R 0.5 each
Architectural Research
This offers a student an opportunity for independent research into architectural problems not offered in the regular curriculum. It allows guided exploration of a specific architectural problem area, of appropriate complexity to the particular term.

Prereq: Approval of (in house) UGAC

ARCH 592/593 W,S 3C 3.0 each
Design Studio
These courses provide an opportunity for the student to select an area of concentration for study and design in depth. A thesis topic is to be submitted and approved during term 8 (4b) and all research work completed by the end of the 8 month co-op term. 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: ARCH 499 and consent of instructor

ARCH 599 W,S 0.0
A letter grade for ARCH 592 will be submitted only after the completion of ARCH 593.
ARTS 122 F 2C:10 0.5

Quest for Meaning in the 20th Century

This course invites students to a quest for personal and corporate meaning in the context of a century in which traditional meaning definitions have been challenged by world wars, nuclear threat and rapidly shifting sexual, social, economic and religious values.

Offered by Conrad Grebel College.

ARTS 198 F W 0.5

Introduction to Computer Technology

A general introduction to the fundamental ideas of computers. Topics treated will include the use of an interactive computing system, word processing, and the beginnings of program writing. The course will examine the history of computing, and will consider the social and economic impact of the use of computers. No previous knowledge of computing is assumed.

ARTS 202 F 0.5

Psychology of Religion in Historical Perspective

A study of the Psychology of Religion in its historical perspective from the nineteenth century to the present day. Methods, techniques and practices of research that are applicable to the examination of religious experience will also be introduced.

ARTS 212/212 F W 0.5/0.5

Computing Techniques in Language and Literature

An introduction to non-mathematical computer programming, with special emphasis on the manipulation of language data. The programming language used will be PL/1. ARTS 211 will concentrate on gaining skill in computer programming. ARTS 212 will stress file management, advanced text formatting and the use of system program utilities. Applications will include word indexes, text concordances, methods of computer-aided text comparison.

Prereq: ARTS 211 presupposes ARTS 198 or equivalent; ARTS 212 presupposes ARTS 211 or permission of the instructor.

ARTS 215 A/B

Man in Crisis (Literary Views)

A critical study of such themes as freedom vs. happiness, nihilism, collectivism vs. individualism, old tablets vs. utopias, alienation, earthbound fragmentation vs. the transcendentals in the artistic writings of Kafka, Brecht, Hesse, Nietzsche, Solzhenitsyn, Dostoevsky, Zamyatin, Camus, and others. Taught in English.

ARTS 215 A 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, Zamyatin, 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 215 B 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 225 F 3C:0.5

Mennonite Authors and Artists

An examination of Mennonite cultural expression in literature (fiction, poetry, drama, children's literature) and the visual arts (especially painting and film) during the past century.

Offered by Conrad Grebel College.

ARTS 249AB J 0.5/0.5

Introductory Topics in Family Life Education: Sexuality and Sex Education

The course will examine human sexuality from a psychological, biological, and social perspective. The significant principles of sex education and some of the most relevant methods and programs will be discussed as well.

Offered at St. Jerome's College.

ARTS 250 AB F.W 0.5/0.5

Introductory Topics in Family Life Education: Marriage and the Family

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 programs will also be given attention.

Offered at St. Jerome's College.
ARTS 300 W 1C.2D 0.5
Integrating Seminar
An interdisciplinary seminar assisting senior students in integrating their studies in the humanities, sciences, and technology, into a coherent world-view informed by moral, religious, and aesthetic values, in preparation for decision-making in personal, social and professional life.
Prereq: Third year standing
Offered at Conrad Grebel College

ARTS 302P W 0.5
Seminar on Selected Topics in Personality and Religion

ARTS 310A/B F/W 0.5/1.5
The Relationship Between Society and the Individual
An interdisciplinary examination of the contributions the humanities and social sciences have made to our understanding of a basic intellectual problem: the relationship between society and the individual. Specifically, the course will provide an opportunity to discover how different disciplinary approaches can be combined to increase our insight into that relationship.
Prereq: Students in third year or above, or consent of instructor.
Offered at St. Jerome's College

ARTS 340A/B A 0.5/0.5
Advanced Topics in Family Life Education: Sexuality and Sex Education
The course presents an in-depth analysis of selected topics in human sexuality, gives special attention to the emotional aspects of sexuality, and focuses on the evaluation of current family life and sex education programs.
Prereq: ARTS 240U
Offered at St. Jerome's College

COURSES NOT OFFERED 1986-87
ARTS 220R Chinese Thought and Culture 1
ARTS 221R Chinese Thought and Culture 2
ARTS 320R/321R Special Topics in Chinese Thought and Culture
ARTS 360A/B Advanced Topics in Family Life Education: Marriage and the Family

ARTS 350A/B Advanced Topics in Arts
ARTS 320R/321R Special Topics in Arts
ARTS 220R Chinese Thought and Culture
COURSES NOT OFFERED 1986-87

ARTS 300 W 1C.2D 0.5
Integrating Seminar
An interdisciplinary seminar assisting senior students in integrating their studies in the humanities, sciences, and technology, into a coherent world-view informed by moral, religious, and aesthetic values, in preparation for decision-making in personal, social and professional life.
Prereq: Third year standing
Offered at Conrad Grebel College

ARTS 302P W 0.5
Seminar on Selected Topics in Personality and Religion

ARTS 310A/B F/W 0.5/1.5
The Relationship Between Society and the Individual
An interdisciplinary examination of the contributions the humanities and social sciences have made to our understanding of a basic intellectual problem: the relationship between society and the individual. Specifically, the course will provide an opportunity to discover how different disciplinary approaches can be combined to increase our insight into that relationship.
Prereq: Students in third year or above, or consent of instructor.
Offered at St. Jerome's College

ARTS 340A/B A 0.5/0.5
Advanced Topics in Family Life Education: Sexuality and Sex Education
The course presents an in-depth analysis of selected topics in human sexuality, gives special attention to the emotional aspects of sexuality, and focuses on the evaluation of current family life and sex education programs.
Prereq: ARTS 240U
Offered at St. Jerome's College

COURSES NOT OFFERED 1986-87
ARTS 220R Chinese Thought and Culture 1
ARTS 221R Chinese Thought and Culture 2
ARTS 320R/321R Special Topics in Chinese Thought and Culture
ARTS 360A/B Advanced Topics in Family Life Education: Marriage and the Family

Department of Biology

Professor, Chairman of the Department
J.E. Thompson, BSc (Toronto), PhD (Alberta)

Associate Professor, Associate Chair of the Department
S.M. Smith, BSc, MSc (McMaster), PhD (Manitoba) Recipient of the Distinguished Teacher Award

Professor, Associate Dean of Graduate Studies, Faculty of Science
W.B. Kendrick, BSc, PhD (Liverpool), FRSC

Professor, Associate Dean for Computing, Faculty of Science
C.I. Mayfield, BSc, PhD (Liverpool)

Associate Professors, Graduate Officers
N.C. Bols BSc (Simon Fraser), MSc (British Columbia), PhD (Toronto)
B.R. Gick, BSc (City College, New York), MSc, PhD (Waterloo)

Associate Professors, Undergraduate Officers
J.C. Carlson, BSc, MSc, PhD (Massachusetts)
C.A. Peterson, BSc, MSc (Alberta), PhD (Calgary, Davis)

Assistant Professors, Undergraduate Officers
D.G. Dixon, BSc (Sir George Williams), MSc (Concordia), PhD (Guelph)
W.H. Hawthorn, BSc, MSc (McMaster), PhD (Western Ontario)

Professor, Advisor on Research to the Vice-President Academic
R.G.H. Downer, BSc, MSc (Queen's), BEd (Western Ontario), DSc (Belfast), Recipient of the Distinguished Teacher Award

Professor Emeritus
H.R.N. Hynes, BSc, PhD, DSc (London), ARCS, FRSC

Researchers
A.M. Charles, BSc, MSc, PhD (McMaster) Recipient of the Distinguished Teacher Award
M. Globus, BSc, MSc (McGill), PhD (Toronto)
A.G. Kempton, BSc, MSc, PhD (Manitoba)
J.R. Loomis, BSc, MS (West Virginia), PhD (Pennsylvania State)
P.E. Morrison, BSc, MSc (Western Ontario), PhD (McMaster)
J.C. Semple, BSc (Tulane), MA, PhD (Washington, D.C.)
K. Zachariah, BSc (Madras), BA Hon (Oxford), MA, PhD (Princeton)

Adjunct Faculty
J.R. Barton, BA (Ohio Wesleyan), MSc (Akron), PhD (Waterloo)
J.J. Herkut, BSc, MSc, PhD (Toronto)
W.D. Taylor, BSc, PhD (Toronto)

Research Assistants
N.W. Lem, BSc, MSc, PhD (Toronto)
NSERC University Research Fellow
S. Vethamanathan, BSc, MA, MSc (Madras), PhD (Toronto)

Instructors
J.E. Thompson, BSc (Toronto), PhD (Alberta)

Teaching Assistants
J.F. Brookfield, BA, BEd, BSc, MSc (Dalhousie)
L. Pasernak, BA, MA (Toronto)
N.J. Scott, BSc, MBA (McMaster), MSc (Waterloo)
K.E. Trels, BSc (Acadia), MSc (Waterloo)

Faculty Members of Biology holding cross appointments to:
Chemistry

ARTS 300 W 1C.2D 0.5
Integrating Seminar
An interdisciplinary seminar assisting senior students in integrating their studies in the humanities, sciences, and technology, into a coherent world-view informed by moral, religious, and aesthetic values, in preparation for decision-making in personal, social and professional life.
Prereq: Third year standing
Offered at Conrad Grebel College

ARTS 302P W 0.5
Seminar on Selected Topics in Personality and Religion

ARTS 310A/B F/W 0.5/1.5
The Relationship Between Society and the Individual
An interdisciplinary examination of the contributions the humanities and social sciences have made to our understanding of a basic intellectual problem: the relationship between society and the individual. Specifically, the course will provide an opportunity to discover how different disciplinary approaches can be combined to increase our insight into that relationship.
Prereq: Students in third year or above, or consent of instructor.
Offered at St. Jerome's College

ARTS 340A/B A 0.5/0.5
Advanced Topics in Family Life Education: Sexuality and Sex Education
The course presents an in-depth analysis of selected topics in human sexuality, gives special attention to the emotional aspects of sexuality, and focuses on the evaluation of current family life and sex education programs.
Prereq: ARTS 240U
Offered at St. Jerome's College

COURSES NOT OFFERED 1986-87
ARTS 220R Chinese Thought and Culture 1
ARTS 221R Chinese Thought and Culture 2
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C.A. Peterson, BSc, MSc (Alberta), PhD (Calgary, Davis)

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P.E. Morrison, BSc, MSc (Western Ontario), PhD (McMaster)
J.C. Semple, BSc (Tulane), MA, PhD (Washington, D.C.)
K. Zachariah, BSc (Madras), BA Hon (Oxford), MA, PhD (Princeton)

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N.J. Scott, BSc, MBA (McMaster), MSc (Waterloo)
K.E. Trels, BSc (Acadia), MSc (Waterloo)

Faculty Members of Biology holding cross appointments to:
Chemistry
Faculty Members holding cross appointments to Biology from:

1. Physics
2. Urban and Regional Planning
3. Optometry
4. Chemistry

Course Descriptions

BIOL 111 F 2C 0.5
Introductory Biology 1
An introduction to basic concepts in biology, including aspects of genetics, evolution and plant biology.
Open to students other than those intending to major in Biology or to enter the School of Optometry.

BIOL 112 W 2C 0.5
Introductory Biology 2
An introduction to the basic principles of zoology and ecology with reference to man as a biological organism.
Open to students other than those intending to major in Biology or to enter the School of Optometry.

BIOL 201 F 2C 0.5
Human Anatomy
Basic anatomical features of the skeletal, muscular, nervous, cardiovascular, endocrine and reproductive systems of the human.
Open to students other than those intending to major in Biology.
BIOL 201 cannot be counted for credit toward a BSc (Kinesiology) degree.

BIOL 202 W 2C 0.5
Embryology and Histology
Fundamental developmental processes in vertebrates, including man; the development of the early embryo; morphogenesis of tissues and the major organ systems. Structure of human cells and tissues at the light-microscope level; epithelia, connective, muscular and nervous tissues and the major organ systems.
Open to students other than those intending to major in Biology.

BIOL 210 F 2C 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,S 2C 0.5
Introductory Vertebrate Zoology
An introduction to the structure, evolution and development of vertebrate organ systems.
Offered during the Spring term in odd-numbered years.

BIOL 220 F 2C 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,S 2C 0.5
Plant Biology 2 - The Diversity of Plants
A comparative survey of the morphology and life histories of the different kinds of plants and fungi important to man and an introduction to their evolution.
Offered during the Spring term in odd-numbered years.

BIOL 222 F T 0.5
Non-Vascular Plants
An introductory course which will survey the evolution, morphology, ecology and importance to man of the fungi, algae, and bryophytes.

BIOL 230 F 2C 0.5
Introductory Cell Biology
An introduction to the concepts of cell biology with emphasis on (1) the structural organization of the cell and its constituent organelles and (2) the function of critical molecular processes that are characteristic of living organisms.
When taking this course, the lab must be designated separately. The lab is compulsory, but does not have any credit weight.

BIOL 233 W,S 2C 0.5
Human Physiology
The physiology of the major organ systems including the nervous, muscular, circulatory, respiratory, urinary, digestive, endocrine and reproductive systems.
Prereq: SCI 251-252
When taking this course, the lab must be designated separately. The lab is compulsory, but does not have any credit weight.

BIOL 239 W,S 2C 0.5
Genetics
Offered during the Spring term in even-numbered years.

BIOL 240 F 2C 0.5
Fundamentals of Microbiology
Introduction to fundamental theories, principles and methods of microbiology. Structure, methods of cultivation, growth, effects of physical factors, and inhibition and killing of microorganisms will be studied.

BIOL 241 W,S 2C 0.5
Introduction to the Microbial World
Biological characterization of major bacterial groups, microorganisms as geochemical agents, utilization of microorganisms by man, and mechanisms of microbial pathogenicity.
Offered during the Spring term in odd-numbered years.

BIOL 245 F 2C 0.5
General Microbiology 1
History and scope of microbiology. Study of the characteristics of bacteria and other microorganisms.
Open to students other than those intending to major in Biology or to enter the School of Optometry.
Not offered in Fall 1986

BIOL 246 W 2C 0.5
General Microbiology 2
Relationships of microorganisms to man and his environment.
Prereq: BIOL 245
Open to students other than those intending to major in Biology or to enter the School of Optometry.
Not offered in Winter 1987

BIOL 250 F 3C 0.5
Ecology
An introduction to the study of the relationships of plants and animals to their environment. The nature of ecosystems, ecological energetics, biogeochemical cycling, community ecology, introduction to population biology.
BIOL 250 is recommended for students specializing in ecology.
Course Descriptions

Biology

BIOL 298 F 1ld lab 0.25
Field Course
A series of one-day field trips from campus, usually the first six Saturdays of term, designed to introduce students to the flora, fauna, and major ecosystems of Southern Ontario. Written reports will be required for each trip.
Co-req: BIOL 250 or equivalent
Field trip fee: A small charge for bus fare.

BIOL 301A/B F/W 2C,3L 0.5/0.5
Human Physiology
The physiology of the major organ systems of the body. The topics discussed include circulation, respiration, digestion and nutrition, metabolism, muscle, nervous system, special senses, and the endocrine system.
No credit or grade will be given for the first term course unless the two term sequence is completed. For Optometry students only.

BIOL 311 W 2C,3L 0.5
Vertebrate Zoology
Major topics in vertebrate zoology as exemplified by both living and fossil members of the subphylum Craniata.
Prereq: BIOL 210

BIOL 315 W 2C,3L 0.5
Invertebrate Zoology
A survey of the major invertebrate phyla other than the arthropods, with emphasis on their functional anatomy, classification and ways of life.
Prereq: BIOL 210

BIOL 316 F,S 2C,3L 0.5
Arthropod Zoology
A survey of the phylum Arthropoda, including the insects, with emphasis on their classification, interrelationships and ways of life.
Prereq: BIOL 210
Offered during the Spring term in even-numbered years.

BIOL 323 F,S 2C,3L 0.5
Plant Anatomy and Morphogenesis
Plant structure in relation to function and development with particular reference to the vascular plants. Cell, tissue and organ differentiation.
Prereq: BIOL 220 and 230
Offered during the Spring term in odd-numbered years.

BIOL 324 F 2C,3L 0.5
The Flowering Plants
Students entering this course are required to make a flowering plant collection. Instructions should be obtained from the Herbarium prior to the summer break.

BIOL 327 F 2S,3L 0.5
Mycology
Fungal taxonomy and ecology; medical mycology; plant pathology; industrial applications; food and food processing; toxins and hallucinogens; biological control; fungi as coprophiles, predators, and symbionts with plants and animals.
Prereq: BIOL 221

BIOL 330 F,S 2C,3L 0.5
Molecular Biology
Molecular biological aspects of chromosome replication, expression of genetic information, functional translation of specific eukaryotic proteins, cell division, gene expression, embryogenesis, hormone action, cellular interactions and cell differentiation.

BIOL 331 W 2C,3L 0.5
Cell Physiology
The functional organization of cells with particular reference to cell-cell interaction, the structure, function and development of organelles and the biological roles of cellular membranes.
Prereq: BIOL 230

BIOL 333 W 2C,3L 0.5
Histology and Cytology
The structure of mammalian cells, tissues and organs interpreted in functional terms. Cell reproduction and differentiation, with some discussion of the embryological origin of tissues and the regulation of tissue growth. Light and electron microscopy techniques.
Prereq: BIOL 211 or 230 or 233

BIOL 335 W 2C,3L 0.5
Plant Physiology
A study of the principal physiological mechanisms that govern the water economy, mineral nutrition, transport processes and metabolism of plants.

BIOL 336 F 2C,3L 0.5
Embryology
Fundamental processes and concepts in embryonic development including the acquisition of multicellularity, organization of the early embryo, morphogenesis of tissues, major organ systems, fetal membranes, growth, differentiation and analysis of common developmental defects.

BIOL 337 F,S 2C,3L 0.5
Comparative Animal Physiology
The comparative physiology of animals with particular emphasis on homeostatic principles as demonstrated by water balance, excretion, nutrition, digestion and the endocrine system.

BIOL 338 W 2C,3L 0.5
Comparative Animal Physiology 2
A comparative study of the cardiovascular, nervous, muscular, respiratory and reproductive systems.
Prereq: BIOL 233

BIOL 342 F,S 2C,3L 0.5
Microbial Biotechnology
The role of microorganisms in biotechnology. Topics examined will include the isolation, selection, and development of microorganisms important in biotechnology, and specialized techniques for their cultivation and maintenance. Processes studied will include biomass conversions, fermentations, bioproduction of compounds, nitrogen fixation, treatment and utilization of wastes and mineral leaching.
Prereq: BIOL 240/241 or permission of instructor

BIOL 344 W 2C,3L 0.5
Microorganisms in Foods
Food preservation, spoilage, poisoning, and modern concepts in quality assurance programs are studied. The aim is to understand factors governing microbial changes in foods. Problem solving in the food industry is emphasized. Laboratory work will reflect current practices in quality control and testing.
Prereq: BIOL 240/241 or permission of instructor

BIOL 350 F,S 2C,3L 0.5
Environmental Toxicology
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 356 W 2C,1T 0.5
Population Ecology 1  
The ecology of populations. Topics include: demographic parameters and their estimation; population growth and regulation; competitive and predator-prey interactions; population genetics and evolution; applied population biology.  
Prereq: BIOL 250 and STAT 202

BIOL 416 F 2C,3L 0.5
Entomology  
Introduction to morphology, systematics and biology of insects.  
Brief field trips will be made to collect insects from different local habitats.

BIOL 420 W 2C,3L 0.5
The Flora of Canada  

BIOL 424 F 3C 0.5
Ferns, Gymnosperms and Fern Allies: an evolutionary survey  
A detailed survey of the non-flowering vascular plants with emphasis on the extant members of each major group in Ontario. The phylogeny of the plants will be explored through a study of fossil ancestors in each line of evolution.  
Prereq: BIOL 220 and 221 or permission of the instructor  
Offered in even-numbered years.

BIOL 426 W 2C,3L 0.5
Phycology  
The taxonomy and ecology of freshwater and marine algae. Algal cytology, morphology, and life histories; biology of planktonic and attached algae; culturing of algae; experimental phycology; economic aspects of algae.  
Prereq: BIOL 220 or 221

BIOL 427 W 2S,3L 0.5
Myology 2  
The growth of myological knowledge will be traced and current developments analyzed. Extensive literature surveys, active class participation, and a lab project, will be required.  
Prereq: BIOL 327

BIOL 430 F 3C 0.5
Comparative Animal Physiology 3  
A comparative study of physiological processes in animals; emphasis will be placed on the neuroendocrine system and animal models that are useful for understanding basic physiological processes.

BIOL 431 W 2C,3L 0.5
Mammalian Reproductive Physiology  
A study of the endocrine and reproductive systems of mammals. Major topics include methods of hormone assay, chemistry of the hormones, regulation of secretion, mechanisms of hormone action, neurosecretion, reproductive cycles, gametogenesis and fertilization.  
Prereq: BIOL 233 recommended

BIOL 432 F 2C,3L 0.5
Plant Growth and Development  
A study of the plant hormones and the mechanisms that control growth, dormancy and development.

BIOL 433 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.

BIOL 434 W 2C,3L 0.5
Advanced Genetics  
A detailed examination of the recent advances in molecular genetics with emphasis on the regulation of gene action in both prokaryotes and eukaryotes. Current research literature will be reviewed.  
Offered every other year. Alternates with BIOL 436.

BIOL 435 F 2C,3L 0.5
Developmental Biology  
Analysis of embryonic development of selected organisms with emphasis on growth and the processes of subcellular, cellular and organ differentiation stressing recent experimental methodology.

BIOL 436 W 2S,3L 0.5
Advanced Molecular Biology  
An examination of the current major issues in molecular biology with emphasis on the technical and conceptual advances. Current research literature will be reviewed.  
Prereq: BIOL 330  
Offered every other year. Alternates with BIOL 434.

BIOL 437 W 2C,3L 0.5
Biochemistry of Natural Products  
The chemistry, functions and distribution of natural products including alkaloids, isoprenoids, amines, phenolics, cyanogenic glycosides and other important compounds in plants and other biological systems.  
Prereq: At least one full-year course or equivalent in organic chemistry plus a one-term course in biochemistry that includes the essentials of carbohydrate and fat metabolism.

BIOL 441 F 2C,3L 0.5
Immunology  
Physical and biological properties of immunological agents that protect against disease, the procedures for their identification and their practical applications.  
Prereq: BIOL 240-241

BIOL 442 W 2C,3L 0.5
Virology  
The nature of viruses and their interaction with their plant, microbial and animal hosts.  
Prereq: BIOL 240-241

BIOL 443 F 2C,3L 0.5
Microorganisms of Industrial Importance  
A study of the role of microorganisms in industrial processes of biosynthesis and degradation.

Prereq: BIOL 344

BIOL 444 W 2C,3L 0.5
Microorganisms and Disease  
A study of the microorganisms involved in pathogenesis, their mode of infection, symptoms and prevention.  
Prereq: BIOL 240, 241, 441

BIOL 446 F 2C,3L 0.5
Microbial Ecology  
A study of the ecological roles of microorganisms. Examples from freshwater, terrestrial, marine and other ecosystems will be used to illustrate the activities and importance of microorganisms in these habitats.  
Prereq: BIOL 240-241, or permission of instructor

BIOL 447 W 2C,3L 0.5
Environmental Microbiology  
A study of the environmental impact of microorganisms. Aspects of pollution, waste treatment, biodegradation of environmental contaminants, and nutrient cycling will be examined.  
Prereq: BIOL 240-241, 446, or permission of instructor
BIOL 448 F 2C,3L 0.5
Microbial Physiology 1
A study of the physiology of microorganisms including multi-plexed and
synchronous growth, cell permeation, nutrition, physical and chemical environ-
mental factors and metabolic mechanisms as elucidated by radioactively
labelled tracers.
Prereq: BIOL 240/241 or permission of instructor

BIOL 449 W 2C,3L 0.5
Microbial Physiology 2
A study of the physiology of microorganisms with emphasis on synthetic and
assembly processes. Mechanisms underlying the biosynthesis of DNA,
protein, stable RNA, peptidoglycan, phospholipids, lipopolysaccharides and
polysaccharides as well as assembly of the cell envelope, the nucleoid and poly-

drones will be discussed.
Prereq: BIOL 240/241 or permission of instructor

BIOL 450 F 2C,3S 0.5
Marine Biology
An examination of coastal and offshore marine environments. Physical and
chemical oceanography, plankton, benthos, and fish are discussed.
Prereq: BIOL 210, a marine field course
Antireq: SCI 453
Not offered in Fall 1986

BIOL 451 W 3C 0.5
Limnology
A study of the geomorphology, physical and chemical processes, and biology of
lakes and streams. Ecology of zooplankton, zoobenthos, and fish are emphasized.
Prereq: BIOL 210, 250
Antireq: SCI 454

BIOL 452 F 2C,3S/field 0.5
Fisheries Biology
The practices of fisheries biology; life history; age and growth, fecundity,
production, harvest and management of fisheries resources.

BIOL 456 F 2C,3L 0.5
Environmental Toxicology 2
Cellular, developmental and physiological effects of toxicants on multicellular
organisms.
Prereq: BIOL 350
Canadian Studies

**Course Descriptions**

**Introductory Note**
The core courses for each year of the program constitute an interdisciplinary study of Canadian problems, and are offered either in a lecture/tutorial format or a seminar format (depending on the number of students registered). These courses are given by faculty members of the participating departments of the University and by eminent scholars from other parts of Canada who visit the University for brief or extended periods during the year.

**Landforms and Mindscapes**
An introduction to the Canadian landscape and its early impact upon the creative imagination of Canadians. The course sets out to provide a basis for dealing with contemporary Canadian culture.

**Social Regionalism**
Lecturers in Geography, Political Science, Sociology and History discuss the roles which economic disparities, social elites, federal/provincial relations, and political parties play in defining Canadian regionalism. Particular attention is paid to Quebec's desire for separate status.

**Cultural Regionalism**
Lecturers discuss the contribution made by literature, film, drama, and fine arts in defining distinctive regional identities in Canada. Particular attention is paid to the emergence of a distinctive Ontario culture.

**Regionalism: West**
This course continues the exploration of Canadian regionalism by applying knowledge gained in CDN ST 201/202 to distinctive problems of Atlantic Canada. The focus of the seminar will vary according to the interests of the faculty and students.

**Regionalism: East**
This course continues the exploration of Canadian regionalism by applying knowledge gained in CDN ST 201/202 to distinctive problems of Atlantic Canada. The focus of the seminar will vary according to the interests of the faculty and students.

Prereq: CDN ST 101, 201 or 202 or permission of instructor

**Research Essay**
An extensive senior research essay, supervised by a committee composed of faculty members from 2 or more of the participating departments, which deals with a specific aspect of Canada utilizing material and methods from several different disciplines. A grade for CDN ST 400A will be submitted only after the completion of CDN ST 400B.

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**Canadian Studies Program Board**
K.M. Bennett, BA, MA (Queens), PhD (McGill)

**Assistant Professors**
D.W. Hoffmam, BSA, MSA (Toronto), PhD (Waterloo)

**Associate Professors**
T.S. Abler, BA (Northwestern), MS (Wiscassin-Milwaukee), PhD (Toronto)
F.C. Gerard, MA (College St. Dominique, France) BD, STM (McGill), PhD (Harvard) P
A. Hunter, BA (British Columbia), MA, PhD (McMaster)
R.D. Legge, BA (Transylvania), STB (Harvard), PhD (McMaster)
E.R. Officer, BA (British Columbia), MA (Wisconsin)
G.E. Stelknaug, BA (Pacific Lutheran), MA, PhD (Nebraska)
W.D. Wilson, MA, PhD (Trinity College, Dublin)

**Assistant professors**
D.J. Horton, BA (Waterloo Lutheran), MA (Waterloo), PhD (McGill)
G.O. Michalenko, BA, PhD (Saskatchewan)
R.P. Woostencroft, BA, PhD (Alberta)

** Participating Faculty**
Professor
R.R. Krueger, BA, MA (Western Ontario), PhD (Indiana)

**Associate Professors**
T.S. Abler, BA (Northwestern), MS (Wiscassin-Milwaukee), PhD (Toronto)
M.S. Bird, BA, MA, PhD (Iowa) R
M.F. McDonald, BA (Toronto), MA, PhD (Pittsburgh)
K.M. McLaughlin, BA (Waterloo), MA (Dehouse), PhD (Toronto)
S.E. Molinlin, BA, MA (Carleton), PhD (Dehouse)
P.G. Sockam, BA (Toronto), MA (Iowa), PhD (Toronto)

**Assistant Professors**
S.D. Burt, BA, MA (Waterloo) PhD (York)
D.J. Horton, BA (Waterloo Lutheran), MA (Waterloo), PhD (McGill)
E. Kman, MA, PhD (Toronto)

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**Notes**

- CDN ST 302 W 3S 0.5
  - **Regionalism: East**
    - This course continues the exploration of Canadian regionalism by applying knowledge gained in CDN ST 201/202 to distinctive problems of Atlantic Canada. The focus of the seminar will vary according to the interests of the faculty and students.
    - Prereq: CDN ST 101, 201 or 202 or permission of instructor

- CDN ST 400A/B T 0.5:0.5
  - **Research Essay**
    - An extensive senior research essay, supervised by a committee composed of faculty members from 2 or more of the participating departments, which deals with a specific aspect of Canada utilizing material and methods from several different disciplines.
    - A grade for CDN ST 400A will be submitted only after the completion of CDN ST 400B.

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**Department of Chemical Engineering**

**Professor, Chairman of the Department**
E. Rhodes, BSc Tech, MSc Tech, PhD (Manchester), PEng

**Professor, Associate Chairman (Graduate Studies)**
G.L. Rempel, BSc, PhD (British Columbia)

**Professor, Associate Chairman (Undergraduate Studies)**
C.M. Burn, BASc, MASC (Toronto), PhD (Polytechnic Institute, Brooklyn), PEng

**Professors**
J.J. Byerley, BASC, MASC (Toronto), PhD (British Columbia)
K.S. Chang, BS (Kwang Institute Technology, Seoul), MSc, PhD (Northwestern)
F.A. Dullein, Dipl Ing (Budapest Technical University), MASC, PhD (British Columbia), PEng
T.Z. Fehidy, BSc, MSc (Queens'), PhD (Illinois), PEng
G.J. Farquhar, BASc (Waterloo), PhD (Wisconsin), PEng, Recipient of the Distinguished Teacher Award
R.Y.M. Huang, BASc (National Taiwan University), MASC, PhD (Toronto), PEng

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Course Descriptions

Introduction

Course Descriptions

Introductory Note

Prerequisite: For all courses in the Department of Chemical Engineering, registration in the Department or permission of the Associate Chairman (Undergraduate Studies) is a requirement.

Course Descriptions

Chemical Engineering Concepts

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 100 F 3C 1.75
Chemical Engineering Concepts 1

An extension of the topics covered in CH E 100. Energy balances. Laboratory experiments illustrate the physical principles discussed.

CH E 102 F 3C 0.5
Chemistry for Engineers

Chemical principles with applications in engineering. Stoichiometric calculations, thermodynamics, heats of reaction, second law, 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 F.S 3C 1.75
Physical Chemistry


CH E 232 F.W 3C 0.5
Inorganic Chemistry

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 F.S 3L 0.5
Physical Chemistry Laboratory

Experiments on viscosity of gases and liquids, chemical kinetics, absorption, homogeneous and heterogeneous catalysis, thermochromy, phase equilibria, diffusion, determination of molecular weight of polymers, training in technical report writing.

CH E 234 F.W 3C 0.5
Transport Processes 1

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 F.W 3C 1.0

Transport Processes 2 (Fluid Mechanics)

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 314 F.W 3C 1.0

Transport Processes 4 (Mass Transfer)

Mass transfer by molecular and turbulent motion, heat-mass transfer analogies, mass transfer models and applications 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.

CH E 317 F.W 3C 1.0

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.

CH E 213 F.S 3C 1.0

Transport Processes 2 (Fluid Mechanics)

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 leaking. Introduction to computer methods for multicomponent mixtures.

CH E 210 F.W 3C 1.0

Transport Processes 1 (Equilibrium Stage Operations)
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 F,W 3C,1T 0.5
Process Dynamics and Control 1
Block and signal flow diagrams, proportion rate-integral-derivative controllers, frequency response, analytical and graphical stability criteria. Introduction to digital control theory. Computer lab includes simulation and control strategy design.

Prereq: MATH 216, CH E 314, CH E 320

CH E 330 W,S 3C 0.5
Chemical Engineering
Thermodynamics
Thermodynamics of flow processes, evaporation and condensation, chemical equilibria in chemical reactions, thermal pollution, the energy crisis, efficient energy utilization and thermodynamics.

Prereq: CH E 231

CH E 331 F,W 3C 0.5
Chemical Reaction Engineering
Heterogeneous reactions; 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, electrochemical conductance and transport, reversiilne, electrode processes, irreversible electrode processes and electrode kinetics, electrochemical measurements and their analytical applications, chemistry of corrosion.

Prereq: CH E 232

CH E 333 F,W 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 finance, time value of money, taxes and depreciation, profitability, estimation of capital and production costs, linear programming, study of piping, valves, pumps, compressors, and fans. Materials of construction.

CH E 410 F,S 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 F,S 3C 0.5
Engineering Economics and Process Design 2
The business cycle and financial statements, cost accounting, optimization, Study of pressure vessels and equipment for heat and mass transfer.

CH E 486 F,S 3C 0.5
Technological 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 NR, and CR must be obtained as a requirement for graduation.

CH E 501 W 3C 0.5
The Engineer as Entrepreneur
A survey course covering the place of small business in Canadian manufacturing. The role of innovation in organizing a successful new business. Topics important to business startup; patent, business plan, financing new ventures, bookkeeping, marketing, government assistance, taxation, and bankruptcy.

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 fluid flow through porous media. Principles of production performance, water flooding and enhanced recovery techniques.

CH E 510 F,S 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. Application of characteristics and behaviour to pseudo two-phase flow in pipes, boiling and evaporation, filtration.

CH E 517 F,S 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 requirement, selection, optimal design and operation, mass transfer with chemical reaction.

CH E 520 F,S 3C 0.5
Chemical Engineering Analysis
Application of advanced mathematical techniques to the analysis of chemical engineering processes.

CH E 521 W 3C 0.6
Process Dynamics and Control 2
Computer control, state space methods, control of complex chemical systems.

Prereq: CH E 321

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 321

CH E 540 F,S 3C 0.5
Introduction to Polymer Science
Basic definitions and polymer nomenclature, molecular weight averages and distributions, constitutional and configurational isomerism, rubber elasticity, step-growth and free radical chain growth polymerizations, emulsion polymerization.

Prereq: CH E 231, CHEM 25A or equivalent

Antireq: CHEM 25D

Course Descriptions

Chemical Engineering
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.  
Coreq: CH E 541

CH E 550 F, W 3C 0.5  
**Introduction to Extractive Metallurgy**  
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 metalurgical processes.

CH E 551 W 3C 0.5  
**Metallurgical Chemistry**  
Ionic equilibria, thermodynamics and kinetics of reactions in solution, bonding, stability and stereochemistry of co-ordination compounds and mechanisms of their reaction, introductory hydrometallurgy, corrosion and homogeneous catalysis.

CH E 553 W 3C 0.5  
**Principles of High Temperature Extractive Metallurgy**  
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.

CH E 560 F, S 3C 0.5  
**Introduction to Biochemical Engineering**  
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.

CH E 561 W 3C 0.5  
**Fermentation Operations**  
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.  
Prereq: CH E 560 or permission of instructor

CH E 563 W SC 0.5  
**Food Processing**  
Effects of formulation, additives, and processing on organoleptic and nutritional quality.  
Prereq: CH E 560 or permission of instructor

CH E 570 F, W 3C 0.5  
**Air Pollution**  
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.

CH E 571 W 3C 0.5  
**Water Pollution**  
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.

CH E 580 F, W 3L 0.5  
**Research-Design Project 1**  
Individually supervised research and/or design project on any Chemical Engineering subject chosen by the student-professor group. Written report required.

CH E 581 W 12L 1.0  
**Research-Design Project 2**  
Continuation of CH E 580. Equivalent to 2 one-term courses. A written report, meeting minimum technical report standards, and a public oral presentation will be required.

CH E 585 W 6L 0.5  
**Process Systems Design**  
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.

CH E 007 F, W, S 1C 0  
**General Awareness Seminar**  
Informal discussions on the Chemical Engineering program.

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**Department of Chemistry**

Professor, Chairman of the Department  
A.J. Cart, BSc, PhD (Nottingham), FOIC

Professor, Associate Chairman of the Department  
R.G. Woolford, MSc (Western Ontario), PhD (Illinois), FOIC

Associate Professor, Associate Dean, Undergraduate Studies, Faculty of Science  
D.A. Brisbin, BSc (Alberta), PhD (Toronto)

Associate Professor, Assistant Dean, Special Projects, Faculty of Science  
R.J. Friesen, BSc, MSc (Manitoba)

Associate Professor, Graduate Officer  
G.I. Dmitrienkko, BSc, PhD (Toronto)

Associate Professor, Undergraduate Officer  
A.D. Maynes, MA, PhD (Toronto)

Professor, (University of Guelph) Director of the Guelph-Waterloo Centre for Graduate Work in Chemistry  
R.J. Balahura, BSc (Waterloo), PhD (Alberta)
Course Descriptions

Some courses are regularly given every other year, and are listed in their regular places.

Introductory Note

In all cases, it is the student's responsibility to determine eligibility to enter a course. It is advisable to obtain special consents in writing before registration period to avoid delays and complications.

Most 300- and 400-level courses are listed as 2 lecture hours. An additional hour may be scheduled at the discretion of the lecturer, usually for a tutorial.

COURSES CARRYING NO UNIVERSITY CREDIT

CHEM 001
Pre-University Chemistry

The course covers the material considered essential preparation for first year chemistry courses. Included are formulae, nomenclature, stoichiometry, an introduction to thermodynamics, solution chemistry, chemical equilibrium, 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 granted by correspondence only.

CHEM 10 W 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 any visiting speakers.

YEAR 1 CHEMISTRY COURSES

CHEM 123 F 3C, 1T 0.5
Chemical Reactions, Equilibria and Kinetics

The stoichiometry of compounds and chemical reactions; principles of equilibria, solubility and acid-base equilibria; electrochemistry; chemical kinetics.

Prereq: Grade 13 Chemistry, (Calculus)
Coreq: (for science students) CHEM 123L
Antireq: CHEM 125

CHEM 123, F 3L 0.25
Chemical Reaction Laboratory 1

Selected experiments for students taking CHEM 123 or 125.

CHEM 124 W.S 3C, 1T 0.5
Organic Chemistry 1

Bonding in carbon compounds, structures, properties and nomenclature of several important classes of organic compounds. Interconversions of functional groups. Mechanisms of organic reactions.

Prereq: Grade 13 Chemistry, Mathematics (Calculus)
CHEM 123 strongly recommended
Coreq: (for science students) CHEM 124L
Antireq: CHEM 126, 06

CHEM 124 W.S 3L 0.25
Chemical Reaction Laboratory 2

Selected experiments for students taking CHEM 124 or 125.
CHEM 125 F 3C, 1T 0.5
Chemical Reactions, Equilibria and Kinetics
An enriched version of CHEM 123 for all students in, or planning to enter, Chemistry or Biochemistry programs.
Prereq: Same as for CHEM 123
Coreq: Same as for CHEM 123
Antireq: CHEM 123

CHEM 126 W, S 3C, 1T 0.5
Organic Chemistry 1
An enriched version of CHEM 124 for all students in, or planning to enter, Chemistry or Biochemistry programs.
Prereq: Same as for CHEM 124
Coreq: Same as for CHEM 124
Antireq: CHEM 124

UPPER YEAR CHEMISTRY COURSES

CHEM 26 F, W, 3C, 3L 0.5
Organic Chemistry 1
Basic chemistry of aliphatic compounds; shapes of molecules. A laboratory course on preparative organic chemistry accompanies the lectures.
Prereq: Grade 13 Chemistry
Antireq: CHEM 124, 124L, 126
For students in Year 2 Engineering

CHEM 261 F, W, 3C 0.5
Structure and Bonding
Prereq: Grade 13 Chemistry, Physics, completion of Year 1 in good standing or permission of instructor
Antireq: CHEM 218
For Honours students only

CHEM 261L F, W, 3C, 1T 0.5
Development of Chemical Bonding and Structure
Prereq: Grade 13 Chemistry, Physics, completion of Year 1 in good standing or permission of instructor
Antireq: CHEM 212

CHEM 219 W 2C, 1T 0.5
Chemistry of Non-Transition Elements
Group trends in main group chemistry. Emphasis will be placed on correlation of structure with physical properties in various groups of compounds.
Prereq: CHEM 212 or 216
Antireq: CHEM 319
By correspondence only

CHEM 220 F, W, 2C, 1T 0.5
Introductory Analytical Chemistry
The principles underlying quantitative measurements.
Prereq: CHEM 123 or 125, 123L
Coreq: (for Science students) CHEM 220L
For Honours students only

CHEM 220L F, W 3L 0.25
Analytical Chemistry Laboratory 1
Selected experiments for students taking CHEM 220.
For Honours students only

CHEM 221 F, W, S 2C 0.5
Multi-component Analysis
Electrochemical and spectroscopic methods for the quantitative description of multi-component systems.
Prereq: CHEM 220
Coreq: (for Science students) CHEM 221L
For Honours students only

CHEM 221L F, W, S 6L 0.5
Analytical Chemistry Laboratory 2
Selected experiments for students taking CHEM 221.
For Honours students only

CHEM 223 W 2C, 3L 0.5
Analytical Chemistry for Life Sciences
Selected topics of importance to Biology students, with related experiments.
Prereq: CHEM 123 or 125, 124 or 126
Antireq: CHEM 220, 221
For students in Honours Biology only

CHEM 227 F, W, S 3C 0.5
Introductory Biochemistry
An introduction to the chemistry of amino acids, carbohydrates, lipids and nucleic acids. Structure and properties of proteins and enzymes.
Prereq: CHEM 264 or 266

CHEM 227L F, W, S 3L 0.25
Introductory Biochemistry Laboratory
Selected experiments for students taking CHEM 227.

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; application of ideal systems; chemical equilibrium.
Prereq: CHEM 123 or 126, MATH 113A/B or equivalent
Antireq: CHEM 356
For Honours students only

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
For Honours students only

CHEM 264 F, W, 3C 0.5
Organic Chemistry 2
Preparation and reactions of typical organic functional groups examined from the basis of reaction mechanisms. Stereochemistry of organic molecules.
Prereq: CHEM 124 or 126
Antireq: CHEM 36, 268
For Honours students only

CHEM 265 F, W, S 2C, 1T 0.5
Organic Chemistry 3
The detailed treatment of organic chemistry begun in CHEM 124 and 264 is continued, with further emphasis on stereochemistry, reaction mechanisms and aromaticity. Introduction to spectroscopy.
Prereq: CHEM 264
Antireq: CHEM 267
For Honours students only

CHEM 266L F, W, S 3L 0.25
Organic Chemistry Laboratory 1
Selected experiments for students taking CHEM 266.
For Honours students only

CHEM 266 F, W 3C 0.5
Basic Organic Chemistry 2
More detailed discussions of the important classes of aliphatic and aromatic compounds. An extended look at stereochemistry and its importance in reaction mechanisms.
Prereq: CHEM 124 or 126
Antireq: CHEM 36, 264

CHEM 266L F, W 3L 0.25
Organic Chemistry Laboratory
Selected experiments for students taking CHEM 266.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Description</th>
<th>Prerequisites</th>
<th>Antirequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 267</td>
<td>Basic Organic Chemistry 3</td>
<td>A continuation of the concepts of CHEM 265. Introduction to carbohydrates, proteins, and lipids. Introduction to NMR and IR spectroscopies.</td>
<td>Prereq: CHEM 265</td>
<td>Antireq: CHEM 36, 265</td>
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<td>For students needing a full year of Organic Chemistry as a prerequisite to medicine, either the sequence 266/267 and 268L, or the sequence 264/265 and 262L should be selected.</td>
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<td>For Honours students only</td>
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<tr>
<td>CHEM 280</td>
<td>Chemical Problem Solving by Computer</td>
<td>Analysis of chemical problems. Development of mathematical and numerical models and algorithms, implementation of programmes using procedure-oriented languages (BASIC, FORTRAN, PASCAL), simulations and calculations on chemical processes, data reduction and treatment.</td>
<td>Prereq: CS 102 or equivalent, good standing in Year 2 of a chemistry program.</td>
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<tr>
<td>CHEM 311</td>
<td>Radiochemistry</td>
<td>An introduction to nuclear stability rules, radioactive decay processes and nuclear structure. Alpha, beta, gamma emission. Nuclear reactions, fission, production of heavy elements. Interaction of radiation with matter. Radioisotopes. Brief introduction to actinide chemistry.</td>
<td>Prereq: Grade 13 Chemistry, completion of Year 1 in good standing or permission of instructor</td>
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<tr>
<td>CHEM 312</td>
<td>Transition Metal Chemistry</td>
<td>The transition elements and their compounds. Stereoechemistry of complexes; Ligand field and molecular orbital theories of metal-ligand bonding; electronic spectra and magnetic chemistry of complexes; reaction mechanisms (if time permits).</td>
<td>Prereq: CHEM 212</td>
<td>Antireq: CHEM 316</td>
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<td>For Honours students only</td>
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<tr>
<td>CHEM 313</td>
<td>Chemistry of Main Group Elements</td>
<td>A systematic approach to the syntheses, properties, reactions and structures of compounds of the main group elements. Trends in chemical behaviour, bonding and stereochemistry.</td>
<td>Prereq: CHEM 212</td>
<td>Antireq: CHEM 219</td>
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<td>For Honours students only</td>
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<tr>
<td>CHEM 314L</td>
<td>Inorganic Chemistry Laboratory 1</td>
<td>An introduction to practical inorganic chemistry.</td>
<td>Coreq: CHEM 312 or 313</td>
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<tr>
<td>CHEM 315L</td>
<td>Inorganic Chemistry Laboratory 2</td>
<td>Advanced experiments in inorganic chemistry.</td>
<td>Prereq: CHEM 314L</td>
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<td>For Honours students only</td>
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<tr>
<td>CHEM 316</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>
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<td>By correspondence only</td>
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<tr>
<td>CHEM 320</td>
<td>Analytical Separations</td>
<td>Basic principles, instrumentation and methods of liquid and gas chromatography.</td>
<td>Prereq: CHEM 221 or permission of instructor</td>
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<tr>
<td>CHEM 321L</td>
<td>Advanced Analytical Laboratory</td>
<td>Selected experiments for students of analytical chemistry.</td>
<td>Prereq: CHEM 221, 221L</td>
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<tr>
<td>CHEM 332</td>
<td>Structural Biochemistry</td>
<td>Determination of concentration, structure and sequence of proteins, nucleic acids and polysaccharides. Protein synthesis. Enzyme kinetics. Coenzymes.</td>
<td>Prereq: CHEM 237</td>
<td>Coreq: CHEM 265 or 267</td>
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<td>For Honours students only</td>
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<tr>
<td>CHEM 333</td>
<td>Metabolism 1</td>
<td>Metabolism of carbohydrates, lipids and amino acids.</td>
<td>Prereq: CHEM 237</td>
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<td>For Honours students only</td>
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<tr>
<td>CHEM 334L</td>
<td>Advanced Biochemistry Laboratory</td>
<td>Selected experiments for students taking CHEM 332 and CHEM 333.</td>
<td>Antireq: CHEM 332L, 333L</td>
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<td>For Honours students only</td>
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<tr>
<td>CHEM 350</td>
<td>Spectroscopy and Molecular Structure</td>
<td>Introduction to concepts and applications of microwave, Raman, IR, electronic and resonance spectroscopy with respect to molecular parameters.</td>
<td>Prereq: CHEM 355</td>
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<tr>
<td>CHEM 353</td>
<td>Introduction to Polymer Science</td>
<td>Basic definitions and polymer nomenclature, molecular weight averages and distributions, constitutional and configurational isomerism, rubber elasticity, step-growth and free radical chain growth polymerizations, emulsion polymerization.</td>
<td>Prereq: CHEM 254, 264 or equivalents</td>
<td>Antireq: CHEM 540</td>
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<tr>
<td>CHEM 355</td>
<td>Physical Chemistry 3</td>
<td>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.</td>
<td>Prereq: CHEM 255, MATH 215 or equivalent</td>
<td>Antireq: PHYS 364</td>
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<tr>
<td>CHEM 355L</td>
<td>Physical Chemistry Laboratory 1</td>
<td>Selected experiments for students taking CHEM 355.</td>
<td>Prereq: CHEM 355</td>
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<td>For Honours students only</td>
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<tr>
<td>CHEM 356</td>
<td>General Physical Chemistry</td>
<td>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.</td>
<td>Prereq: CHEM 123 or 125, MATH 113A/B or equivalent</td>
<td>Antireq: CHEM 254</td>
</tr>
</tbody>
</table>
CHEM 356L F,W,S 3L 0.25
General Physical Chemical Laboratory 1
Selected experiments for students taking CHEM 356.
A special section in Winter term will be available for Honours Biochemistry (Biology and Chemistry) students only.

CHEM 357 W 2C,1T 0.5
Physical Chemistry for the Life Sciences
An introductory survey of kinetic molecular theory and transport phenomena with applications to biological systems.
Prereq: CHEM 123 or 125, MA/113A/B or equivalent

CHEM 357L W 3L 0.25
General Physical Chemistry Laboratory 2
Selected experiments for students taking CHEM 357.
Prereq: CHEM 356L

CHEM 358 F,W 2C,1T 0.5
Physical Chemistry 4
The statistical nature of large assemblies of atoms and molecules, kinetic theory of gases, transport processes, the collision theory and transition state theory of chemical kinetics.
Prereq: CHEM 355
For Honours students only

CHEM 360L F,W 8L 0.5
Physical Chemistry Laboratory 3
Selected experiments for students taking CHEM 360.
Prereq: CHEM 358L
For Honours students only

CHEM 362 W (even years) 2C 0.5
Mechanistic Organic Chemistry
Simple molecular orbital theories and their use in organic chemistry. Effects of substituents and reaction conditions on the mechanism of organic reactions.
Prereq: CHEM 265
Coreq: CHEM 368

CHEM 363 W 2C 0.5
Applied Organic Chemistry
The organic chemistry involved in selected industrial processes will be discussed. Petroleum chemistry, synthesis of dyestuffs, pharmaceuticals, pesticides, organic polymers, etc.
Prereq: CHEM 265 or 267

CHEM 366 F 2C 0.5
Structural and Synthetic Organic Chemistry
Stereochemistry in organic reactions, synthesis of selected organic compounds, examination in detail with emphasis on cyclic-addition reactions and condensation reactions.
Prereq: CHEM 265 or 267
Antireq: CHEM 368

CHEM 366L F 3L 0.25
Organic Chemistry Laboratory
Selected experiments for students taking CHEM 366.

CHEM 368 F,W,S 2C 0.5
Organic Chemistry 4
The design of organic syntheses, and especially the formation of enolate ions and their use in the formation of new carbon-carbon bonds. Acidity and basicity of organic molecules. Stereochemical concepts applied to organic molecules as well as conformational analysis.
Prereq: CHEM 265
Antireq: CHEM 366
For Honours students only

CHEM 368L F,W,S 8L 0.5
Organic Chemistry Laboratory 2
Selected experiments for students taking CHEM 368.
For Honours students only

CHEM 369A W 2C 0.5
Applied Inorganic Chemistry
The synthesis 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 369B W 18L 1.5
Research Project 2
For students in the degree-by-thesis program.

CHEM 375 W (odd years only) 3C 0.5
History of Chemistry
The development of chemistry will be traced from alchemy to the 20th century. The contributions of famous scientists to the concepts and models of modern chemistry will be emphasized.
Prereq: Completion of 2 years of a Chemistry Honours program.

CHEM 390 W 2C 0.5
Industrial Chemistry
Given entirely by invited lecturers from a broad spectrum of chemistry-related industries. The range of topics will include current industrial laboratory practice, the laboratory–plant interface, and the handling of large quantities of materials.
Strongly recommended for all chemistry majors.

CHEM 390W W (odd years only) 2C 0.5
Solid State Chemistry
Packing in solids; metals, alloys and molecular crystals; ionic and covalent solids; chemical factors inorganic 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 413 W 2C 0.5
Applied Inorganic Chemistry
The synthesis 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 (odd years only) 2C 0.5
Inorganic Cage Compounds
The synthesis, structure and reactions of selected groups of important cage compounds such as metal clusters, metalloenes, boranes, and carbonanes 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 alkal and alkaline earth metal cations.
Prereq: CHEM 312 or 313
Analytical Chemistry
Selected topics in modern analysis of inorganic materials such as rocks, ores, ceramics, metals and alloys; atomic flame spectroscopic methods, analytical X-ray techniques, methods for ultrapure materials, trace and micro determinations.
Prereq: CHEM 221 or permission of instructor

CHEM 421 W 2C 0.5
Mass Spectral and Chromatographic Analysis
Techniques and fundamental principles of combining chromatography and mass spectrometry for the identification of chemical compounds.
Prereq: CHEM 320, 264, or permission of instructor

CHEM 422 F 2C 0.5
Thermal and Electrical Analytical Methods
Techniques and fundamental principles of thermal and electroanalytical methods.
Prereq: CHEM 221, PHYS 243 or permission of instructor

CHEM 423 W 2C 0.5
Metabolism 2
Prereq: CHEM 333
Coreq: CHEM 332

CHEM 432 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 F 2C 0.5
Polymer Properties and Polymerization
Copolymerization, ionic and coordinate polymerizations, introduction to polymer reaction engineering, mechanical properties of polymers, polymer mixtures.
Prereq: CHEM 353 or equivalent
Alternatively: CH E 541

CHEM 454 F 2C 0.5
Surface Chemistry
An introduction to the physical chemistry of surfaces. Qualitative and quantitative descriptions of surfaces and interfaces and the development of relevant techniques and theories. Application to surface tension, spreading, wetting, adsorption, and other interfacial phenomena.
Prereq. CHEM 353

CHEM 455 F 2C 0.5
Electrochemistry
Electrolytic conduction 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 465 F 2C 0.5
Quantum Chemistry
The nature of electronic structure and chemical bonding in \( \text{H}_2^+ \) and other simple molecules and its implications for theories of chemical reactions.
Prereq: CHEM 355

CHEM 466 F 2C 0.5
Spectroscopy in Organic Chemistry
Elucidation and identification of organic structures by contemporary spectroscopic techniques.
Prereq: CHEM 265

CHEM 475 W 2C 0.5
Special Topics in Organic Chemistry
Topics will be selected from photochemistry, organometallics, synthesis, heterocycles, natural products, molecular rearrangements. (May be taken in third and fourth year as 465A and 465B. Provided topics are different).
Prereq/Coreq: CHEM 368

CHEM 492A F 9L 0.75
Advanced Laboratory
Laboratory work on a senior year research project. See CHEM 492 co-ordinator for descriptive booklet and details.
For Honours students only

CHEM 492B W 9L 0.75
A continuation of CHEM 492.

CHEM 495A F 9L 0.75
Research Project 3
Only for students in the degree-by-thesis program.

CHEM 495B W 18L 1.5
Research Project 4
Only for students in the degree-by-thesis program.
Department of Civil Engineering

Professor, Chairman of the Department
R.C.G. Haas, BSc, MSc (Alberta), PhD
(Waterloo), PEng

Professor, Dean of the Faculty of Engineering
W.C. Lennox, BASc, MSc (Waterloo),
PhD (Lehigh), PEng

Professor, Dean of Graduate Studies
H.H.E. Leipholz, DSc, Eng, Dr Ing,
Docent Hab (Stuttgart), FRSC, PEng,
Recipient of the Distinguished Teacher Award

Professor, Associate Chairman Graduate Studies
G.J. Farquhar, BASc (Waterloo), PhD
(Winnipeg), PEng, Recipient of the
Distinguished Teacher Award

Associate Professors

Associate Professor, Associate
Chairman, Undergraduate Studies
B. LeLievre, BEng (West Australia),
MSc (Waterloo), PEng

Professors

S.I. Anaranam, BSc (Eng) (Ceylon),
MSc (London), PhD (Cambridge),
PEng

M.B. Dusseau,6 BSc, PhD (Alberta),
PEng

E.F.P. Burnett, BSc (Cape Town), DIC,
MS, PhD (London), PEng

M.Z. Cohn, CSc (Bucharest), PEng

G.M.L. Gladwell,7 BSc, PhD, DSc
(London)

R. Green, BSc (Eng) (London), MSc
(Queen's), MSc (Waterloo), PhD
(Texas), PEng

D.E. Grison, BASc, MSc, PhD
(Waterloo), PEng

V.K. Handa, BSc (Calcutta), BSc (Eng)
(London); MSc (Queen's), MASc, PhD
(Waterloo), PEng

B.S. Hutuba, BE (Sydney), MSc
(Queen's), PhD (Waterloo), PEng

N.C. Lind, MSc (Technical University
of Denmark), PhD (Minnesota), FRSC,
PEng

E.L. Matisse, BASc (Toronto), DIC, PhD
(London), PEng

E.A. McBean, BASc (British Columbia),
SM, PhD (MIT), PEng

W.A. McLaughlin, BSc (Saskatchewan),
MSc, PhD (Purdue), PEng

G.M. McNeice, BASc (Waterloo), PhD
(London), PEng

T. Prasad, BSc, MSc (Banaras Hindu),
PhD (Cambridge)

J. Roorda, RA Sc (Waterloo), PhD
(London), PEng

J. Schroeder, BEng, MEng (McMaster),
PhD (Waterloo), PEng

A.N. Sherbourne, BSc, DSc, (London),
MS (Lehigh), MA, PhD
(Cambridge), PEng

J. Shortreed, Eng.Sc, (Western Ontario),
MSc (Queen's), PhD (Northwestern),
PEng

K.N. Smith, BASc (Toronto), MSc (Illinois),
PhD (Waterloo), PEng

S.J. Solomon, Civ.Hy Eng (Bucharest),
PhD (City University, London), PEng

T.H. Topper, BASc (Toronto), PhD
(Cambridge), PEng

T.E. Unny,6 ES (Morat), M1ecm (Khar-
agpur), Dr Ing (Dresden), PEng

S. Yagar, BASc, MASC (Toronto), PhD
(California), PEng

Associate Professors

R.W. Cockfield, BSc, MSc (Queen's),
PhD (Waterloo), PEng

R.M. Schuster,6 BSc, MS (North Dakota
State), PhD (Iowa State), PEng

J.F. Sykes, RA Sc, MSc, PhD
(Waterloo), PEng

J.C. Thompson, BASc (Toronto), MS,
PhD (Illinois), PEng

Assistant Professors

L. Rothenburg, Dipl phy (Moscow); PhD
(Carleton), PEng

F.F. Saccomanno, BSc, MCP (Manitoba),
PhD (Toronto), PEng

Adjunct Faculty

J.A. Franklin,6BSc (London), MSc, PhD
(Imperial College, London)

D.A. Godden, BASc (Toronto), LLB
(Osgoode Hall) LLM (York)

D.T. McClurkin, Chartered Accountant
N.W. McLeod, BSc (Alberta), MSc
(Saskatchewan), ScD (Michigan),
FRSC, PEng

W.R. Powl, DPA (Berlin), PEng

J.T. Pinder, Dr of Tech Sciences
(Waraw), Docent Hab (Cracow),
PEng

D.W. Schnurr, BSc (Toronto), LLB
(Osgoode Hall), PEng

O. Stradal, CE, DSc (Prague)

Faculty Members of Civil Engineering
noading cross appointments to:
Mechanical Engineering
Applied Mathematics
Chemical Engineering

Faculty Members holding cross and/or
joint appointments to Civil Engineering
from:
Architecture
Earth Sciences
Systems Design Engineering

Course Descriptions

CIV E 126 W.S 2C.4LT 0.5
Civil Engineering Concepts
A continuation of GEN E 115 with appli-
cations of graphics, measurement and
other analytic principles to introductory
problems in the various disciplines of
Civil Engineering; an introduction to
e design engineering methods as applied
to Civil Engineering and including speci-
fication development, information-
gathering, concept formulation, feasibility
analysis and report writing.

CIV E 203 F.W 2C.2T 0.5
Statics
Equilibrium of rigid and deformable
bodies. Analysis of internal forces in
structures; beams, cables, arches, trusses.

CIV E 204 F.W 3C.1T 0.5
Mechanics of Solids 1
Stress-strain-temperature relationships.
Axial tension. Thin-walled pressure
vessels. Torsion of shafts. Bending of
beams. Analysis of stresses in beams.

CIV E 205 F.S 3C.1T 0.5
Mechanics of Solids 2
Duckling and Stability. Failure hypoth-
eses. Virtual work. Displacement anal-
ysis. Introduction to influence lines.

CIV E 221 F.W 3C.1T 0.5
Calculus 2
A review of Year 1 Calculus. Hyperbolic
Functions. Partial derivatives. Multiple
integration with applications. Vector
analysis, theorems of Green and Gauss,
line integrals. Elements of Fourier series.

CIV E 222 F.S 3C.1T 0.5
Differential Equations
An introduction to linear and partial
differential equations. Standard methods
of solution, applications to physical and
engineering problems, linear equations
with constant coefficients, systems of
differential equations, solution by series,
numerical methods, partial differential
equations. Applications from Dynamics
and Vibrating Systems.

CIV E 223A F.W 1C.3T 0.25
Computer Workshop A
An introduction to Microcomputers,
Spreadsheets, Word Processors and the
BASIC language. Workshop includes
applications selected from Year 2 Civil
Engineering courses.

For Civil and Geological Engineering
students only
CIV E 223B 3,F 1C,3T 0.25
Computer Workshop B
An introduction to the use of Microcomputers, Spreadsheets and Word Processors; Application to problems in Civil Engineering. 5 weeks only
For Civil and Geological Engineering students only

CIV E 224 F,W 2C,2T 0.5
Probability and Statistics

CIV E 253 F,S 2C,2T 0.5
Geology for Engineers
A study of earth processes and earth materials from an engineering point of view. Topics include: mineral and rock identification, the rock cycle, structural geology, geology of Canada, effects of water, ice and wind. Description of aggregates used in engineering works. Field trip.

CIV E 285 F,W 3C,1T,3L 0.5
Structure and Properties of Materials

CIV E 290 S,F 4C,2T,2L 0.75
Fluid Mechanics and Thermal Sciences
An introduction to fluid mechanics and thermal sciences. Fluid properties, fluid statics: thermodynamic principles: Bernoulli equation; the momentum equation and applications; laminar and turbulent flow; closed conduit flow; pipe network analysis; dimensional analyses and similitude; steady flow in pipes; heat transfer. 4 lab sessions.

CIV E 291 F 1 wk flud lab 0.5
Survey Camp
A one-week course in surveying. Introduction to surveying, engineering measurements, levelling, transit surveys. Approximate cost to each student $120.

CIV E 292 F,W 2C,2T 0.5
Engineering Economics
An introductory course on the principles of engineering economy. Basic concepts; capital; interest formulas and derivations; annual worth comparisons; present worth; return on investment; benefit-cost ratio depreciation effect of taxes.

CIV E 298 F,W 2S 0.0
CIV E 299 S,F 2S 0.0
Seminar
The engineer in society. Principles, methods and practice of Civil Engineering. Informal lectures.

CIV E 300 W,S 2C,2T 0.5
Civil Engineering Project 1
The development of problem-solving skills utilizing the systems approach to the solution of civil engineering problems. Knowledge from previous courses and the practical application of the digital computer are integrated in a team/project-oriented environment. A written report and a verbal presentation are requirements. 6 lab sessions.

CIV E 303 W,S 3C,1T 0.5
Structural Analysis 1

CIV E 313 F,W 3C,1T 0.5
Water Quality Engineering
Basic water chemistry. Mathematical modeling of water quality. Treatment systems. Solid Waste Management. Air pollution. 7 lab sessions.

CIV E 321 F 1C,3T 0.5
Hydraulics
Open channel flow; flood routing; dams; spillways; gates and culverts; pumps and turbines; flood mapping; urban drainage.

CIV E 324 F,W 3C,1T 0.5
Transport Principles and Applications
Introduction to basic principles and procedures of transport planning and engineering, as applied to Canadian intercity transport problems.

CIV E 342 F 2C,2T 0.5
Traffic Engineering
Theories of road capacity, Capacity and quality of service on rural and urban roads. Traffic signals: capacity, delay, association and optimization of phase times. Control of combinations and networks of signals. Application of assignment in traffic models.

CIV E 343 F 2C,2T 0.5
Urban Transport Planning
Basic concepts needed to explore current issues in Urban Transportation; includes planning models of trip generation, mode split distribution and assignment. Evaluation of transport proposals based on the decision environment and extensions of engineering economics. Basic notions of system continuity, historical perspectives and system operating characteristics are addressed.

CIV E 353 W,S 3C,1T,2L 0.5
Geotechnical Engineering 1
An introduction to geologic processes; subsurface exploration; classification systems, weight-volume relationships, soil mechanics principles including state of stress, ground water flow, consolidation and shear strength.

CIV E 354 F,W 3C,1T 0.5
Geotechnical Engineering 2
Foundation engineering; earth pressure theories; retaining walls; anchors; shallow and deep foundations; braced trenches and excavations; slope stability.

CIV E 361 F,W 3C,1T 0.5
Hydraulics
Open channel flow; flood routing; dams; spillways; gates and culverts; pumps and turbines; flood mapping; urban drainage.

CIV E 375 W,S 3C,1T,2L 0.5
Water Quality Engineering
Basic water chemistry. Mathematical modeling of water quality. Treatment systems. Solid Waste Management. Air pollution. 7 lab sessions.

CIV E 398 W,S 2S 0.0
CIV E 399 W,S 2S 0.0
Seminar
The engineer in society. Principles, methods and practice of Civil Engineering. Informal lectures.

CIV E 400 F,S 1C,3T 0.5
Civil Engineering Project 2
The purpose is to provide the students with an opportunity to demonstrate their capacity to engage in the practice of civil engineering as a profession. The students are encouraged to independently identify and resolve a problem within the scope of their chosen area of specialization utilizing knowledge gained from their academic and employment experiences. A written report and a verbal presentation are requirements.
CIV E 401 W 4T 0.5
Civil Engineering Project 3
An independent or team project dealing with engineering design or research, under the direction and with the consent of a faculty member.

CIV E 403 F,S 3C,1T 0.5
Structural Analysis 2
Advanced structural analysis of planar and space frameworks, linear and nonlinear behavior. Computer Applications.
Prereq: CIV E 303

CIV E 404 W 2C,2T 0.6
Structural Analysis 3
Approximate methods of analysis for a variety of structural forms. Application of approximate techniques to beams, building frames, shear walls, plates, tension and vibration problems. Approximate structural design.
Prereq: CIV E 313, 413

CIV E 405 W 2C,2T 0.5
Structural Dynamics

CIV E 406 W 2C,2T 0.5
Mechanics of Solids 3

CIV E 407 W 2C,2T 0.5
Building Sciences and Technology
The building process: loadings; gravity, wind, thermal, moisture, fire; enclosure design: walls, windows, roof, subgrade construction; energy related considerations; energy load, economics.
Prereq: CIV E 313, 413, 414 or consent of instructor

CIV E 413 F,S 3C,1T 0.5
Structural Steel Design
Prereq: CIV E 303

CIV E 414 S,F 3C,1T 0.5
Structural Concrete Design 2
Prereq: CIV E 313

CIV E 415 W 2C,2T 0.5
Structural Systems
Geometries, loads, safety and serviceability, structural idealizations. Building design and bridge design. Proportioning of components and structures in concrete, steel, masonry and wood.
Prereq. CIV E 313, 413, 414

CIV E 422 W 2C,2T 0.5
Finite Element Analysis
Introduction to the Finite Element Methods in field problems. Applications to the theory using available computer programs.

CIV E 430 W 2C,2T 0.5
Experimental Mechanics

CIV E 440 W 3C,1T 0.5
Transport Systems Analysis
Introduction to basic concepts of transport systems analysis: systems analysis framework, accounting methods, experimental design techniques, decision theory, basic approaches to simulation modeling. The emphasis is on development of methods of analysis, for application to selected case studies in the transport sector.
Prereq: CIV E 342

CIV E 442 W 3C,1L 0.5
Pavement Structural Design
Pavement design, soil identification, subgrade design, base courses, flexible pavement design, design and testing of asphaltic concrete mixes, surface treatments.
Prereq: CIV E 353

CIV E 444 W 2C,2T 0.5
Geotechnical Engineering 3
Simulation of geotechnical consulting practice. Students are required to complete several projects, based on actual case studies, which require problem identification, evaluation of geotechnical data, analysis, design and report preparations.
Prereq: CIV E 353, 354

CIV E 446 F 3C,2T 0.5
Orthopaedic Bioengineering
Introduction of engineering technology to the field of orthopaedics. Specific topics deal with the repair and reconstruction of portions of the musculoskeletal system affected by trauma or pathological response. Primary study is directed toward the skeletal joints and major load carrying structures. Students must have had background study in properties and mechanics of materials equivalent to CIV E 204 and CIV E 265. Registration in this course will be assessed on an individual basis through scheduled interviews.
Cross-listed as GEN E 480.

CIV E 472 F,S 3C,1T 0.5
Wastewater Treatment
Introduction to wastewater treatment. Wastewater quantity; Wastewater characteristics; Primary treatment; Secondary treatment; Sludge treatment and disposal; Industrial wastewater management. Design project.
Prereq: CIV E 375
Coreq: CIV E 381

CIV E 473 W 2C,2T 0.5
Contaminant Transport
Prereq: CIV E 372
Coreq: CIV E 381

CIV E 480 W 2C,2T 0.5
Water Resources Management
A course on water resource management problems in Canada. Description of basic areas of water resource management. Application of systems analysis and operations research techniques: management. Benefit-cost analysis. Social, political, legal and ecological considerations.
Coreq: CIV E 381

CIV E 486 S,F 3C,1T 0.5
Hydrology
Basic hydraulics principles; elementary hydrologic design; principles of reservoir design; mathematical modelling of hydrologic budget; data networks; design events; urban hydrology.
Coreq: CIV E 381
Course Descriptions

Department of Classical Studies

Professor, Chairman of the Department
P. Forsyth, AB (Mount Holyoke), MA, PhD (Toronto), Recipient of the Distinguished Teacher Award

Assistant Professor and Undergraduate Officer
R.L. Fowler, BA, MA (Toronto), DPhil (Oxford)

Assistant Professors
P. Keresztes, MA (Toronto), PhD (Graz)

Participating Faculty in Classics at Wilfrid Laurier University
H.A. MacLean, BA (McMaster), MA, PhD, (Wisconsin)
D.W. Roller, BA, MA (Oklahoma), PhD (Harvard)
G.P. Scharff, BA, MA (Dahousie), PhD (Pennsylvania)
G.R. Vallée, BA, MA (McGill), PhD (Chicago)
J. Zeyl, BA, MA (Toronto), PhD (McMaster)

Faculty Member of Classical Studies holding cross appointment to:
Fine Arts

CLASICAL CIVILIZATION

(Courses in Translation)

Courses not offered in the current academic year are listed at the end of this section.

Classical Studies

Greeks

A survey of ancient Greece, emphasizing its political, military, social and economic aspects.

This course is acceptable for credit by the History Department.

Ancient Roman History

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.

Students are advised to preregister early for this course as enrolment is limited.

Ancient Greek History

A survey of ancient Greece, emphasizing its political, military, social and economic aspects.

This course is acceptable for credit by the History Department.

Ancient Roman History

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.

Students are advised to preregister early for this course as enrolment is limited.

Course Descriptions

C CIV 101 F 3C 0.5
Colossus - The Major Figures of Ancient Greece
An introductory study of the achievement of ancient Greece through some of its most prominent figures. Each year 2 of the following will be featured: Theseus: The Minoan-Mycenaean Age of Bronze; Pericles and the Rise of Democracy; Socrates and Plato; Alexander the Great and The Age of Expansion.

C CIV 102 W 3C 0.5
Colossus - The Major Figures of Ancient Rome
An introductory study of the achievement of ancient Rome through some of its most prominent figures. Each year 2 of the following will be featured: Julius Caesar and his Collapse of the Republic: Augustus: The Empire Rises; Nero and the Corruption of Power; Hadrian and the Imperial Machine.

C CIV 201 S.F 3C 0.5
Ancient Greek History
A survey of ancient Greece, featuring such topics as the individual (male and female), political institutions, art, religion, philosophy, literature, social life and leisure activities.

Students are advised to preregister early for this course as enrolment is limited.

C CIV 202 W 3C 0.5
Ancient Roman History
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.

Students are advised to preregister early for this course as enrolment is limited.
### Course Descriptions

**Classical Studies**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Division</th>
<th>Credits</th>
<th>Description</th>
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</table>
| CIV 266 | W | 3C | 0.5 | Medieval Civilization 1  
A study of medieval literature, art, architecture, music and other expressive forms. The period from late antiquity to A.D. 1200 will be studied. |
| CIV 266 F | 3C | 0.5 | Ancient Tragedy in Translation  
This course focuses upon the dramatic literature of the classical age in Athens. It features the Orestes of Aeschylus, the "Oedipus" plays of Sophocles, and the Medea, Hippolytus and Bacchae of Euripides. Roman tragedy is also studied for comparative purposes through the plays of Seneca. No knowledge of Greek or Latin is needed. Cross-listed as DRAMA 251. |
| CIV 266 | 3C | 0.5 | Social Problems in Antiquity  
A study of selected social problems in ancient Greece and Rome. Each year, 2 of the following will be examined: women in society, slavery and the labor force, the aged and infirm, human sexuality and sexual mores, children and education, minority groups and racial prejudice, war and conflict. Prereq: C IV 201 or 202 or instructor's permission. |
| 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 flood, the ages of man. |
| CIV 302 S.W | 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 the mystery religions (with their relation to Christianity). |
| CIV 351 F | 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. Cross-listed as FNE 310. |
| CIV 362 W | 3C | 0.5 | Roman Art and Architecture  
A survey of the art and architecture of the Roman world from Etruscan to imperial Times. Cross-listed as FNE 311. |
| CIV 361 F | 3C | 0.5 | History of Ancient Philosophy 1  
From the beginnings to Plato. Cross-listed as PHIL 380. |
| CIV 362 W | 3C | 0.5 | History of Ancient Philosophy 2  
From Aristotle to the close of classical antiquity. Cross-listed as PHIL 381. |
| CIV 365 W | 3C | 0.5 | Ancient Comedy in Translation  
The comedy of the ancient Greeks and Romans will be examined through selected plays of Aristophanes, Menander, Plautus and Terence. The different types of comedy, and their evolution, will be studied in lectures and discussions. No knowledge of Greek or Latin is needed. Prereq: CIV 265 or instructor's permission. Cross-listed as DRAMA 358. |
| CIV 361 F | 3C | 0.5 | From Diocletian to Constantine  
A study of the political and economic collapse of the Roman Empire, essential ideas of the ruler, paganism, and the persecution of the Christian Church. |
| CIV 362 W | 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 empire and its economy, his relationship with the Christian Church, and the establishment of 'new Rome'. |
| CIV 364 W | 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, medicine, and of the technological skills which produced and distributed raw materials, manufactured goods and agricultural products. Prereq: First year science or engineering course. CIV 201 or 202 or 251 or 252 or instructor's permission. |
| CIV 402 W | 3C | 0.5 | The Aegean in the Bronze Age  
A senior course concentrating on the Cycladic, Minoan and Mycenaean civilizations of the Bronze Age. Prereq: CIV 201, 202, 351 or instructor's permission. |
| CIV 485 F | 2C | 0.5 | Greco-Roman Civilization and History 1  
Senior seminar: intensive study of various problems. Prereq: Previous work in ancient history or instructor's permission. This course is acceptable for credit by the History Department (but not as a senior seminar). |
| CIV 402-408 | | | 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. |

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**COURSES NOT OFFERED 1988-89**

- CIV 256 Medieval Civilization 2
- CIV 266 Ancient Epic in Translation
- CIV 366 Ancient Lyric and Satire in Translation
- CIV 371 Christianity and the Roman Empire 1
- CIV 372 Christianity and the Roman Empire 2
- CIV 456 Greco-Roman Civilization and History 2

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**GREEK**

Courses not offered in the current academic year are listed at the end of this section.

- **GRK 100A** F. 4C 0.5
  **Introductory Ancient Greek 1**
  A course designed for students beginning the study of ancient Greek or who have not yet reached the level expected in GRK 231/232. The aim is to attain as rapidly as possible the ability to read simple prose. Those desiring further competence should go on to do GRK 100B.
  Prereq: GRK 100A and RS 106A may not both be taken for credit.

- **GRK 100B** W 4C 0.5
  **Introductory Ancient Greek 2**
  Continuation of GRK 100A. The aim is to attain basic reading competence in prose.
  Prereq: GRK 100A or RS 106A

- **GRK 231** F 3C 0.6
  **Intermediate Greek 1: The World of Heroes**
  Selections from Homer, Herodotus and Sophocles.
  Prereq: GRK 100B, Grade 13 Greek or instructor's permission

- **GRK 252** W 3C 0.5
  **Introduction to Plato**
  Selections from Plato.
  Prereq: GRK 100B, Grade 13 Greek or instructor's permission
GRK 371 W 3C 0.5
Introduction to the Greek Historians
Selections from Xenophon and others.
Prereq: One full 200-level Greek course or instructor’s permission.
Offered 1986-87 at Wilfrid Laurier

GRK 372 F 3C 0.5
Herodotus
Selections from the Persian Wars.
Prereq: One full 200-level Greek course or instructor’s permission

GRK 452 W 3C 0.5
Homer
Extended reading of Homer.

GRK 400-400
Senior Seminars
By arrangement with the Department, an individual student or a small group of students will follow a course of study under the supervision of a faculty member.

Senior standing or instructor’s permission is a prerequisite for any 400-level Greek course.

COURSES NOT OFFERED 1986-87
GRK 232 Intermediate Greek 2: The Intellectual Revolution
GRK 271 Hellenistic and Later Greek Literature
GRK 351 Greek Composition and Grammar
GRK 361 The Drama of Euripides
GRK 382 The Drama of Sophocles
GRK 481 The Drama of Aeschylus
GRK 482 The Comedy of Aristophanes
GRK 471 Thucydides
GRK 481 The Philosophy of Plato
GRK 482 The Philosophy of Aristotle

LAT 100B W 4C 0.5
Introduction to Latin 1
A course designed for students beginning the study of Latin or who have not yet reached the level expected in LAT 203/204. The aim is to attain as rapid as possible the ability to read simple prose. Those desiring further competence should go on to do LAT 100B.
Students are advised to preregister early. This course as enrolment is limited.

LAT 100B W 4C 0.5
Introducory Latin 2
Continuation of LAT 100A. The aim is to attain basic reading competence in prose.
Prereq: LAT 100A

LAT 203 F 3C 0.5
A Survey of Latin Literature 1
A general survey of Latin prose and poetry from its origins to the beginning of the Roman Empire. The literary achievement of Rome will be examined mainly through selections in Latin with occasional readings in translation.
Prereq: Grade 13 Latin, LAT 100B or instructor’s permission

LAT 204 F 3C 0.5
A Survey of Latin Literature 2
A general survey of Latin prose and poetry from the beginning to the fall of the Roman Empire; a continuation of LAT 203.
Prereq: LAT 203 or instructor’s permission

LAT 272 W 3C 0.5
An Introduction to Vergil.
Selections from the Works of Vergil.
Prereq: Grade 13 Latin, LAT 100B or instructor’s permission

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.
Prereq: One full 200-level course or instructor’s permission

LAT 363 F 3C 0.5
Roman Comedy
The study in Latin of at least one play by Plautus or Terence, with supplementary readings in translation.
Prereq: One full 200-level course or instructor’s permission
Offered 1986-87 at Wilfrid Laurier

LAT 491-494
Senior Seminars
By arrangement with the department, an individual student or a small group of students will follow a course of study under the supervision of a faculty member. This winter’s topic will be Catullus.
Senior standing or instructor’s permission is a prerequisite for any 400-level Latin course.

COURSES NOT OFFERED 1986-87
LAT 251 Latin Composition and Grammar
LAT 261 Latin Prose 1
LAT 262 Latin Prose 2
LAT 261 Latin Poetry 1
LAT 262 Latin Poetry 2
LAT 352 The History of the Latin Language
LAT 362 Lucretius
LAT 371 Introduction to the Roman Historians
LAT 372 Tacitus
LAT 361 Medieval Latin 1
LAT 362 Medieval Latin 2
LAT 461 Vergil 1
LAT 462 Vergil 2
LAT 471 Roman Elegy
LAT 481 Roman Satire 1
LAT 482 Roman Satire 2

Dance Group

Associate Professor, Chairman of Dance Group
R. Priddle, BPHE (Toronto), MSc (Springfield), MA (Waterloo), PhD (Waterloo)

Associate Professor, Undergraduate Officer
R. Ryman, BA, MA (York), Al Chor (London)

Assistant Professors
J. Chapman, BA, MA (York), PhD (CNA, England)
J. Officer, ARAD (Adv. and ATC) (London), Recipient of the Distinguished Teacher Award

Lecturers
N. DeShane BA, MA (York)
L. Prada, BSc (Waterloo), ARAD (London)
Z. Wolofsky, BSc (McGill), MSc (Simon Fraser)

Instructor
J. Stone, BSc (Waterloo)
Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

DANCE 110 F 2C,2T 0.5
Introduction to 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. Of particular interest to students planning a career in teaching or choreography.

DANCE 220 F 2C,1 1/2std 0.5
Socio-Cultural Study of Western Dance
Development and significance of dance as a social phenomenon in Western Society.
Prereq: ANTH 102A or consent of the instructor

DANCE 221 W 2C,1std 0.5
Socio-Cultural Study of Non-Western Dance
Development and significance of dance as a social phenomenon in non-Western Society.
Prereq: DANCE 220 and ANTH 102A or consent of the instructor
Offered alternate years.

DANCE 230 F 2C,1std 0.5
Roots of Western Theatrical Dance
History and cultural significance of dance up to and including Fokine and Duncan.

DANCE 231 W 3C 0.5
History of Ballet in the 20th Century
A study of the factors affecting ballet in the 20th century from the advent of the Russians in Paris in 1909 to the influence of contemporary dance in recent years.
Prereq: DANCE 230
Offered alternate years.

DANCE 241 F 3C,1 1/2std 0.5
Benesh Notation 1
A theoretical and practical introduction to Benesh Movement Notation at the elementary level focusing on the reading of ballet syllabus work.
Prereq: DANCE 192D or equivalent
Offered alternate years.

DANCE 264A F 2C, IT
Formerly 364A
Developmental Aspects of Movement
A study integrating the theoretical and applied aspects of motor and perceptive motor development in children and adolescents. Tutorials will emphasize creative dance activities for school-age children. Opportunity is available to work with children in an applied setting.
Prereq: DANCE 111
Antireq: DANCE 264B and 264C

DANCE 264B F 2C, IT
Formerly 364B
Developmental Aspects of Movement
A study integrating the theoretical and applied aspects of motor and perceptive motor development in children and adolescents. Tutorials will focus on movement education with preschool children. Opportunity is available to work with children in an applied setting.
Prereq: Early Childhood Education Students only
Antireq: DANCE 264A and 264C

DANCE 264C F 2C, IT
Formerly 364C
Developmental Aspects of Movement
A study integrating the theoretical and applied aspects of motor and perceptive motor development in children and adolescents. Tutorials will examine children in an applied setting.
Antireq: DANCE 264A and 264B

DANCE 333 W 3C 0.5
Canadian Perspectives on Theatre Dance
The historical development of theatrical dance in Canada. Focusing primarily on 20th-century activity, the Canadian scene will be placed within the broader context of Western European dance history.
Prereq: DANCE 231
Offered alternate years

DANCE 338 F 3C 0.5
Dance Criticism
This course examines critical dance literature historically and stylistically, and introduces students to practical skills in writing dance criticism.
Prereq: DANCE 231 or 233

DANCE 341 W 3C 0.5
Benesh Notation 2
A theoretical and practical study of Benesh Movement Notation focusing on the reading and recording of ballet variations.
Prereq: DANCE 241
Offered alternate years.

DANCE 353 W 2C,2std 0.5
Modern Dance Composition
This course explores major forms and theories of modern dance choreography through studio practice and seminars.
Prereq: DANCE 294D or equivalent
Offered alternate years.

DANCE 366 F 2C,2std 0.5
Developmental Foundations of Dance Technique
A study of the physical development of the child between preschool and adolescence, and an integration of this knowledge to the selection and sequencing of dance technique in the applied setting with children.
Prereq: DANCE 264 and 264A
Coreq: DANCE 241

DANCE 377 W 2C,2std 0.5
Developmental Aspects of Movement Learning
An examination of the developmental changes significant to the learning process with a particular emphasis on those factors which affect the learning of dance during childhood and early adolescence.
Prereq: DANCE 366 and KIN 235

DANCE 410/411 3C
Honours Dance Major Paper
Students will examine dance research from different approaches including experimental, descriptive, ethnological, historical and philosophical.
Prereq: Honours Dance students only
Students must register in 1 of the following:

DANCE 410A and
DANCE 411A Biomechanics Area - Honours Bachelor of Science degree only
Prereq: DANCE 346 and 347, KIN 102, 200, 222, 321 and 425 (KIN 425 may be in conjunction with DANCE 410A)

Exercise Physiology, Fitness and Dance Injury, Prevention and Care - Honours Bachelor of Science degree only
Prereq: DANCE 346, KIN 102, 200, 300, 335, 340 and 346

DANCE 410B and
DANCE 411B Skill Learning
Prereq: DANCE 364 and 485, KIN 222, 255, 330

DANCE 410C and
DANCE 411C Dance Anthropology/ Ethnology
Prereq: DANCE 220, 221 and 225.
ANTH 102A, plus at least 1 other course in Socio-Cultural Anthropology
DANCE 410D and
DANCE 411D Dance Notation
Prereq: DANCE 241, 341 and 482 or 474 (Benesh) or DANCE 242, 342 and 482 or 474 (Labanotation)

DANCE 410E and
DANCE 411E Dance History
Prereq: DANCE 230, 231 and 233, plus DANCE 480 if topic is in early ballet history

DANCE 410F and
DANCE 411F Developmental Studies with Children in Dance
Prereq: DANCE 364 and 484
Recommend auditing KIN 330 and PSYCH 211

DANCE 412 W 3C 0.5
Seminar in Dance
An examination of current and major issues in dance.
Prereq: Honours Dance students only

DANCE 414 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: Permission of Instructor

DANCE 480 F,W workshop 0.5
Workshop Series
The following courses are designed to give the student an opportunity to take theoretical knowledge to the applied setting. Offerings each year are determined by student interests. Topics available include:

DANCE 480 Historical Dance
Prereq: DANCE 230 and 231
DANCE 481 Ballet Choreography
Prereq: DANCE 351 and 2920 or equivalent
Coreq: DANCE 481D
DANCE 482 Dance Notation Reconstruction
Prereq: DANCE 341 or 342
DANCE 483 Modern Dance Composition
Prereq: DANCE 353 and 394D or equivalent
Coreq: DANCE 483D
DANCE 484 Developmental Perspectives of Creative Movement with Children
Prereq: DANCE 364 and 242
DANCE 486 Dance Criticism
Prereq: DANCE 336 and 2 of DANCE 231/233/233
DANCE 487 Dance Ethnology
Prereq: DANCE 220 and 1 of DANCE 221/225/226
DANCE 488 Dance Production
Prereq: DANCE 351 or 353

The Workshop series is open only to 3rd and 4th year Dance students. Two workshops in the 480 series may be taken toward the Honours degree. Workshops are offered pending sufficient enrolment.

Technique Courses
0.25
Each of the following technique courses consists of two 1/2 hour classes per week. Students are advised to check with their home department regarding the acceptability of Technique Courses for credit.

Entrance to Technique Courses is by audition only. Auditions are held during registration week on Thursday, September 4, 1996 at 10:30 a.m. for Ballet and at 1:30 p.m. for Modern Dance. Students holding credentials in specific technique syllabi should see the Undergraduate Officer in the Dance Department upon arrival on campus.

DANCE 191D Pre-Elementary Ballet I F
DANCE 192D Pre-Elementary Ballet II W
DANCE 193D Pre-Elementary Modern Dance I F
DANCE 194D Pre-Elementary Modern Dance II W
DANCE 195D Pre-Elementary Folk Dance I F
DANCE 196D Pre-Elementary Folk Dance II W
DANCE 291D Elementary Ballet I F
DANCE 292D Elementary Ballet II W
DANCE 293D Elementary Modern Dance I F
DANCE 294D Elementary Modern Dance II W
DANCE 391D Intermediate Ballet I F
DANCE 392D Intermediate Ballet II W
DANCE 393D Intermediate Modern Dance I F
DANCE 394D Intermediate Modern Dance II W
DANCE 491D Advanced Ballet I F
DANCE 492D Advanced Ballet II W
DANCE 493D Advanced Modern Dance I F
DANCE 494D Advanced Modern Dance II W

COURSES NOT OFFERED 1986-87
DANCE 225 Dance Ethnology
DANCE 233 History of Modern Dance
DANCE 242 Labanotation I
DANCE 325 Festivals: Mediators in Multiculturalism
DANCE 342 Labanotation II
DANCE 346 Applied Movement Analysis (Part 1)
DANCE 347 Applied Movement Analysis (Part 2)
DANCE 351 Ballet Choreography
Drama and Theatre Arts Group

Associate Professor, Chairman
W.R. Chadwick, BA, MA (Toronto), PhD (London)

Assistant Professor, Undergraduate Officer
C.D. Abel, BA (Queen's), MA, PhD (Toronto), LRAM (Speech and Drama)

Assistant Professor
M.G. van Deijl, BA, MA (Wellington), PhD (Toronto)

Lecturer, Technical Director
A. Anderson

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Note
Laboratory sessions and rehearsal periods may be added to any course at the discretion of the instructor.

DRAMA 101A  F  3C  0.5
Introduction to the Theatre 1
Introductory study of the theatre as a major art form. Selected plays as produced in their historical contexts. Contributions of the actor, designer and technician to theatrical production.

DRAMA 101B  W  3C  0.5
Introduction to the Theatre 2
An extension of the studies described in 101A.

DRAMA 102  F, W  4L  0.5
Introduction to Acting
An introduction to acting. The class will be structured as a rehearsal, where the students will explore improvisation and text work, concentrating on the practical problems of an actor's experiences in creating a role.
Prereq/Coreq: DRAMA 101A or B Limited Enrolment

DRAMA 221  F  8L  0.5
Intermediate Acting 1
An extension of Drama 102. This course stresses development of the actor through scene study.
Prereq: DRAMA 101A, 102 and permission of the instructor. Limited enrolment

DRAMA 222  W  8L  0.5
Intermediate Acting 2
An extension of Drama 221.
Prereq: DRAMA 221 and permission of the instructor

DRAMA 243  F  2C, 2L  0.5
Introduction to Technical Production 1
Theory and practice of building, painting, rigging and shifting scenery; construction of properties; familiarity with lighting instruments, sound equipment and their control systems. Students must spend a certain number of hours working on department productions.
Prereq: Permission of the instructor

DRAMA 244  W  2C, 2L  0.5
Introduction to Technical Production 2
An extension of the studies described in DRAMA 243.
Prereq: DRAMA 243

DRAMA 251  F  3C  0.5
Survey of Dramatic Literature and Dramatic Theory 1
The Greek and Roman periods. Cross-listed as CIV 266

DRAMA 252  3C  0.5
Survey of Dramatic Literature and Theory 2
The Middle Ages, the Elizabethans and Jacobean (excluding Shakespeare) and the Spanish Golden Age.

DRAMA 253  3C  0.5
Survey of Dramatic Literature and Theory 3
French neo-classicism, the Restoration period and sentimental drama.

DRAMA 254  3C  0.5
Survey of Dramatic Literature and Theory 4
The late 18th, 19th and early 20th centuries, romanticism and naturalism.

DRAMA 255  3C  0.5
Survey of Dramatic Literature and Theory 5
Dramatic literature of the 20th century.

DRAMA 256  3C  0.5
Survey of Dramatic Literature and Theory 6
A survey of the modern drama of Australia, New Zealand, and the drama, in English, of Africa and the West Indies

DRAMA 257  3C  0.5
Masterpieces of Western Drama - A Study of Performance 1
Plays of film. This course will entail studying a play and then viewing it as a movie.

DRAMA 261  F  3C  0.5
Introduction to Directing 1
A study of theories of the modern stage, the emergence of the director and the principles of stage direction, with special reference to the work of Stanislawski and Brecht.
Prereq: DRAMA 101A, 101B, 102, at least 1 dramatic literature class and permission

DRAMA 262  3L  0.5
Introduction to Directing 2
A workshop course consisting of the preparation of one or more detailed production books. Interpretation and analysis will be emphasized.
Prereq: DRAMA 261, 2 dramatic literature classes, and permission

DRAMA 301  F  3C  0.5
Script Interpretation 1
Advanced study and analysis of plays in the process of production covering selected periods and types of playwriting. May include production casebook.

DRAMA 302  W  3C  0.5
Script Interpretation 2
Advanced study and analysis of plays in the process of production covering selected periods and types of playwriting. May include production casebook.

DRAMA 306 A/B/C  F std 0.5
Special Studies in Theatre Production 1
Production participation and the study of selected problems of theatrical production.
Prereq: Permission of the play director

DRAMA 307 A/B/C  W std 0.5
Special Studies in Theatre Production 2
See Drama 306.
Prereq: Permission of the play director

DRAMA 321  F  8L  0.5
Advanced Acting 1
Advanced work in acting. Course involves individual and ensemble work in selections from specific plays with attention given to various periods and styles in acting.
Prereq: DRAMA 221, DRAMA 222, and permission of the instructor.
Usually restricted to Drama majors

DRAMA 322  W  8L  0.5
Advanced Acting 2
An extension of the studies described in DRAMA 321.
Prereq: DRAMA 321 and permission of the instructor
DRAMA 326 F 4L 0.5
Seminar in Voice 1
A workshop course in voice for the
actor, designed to increase vocal power,
range, flexibility and variety in presenting
the spoken word.
Pre req: Coreq: DRAMA 221

DRAMA 327 W 4L 0.5
Seminar in Voice 2
An extension of the studies described in
DRAMA 326.
Pre req: DRAMA 326

DRAMA 331 F 3LD 0.5
Design for the Theatre 1
An introduction to the problems of
designing for the theatre. Work for the
course will include the preparation of
drawings and models as well as practical
experience in the theatre.
Pre req: DRAMA 244

DRAMA 332 W 3LD 0.5
Design for the Theatre 2
An extension of the studies described in
DRAMA 331, concentrating on the prac-
ticities of set design.
Pre req: DRAMA 331

DRAMA 341 F 4L 0.5
Lighting Design for the Theatre 1
An introduction to the theory and prac-
tice of theatre lighting design through
studio experience.
Pre req: DRAMA 244

DRAMA 342 W 4L 0.5
Lighting Design for the Theatre 2
Advanced studies in theatre lighting
design, including major production
experience.
Pre req: DRAMA 341

DRAMA 343 F 2L,2C 0.5
Theatre Technology 1
Advanced studies in the theory and
practice of theatre technology, including
an apprenticeship program.
Pre req: DRAMA 243 and 244

DRAMA 344 W 2L,2C 0.5
Theatre Technology 2
A continuation of the studies described
in DRAMA 343.
Pre req: DRAMA 343

DRAMA 348 3C 0.5
Arts Administration 1
An introduction to the problems and
techniques of arts administration. Topics
include: budgeting, program selection,
fund raising, publicity and audience
analysis.

DRAMA 349 3C 0.5
Arts Administration 2
An extension of the studies in DRAMA
348.

DRAMA 350 3C 0.5
Theatre Production 1
A working co course in the practical
aspects of theatre production, leading
to the production of a full-length play.
Pre req: DRAMA 311 and permission
of the department

DRAMA 351 3C 0.5
Theatre Production 2
An extension of the studies described in
DRAMA 350, including the preparation
of a production casebook.
Pre req: DRAMA 350 and permission
of the department

DRAMA 355 3C 0.5
The Stage as Forum: German
Drama in Translation
Cross-listed as ENGL 316

DRAMA 356 3C 0.5
The Stage as Forum: Russian
Drama in Translation
Cross-listed as RUSS 356

DRAMA 357 3C 0.5
The Theatre of the Absurd
Cross-listed as ENGL 367R

DRAMA 358 3C 0.5
Ancient Comedy in Translation
Cross-listed as C CIV 365

DRAMA 361 F std 0.5
Advanced Directing 1
Work as an assistant director on a major
production involving the writing of a
production casebook.
Pre req: DRAMA 261 or 262, at least
three dramatic literature classes and
permission.

DRAMA 362 W std 0.5
Advanced Directing 2
Students will be expected to form their
own production company, mount a short
play, and submit a detailed promptbook.
Pre req: DRAMA 361 and at least four
dramatic literature classes.

DRAMA 363 F std 0.5
Advanced Acting 1
A first course in acting. An intensive
workshop in which students explore
fundamental acting principles.
Pre req: DRAMA 341 and 342

DRAMA 364 W std 0.5
Advanced Acting 2
A second course in acting. An intensive
workshop in which students explore
fundamental acting principles.
Pre req: DRAMA 341 and 342

DRAMA 365 3C 0.5
Theatre History 1
Theatre History from Classical Greece to
the Renaissance.

DRAMA 366 3C 0.5
Theatre History 2
Theatre History from the Classical
French and English Restoration periods
to the present era.

DRAMA 368 3C 0.5
Art History 1
An introduction to the history of art and
architecture. Topics include: European
art, American art, and non-Western
art.

DRAMA 369 3C 0.5
Art History 2
A continuation of the studies described in
DRAMA 368.

DRAMA 371 3C 0.5
Theatre History 1
Theatre History from Classical Greece to
the Renaissance.

DRAMA 372 3C 0.5
Theatre History 2
Theatre History from the Classical
French and English Restoration periods
to the present era.

DRAMA 406 A/B/C F std 0.5
Theatre Workshop 1
Participation in stage production for
advanced students.
Pre req: Permission of the play
director and DRAMA 101A and B

DRAMA 407 A/B/C W std 0.5
Theatre Workshop 2
Participation in stage production for
advanced students.
Pre req: Permission of play director
and DRAMA 101A and B

DRAMA 409 W 3C 0.5
Theatre Criticism
Study and practice of the criticism of
theatre production and performance.
This course will not normally be taken
until the student's final year.

DRAMA 421 F 6L 0.5
Advanced Acting Workshop 1
An intensive workshop designed to
develop performance skills. Special
attention given to individual acting
problems.
Pre req: DRAMA 321, 322, and permis-
sion of the instructor

DRAMA 422 W 6L 0.5
Advanced Acting Workshop 2
An extension of DRAMA 421.
Pre req: DRAMA 421 and permission of
the instructor

DRAMA 450 A/E F wskhp 0.5
Selected Seminars in Drama and
Theatre Arts
Seminar in special areas of drama and
theatre.
Pre req: Permission of the department

DRAMA 491 A/E W wskhp 0.5
Selected Seminars in Drama and
Theatre Arts
Seminar in special areas of drama and
theatre.
Pre req: Permission of the department

DRAMA 498/499 A/B F W T 0.5/0.5
Senior Seminar
Open only to drama majors in their
fourth year. It is designed to give
the student an opportunity to complete
a comprehensive presentation in his or
her major area of concentration.
A letter grade for DRAMA 498A will
be submitted only after the completion of
DRAMA 498B.

COURSES NOT OFFERED 1980-87
Consult with Drama Undergraduate
Officer to determine offerings for
1980-87.
Department of Earth Sciences

Professor, Chairman of the Department
P. Fritz, Dip. Geol. Dr. rer. nat. (Stuttgart)

Professors
J.A. Cherry, BE (Saskatchewan), MS (California, Berkeley), PhD (Illinois), P.Eng
M.B. Dusseault, BSc, MSC, PhD (Alberta), P.Eng
R.N. Faris, BSc, MSc (Alberta), PhD (Illinois)
E.O. Finn, BASc, MASC, PhD (Toronto), P.Eng
I.L. Gibson, BSc, PhD (Imperial College, London)

Associate Professors
E.C. Appleyard, BSc (Western Ontario), MSc (Queen's), PhD (Cambridge)
R.W. Gallinham, BSA (Toronto), MSc (Guelph), PhD (Illinois)
J.P. Greenhouse, BSc, MSC, PhD (Queen's, Toronto), P.Eng
D.E. Lawson, BSc (New Brunswick), PhD (Reading)
J.A. Legault, BSc, MSc (Ottawa), PhD (Oklahoma)
E.J. Reardon, BA (St. Francis Xavier), PhD (Pennsylvania State)
R.G. Roberts, BA (Cambridge), MSc (UK), PhD (McGill)

Assistant Professors
J.F. Banker, BSc, MSC (McMaster), PhD (Waterloo)
S.K. Frappe, MSc, PhD (Queen's)

Research Associate Professor
J.A. Franklin, BSc (London), MSc, PhD (Imperial College, London)

Research Assistant Professors
E.A. Sudicky, BSc, MSC, PhD (Waterloo), P.Eng
B.G. Warner, BSc, MSc (Waterloo), PhD (Simon Fraser)

Adjunct Faculty
R.M. Brown, BSc (Bishops), PhD (McGill)
L.D. Delorme, BSc (Saskatchewan), MSc (Alberta), PhD (Saskatchewan)
J.E. Gate, BA, BSc (Memorial), MSc (Western Ontario), MEngSc, PhD (California, Berkeley), P.Eng
D. Lee, BSc, MSc (North Dakota), PhD (Virginia Polytechnical Institute)

R.W. Macqueen, BA, MA (Toronto), PhD (Princeton)
I.P. Martini, PhD (McMaster)
J.O. Ninag, MSc (Wisconsin), PhD (Toronto)
F.A. Prantl, MSc, Dr. rer. nat. (Innsbruck)
H.C. Saunders, BA (Queen's Belfast), MA, PhD (Toronto)
L.R. Snowdon, BSc (Calgary), PhD (Rice)
G. van der Kamp, MSc, PhD (Free University, Amsterdam)
O.L. White, BSc, MASC (Toronto), PhD (Illinois), P.Eng

Senior Demonstrators
J.L. Lang, BSc, MBA (Queen's)
K. Lariay, BSc, MSc (Queen's)

Faculty Members holding cross appointments from Earth Sciences to:
Civil Engineering

Course Descriptions
Introductory Notes
1. EARTH 121/122 is normally regarded as a prerequisite for any major program in Earth Sciences.

2. Second, third and fourth year courses may involve field trips in the fall. All those enrolled in Honours Earth Sciences programs are required to take a two-week field camp at the end of the third year (EARTH 380). The cost will range from $50-$100 per student.

3. Regular Earth Sciences students are encouraged to seek geological employment in the summers.

EARTH 221 W.S 3C,1T 0.5
Geochmestry 1

Prereq: EARTH 231 or permission of instructor

EARTH 231 F 2C,3L 0.5
Mineralogy
Introduction to systematic mineralogy. Bases of mineral classification. Interpretations of chemical, structural and physical properties. Occurrence of major groups of rock-forming minerals. Introduction to optical properties of minerals and the use of the petrographic microscope as a tool in identifying minerals and interpreting their genetic history.

Prereq: EARTH 212

EARTH 232 W.S 2C,3L 0.5
Petrography
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
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 226 F 2C,3L 0.5
Principles of Paleontology
The principles of paleontology will require particular stress on the species concept and evolution; examples will be drawn primarily from the fossil record of plants and vertebrates. Laboratory work will include projects related to lecture topics.

Prereq: EARTH 121/122

EARTH 238 W.S 2C,3L 0.5
Introductory Structural Geology

Prereq: EARTH 121/122
EARTH 330 F 2C.2L 0.5
Applied Geophysics 1
An introduction to seismic, gravity, elec- 
tric, electromagnetic and magnetic 
methods of exploration geophysics. 
Prereq: PHYS 111/112 or consent of 
instructor

EARTH 331 F 2C.3L 0.5
Igneous Petrology
The principles and theories of igneous 
rock generation. Silicate phase equilibria in 
magmatic systems. Magmatic differentia-
tion; distribution and occurrence of 
magma types. 
Prereq: EARTH 231, 232

EARTH 332 W 2C.3L 0.5
Metamorphic Petrology
Principles and theories of metamorphic 
rock generation. Static, dynamic and poly-
phal crystallization growth. Processes 
of solid-state crystallization in meta-
morphic environments. Zonal and facies 
classifications; facies series and the 
place of metamorphism in global 
tectonics. Introduction to metamatism. 
Prereq: EARTH 232
For Honours Earth Sciences and 
Geological Engineering students only.

EARTH 333 W 2C.3L 0.5
Introductory Sedimentology
The origin, transport and deposition of 
sediments. Size analysis and sedimen-
tary 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, 
palaeoecology and stratigraphic value of 
fossil invertebrates. Laboratory study of 
fossils. 
Prereq: EARTH 236

EARTH 342 F 2C.3L 0.5
Geomorphology
The process of landscape evolution and 
the classification of landforms. 
Geomorphic effects of glacial, fluvial, 
marine and slope processes. Physical 
and chemical weathering, soil formation: 
Laboratory study of topographic maps 
and air photo interpretation. Field trips. 
Prereq: GEOG 302

EARTH 345 W 2C.2L 0.5
Historical Geology
A systematic review of the geological 
history of North America from the 
Precambrian to the Recent exemplified 
by regional geology. Laboratory work will 
include study of rocks and fossil 
regional suites and geological maps. 
Prereq. EARTH 233

EARTH 355 F 3C.0.5
Statistical Methods in Geology
Introduction to the principles of prob-
ability and statistics and their application 
in the earth sciences. Evaluation of 
quantitative data; statistical models. 
Prereq: MATH 113A/B and an intro-
ductive course in computer program-
ing

EARTH 360A W 3C.0.5
Global Geophysics
Topics in the plate tectonics, heat flow, 
gravity, seismology, magnetics, electro-
магниты и динамики планеты. 
Prereq: PHYS 121/122, EARTH 230
Offered every other year alternating 
with EARTH 460.

EARTH 366 F 2C.0.5
Geophysics 1
Introductory topics on the physics of the 
earth. Seismology and the earth's 
interior. Thermal history of the earth. 
Gravity and tectonics. Origin of the con-
inentals and continental drift. 
Prereq: MATH 113A/B, PHYS 121/122 
or equivalent
Cross-listed as PHYS 366

EARTH 369 W 3C.0.5
Geophysics 2
The geology of the ocean basins. 
Topics in physical oceanography. Phys-
ical properties of ocean water, heat 
budget of the world oceans. Oceanic 
circulation, Convolcs effects. Some ideal-
ized current regimes. 
Prereq: MATH 113A/B and PHYS 
121/122 or equivalent
Cross-listed as PHYS 369.

EARTH 370 W 3C.2L 0.5
Economic Geology
The occurrence and geological setting of 
metallic, non-metallic minerals and 
construction materials. Energy 
resources. Special emphasis on Cana-
dian resource industries. The laboratory 
will involve sampling methods, ore calcu-
lation and property evaluation. 
Prereq: EARTH 231, 232

EARTH 381 W 3L.0.5
Methods in Geological Mapping
Ten day field camp at Whitefish Falls, 
held at beginning of spring term.

EARTH 421 F 2C.3L 0.5
Geochemistry 2
The application of chemical thermody-
namics to geochemical problems. Devel-
opment of the 3 laws of Thermody-
namics; Gibbs free energy and equilibrium 
constants. Introduction to various topics 
in aqueous geochemistry such as 
mineral equilibria, ion exchange and 
redox equilibria. Various aspects of 
organic geochemistry and geochemical 
exploration will also be covered. 
Prereq. First year chemistry, EARTH 
221
Restricted to fourth year and grad-
uate students.

EARTH 427 W 2C.3S 0.5
Crustal Evolution
An analytical critique of the plate 
tectonics theory. Tectonic syntheses 
based on the theory in the light of world 
geochemistry. 
Normally restricted to fourth year 
Earth Sciences students.

EARTH 432 F 3C.2L 0.5
Precambrian Geology
The geology, tectonics, stratigraphy and 
history of the Canadian Precambrian 
Shield. The early evolution of the earth's 
crust. The Precambrian time scale and 
problems of geochronology. Life, climate 
and physical conditions in Precambrian 
time.

EARTH 433 W 2C.3L 0.5
Applied Sedimentology
The source, migration and sedimentary 
environment of hydrocarbons, explo-
ration, types of traps, extraction. Carbo-
rate sediments and their diagenesis. 
The environmental impact and control of 
recent sedimentation. 
Prereq: EARTH 233

EARTH 434 W 2C.3S 0.5
Biostratigraphy
Methods of using paleontological data 
to solve stratigraphic problems. Faunal 
provinces in space and time. Effects of 
continental drift and climatic change on 
biogeography through the Phanerozoic. 
Prereq: EARTH 336

EARTH 435 W 3C.2L 0.5
Advanced Structural Geology
The geometry, kinematics and dynamics 
of structural geology. The relationships 
of structures from the microscopic to 
the megascopic scale; statistical studies 
of structural elements. 
Prereq: EARTH 290
EARTH 436A/B F W 6L 0.5/0.5
Honours Thesis
(A course for Honours Earth Sciences students only.)
Each student will work under the direction of a member of the Department on a
short research project. The results of this will be presented in thesis form and will be critically examined by members of this and, where pertinent, other
departments.

EARTH 437 F 2C,3L 0.5
Rock Mechanics
Review of stress and strain. Mohr's circle, strength theories, laboratory tests, classification of rocks. Rock mechanics considerations in the construction of
shafts, drifts, tunnels, foundations and rock slopes. Laboratory exercises will
deal with uniaxial, triaxial, flexure, hardness and tensile testing of rock. Problem sets will be assigned.
Prereq: A course in Statics and Mechanics of deformable materials, or
coequivalent of instructor

EARTH 438 W 2C,3wkshop 0.5
Engineering Geology
Review of basic concepts in soil and rock mechanics. Field and laboratory
methods used to define and characterize the properties of geological
materials and their use in selected engineering geotechnical 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,5L 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 geology or
geography is recommended.
Antireq: for students majoring in Earth Sciences: GEOG 300 and GEOG 401
Not to be taken by third year
students.

EARTH 456 F 3C 0.5
Numerical Methods in Geoscience
Introduction to numerical methods and their use in geology and hydrogeology.
Finite differences and finite elements. Solution of boundary value problems, mathematical
modelling.
Prereq: MATH 113A/B and an introductory course in computer programming

EARTH 460 W 3C,1T 0.5
Applied Geophysics 2
A new examination of selected topics in exploration geophysics, with an
emphasis on data processing and computer modelling of geophysical
responses.
Prereq: EARTH 260 and an introductory course in computer programming
Offered every other year alternating with EARTH 460A

EARTH 461 F 2C,3L 0.5
Applied Geophysics 3
Geophysical field methods for Engineering and Hydrogeology.
Prereq: Students must be enrolled in
the Geophysics Option

EARTH 470 F 3C,2L 0.5
Metallic Mineral Deposits
The petrology and genesis of metallic ore deposits. The description of classic deposits; the stability of ore
minerals; ore minerals in aqueous systems. The laboratory will include
instruction and practice in ore microscopy.
Prereq: EARTH 370

EARTH 480 S fidlab 0.5
Field Study
Depending on the demand and the availability of an instructor, a 6 week
field course may be offered in an area of unusual geological interest during the
spring or summer. This course will consist of 2 weeks of classroom
lectures and 1 month in the field location. Expenses are to be paid by the
student.
Prereq: Consent of the instructor

EARTH 490 F fidlab 0.0
Field Trip
One or more regional geology field trips
normally conducted at the beginning of the Fall term. These trips will emphasize
the integration of the various subdisciplines within Geology to achieve an
understanding and synthesis of a geologically complex region such as the
central and western Appalachians of southern Quebec. Field exercises will be
part of the trip. Enrolment will be limited to not more than 30 students per trip;
Open to Honours Earth Sciences students only.

Department of Economics

Associate Professor, Chairman
K.M. Bennett, BA, MA (Queen's), PhD
(McGill)

Professor, Associate Chairman
W.R. Thirsk, BA (British Columbia), MA,
PhD (Yale)

Professor, Associate Dean,
Undergraduate Affairs, Faculty of Arts
R.R. Kerton, BComm (Toronto), MA
(carleton), PhD (Duke)

Associate Professor, Graduate Officer
L.P. Fletcher, BComm (Mount Allison),
AM, PhD (Brown)

Lecturer, Undergraduate Officer
E.W. Lau, BA (Toronto), MA
(Manchester)

Professors
S.K. Ghosh, BSc, MSc (Calcutta), MS,
PhD (Wisconsin)
J.H. Hotson, BA (Colorado College), MA,
PhD (Pennsylvania)
L. Needham, MA (Oxford), PhD
(Glasgow)
D. Wilton, BComm (McMaster), PhD
(Montreal)

Associate Professors
A.A. Avinuthambula, BA (Athens), MA
(Wayne State), PhD (Southern Calif)
J.A. Brox, BA (Toronto), MA, PhD
(McMaster)
J.E. Cuenca, LIC (Madrid), MA (Western
Michigan), PhD (Toronto)
M.C. Howard, BA, MA (Lancaster), PhD
(Leicester)
Course Descriptions

Economics

Introductory Notes

1. Some Economics courses do not have a "term offered" indicated. This information will be available at preregistration and students can confirm the "term offered" with their Departmental advisor.

2. The "normal" number of lectures per week in each course is 3; however, each instructor determines how often his or her particular class will meet.

S.W. Kardasz, BA (Loyola), PhD (Queen's)
R.C. Kumar, BStat, MStat (Indian Statistical Institute), MA, PhD (Toronto)
W.R. Needham, BComm (Carleton), MA, PhD (Queen's)
K.R. Stottery, BA (Southern California), MA, PhD (Queen's)

Assistant Professors
R.A. Androkovich, BSc (Lethbridge), MA, PhD (Western Ontario)
R.W. Bodell, BSc (Sydney, Australia), MA, PhD (York)
E. Carvalho, BA, MA, PhD (Waterloo)
F.M. Naqib, BSc (Washington), MSc (Oregon), PhD (Queen's)
T.T. Nguyen, BSc, QHC (California, Berkeley), MA (Simon Fraser), PhD (Western Ontario)
E. Nosal, BA (Queen's), MA (McMaster), PhD (Queen's)

Lecturers
C. Fadel, BA (Windsor), MA (Western Ontario)
G. Stirling, BMath (Waterloo), MA (Guelph)

Adjunct Lecturers
R.F. Kilminik, BA (Waterloo), MBA (McMaster)
L. Smith, BA (Waterloo), MA (Waterloo)

Faculty Member of Economics holding a cross appointment to:
Accounting

COURSE DESCRIPTIONS

Introductory Notes

1. Some Economics courses do not have a "term offered" indicated. This information will be available at preregistration and students can confirm the "term offered" with their Departmental advisor.

2. The "normal" number of lectures per week in each course is 3; however, each instructor determines how often his or her particular class will meet.

ECO 101 F.W.S 3C 0.5
Introduction to Microeconomics
An introduction to the central economic problems of society, the functioning of a mixed enterprise system, the economic role of government, the composition of and pricing of national output, pricing of productive factors, and income distribution.

ECO 102 F.W.S 3C 0.5
Introduction to Macroeconomics
Determination of national income, the banking system; government fiscal and monetary policy; international trade and finance; and current economic problems.

ECO 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

ECO 202 F.W.S 3C 0.5
Macroeconomic Theory
Theory of the determination of the level of national income (GNP), the unemployment rate, interest rates, prices and inflation; analysis of macroeconomic policies to stabilize the economy and alleviate the problems of inflation and unemployment.
Prereq: ECON 102, 102

ECO 211 F.W 3C 0.5
Mathematics of Economists
Application of mathematics to problems in economic theory. Topics include an introduction to matrix algebra, differentiation, partial derivatives, optimization techniques including constrained optimization— all developed within the context of economic theory.
Prereq: ECON 101, 102

Students who have not taken Grade 13 Algebra and Calculus are strongly advised to take MATH 104.

ECO 221 F.W.S 3C 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

Students who have taken or are taking a course of similar content in another discipline should check with their Undergraduate Officer or the Arts Registrar's Office to determine if credit will be granted for both courses.

ECO 231 F.W.S 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

ECO 241 F.W.S 3C 0.5
Cost-benefit Analysis and Project Evaluation
Methods for evaluating private and public projects; decision rules; efficiency conditions and methods of conducting cost-benefit analysis. Application of the techniques.
Prereq: ECON 201

ECO 253 W 3C 0.5
Economic History of Canada
A study of the economic development of Canada; development theories, industrial structure and national policies analyzed in a Classical-Manian framework.
Prereq: ECON 101, 102

ECO 301 F.W.S 3C 0.5
Intermediate Microeconomics
Theory of modern welfare economics with some applications; the meaning and measurement of economic efficiency and equity and their relationship to economic welfare.
Prereq: ECON 201, 202

ECO 332 F, W 3C 0.5
Intermediate Macroeconomics
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, 201, 231

ECO 333 F 3C 0.5
Economic Thought
A critical survey of the development of Economic Theory from Classical Political Economy to the Keynesian Revolution.
Prereq: ECON 201, 202, 231

ECO 311 F.W 3C 0.5
Introduction to Mathematical Economics
Mathematical treatment of some micro- and macro-partial and general equilibrium models; programming and other techniques; simple growth models.
Prereq: ECON 201, 202, 211 (or MATH 130)

Strongly recommended for students who intend to do graduate work in Economics
ECON 321 F.W 3C 0.5
Introduction to Econometrics
Introductory level course in econometrics; includes economic model building and testing, regression and correlation analysis, and price indices.
Prereq: ECON 221

ECON 322 F.W 3C 0.5
International Trade and Finance
An examination of structural characteristics, development and growth in international systems. Integration of regional economic and spatial analysis related to theory and policy through a focus on models such as neoclassical, export-biased, shift-share, stages, cumulative-causation, central-place and core-periphery.
Prereq: ECON 231, 201

ECON 333 W 3C 0.5
Regional Economics
An examination of structural characteristics, development and growth in regional systems. Integration of regional economic and spatial analysis related to theory and policy through a focus on models such as neoclassical, export-base, shift-share, stages, cumulative-causation, central-place and core-periphery.
Prereq: ECON 201, 231

ECON 335 W 3C 0.5
Economic Development
The nature of the problem of economic development; theories of economic development; major policy issues in economic development.
Prereq: ECON 201, 202, 231

ECON 341 F.W 3C 0.5
Public Finance
The economic rationale of governmental fiscal activity; cost-benefit analysis; the structure and economic effects of public expenditure and revenues; the analysis of income, consumption and wealth taxes.
Prereq: ECON 102, 201

ECON 343 F 3C 0.5
Urban Economics
Application of economic analysis to location decisions of firms and households; discussion of policy problems, for example, urban renewal and housing.
Prereq: ECON 101 (ECON 201 is recommended)

ECON 344 F 3C 0.5
Consumer Theory
The development of economic principles for consumer analysis. The course examines 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 W 3C 0.5
Industrial Organization
An economic analysis of market structure, behaviour and performance with special reference to the Canadian manufacturing sector.
Prereq: ECON 201

ECON 351 W 3C 0.5
Labour Economics
Wage theory, training and mobility theory; economics of information in Canadian labour markets; other investments in human capital; manpower policies, unemployment issues.
Prereq: ECON 201

ECON 352 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. Issues concerning the economic behaviour of Canada's fishery, forest, fuel and nonfuel mineral industries will be considered.
Prereq: ECON 201

ECON 356 W 3C 0.5
Economic Development
A survey of Europe's economic development from the Industrial Revolution to 1973: Case studies of England, France, Germany, Russia and the Soviet Union. Emphasis on technology, economic institutions, capital formation, standards of living and the role of the State.
Prereq: ECON 101, 102

ECON 361-369 3S each 0.5
Special Topics
One or more special half courses will be offered at different times as announced by the Department.
Prereq: Consent of instructor

ECON 401 F.W 3C 0.5
Advanced Microeconomic Theory
This course concentrates upon Walrasian general equilibrium analysis with special reference to Debreu's formulation and temporary equilibrium theory; the micro-foundations of Keynesian economics and the Sraffian alternative to, and critique of, supply and demand theories.
Prereq: ECON 211, 301, 302
Preference for admission will be given to 4th Year Honours students. Consent of the instructor or undergraduate officer required for other students.

ECON 402 F.W 3C 0.5
Advanced Macroeconomic Theory
Classical, Keynesian, Monetarist and New Classical models of macroeconomics; recent contributions to the theory of consumption, investment, inflation, interest expectations, unemployment and economic growth.
Prereq: ECON 211, 221, 301, 302 and permission of the instructor or undergraduate officer for all students who are not registered in the 4th year of an Honours Economics program.

ECON 403 W 3C 0.5
Economic Analysis, Forecasting, and Public Policy
The course focuses on the problems of forecasting economic activity (as measured by the principal macroeconomic variables), and of designing and implementing policies to control those variables; topics covered include a critical review of current forecasting methods, problems associated with lags of the impact of policies, and so forth.
Prereq: ECON 301, 302, 321
ECON 404 W 3C 0.5
Advanced Monetary Theory and Policy
A discussion of topics in monetary policy. Topics may include: foundations of monetary theory; portfolio choice; term structure of interest rates; money supply and money demand; decision-making under uncertainty; capital asset pricing models; financial flow analysis; rational expectations and monetary policy.
Prereq: ECON 211, 221, 301 and 302
Recommended: Econ 402, completed or taken concurrently.

ECON 406 F.S 3S 0.5
Keynes and Post Keynesian Economics
This course draws on Keynes, Fisher, Kalecki, Wrentnab, Minsky and others to explore alternatives to current macroeconomic theory and policies seeking solutions to problems of stagnation, debt crises, high interest rates and lagging growth.
Prereq: ECON 301, 302
This course is primarily for 4th Year General and Honours students. However, M.A. students and 3rd Year students who meet the prerequisites may also be admitted.

ECON 421/422 F.W 3C 0.5/0.5
Econometrics 2
Review of linear algebra and development of basic statistical inference; formulation, identification, estimation, and tests of single equation and simultaneous equation regression models of micro- and macro-economics, empirical models.
Prereq: ECON 201, 202, 211, 221, 321

ECON 431 W 3C 0.5
International Economic Policy
Analysis of selected policy problems of open economies, 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

ECON 461 F 3S 0.5
Comparative Economic Systems
This course concentrates upon the criteria which are relevant for comparing different economic systems, how well various forms of economic theory make comparisons, the development of capitalist and socialist economies, together with the analysis of alternative types of price system and planning.
Prereq: ECON 201, 202

ECON 463 W 3S 0.5
Political Economy of Capitalist Development
A study of the main tools and models of modern political economy. Micro and macro tools and concepts, based on the work of Robinson, Sraffa, Kaleck, Pasinetti, Rowthorn, Nei, Sweezy and others are integrated in what can be termed the "Classical Marxian" tradition.
Prereq: Consent of instructor

ECON 472 W 3S 0.5
Advanced Public Policy and Applied Economics
An advanced discussion of selected topics in macroeconomic theory, policy and empirical research. Seminar topics include the role of stabilization policy, the usefulness of income policy and evaluation of Monetarism as practiced by the Bank of Canada.
Prereq: ECON 321, 402 (may be taken concurrently)

ECON 481/488 3S 0.5 each
Special Studies
Research and reading courses under the direction of individual instructors. Admission by consent of instructor.

COURSES NOT OFFERED 1986-87

ECON 357 Environmental Economics
ECON 361 North American Economic History
ECON 411 Mathematical Economics
ECON 413 Economic Growth Theory
ECON 441 Economics of the Public Sector 1
ECON 442 Economics of the Public Sector 2
ECON 451 Advanced Topics in Resource Economics
ECON 463 Political Economy of Capitalist Development

Department of Electrical Engineering

Professor, Chairman of the Department
J.W. Mark, BASc (Toronto), MEng, PhD (McMaster), PEng

Professor, Associate Chairman for Graduate Affairs
S.G. Chamberlain, MSc, PhD (Southampton)

Professor, Associate Chairman for Undergraduate Affairs
J.A. Field, BE (Saskatchewan), MSc, PhD (Toronto), PEng

Professor, Director, Computer Communications Networks Group
J.W. Wong,2 PhD (California-Los Angeles)

Professors
J.D. Aplevich, BE (Saskatchewan), PhD (Imperial College, London), PEng
I.F. Blake, BSc, MSc (Queens), MA, PhD (Princeton), PEng
P.R. Bryant, MSc (London), MA, PhD (Cambridge)
Y.L. Chow, BEng (McGill), MSc, PhD (Toronto), PEng
J.D. Cross, BSc (Wales), MS, PhD (Carleton), PEng
M.I. Elmasry,1 BSc (Cairo), MSc, PhD (Ottawa), PEng
J.V. Hanson, BSc (Toronto), MSc, PhD (Imperial College, London)
E.L. Heasell, BSc, PhD (Imperial College, London), PEng
S.N. Kaira, BSc (Punjab), MS, PhD (Illinois), PEng
R.H. MacPhia, BASc (Toronto), MS, PhD (Illinois)
E.G. Manning,4 BSc, MSc (Waterloo), PhD (Illinois)
V.H. Quintana, BEng (Chile), MSc (Wisconsin), PhD (Toronto), PEng
R.S. Ramthaw, BSc, PhD (Nottingham), PEng
H.C. Ratz, BASc (Toronto), MS (Massachusetts Institute of Technology), PhD (Saskatchewan), PEng
J. Reive, BSc, MSc, PhD, DSc (Manchester), PEng
D.J. Roulston, RSc (Realtor), PhD (Imperial College, London), CEng
K. Singhal,2 BTech (Indian Institute of Technology, Kharagpur), MS, EngScD (Columbia), PEng
R.G. van Heeswijk, Jr (Delft, Holland), PEng
Course Descriptions

Electrical Engineering

M. VidyaSagar, BSc, MASc, PhD (Winnipeg)
T.R.Viewerathan, BASc (Madras), MSc, PhD (Saskatchewan)
J. Viach, Dipl Ing CSc (Technical University of Prague)
L.A.K. Watt, BSc (Manitoba), MS (Chicago), PhD (Minnesota)

Associate Professors
S.K. Chaudhuri, PhD (Manitoba)
P.P. Dasiwicz, BSc, MSc, PhD, (Waterloo), PEng
J.S. Keeler, BASc, MASc, (Toronto), PEng

W.M. Loucks, BASc (Waterloo), MASC, PhD (Toronto), PEng
F. Manevski, BSc (Tetovo), Dipl kem-Graduate Studies (Netherlands), PhD (Imperial College), DIC
H.E. Sevora, Dipl Ing (Czeck technical University), PhD (Toronto), PEng
W.J. Wilson, BE, MSc (Saskatchewan), PhD (Cambridge), PEng

Assistant Professors
G.B. Agnew, BASc, PhD (Waterloo)
J.W. Banis, BSc, MSc (Technical University of Lodz, Poland), PhD (Manitoba)
G.H. Freeman, BASc, PhD (Waterloo)
A.J. Heinis, BSc (South Africa), MSc, PhD (Imperial College, London)

Adjunct Faculty
R.G. Athans, BASc, MASc (Toronto), PEng
R. Bartnikas, BASc (Toronto), MEng, (McGill)
J. Carr, PhD (Waterloo), PEng
R. Malewski, BSc, MSc (Technical University of Warsaw), PhD (Electro-technical Institute of Warsaw)
L.Y. Wei, BS (National Northwestern College, China), MSc, PhD (Illinois)

Laboratory Director
R.L. Wright, PEng

Faculty Member of Electrical Engineering holding cross appointment to:
1Computer Science

Faculty Members holding cross appointment to Electrical Engineering from:
1Computer Science
2Systems Design Engineering

Course Descriptions

EL E 123 F,S 3C,1T,3L 0.5
Electrical Engineering Circuits
Introduction to network variables; resistors; Kirchhoff's laws; circuit simplification techniques; circuit analysis methods; operational amplifiers and their uses; resistor-capacitor circuits; resistor-inductor circuits; sinusoids and phasors; impedance and admittance; circuit functions and analysis techniques.

EL E 124 W,S 3C,1T,3L 0.5
Electricity and Magnetism
Electrostatics; electric flux and potential energy; dielectrics, capacitors and capacitance; flow of electric charge and resistance; Kirchhoff's Voltage and Current Laws; magnetism; magnetic materials and circuits; Faraday's Law and inductance.

EL E 125 W,S 3C,1T,3L 0.5
Numerical Methods
Pre: EL E 723 or equivalent

EL E 201 F,W 1C 0.0
Seminar
General Seminar

EL E 202 F,S 1C 0.0
Seminar
General Seminar

EL E 205 F,W 3C,1T 0.5
Advanced Calculus for Electrical Engineers 1
Fourier Series; Ordinary differential equations; Laplace transform; applications to linear electrical systems.
Cross-listed as MATH 211.

EL E 206 F,S 3C,1T 0.5
Advanced Calculus for Electrical Engineers 2
Partial differentiation, relative maxima and minima, directional derivatives, divergence and curl of vector fields with applications; multiple integrals, double and triple integrals; line and surface integrals, applications of divergence and Stokes theorems. Complex analysis: limits, analytic functions, complex line integral, Cauchy's integral formula, residues. Partial differential equations.
Cross-listed as MATH 212.

EL E 208 W 3C,1T,3L 0.5
Electronic Circuit Analysis
This is an introductory course in electronic circuit analysis which follows the first circuits course EL E 123. The topics to be discussed are: Operational amplifier applications, diodes, rectifiers, introduction to MOS and bipolar transistors, basic amplifier circuits, frequency response, elementary treatments of feedback, filters and oscillators. The student is introduced to computer-aided analysis techniques using WATAND.
Pre: EL E 123 or equivalent

EL E 222 W 3C,1T,3L 0.5
Digital Computers
Coreq: GEN E 121 or equivalent

EL E 224 F,S 3C,1T 0.5
Numerical Methods
Pre: GEN E 121 or equivalent

EL E 231 F 3C,1T,3L 0.5
Electronic Devices
Review of band theory and doped semiconductors in thermal equilibrium, charge neutrality, mass action law, recombination and transport mechanisms, Boltzmann relations, derivation of p-n junction dc and ac characteristics, charge storage effects. The bipolar transistor; derivation of dc and ac terminal characteristics. equivalent circuits. The Junction Field Effect Transistor (JFET) and Metal Oxide Semiconductor FET, derivation of dc characteristics.
Pre: PHYS 125 or equivalent

EL E 231 F 3C,1T,3L 0.5
Electronic Devices
Review of band theory and doped semiconductors in thermal equilibrium, charge neutrality, mass action law, recombination and transport mechanisms, Boltzmann relations, derivation of p-n junction dc and ac characteristics, charge storage effects. The bipolar transistor; derivation of dc and ac terminal characteristics. equivalent circuits. The Junction Field Effect Transistor (JFET) and Metal Oxide Semiconductor FET, derivation of dc characteristics.
Pre: PHYS 125 or equivalent

EL E 231 F 3C,1T,3L 0.5
Electronic Devices
Review of band theory and doped semiconductors in thermal equilibrium, charge neutrality, mass action law, recombination and transport mechanisms, Boltzmann relations, derivation of p-n junction dc and ac characteristics, charge storage effects. The bipolar transistor; derivation of dc and ac terminal characteristics. equivalent circuits. The Junction Field Effect Transistor (JFET) and Metal Oxide Semiconductor FET, derivation of dc characteristics.
Pre: PHYS 125 or equivalent

EL E 231 F 3C,1T,3L 0.5
Electronic Devices
Review of band theory and doped semiconductors in thermal equilibrium, charge neutrality, mass action law, recombination and transport mechanisms, Boltzmann relations, derivation of p-n junction dc and ac characteristics, charge storage effects. The bipolar transistor; derivation of dc and ac terminal characteristics. equivalent circuits. The Junction Field Effect Transistor (JFET) and Metal Oxide Semiconductor FET, derivation of dc characteristics.
Pre: PHYS 125 or equivalent
Course Descriptions

Electrical Engineering

EL E 234 S 3C,17,3L 1 0.5
Microelectronic Circuits and Devices

The first of a two course sequence covering the following topics: theory of devices, theory of networks, analog circuits, digital circuits, operational amplifiers.
Prereq: EL E 123
1Alternate weeks

EL E 251 F 3C,17,0L 0.5
Programming Languages and
Translators

Data types and representations, operations, sequence control, data control, storage management, language syntax, compilers and interpreters.
Prereq: GEN E 121

EL E 252 S 3C,17,0L 0.5
Data Structures

Introduction to data and data abstraction, fundamental data structures, implementing and manipulating data structures, basic file systems.
Prereq: EL E 251

EL E 253 S 3C,17,3L 1 0.5
Microprocessor Systems and
Interfacing

Microprocessor system architecture, buses, memories, peripheral connections, parallel, serial, analog interfaces, magnetic storage media, data communications, testing and debugging.
Prereq: EL E 222, EL E 251
1Alternate weeks

EL E 261 W 3C,17,3L 1 0.5
Energy Systems and Components
1
Comparative and historical review of energy sources and systems. Operating, security and planning principles for the electric energy generation, transmission and distribution systems. Excitation and loss analysis of ac magnetic circuits. Principles, circuit modeling, and performance of transformers.
1Alternate weeks

EL E 262 F 3C,17,3L 1 0.5
Energy Systems and Components
2
Prereq: EL E 261
1Alternate weeks

EL E 269 F,W 3C,2T,3L 1 0.5
Electrical Engineering
2
1Alternate weeks.

EL E 301 W,S 1C 0.0
Seminar

General Seminar

EL E 302 F,W 1C 0.0
Seminar

General Seminar

EL E 316 W,S 3C,1T 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 318 F,W 3C,17,3L 1 0.5
Communications Systems

Orthogonality and signal representation in continuous time. Fourier spectrum, Fourier transforms and applications to communications. Convolution. Transfer functions and filters. Power spectral density. Amplitude modulation and applications to techniques such as DBS, AM, SSB, etc. Angle modulation and the spectrum of frequency modulated signals. Techniques for the generation and demodulation of FM signals. Introduction to noise and its effects in AM and FM systems. Noise figure and noise temperature.
1Alternate weeks

EL E 322 F,W 3C,17,3L 1 0.5
Digital Circuits and Systems

1Open

EL E 332 S 3C,17,3L 1 0.5
Electronic Circuits

Amplifier biasing networks, single and multi-stage small-signal amplifiers, the hybrid-pi model; high and low frequency effects; negative feedback amplifiers; oscillators; noise in electronic circuits; introduction to large signal amplifiers; introduction to digital circuits.
1Alternate weeks

EL E 333 W 3C,17,3L 1 0.5
Microelectronic Circuits and Devices
II
The second of a two course sequence covering the following topics: theory of devices, theory of networks, analog circuits, digital circuits, operational amplifiers.
Prereq: EL E 234
1Alternate weeks

EL E 342 W,S 3C,1T 0.5
Electrical Networks
1

EL E 344 W 3C,17,0L 0.6
Real-Time Operating Systems

Introduction, basic concepts, process management, interprocess communication and synchronization, memory management, resource management, interrupt handling, concurrent programming.
Prereq: EL E 251, EL E 252

EL E 371 S 3C,17,3L 1 0.5
Transmission Lines and Basic Field Theory

Transmission lines: transmission line equations, steady state (sinusoidal) solution, terminated lines, matching and the Smith Chart. Basic Field Theory: vector calculus, electrostatic and magnetostatic fields, time-varying fields and Maxwell's equations, plane wave propagation, polarization, reflection, refraction, applied boundary value problems.
Prereq: EL E 126 or equivalent
1Alternate weeks

EL E 380 F,W 3C,17,3L 1 0.5
Systems and Control

1Alternate weeks

EL E 401 F.S 1C 0.0
Seminar
General Seminar

EL E 402 W 1C 0.0
Seminar
General Seminar

EL E 402-408, 490-497 0.5
Special Topics in Electrical Engineering

EL E 411 F.S 3C,1T 0.5
Digital Communications

EL E 412 W 3C,1T 0.5
Data Communication

EL E 426 F.S 3C,1T,3L 0.5
Software Engineering
Block structured languages, actual and formal parameters, recursion, formal description, relationship to machine code. Compilers. Data structures, arrays, lists, stacks, associative structures. Searching and sorting. Operating system organization, co-operating processes, process synchronization primitives. Structured software design, software testing and maintenance.

EL E 427 W 2C,1T,3L 0.5
Digital Systems Engineering

EL E 428 F.S 3C,1T 0.5
Computer Communications Networks

EL E 435 F.S 3C,1T 0.5
Semiconductor Devices
Metal-Semiconductor junctions (Schottky barriers), heterojunctions, solar cell, light emitting diode, phototransistors. FETs, MESFETs, MOSFETs, VLSIs. Bipolar and MOS devices, CCM, charge coupled devices, power transistors, power switching transistors, PIN rectifiers.

EL E 436 F.S 2C,1T,3L 0.5
Design of Integrated Circuits and Devices
Design and process details of discrete bipolar, JFET and MOSFET devices. Design and implementation of linear and analog circuits. Process, device and circuit CAD.

EL E 437 W 2C,1T,3L 0.5
Integrated Electronic Systems
Integrated circuit design; memory cells and systems, logic arrays, analog system design; application in digital signal processing; applications in data processing.

EL E 438 F.S 2C,1T,3L 0.5
Switching and Digital Circuits
Switching characteristics of semiconductor devices, non-sinusoidal wave generation and shaping, comparators, digital integrated circuits, including ECL, TL, PL, STL, MOS, CMOS.

EL E 439 W 2C,1T,3L 0.5
Analog Electronic Circuits

EL E 443 W 2C,1T,3L 0.5
Electrical Networks 2
Topics from the following: two-port descriptions of ideal devices, including operational amplifiers; network functions, formulation and solution of network equations; sensitivity calculations in the frequency domain; active networks their analysis; simple filter design; time domain solutions; simulation; introduction to digital and switched capacitor networks; computer-aided analysis and design of networks.

EL E 446 F.S 3C,1T 0.5
Linear Systems
Three types of linear multivariable systems are studied:
1. real time-continuous systems;
2. real time-discrete systems;
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 459 W 2C,1T,3L 0.5
Sound, Noise, and Electroacoustics
An interdisciplinary study of acoustical physics; human response to sound and audio engineering. Main topics include: the physics of sound; acoustical measurements; human hearing; environmental noise; electroacoustical systems and transducers.

EL E 462 F.S 3C,1T,3L 0.5
Analog Signal Processing
Discrete systems for signal processing, in particular linear filtering, are rapidly replacing analog forms. This course serves as an introduction to the analysis and design of linear, time-invariant discrete systems, with both software and hardware implementations.
EL E 468 W 3C1TSL 0.5

High Voltage and Insulation Engineering
Nature and origin of high voltage surges encountered on power systems; Traveling waves on transmission systems; Insulation engineering, electrostatic fields in high voltage apparatus, insulation failure; corona; insulation testing; circuit breakers and surge protection devices; insulation coordination.

1Alternate weeks.

EL E 465 W 3CTSL 0.5

Power Systems
Introduction to system concepts; aspects of power system planning and operation. Energy sources; environmental and resource implications. Per-unit and co-ordinate systems. Representation of equipment such as generators, transformers and transmission lines in system analysis. Analysis of imbalanced systems and faults. Voltage and reactive power control. Load/frequency control. Power transfer and system stability. Introduction to load flow methods. High voltage dc transmission.

EL E 473 W 2C1TSL 0.5

Microwave Engineering
Review of Maxwell's equations, rectangular and circular waveguide, microwave circuits, scattering matrix theory, microwave filters, simple waveguide discontinuities, klystrons and magnetrons.

Prereq: EL E 371 or equivalent

1Every third week.

EL E 474 F.S 2C1TSL 0.5

Antenna Engineering
An introduction to the theory of radiation and of antenna and propagation engineering: linear antennas, linear arrays, aperture antennas, frequency independent antennas, measurement theory.

Prereq: EL E 371 or equivalent

1Every third week.

EL E 475 W 3C1TSL 0.5

Guided Wave Engineering
Conducting waveguiding structures; rectangular and circular waveguides, microstrip theory and applications, numerical field analysis on microstrip lines, microstrip components. Dielectric waveguiding structures; dielectric slab waveguides, propagation theory for step-index fibres and graded-index fibres. Fibre measurements; loss measurements, time-domain and frequency-domain measurements, measurement of refractive index profiles. Fibre-optical telecommunication systems; system design considerations, fibre characteristics, source and detector characteristics.

1Project

EL E 481 F.S 2C1TSL 0.5

Design of Analog and Digital Control Systems

1Alternate weeks.

EL E 482 W 2C1TSL 0.5

Multivariable Control Systems

Prereq: EL E 446, EL E 481

1Open lab.

EL E 485 W 2C1TSL 0.5

Computer Control Applications

Prereq: EL E 402, EL E 401

1Project

EL E 489A F.S 9L 0.5

Project
An engineering assignment requiring the student to demonstrate initiative and assume responsibility. The student will select a project at the end of the 3B term from an approved list prepared by the Department. For a one term project, a report is required at the end of the 4A term. For a two term project, a short progress report at the end of the 4A term and a full report at the end of the 4B term are required.

EL E 498 W 9L 0.5

Project
Either a continuation of EL E 499A or a separate one-term project.

COURSES NOT OFFERED 1986-87

EL E 307 Electromagnetic Fields and Formacs
EL E 355 Database Systems
EL E 456 Software Engineering
EL E 498 Project

Department of English

Associate Professor, Chairman of Department
G.E. Slethaug, BA (Pacific Lutheran), MA, PhD (Nebraska)

Associate Professor, Associate Chairman and Graduate Officer
H.M. Logan, AB (Franklin and Marshall), PhD (Pennsylvania)

Associate Professor, Associate Chairman and Undergraduate Officer
J.S. North, BA, MA (British Columbia), PhD (Alberta)

Professor Emeritus
G.R. Hibbard, BA, MA (London)

Professors
L.A. Cummings, AB (Washington), AM (Missouri), PhD (Washington), Recipient of the OCUSA (Ontario) Teaching Award
J. Gold, BA (Birmingham), PhD (Wisconsin)
J.C. Gray, BA (Washington State), MA (Connecticut), PhD (Sydney)
K.L. Ledbetter, AB (Central College, Mo.), MA, PhD (Illinois), Recipient of the Distinguished Teacher Award
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)

P.H. Smit, Jr., BA (Harvard), PhD (Pennsylvania)

W.K. Thomas, MA, PhD (Toronto)

Associate Professors

P.D. Beam, BA (Waterloo), MA (McMaster), PhD (Toronto)

R.R. Dubinski, BA, MA (Western Ontario), PhD (Toronto)

A.I. Dust, MA, PhD (Illinois)

H.B. Ellis, BA (Rollins), MA, PhD (Illinois)

S. Foaee, BA (Carleton), MA (British Columbia), PhD (Purdue) J

R.N. Gosselin, BA (Kansas), MA, PhD (Manitoba)

P.M. Hinchcliffe, BA (British Columbia), MA, PhD (Toronto) J

N.C. Hulten, BA (Concordia), MA (Chicago), PhD (Johns Hopkins)

D.R. Letson, BA (Waterloo), MA (McMaster), PhD (Toronto) J, Recipient of the Distinguished Teacher Award

L. Lutes, BA, MA, PhD (Toronto)

W.R. Macnaughton, BA (Toronto), MA, PhD (Wisconsin)

E.P. McCormack, MA (Glasgow), PhD (Manitoba) J

C.E. McGee, BA, MA, PhD (Toronto); J

S.E. McMullen, BA, MA (Carleton), PhD (Darthouse)

E.F. Shields, AB (Chesnut Hill), MA (Villanova), PhD (Illinois)

Assistant Professors

M.A. Gerhardtstein, BA, MA (Montana), PhD (Iowa)

M. Hopkins, BA (St. Francis Xavier), MA, PhD (York) J

A.L. Magnuson, BA (Manitoba), MA, PhD (Toronto)

J. Miller, BA, BLS (McGill), MA, MPhil (Waterloo), PhD (York), R

N.F. Randell, BA (Queen's), MA (Waterloo), PhD (York)

Adjunct Faculty

C.F. MacRae, BA (Western Ontario), MA (McMaster), PhD (Toronto)

C.R. Parent, BA (Queen's), MA (Waterloo)

J.S. Stone, BA, MA (British Columbia)

Lecturers

L. Dorney, BA, MA (Louisville), J (Part-time)

Faculty Members holding cross appointments to English from:

1 Architecture

2 Faculty of Arts

J refers to faculty members at St. Jerome's College

R refers to faculty members at Renison College

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes

1. Although the Department of English provides advisors to help students choose their programs, arrange their courses and conform with the University, Faculty, and Department regulations, students are urged to study the Calendar very carefully because they are themselves responsible for failure to abide by these regulations.

2. W.K. Thomas's Correct Form in Essay Writing is the official style sheet for all undergraduate English courses.

3. The "normal" number of lectures per week in each course is 3; however, instructors determine how often their particular class will meet.

4. In all English courses, emphasis will be placed on student essays written in connection with the reading.

'R' courses are administered by Renison College.

GROUP ONE

Courses in this group count towards a degree as electives in any program in the University. Normally, none of them qualifies as a major credit for a General or Honours program in English (see Note 1). These courses are primarily designed to make students aware of the different functions of language in various contexts and to assist them to improve their writing.

ENGL 109 Introduction to Essay Writing 1

ENGL 110 Introduction to Essay Writing 2

ENGL 129R Introduction to Written English

ENGL 140R The Use of English 1

ENGL 141R The Use of English 2

ENGL 150 English as an Instrument of Thought and Communication 1

ENGL 161 English as an Instrument of Thought and Communication 2

ENGL 240R Form and Function 1

ENGL 241R Form and Function 2

Students completing any of ENGL 109, 110, 141R, 150, 151 with at least a B average may petition the English Department (through the Undergraduate Officer) to accept these courses for English major credit. This option became effective as of the Fall term 1984 and may not be applied retroactively.

ENGL 109 F.W.S 0.5

ENGL 110 W 0.5

ENGL 129R F.W.S 1C,2L,2T 0.5

ENGL 140R F.W.S 1C,2L,2T 0.5

ENGL 141R F.W.S 1C,2L,2T 0.5

ENGL 150 English as an Instrument of Thought and Communication 1

ENGL 161 English as an Instrument of Thought and Communication 2

ENGL 240R Form and Function 1

ENGL 241R Form and Function 2

ENGL 109 F.W.S 0.5

ENGL 110 W 0.5

ENGL 129R F.W.S 1C,2L,2T 0.5

ENGL 140R F.W.S 1C,2L,2T 0.5

ENGL 141R F.W.S 1C,2L,2T 0.5

ENGL 150 English as an Instrument of Thought and Communication 1

ENGL 161 English as an Instrument of Thought and Communication 2

ENGL 240R Form and Function 1

ENGL 241R Form and Function 2

ENGL 109 F.W.S 0.5

ENGL 110 W 0.5

ENGL 129R F.W.S 1C,2L,2T 0.5

ENGL 140R F.W.S 1C,2L,2T 0.5

ENGL 141R F.W.S 1C,2L,2T 0.5

ENGL 150 English as an Instrument of Thought and Communication 1

ENGL 161 English as an Instrument of Thought and Communication 2

ENGL 240R Form and Function 1

ENGL 241R Form and Function 2

ENGL 109 F.W.S 0.5

ENGL 110 W 0.5

ENGL 129R F.W.S 1C,2L,2T 0.5

ENGL 140R F.W.S 1C,2L,2T 0.5

ENGL 141R F.W.S 1C,2L,2T 0.5

ENGL 150 English as an Instrument of Thought and Communication 1

ENGL 161 English as an Instrument of Thought and Communication 2

ENGL 240R Form and Function 1

ENGL 241R Form and Function 2

ENGL 109 F.W.S 0.5

ENGL 110 W 0.5

ENGL 129R F.W.S 1C,2L,2T 0.5
ENGL 141R W 0.5
The Use of English 2
A continuation of ENGL 140R. The study of factual, emotive, scientific and imagi-
native writing; relevance, context, meaning, tone, tautology and intention.
Prereq: ENGL 140R

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 clari ty 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 8 written exercises are assigned.

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 elemen-
tary logic, students will proceed to
examine more complex language in
fiction and other forms of literature.
About 6 written exercises are assigned.
Prereq: ENGL 150

ENGL 240R F 0.5
Form and Function 1
The uses of literacy and the functions of
language as acquired in ENGL
140R/141R. These will be applied to the
more advanced form of the literary and
critical assignment essay, involving
comparison, evaluation and exposition.

GROUP TWO
Courses in this group carry degree
credit and may be counted as fulfilling
the minimum requirements for a General
or Honours program in English.

ENGL 102 A/B
The Major Forms of Literature
Different kinds of literature will be
explored to discover how the shape of a
literary work contributes to its meaning.
Students will read novels, poetry, short
stories and drama.
Also offered at St. Jerome's College.

ENGL 102A F 0.5
The Major Forms of Literature:
Short Stories and Drama
A study of short stories and drama to
determine how the shape of a literary
work contributes to its meaning.
Also offered at St. Jerome's College.

ENGL 102B W 0.5
The Major Forms of Literature:
Novels and Poetry
A study of novels and poetry to deter-
mine how the shape of a literary work
contributes to its meaning.
Also offered at St. Jerome's College.

ENGL 103A F 0.5
The Nature and Structure of the
English Language
Introduction to the study of the English
language. Topics to be discussed
include the nature and origin of
language, the structure of English and its
development, and the relations
between language and reality.

ENGL 103B W 0.5
Varieties of English
Introduction to the study of varieties of
the English language - regional, social,
temporal, functional, and stylistic. The
relations of languages and literature and
of speech and writing will be discussed.
Prereq: ENGL 103A or consent of
instructor

ENGL 105A/R
A close examination of a representative
selection of works by major British,
Canadian, American and other authors
writing in English.
Also offered at St. Jerome's College.

ENGL 105A F,W,S 0.5
20th-Century Literature in English,
1900-30
A close examination of a representative
selection of works by major authors
writing in English such as W.B. Yeats,
Virginia Woolf, D.H. Lawrence, T.S. Eliot,
and Ernest Hemingway.
Also offered at St. Jerome's College.

ENGL 105B W 0.5
20th-Century Literature in English,
1930-80
A continuation of ENGL 105A. A close
examination of a representative selec-
tion of works by major authors writing in
English such as William Faulkner, Dylan
Thomas and Margaret Laurence.
Prereq: ENGL 105A or consent of
instructor
Also offered at St. Jerome's College.

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 excellency in thought
and action embodied in representative
men and women, as seen through
works of literature.

ENGL 109E 0.5
Women in Literature
A study of the nature and role of
women in British, Canadian and
American literature. Works by both men
and women will be studied in which
women are seen in such forms as
mothers, saints, sex objects and
witches.
Also offered at St. Jerome's College.

ENGL 109F 0.5
The Rebel
A study of various works of literature in
which the protagonist is a rebel against
existing norms. The course will examine
a number of rebel types and concepts,
moral implications and final outcomes
either in successful realisation or in
tragic defeat.
Also offered at St. Jerome's College.

ENGL 149H W 0.5
Isolation and Alienation
The study of a variety of works
centering on the theme of man in crisis,
the stress being on the individual at vari-
ance with his inner self, his fellow men
or his world. The course will discuss the
process in which wisdom and maturity
are gained as the ultimate products of
suffering.
Also offered at St. Jerome's College.

ENGL 150 F,W,S 0.5
Shakespeare
Designed for students in all faculties,
the course examines some of Shake-
peare's comedies, history plays and
tragedies. Shakespeare's variety and
flexibility in developing characters and
dramatic structures are stressed, as are
significant themes.
No previous work in Shakespeare is
required.

ENGL 200A/B
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 F 0.5
Survey of British Literature 1
An historical survey of major figures,
types and trends in British literature from
the Middle Ages to the late 18th
century.
Also offered at St. Jerome's College.

ENGL 200B W,S 0.5
Survey of British Literature 2
An historical survey of major figures,
types and trends in British literature from
the late 18th century to the present.
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.

Also offered at St. Jerome's College.

ENGL 202A/B
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 202A 0.5
The Bible and Literature 1
Selections from Hebrew Scripture will be studied in relation to English literature.

ENGL 202B 0.5
The Bible and Literature 2
The course will continue the study of the Bible, emphasizing the Christian gospels and epistles in relation to English literature.

Prerequisite: ENGL 202A or consent of instructor.

ENGL 203 0.5
Introduction to Folklore 1
An introduction to the scope and aims of folklore, together with a survey of the major types of folklore in the English tradition from nations of the English-speaking world. Topics such as oral literature, myth, legend, tale and marchen will be discussed.

ENGL 204 0.5
Introduction to Folklore 2
Similar to 203 but dealing with folk-drama, ballads, songs, medicines, riddles, chants, proverbs and charms.

ENGL 205 F.W 0.5
The Canadian Short Story
Exploration of the Canadian short story, from its beginnings - in the bush, in the north, on the land, in the small towns - through the struggles of an urbanizing society to the present. Students will be expected to work in some depth with individual authors.

ENGL 206
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.

Also offered at St. Jerome's College.

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 Thuberti will be studied.

Also offered at St. Jerome's College.

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, Heibert and a dramatist of the absurd, but also attention to satiric cartoons and nightclub satire.

ENGL 208E 0.5
Women Writers of the 20th Century
A study of such major 20th century writers as Woolf, Hettleman, 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 208F 0.5
The Literature of Aging
This course will focus on literary works that present various aspects of aging, such as changes in physical and mental abilities, relationships with children and grandchildren, coping with disease and death, and the satisfactions unique to the elderly.

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 209K 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, Hamsatt, Buchan, Greene, Deighton and Le Carré will be discussed. The course includes the examination of critical approaches to the form of detective fiction.

ENGL 209Q 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 209R 0.5
Writing Strategies
Students practise effective writing along with the study of established models. The goal is to develop language competence to meet a variety of academic, business, and professional situations.

Prerequisite: Second-year standing or above.

Counts as an English Major credit as of Fall 1984.

ENGL 210A 0.5
Business and Technical Writing
A study of the principles of business and technical writing including the styles, techniques, and forms of business and technical correspondence, application letters and résumés, abstracts, outlines, and technical description, with copious writing practice. Special attention to techniques of editing and presentation. Some practice in oral presentation.

Prerequisite: Second-year standing or above.

ENGL 210B 0.5
Arts and Literature
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.

Also offered at St. Jerome's College.
ENGL 210C 0.5
Report Writing
A study in the principles and practice of good report writing including report language and styles and various forms of report organization — various kinds of short reports as well as the long formal research report.
Prereq: Second-year standing or above

ENGL 211/212
The Novel 1
The 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
The 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 219 0.5
Contemporary Usage
An in depth, applied study of the conventions governing contemporary English grammar, punctuation, syntax, diction, spelling, and sentence structure. In addition, the course will examine variations and changes in conventions, the question of the determiners of correct usage, and the impact of dictionaries, textbooks, journals, large publishing houses, and international wire services on accepted English usage in general and on Canadian usage in particular.

ENGL 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.
Students may receive credit for only one of ENGL 232 or DRAMA 252.

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.
Students may receive credit for only one of ENGL 233 or DRAMA 253.

ENGL 251A/B
The Practice and Theory of Criticism 1
The study and practice of skills needed for a close, analytical reading of literary texts and for the writing of critical analysis on them, studies of theories concerning literature and literary criticism.
Also offered at St. Jerome's College.

ENGL 251A F 0.5
The Practice and Theory of Criticism 1
The first half of ENGL 251A/B (see above).
Also offered at St. Jerome's College.

ENGL 251B W.S. 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 305A/B
Old English
An introduction to the English language in its earliest form and to the literature of pre-Conquest England.

ENGL 306C 0.5
Introduction to Linguistics
Introduction to linguistics and the principles of linguistic analysis through an examination of English phonology, forms, syntax and discourse.
(formerly ENGL 375A)

ENGL 306A 0.5
Modern English Grammar
Introduction to modern English grammar and structure — its meaningful forms and syntax. Several methods of analysis will be employed and evaluated, including the traditional, structural, transformational, generative and functional.
Prereq: ENGL 306A
(formerly ENGL 375B)

ENGL 306B 0.5
Historical Linguistics
Introduction to historical reconstruction and comparative analysis. Basic phonological, morphological, syntactic changes as they manifest themselves in language will be examined.
Prereq: ENGL 306A
(formerly ENGL 374A)

ENGL 306D 0.5
The History of English
Introduction to the linguistic history of English from earliest documents to the present, with some consideration of various modern dialects.
Prereq: ENGL 306A
(formerly ENGL 373A)

ENGL 308A 0.5
Rhetoric: Principles and Practice 1
A study of various theories of rhetoric. Students are assigned several essays in order to practise and apply the principles of rhetoric to discourse.
Prereq: A 200-level writing course or consent of instructor

ENGL 308B 0.5
Rhetoric: Principles and Practice 2
A continuation of ENGL 308A with an emphasis on the importance of style in rhetorical theory and practice.
Prereq: A 200-level writing course or consent of instructor

ENGL 308C 0.5
Contemporary Rhetoical Theory
An examination of contemporary rhetorical theory and its relationships to criticism, interdisciplinary studies, and computer applications.
Prereq: A 200-level writing course or consent of instructor

ENGL 309A 0.5
English Language and Linguistics
A study of basic linguistic principles and concepts, historical and formal.
(formerly ENGL 373 and ENGL 375)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 308D</td>
<td>Approaches to Style</td>
<td>Theories of style and approaches to the stylistic analysis of both literary and non-literary texts. Students will consider contributions to the study of style from such areas as traditional stylistics, New Criticism, formalism, effective stylistics, speech act theory, discourse analysis, and sociolinguistics. Prereq: Consent of instructor</td>
</tr>
<tr>
<td>ENGL 310A/B</td>
<td>Middle English</td>
<td>A study of Middle English literature with special emphasis on the work of Geoffrey Chaucer. Also offered at St. Jerome’s College.</td>
</tr>
<tr>
<td>ENGL 311A</td>
<td>Middle English 1</td>
<td>A study of the minor poems of Chaucer, “The Book of the Duchess,” “The Parliament of Foules,” and “Trostes” along with related Middle English texts. Also offered at St. Jerome’s College.</td>
</tr>
<tr>
<td>ENGL 311B</td>
<td>Middle English 2</td>
<td>A study of Chaucer’s Canterbury Tales and related Middle English poems and prose. Also offered at St. Jerome’s College.</td>
</tr>
<tr>
<td>ENGL 312</td>
<td>Literature of the Commonwealth</td>
<td>A survey of Australian poetry and prose, with some consideration of the literature, in English, from Africa and the West Indies. Also offered at St. Jerome’s College.</td>
</tr>
<tr>
<td>ENGL 313</td>
<td>Canadian Literature to 1920</td>
<td>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 stylistic novels of the 19th and early 20th centuries. Also offered at St. Jerome’s College.</td>
</tr>
<tr>
<td>ENGL 315</td>
<td>Canadian Prose Since 1920</td>
<td>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.</td>
</tr>
<tr>
<td>ENGL 316</td>
<td>Canadian Drama</td>
<td>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 as DRAMA 351.</td>
</tr>
<tr>
<td>ENGL 325</td>
<td>Reading, Leisure and Human Development</td>
<td>An introduction to the selection and application of literature in Counselling. Recreation and community settings. Students will be offered theoretical and experiential instruction in a workshop-style seminar. Assignments will be approximately eight novels or anthologies. A bibliography will be provided. A term paper will be required.</td>
</tr>
<tr>
<td>ENGL 330A/B</td>
<td>Elizabethan Literature (excluding Drama)</td>
<td>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 I and England – The Faerie Queene. Also offered at St. Jerome’s College.</td>
</tr>
<tr>
<td>ENGL 333A</td>
<td>Elizabethan Literature 1 (excluding Drama)</td>
<td>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.</td>
</tr>
<tr>
<td>ENGL 336</td>
<td>Elizabethan Literature 2 (excluding Drama)</td>
<td>A continuation of ENGL 330A. Reserved for special attention is Spenser’s epic poem glorifying England and Elizabeth I – The Faerie Queene. Prereq: ENGL 330A or consent of instructor Also offered at St. Jerome’s College.</td>
</tr>
<tr>
<td>ENGL 337</td>
<td>Creative Writing 1</td>
<td>Aimed at encouraging students to develop their creative and critical potentials, the course consists of supervised practice, tutorials and seminar discussions. Also offered at St. Jerome’s College.</td>
</tr>
<tr>
<td>ENGL 338</td>
<td>Creative Writing 2</td>
<td>Designed to assist advanced creative writers to develop their skills in various genres by means of workshop processes, supervised practice and critical discussion of one or more major projects. Prereq: ENGL 335 or consent of instructor</td>
</tr>
<tr>
<td>ENGL 343</td>
<td>American Literature</td>
<td>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.</td>
</tr>
<tr>
<td>ENGL 344</td>
<td>Modern American Literature</td>
<td>Approaches to reality amid the confusion and uncertainty of 20th-century America. Emphasis on such major writers as Faulkner, Mister and Cummings. Prereq: ENGL 343 or consent of instructor Also offered at St. Jerome’s College.</td>
</tr>
<tr>
<td>ENGL 345A</td>
<td>American Literature</td>
<td>Designed to assist advanced creative writers to develop their skills in various genres by means of workshop processes, supervised practice and critical discussion of one or more major projects. Prereq: ENGL 335 or consent of instructor</td>
</tr>
<tr>
<td>ENGL 345B/C</td>
<td>Studies in American Literature</td>
<td>Approaches to reality amid the confusion and uncertainty of 20th-century America. Emphasis on such major writers as Faulkner, Misters and Cummings. Prereq: ENGL 343 or consent of instructor Also offered at St. Jerome’s College.</td>
</tr>
<tr>
<td>ENGL 345D</td>
<td>American Literature</td>
<td>Designed to assist advanced creative writers to develop their skills in various genres by means of workshop processes, supervised practice and critical discussion of one or more major projects. Prereq: ENGL 335 or consent of instructor</td>
</tr>
<tr>
<td>ENGL 346C</td>
<td>American Fiction</td>
<td>Special emphasis will be given to the works of 2 or 3 major American novelists such as Herman Melville and William Faulkner. Prereq: ENGL 343 or consent of instructor Also offered at St. Jerome’s College.</td>
</tr>
<tr>
<td>ENGL 347A</td>
<td>Contemporary American Literature</td>
<td>A study of American Literature from World War 2 to the present. Prereq: ENGL 343 or consent of instructor Also offered at St. Jerome’s College.</td>
</tr>
</tbody>
</table>
ENGL 350A/B 17th-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.

ENGL 350B 0.5
17th-Century Non-Dramatic Literature 2
A study of selected prose works of Bacon, Burton and Browne. A more intensive study of Milton’s English poetry and a selection of his prose works.
Also offered at St. Jerome’s College.

ENGL 362 0.5
Shakespeare 1
A study of the plays written before 1599-1600, excluding Julius Caesar.
Also offered at St. Jerome’s College.
ENGL 363 0.5
Shakespeare 2
A study of the plays written after 1599-1600, including Julius Caesar.
Also offered at St. Jerome’s College.

ENGL 355/356 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 406A/B Writing for Special Purposes 1 and 2
Each term will consist of three or four units on such topics as editing, magazine, newspaper, and editorial writing; advertising and public relations writing; instructional manuals; interpretation of specialized information for general audiences; writing for non-print media; ethics in writing; etc. Substantial use will be made of non-academic experts in the field covered.
Enrollment limited to 4-year students in RTW program, or consent of instructor

ENGL 410A/B Restoration and 18th-Century Literature
Restoration and Early 18th Century
The Restoration comedy of manners, heroic and high tragedy, poetry of the court wits and other amused commentators on society, and the major writings of Dryden, Swift, Addison, Defoe and Pope.

ENGL 410A 0.5
Satire and Sensibility: The Restoration and Early 18th Century
The Restoration comedy of manners, heroic and high tragedy, poetry of the court wits and other amused commentators on society, and the major writings of Dryden, Swift, Addison, Defoe and Pope.

ENGL 410B 0.5
Sense and Sensibility: The Middle and Later 18th Century
The probing of mores and manners by Pope and Johnson, the emergence of the novel with Fielding and Sterne, and the transformation (in “the age of sensibility”) of literary attitudes and practice from classical to Romanticism.

ENGL 430A/B 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.

ENGL 430A 0.5
The Romantic Movement 1
The poetry and critical theory of Blake, Wordsworth and Coleridge. Emphasis is primarily on poetry; selected minor writers may be considered.

ENGL 430B 0.5
The Romantic Movement 2
The poetry and critical theory of Byron, Shelley and Keats. Emphasis is primarily on poetry; selected minor writers may be considered.

ENGL 451A/B Literature of the Victorian Age
An historical and critical study with emphasis on the major poets (Browning, Tennyson, Arnold) and the major writers of the literary period.

ENGL 451A 0.5
Literature of the Victorian Age 1
An historical and critical study of major poets (Browning, Tennyson, Arnold) and of the literary criticism of the period.
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 495A/B British Literature from Shaw to Eliot
A study of the major writers. British Literature from 1885 to World War 2, with special emphasis on such writers as Shaw, Yeats, Eliot, Conrad and Yeats.
Also offered at St. Jerome’s College.

ENGL 460A 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 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 495A/B 0.5
Supervision of Honours Essay
A letter grade for ENGL 495A will be submitted only after the completion of ENGL 495B.
Faculty of Environmental Studies

The following persons have wide ranging interests and hence have been appointed to the Faculty of Environmental Studies rather than to a specific Department and/or School:

- Associate Professor, Associate Dean, Computing and Communications: R.T. Newkirk, BA, MSc, PhD (Western Ontario)
- Professor, Director of Teaching Resources and Continuing Education: C.K. Knapper, BA (Iona (Sheffield), PhD (Saskatchewan)

The following persons are Professors:

- P.J. Howarth, BA (Cambridge), PhD (Glasgow)
- P.H. Nash, BA, MA (Carleton-Los Angeles), CE (Grenoble), MCP, MPA, PhD (Harvard), MCP, AICP

The following persons are Associate Professors:

- D. Estrin, BA, LLB (Alberta) (Part-time)

The following persons are Adjunct Faculty:

- K. Elliott, Diploma Creative Arts
- S. Garrard, BA (McMaster), LLB, MES (York)

Faculty Members holding cross and/or joint appointments to Environmental Studies from:

1. Planning
2. Psychology
3. Man-Environment Studies

ENV S 200 F,W 2C,2L 0.5
Field Ecology
Introduces the main concepts and principles of ecology; the cycling of elements; energetics and structural organization of major ecological systems; population dynamics; impact of natural resource management practices and urban and industrial development on the environment; incorporating environmental quality considerations into development activities. There are weekly field trips to study natural and disturbed ecosystems, urban and applied ecology.

Prereq: Second, third and fourth year students only.

ENV S 201 F,W 3C,1.5S 0.5
Introduction to Environmental and Planning Law
Introduction to legal concepts generally and to environmental and planning law concepts in particular. Designed both for students who do not plan to take further in depth legal courses and as a prerequisite for senior legal courses - ENV S 401 and ENV S 402. Topics to be covered include Sources of Law, Nature of Legal Remedies, Common Law, Judicial Review, Administrative Agencies and the law relating to them Planning Act, Environmental Protection and Assessment Acts, and Federal Fisheries Act.

ENV S 202 W 2C,1L 0.5
Social Science Approaches to Environmental Problems
Research strategies for understanding and addressing environmental problem/opportunity situations based on concepts and methods derived from the social and behavioural sciences. Particular attention is given to determining the appropriate mix of research strategies for a range of situations in terms of data validity and reliability, time and financial constraints, and ethical considerations.

Prereq: Second year students or consent of instructor.
ENVS 322 F 3C 0.5

Media Tools for Environmental Studies
Instruction in basic black and white photography relating to photography's role as a media tool—basic darkroom functions, camera operation, composition, photographic theory, and photo essay production. Much of the course work and projects will be done outside the classroom in field situations of environmental concern using initiative in project development. Students are expected to supply their own cameras. A limited number of cameras will be available on a rental basis.
Prereq: ENV S students; others with consent of instructor
Lab fee of $5 for (optional) use of ES Student Darkroom

ENVS 277 F,W 3C,1L 0.5
Introduction to Environmental Research Methods
Introduction to methods of developing, evaluating and using evidence in Environmental Studies. Methods for summarizing and critical appreciation of data describing environmental systems. Skill development in applying statistical techniques and in using microcomputers as a research tool.
Prereq: CS 100 or high school computing course or consent of instructor
Students may receive credit for only one of ENV S 277 and PSYCH 292; STAT 202, 204, 205, 210, 220

ENVS 310 F 2C 0.5
Behavioural Studies
An examination of the way we perceive our environment—both natural and man-made—and how it influences our attitudes and behaviour. Students will carry out a number of empirical exercises and projects on various aspects of environmental perception and behaviour.
Prereq: Second, third or fourth year students only

ENVS 234 F 3C,1L 0.5
Park Management
Basic administrative procedures in park management. Operational techniques are examined together with general policies of acquisition, operation and development.
Prereq: REC 230 and REC 332
Cross-listed as REC 334
Students may receive credit for only one of ENV S 334 and REC 334

ENVS 377 W 3C,1L 0.5
Advanced Environmental Research Methods
Advanced methods for developing, evaluating and using evidence in Environmental Studies. Systematic approaches to problems of measurement and problems in time and space. Skill development in applying parametric statistical inference, systems of equations, finite differences, mathematical interpolation and extrapolation with computer aids to analysis.
Prereq: ENV S 277
Students may receive credit for only one of ENV S 377 and PSYCH 292; STAT 202, 204, 205, 210, 220

ENVS 380/381 F,W C 0.5 each
Environmental Studies Workshop
An interdisciplinary workshop focusing upon environmental issues in a project or research format.
Prereq: Third and fourth year students in Environmental Studies; enrollment 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

ENVS 401 W 3C 0.5
Environmental Law
Detailed consideration of recent developments in Canadian environmental and resources regulatory regimes combined with guidance on presentation of expert evidence to courts and tribunals.
Prereq: ENV S 201

ENVS 402 W 3C,1S 0.5
Planning Law
An analysis of the legal basis for planning in Ontario and the practice of planning law as it affects planners, municipalities, local councils, property owners and residents. The roles of planning board, municipal councils, the Ontario Municipal Board, the Ministry of Housing, provincial Cabinet and the Niagara Escarpment Commission in the planning process will be discussed.
Prereq: ENV S 201

ENVS 411 F 3C 0.5
Alternative Future Environments 1
Analysis of "ideal" environments of the past, including "utopian" communities. Scrutiny of current "concepts" of future environments, including distillation of works of Bell, Clarke, Commoner, de Chardin, de Jouvenal, Dorn, Doxiadis, Ehrlich, Forrester, Fuller, Kahn, Mead, Meadows, McIntosh, Michael, Polak, Theobald, Thompson, Toynbee and Ward.
Prereq: 3rd or 4th year standing or consent of instructor.

ENVS 412 W 3S 0.5
Alternative Future Environments 2
Examination of "issues" in futures 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, including "nuclear winter" and settlements in "outer space".
Prereq: ENV S 411 or consent of instructor

ENVS 417 F 3S 0.5
Land Use History and Landscape Change 1
Literature, theory and method relating to man's effects on landscapes and ecosystems. A human ecological approach. Case studies and field work.
Prereq: Consent of instructor

ENVS 418 W 3C 0.5
Land Use History and Landscape Change 2
Research on literature, theory, and method relating to man's effects on landscapes and ecosystems.
Prereq: ENV S 417 and consent of instructor

ENVS 433 W 3C,1S 0.5
People in Natural Areas
Designing and managing for people in natural areas. Environmental research and its relevance to the design and operation of natural areas and facilities will be emphasized. Means of understanding and involving neighbouring and visiting publics and indigenous people in the design and management of natural areas will be studied.
Prereq: REC/ENV S 334
Cross-listed as REC 433
Students may receive credit for only one of ENV S 433 and REC 433

ENVS 434 W 3C 0.5
Advanced Park Planning and Management
A study of policies, procedures, and practices related 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/ENV S 334
Cross-listed as REC 434
Students may receive credit for only one of ENV S 434 and REC 434
Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

ART HISTORY OFFERINGS

FINE 110 F 3C 0.5
Introduction to World Art 1
A survey of the art and architecture of the ancient Greek world from the Minoan to the Hellenistic periods.

FINE 111 W 3C 0.5
Introduction to World Art 2
A comparative survey of Western Art from the Classical to the Modern Period, emphasizing visual form as an expression of its historical and cultural context.

FINE 210 F 3C 0.5
Modern Art 1
An examination of the history of Modern Art from the late 18th century up to the time of impressionism.

FINE 211 W 3C 0.5
Modern Art 2
A continuation of FINE 210, commencing with impressionism and proceeding through the major trends of the early 20th century up to the contemporary period.

FINE 212 F 3C 0.5
Italian and Northern Renaissance Art 1
A survey of the innovations in European painting, sculpture, and architecture between 1260 and 1500.
Prereq: FINE 111 or consent of instructor

FINE 214 F 3C 0.5
Medieval Art and Architecture
A study of Early Christian Romanesque and Gothic Art.
Prereq: FINE 111 or consent of instructor

FINE 216 F 3C 0.5
Art of the 18th-Century in Europe
A study of painting, sculpture, graphic arts and architecture in 18th-century Europe.

FINE 310 F 3C 0.5
Greek Art and Architecture
A survey of the art and architecture of the ancient Greek world from the Minoan to the Hellenistic periods.
Consult Classical Studies Cross-listed as C CIV 351.

RINE 311 W 3C 0.5
Roman Art and Architecture
A survey of the art and architecture of the Roman world from Etruscan to Imperial times.
Consult Classical Studies Cross-listed as C CIV 352.

FINE 316 F 3C 0.5
Canadian Native Art
The arts and crafts of Canadian Indian and Inuit (Eskimo) peoples are examined with slide lectures, films, and student presentations.

FINE 318 W 3C 0.5
Canadian Ethnic and Traditional Arts
An historical survey of Canadian ethnic, folk and traditional arts and crafts with particular focus on the ethnic and traditional arts of the Waterloo Region.
Admission by consent of instructor

FINE 319A F 3C 0.5
Special Topics in 20th Century Art 1900-1940
A study of the major innovations in early 20th century painting, sculpture and architecture. Honours Art History majors interested in the modern period are encouraged to use this course as preparation for the 4th-year honours presentation.
Prereq: FINE 211 or consent of instructor

FINE 330 W 3C 0.5
Fine Arts Exhibition Curatorship
The development, design, documentation, security, conservation, installation, and interpretation of arts and craft exhibitions will be explored through lectures on the history, purpose and function of fine arts exhibitions: gallery visits; student projects; and the creation and presentation of an actual exhibition.

FINE 390 F R 0.5
Selected Subjects in Fine Arts
Research and reading courses under the direction of individual instructors.
Admission by consent of instructor.

FINE 390A W 3S 0.5
Methods in the History of Art
For students planning a Senior Honours Presentation in Art History. Students will examine methods of formal and stylistic analysis, iconographical interpretation and the application of social and political history to the understanding of works of art. Required of all art history majors who take FINE 490/491 and 490A.
Admission by consent of instructor.
20th century. Regular film screenings. -.

Development into a prominent art form of the productions and movements, and their work of outstanding directors, national contribution to the film medium's development into a prominent art form of the 20th century. Regular film screenings.

FILM STUDIES OFFERINGS

FINE 301 W R 0.5
Selected Subjects in Fine Arts
Research and reading courses under the direction of individual instructors.
Admission by consent of instructor.

FINE 472 F H 0.5
Senior Seminar 1
Admission by consent of instructor.

FINE 473 W R 0.5
Senior Seminar 2
Admission by consent of instructor.

FINE 490 F.S. S.std.R 0.5
Senior Honours Presentation 1
Course description on last page of Studio Offerings.

FINE 490A F S.std.R 0.5
Senior General Seminar
Course description on last page of Studio Offerings.

FINE 491 W S.std.R 0.5
Senior Honours Presentation 2
Course description on last page of Studio Offerings.

FINE 491A W S.std.R 0.5
Senior General Seminar 2
Course description on last page of Studio Offerings.

COURSES NOT OFFERED 1986-87
FINE 213 Italian & Northern Renaissance Art 2 - by correspondence only
FINE 215 Art of the 17th Century in Europe
FINE 218 Western Religious Art
FINE 219 Canadian Art History
FINE 213 Special Topics in 18th and 19th Century Art
FINE 319 Contemporary Art
FINE 3108 Special Topics in 20th Century Art: 1940-1960

FILM STUDIES OFFERINGS

FINE 250 F 3.5L:2D 0.5
History of Film 1 (1895-1940)
General history of world cinema in its silent and early sound era, covering the work of outstanding directors, national productions and movements, and their contribution to the film medium's development into a prominent art form of the 20th century. Regular film screenings. Film fee.

FINE 252 F 2C,1D 0.5
Film and the Quest for Meaning 1
An exploration of spiritual themes and issues in the cinema. An assessment of film's special characteristics as an art form capable of addressing the human quest for a significant existence. Emphasis upon the films of Ingmar Bergman.
Cross-listed as R S 266.
Film fee: $5.00

FINE 253 W 2C,1D 0.5
Film and the Quest for Meaning 2
A consideration of selected themes-death, evil, guilt, fate, alienation, courage, love, redemption-in the films of several of today's leading directors. Emphasis upon a variety of directors from divergent cultural backgrounds. Cross-listed as R S 267.
Film fee: $5.00

FINE 255 F S 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 258 W 0.5
Canadian Film
A study of Canadian film, from 1895 to the present, based on the screening and analysis of selected films.
This is a WLU course for Film Studies Majors/Minors only.

FINE 352 F 2L:2D 0.5
The Cinema of Science Fiction
A chronological survey of one of the richest and most intriguing of film genres. Discussion of its aesthetic, philosophical and cinematic aspects. Film screenings will present major international works in this genre (Goebbels, Kubrick, Lang, Lucas, Marker, Siegel, Tarkovsky, Truffaut and other directors). Regular term screenings.
Prereq: FINE 250/251 or consent of instructor.
Film fee.

FINE 355R/357R 0.5/0.5
Special Topic in Film
Special topics will be announced from year to year.

FINE 356 F.W 3C 0.5
Film and Literature in Germany
This course introduces students to significant aspects of modern German culture through film, and links this study with that of literature. It involves viewing and analyzing films and establishing a connection to related literary and cultural traditions.
Prereq: Open to all students above first year
Cross-listed as GER 300.
Taught in English

FINE 360 F R 0.5
Selected Subjects in Fine Arts
Research and reading courses under the direction of individual instructors.
Admission by consent of instructor.

FINE 361 W R 0.5
Selected Subjects in Fine Arts
Research and reading courses under the direction of individual instructors.
Admission by consent of instructor.

FINE 471 W 0.5
Senior Seminar in Film Concepts 2
Film screenings.
Admission by consent of instructor.

FINE 490 F S.std.R 0.5
Senior Honours Presentation 1
Course description on last page of Studio Offerings.

FINE 491 W S.std.R 0.5
Senior General Seminar 2
Course description on last page of Studio Offerings.

COURSES NOT OFFERED 1986-87
FINE 251 History of Film 2 (since 1941)
FINE 256W German Film (WLU)
FINE 270W The Film as a Modern Medium (WLU)
FINE 271 W Sound and Colour in Film (WLU)
FINE 350 French Film After 1945
FINE 351 Central and Eastern European Film After 1945
FINE 363 Contemporary Italian Film
FINE 360 Film Theory I
FINE 361 Film Theory II
<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Description</th>
<th>Prereq/Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>FINE 220 F 8L 0.5</td>
<td>Fundamentals of Visual Art 1</td>
<td>An introduction to the fundamental principles and concepts of visual art through a series of experimental studio problems in 2 and 3 dimensional materials and media.</td>
<td></td>
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<tr>
<td>FINE 221 W 12L 0.5</td>
<td>Fundamentals of Painting 2</td>
<td>A continuation of FINE 220 with emphasis on colour.</td>
<td></td>
</tr>
<tr>
<td>FINE 222 F 12L 0.5</td>
<td>Fundamentals of Painting 1</td>
<td>An introduction to the fundamental principles and concepts of visual art through a series of experimental studio problems in 2 and 3 dimensional materials and media.</td>
<td></td>
</tr>
<tr>
<td>FINE 223 W 12L 0.5</td>
<td>Fundamentals of Sculpture 2</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>FINE 224 F,S 9L 0.5</td>
<td>Introduction to Drawing</td>
<td>Students will make analytical and expressive drawings in a variety of media, in order to develop accurate observation and understanding of form.</td>
<td></td>
</tr>
<tr>
<td>FINE 225 W 3 9L 0.5</td>
<td>Analytical Figure Drawing</td>
<td>Analytical figure drawing from the model will be combined with a study of human anatomy for artists.</td>
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</tr>
<tr>
<td>FINE 226 Printmaking</td>
<td>Introduction to materials and methods of printmaking. Current offerings are given below.</td>
<td></td>
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</tr>
<tr>
<td>FINE 227 F 5L 0.5</td>
<td>Scientific Drawing</td>
<td>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.</td>
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</tr>
<tr>
<td>FINE 228 Applied Arts</td>
<td>The history, design and practice of various applied arts will be explored in slide lectures and studio projects. Specfic arts will vary from year to year;  current offerings are given below.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FINE 229 W 12L 0.5</td>
<td>Expressive Textile Forms</td>
<td>The history of textile arts and problems of design for textile media will be explored combining lectures and studio projects in both 2 and 3 dimensional expressive forms. Traditional textile materials and methods will be applied to the creation of contemporary expressive and autonomous forms. Students will supply their own materials.</td>
<td></td>
</tr>
<tr>
<td>FINE 229A W 12L 0.5</td>
<td>Photography for Artists</td>
<td>Introduction to photographic techniques for use as a tool for artists. Basic techniques will be taught through a series of exercises, with emphasis on applications for creative artistic expression and documentation. Intended for Fine Arts majors. Supplies at student’s expense.</td>
<td></td>
</tr>
<tr>
<td>FINE 230 W 9L 0.5</td>
<td>Calligraphy</td>
<td>A study of the art of written forms, combining studio projects with slide lectures on the history of writing, illuminating and lettering. Students will strive for mastery in various calligraphic forms selected from among historic styles such as Roman, Uncial, Bookhand, Gothic, Italic and Fraktur.</td>
<td></td>
</tr>
<tr>
<td>FINE 230A W 12L 0.5</td>
<td>Advanced Applied Graphics</td>
<td>A continuation of FINE 228D, exploring commercial illustration, type and symbol of design, multi colour print reproduction and various other advanced graphics techniques.</td>
<td></td>
</tr>
<tr>
<td>FINE 230B W 8L 0.5</td>
<td>Electronic Imaging</td>
<td>An introduction to the use of the computer for monochrome and colour two dimensional image generation and manipulation. Students will produce 35mm colour transparencies and colour photographic prints to document their work. Intended for Fine Arts majors.</td>
<td></td>
</tr>
</tbody>
</table>
### University Course Descriptions

**Fine Arts**

**French**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>FINE 320</td>
<td>Independent Studio</td>
<td>An intensive course, stressing the development of individual forms of creative expression, open to advanced students working in the areas of printmaking, sculpture or painting. Each student will work independently in consultation with the instructor. Discussion, presentations and critiques will be held during regular class. This course will culminate in an exhibition. Prereq: FINE 320, 322 or 324 Lab fee.</td>
<td>1-0.5</td>
</tr>
<tr>
<td>FINE 321</td>
<td>Advanced Painting 1</td>
<td>Drawing upon the experience gained in FINE 220/221 this course will emphasize the student's individual development as a beginning painter, through independent problems, along with class discussions and individual critiques. Prereq: FINE 220/221 or consent of instructor Lab fee.</td>
<td>1-0.5</td>
</tr>
<tr>
<td>FINE 322</td>
<td>Advanced Painting 2</td>
<td>A continuation of FINE 320 with a further emphasis on independent problems. Prereq: FINE 320 or consent of instructor Lab fee.</td>
<td>1-0.5</td>
</tr>
<tr>
<td>FINE 323</td>
<td>Advanced Sculpture 1</td>
<td>An exploration of sculpture problems in a variety of media as vehicles for serious creative expression. Prereq: FINE 222/223 Lab fee.</td>
<td>1-0.5</td>
</tr>
<tr>
<td>FINE 324</td>
<td>Advanced Sculpture 2</td>
<td>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</td>
<td>1-0.5</td>
</tr>
<tr>
<td>FINE 325</td>
<td>Advanced Drawing 1</td>
<td>A course in which drawing is investigated as a means of expression and communication. The human figure, objects, and the landscape will be studied as sources of artistic imagery. The student will be encouraged to experiment with imagery, to develop personal vision, and to devise individual formal means of expression. Prereq: FINE 224 or consent of instructor Lab fee.</td>
<td>1-0.5</td>
</tr>
<tr>
<td>FINE 326</td>
<td>Advanced Drawing 2</td>
<td>Continuation of FINE 324</td>
<td>1-0.5</td>
</tr>
<tr>
<td>FINE 326A</td>
<td>Advanced Printmaking</td>
<td>A continuation of printmaking concepts for independent study. Admission by permission of instructor. Lab fee.</td>
<td>1-0.5</td>
</tr>
<tr>
<td>FINE 328H</td>
<td>Electronic Imaging II</td>
<td>A continuation of FINE 228H and an introduction to three dimensional image generation and manipulation. Students will produce 35mm transparencies and colour photographs to document their work. Intended for Fine Arts majors. Supplies at student's expense. Prereq: FINE 228H or consent Lab fee.</td>
<td>1-0.5</td>
</tr>
<tr>
<td>FINE 329</td>
<td>Senior Graphics Techniques 1</td>
<td>Admission by consent of instructor.</td>
<td>1-0.5</td>
</tr>
<tr>
<td>FINE 330</td>
<td>Senior Seminar 1</td>
<td>Admission by consent of instructor.</td>
<td>1-0.5</td>
</tr>
<tr>
<td>FINE 331</td>
<td>Senior Seminar 2</td>
<td>Admission by consent of instructor.</td>
<td>1-0.5</td>
</tr>
<tr>
<td>FINE 332</td>
<td>Senior Seminar 3</td>
<td>Admission by consent of instructor.</td>
<td>1-0.5</td>
</tr>
<tr>
<td>FINE 333</td>
<td>Senior Seminar 4</td>
<td>Admission by consent of instructor.</td>
<td>1-0.5</td>
</tr>
<tr>
<td>FINE 334</td>
<td>Senior Seminar 5</td>
<td>Admission by consent of instructor.</td>
<td>1-0.5</td>
</tr>
</tbody>
</table>

**COURSES NOT OFFERED 1986-87**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>FINE 328A</td>
<td>Advanced Calligraphy</td>
<td></td>
<td>1-0.5</td>
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<tr>
<td>FINE 329</td>
<td>Illustration</td>
<td></td>
<td>1-0.5</td>
</tr>
<tr>
<td>FINE 400A</td>
<td>Senior General Seminar</td>
<td>As in FINE 490, each student will work under the direction of a Fine Arts faculty member on an advanced creative or research project, and will participate in group critiques and discussions. Required of all 4 year General Fine Arts students. Admission by permission only.</td>
<td>1-0.5</td>
</tr>
<tr>
<td>FINE 491</td>
<td>Pulitzer Presentation 2</td>
<td>A continuation of FINE 490. Admission by permission only.</td>
<td>1-0.5</td>
</tr>
<tr>
<td>FINE 491A</td>
<td>Pulitzer Presentation 2</td>
<td>A continuation of FINE 490A. An optional course for 4 year General Fine Arts students. Admission by permission only.</td>
<td>1-0.5</td>
</tr>
<tr>
<td>FINE 220</td>
<td>Watercolour</td>
<td></td>
<td>1-0.5</td>
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<tr>
<td>FINE 223</td>
<td>Clay Studies</td>
<td></td>
<td>1-0.5</td>
</tr>
<tr>
<td>FINE 223C</td>
<td>Images and Effigies</td>
<td></td>
<td>1-0.5</td>
</tr>
<tr>
<td>FINE 220D</td>
<td>Applied Graphics</td>
<td></td>
<td>1-0.5</td>
</tr>
<tr>
<td>FINE 322A</td>
<td>Assemblage</td>
<td></td>
<td>1-0.5</td>
</tr>
<tr>
<td>FINE 328A</td>
<td>Advanced Calligraphy</td>
<td></td>
<td>1-0.5</td>
</tr>
<tr>
<td>FINE 329</td>
<td>Illustration</td>
<td></td>
<td>1-0.5</td>
</tr>
</tbody>
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**Department of French**

Associate Professor and Chairman of the Department
W.D. Wilson, MA, PhD (Trinity College, Dublin)

Associate Professor and Graduate Officer
P.G. Socken, BA (Toronto), MA (Iowa), PhD (Toronto)

Associate Professor and Undergraduate Officer
H.S. Fournier, BA (Toronto), MA, PhD (Western Ontario)

Professors
A. Ages, BA (Carleton), MA, PhD (Ohio State)
J.R. Finn, CR, BA (Western Ontario), MA (Toronto), PhD (Illinois) J
R.L. Myers, BA (Western Ontario), MA, PhD (Johns Hopkins)
FR 192 F.W. 4C, 1L 0.5
French Language
For students with Ontario Grade 13 French. An intensive French language course. 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, 155 or consent of the Department
All students enrolling in FR 192 must take the French Placement Test to be held on Thursday, September 4, 1986, from 11:30 a.m. to 1:30 p.m. in Arts Lecture Hall 116.
Also offered at St. Jerome’s College.

FR 192A F.W. 4C, 1L 0.5
French Language
Continuation of FR 192A.
Also offered at St. Jerome’s College.

FR 193 3C 0.5
French for Bilingual Students
A course for francophones and for graduates of immersion programs. This course will focus on the language difficulties particular to fluent and near-fluent speakers of French. Emphasis will be on grammatical accuracy.
Prereq: Consent of Department

FR 198 F 3C, 1L 0.5
Reading French
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. Successful completion of FR 199/199 will satisfy the “reading knowledge of French” requirement of the University of Waterloo Graduate program.
This course may be taken on a CR/FAIL basis only: There is no grade assigned.
Prereq: Consent of Department
Not open to students with Ontario Grade 12 French or above, or with FR 151, 152, 155 or 192.

FR 199 W 3C, 1L 0.5
Reading French
A continuation and completion of the work begun in FR 198.
This course may be taken on a CR/FAIL basis only. There is no grade assigned.
Prereq: FR 198 or consent of the Department
FR 206 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 1 of: FR 152, 155 or consent of Department
Maximum enrolment of 15 in each section.

FR 206 3C, 1L 0.5
**Spoken French**
Continuation and completion of work begun in FR 205.
**Prereq:** FR 205 or consent of Department
Maximum enrolment of 15 in each section.

FR 207 3C, 1L 0.5
**Spoken French**
Advanced level for continued intensive oral and aural training in the classroom. Particular emphasis on comprehension and conversation, with the class divided into small groups for practice in speaking.

**Prereq:** FR 192, 195/196, 206, 251 or consent of Department
Maximum enrolment of 15 in each section.

FR 208 3C, 1L 0.5
**Spoken French**
Continuation and completion of work begun in FR 207.
**Prereq:** FR 207 or consent of Department
Maximum enrolment of 15 in each section.

FR 210 2C 0.5
**Report Writing in French**
This course is designed to give students practice in the research, organization and writing of a variety of reports in the French language.

**Prereq:** FR 192, 195/196 or consent of Department
May only be used for elective credit by French Major or Honours students.

FR 251 3C, 1T 0.5
**French Language**
Continued training in spoken and written French, with emphasis on more difficult problems of the language. Taught in French.

**Prereq:** FR 192, 195/196 or consent of Department

FR 252 3C, 2T 0.5
**Written and Spoken French**
Continued training in spoken and written French, with emphasis on more difficult problems of the language. Taught in French. Free composition will be stressed.

**Prereq:** FR 251 or consent of Department

FR 255 3C, 1L 0.5
**Business French**
A French language course designed to enable the student to carry on standard business practices in spoken and written French.

**Prereq:** FR 192, 195/196 or consent of Department

FR 293 3C 0.5
**French for Bilingual Students II**
A second level course for francophones and near-fluent speakers of French. In addition to continued emphasis on correct usage, attention will be paid to stylistic improvement.

**Prereq:** FR 193 or consent of Department

FR 301 2C, 2T 0.5
**French Language**
This course includes a review of advanced grammar. It aims to develop writing skills through compositions, and to provide practice in advanced oral skills with work in small groups. Taught in French.

**Prereq:** FR 205, 252, or consent of Department

FR 302 2C, 2T 0.5
**French Language**
This course concentrates on the development of writing skills through a study of the practical stylistics of French, and provides practice in advanced oral skills, with work in small groups.

**Prereq:** FR 251 and 207 or 208 or 252 or 255, or consent of Department

FR 401 0.5
**Advanced Language Study**
A course in advanced translation, dealing with both the theories of translation and their implementation. Special attention will be paid to metalinguistic problems which affect style and meaning.

**Prereq:** FR 301, 302, or consent of the Department

FR 402 0.5
**Advanced Language Study**
A continuation of the work done in FR 401. Special attention will be given to the practice of translation.

**Prereq:** FR 401 or consent of the Department

**LINGUISTICS COURSES**

**Language of Instruction:**
Courses are normally taught in French. However, in the case of students not enrolled in a French Major or Honours Program, permission may be given for written assignments and examinations to be done in English.

FR 203 3C, 1L 0.5
**Introduction to the Phonetics of French**
This course introduces the student to a practical level to the phonetic system of contemporary French, and on a theoretical level to a phonological description of that system. Taught in French.

**Prereq:** FR 192 or consent of Department

FR 303 3C, 1L 0.5
**Introduction to Linguistics**
This course will introduce students to a basic theoretical reflection on language. Various important schools of modern linguistic thought ranging from Saussure to Chomsky will be discussed. Taught in French.

**Prereq:** FR 250, 252, or consent of Department

FR 403 0.5
**Topic in Linguistics**
An area in Linguistics of particular interest to the instructor and the students will be chosen. Taught in French.

**Prereq:** FR 250, 252 or consent of Department

FR 405 3C 0.5
**Medieval French Language**
Introduction to the early development of French.
Offered at St. Jerome's College.

**CIVILIZATION COURSES**

**Language of Instruction:**
Courses are normally taught in French. However, in the case of students not enrolled in a French Major or Honours Program, permission may be given for written assignments and examinations to be done in English.
FR 263 3C 0.5
Aspects of France
An examination of contemporary French society through representative literary texts as well as such genres as film and the popular press.
Prereq: FR 192 or consent of Department

FR 273 3C 0.5
Aspects of Quebec
A presentation of traditional and contemporary Quebec in the fields of the Arts, literature, music, politics and society. Taught in French.
Prereq: FR 192, 196 or consent of Department

FR 291 3C 0.5
French Civilization 1
This course traces the cultural development of France from its origin to the beginning of the Napoleonic Empire. Emphasis is given to the study of music, art, architecture, literature, ideas and "daily life" in their historical context. See Note under FR 202.

FR 292 3C 0.5
French Civilization 2
This course completes the study of the cultural development of France to 1900. After that, the course emphasizes a study of life in these 2 areas today. Considerable attention will be paid to art, politics, industry, etc.
Prereq: FR 291 is recommended. FR 291 and 292 are taught in English Open to Arts students in second year and higher, and to others in any year. Students in a French Major, Honours, or Minor Program are encouraged to take this course as an elective.

FR 383A/B 0.5/0.5
French Civilization, 1884-1914
Offered in the Nantes Program

FR 395A/B 0.5/0.5
French Thought
A survey of the principal thinkers and currents of ideas in France from the Renaissance to the Present. Offered in the Nantes Program.

LITERATURE COURSES

Language of Instruction:
Courses are normally taught in French. However, in the case of students not enrolled in a French Major or Honours Program, permission may be given for written assignments and examinations to be done in English.

FR 195 3C 0.5
French Literature 1
For students with Ontario Grade 13 French. A study of various critical approaches and their application to French literature, with emphasis on the literature of French Canada. Taught in French.
Prereq: Grade 13 French or equivalent, FR 194, 195 or consent of Department

FR 196 3C 0.5
French Literature 2
For students with Ontario Grade 13 French. A study of various critical approaches and their application to French literature, with emphasis on the literature of France. A continuation of FR 195. Taught in French.
Prereq: Grade 13 French or equivalent, FR 152, 155 or consent of Department

FR 231 3C 0.5
Survey of Seventeenth Century French Literature
This course will trace the development of French literature from 1600-1700. Taught in French.
Prereq: FR 192, 196 or consent of Department

FR 232 3C 0.5
Topics and Problems in Seventeenth Century French Literature
A more detailed study of writers/works of the classical period. Taught in French.
Prereq: FR 192, 196 or consent of Department

FR 253 3C 0.5
Romanticism
This course will deal with French literature between 1789 and 1848. This course will explore the principal literary movement of this period: Romanticism. Taught in French.
Prereq: FR 192, 196 or consent of Department

FR 264 3C 0.5
Twentieth-Century French Theatre
The study of a representative number of authors and texts from Claudel to Lemeroux. Taught in French.
Prereq: FR 192, 196 or consent of Department

FR 275 3C 0.5
Contemporary French-Canadian Novel
A study of a limited number of texts by authors such as Gabrielle Roy, André Langlois, Hubert Aquin, Gérard Bessette. Taught in French.
Prereq: FR 192, 196 or consent of Department

FR 347 3C 0.5
Eighteenth Century French Literature
This course will trace the development of French literature from 1700-1800. Taught in French.
Prereq: FR 192, 196 or consent of Department

FR 348 3C 0.5
Topics and Problems in Eighteenth Century French Literature
A more detailed study of one or more aspects of the Enlightenment. Taught in French.
Prereq: FR 192, 196 or consent of Department

FR 354 3C 0.5
Realism and Naturalism
This course will study the literature from 1848 to 1900. It will cover not only the major writers but also the theories behind the social, artistic and intellectual trends in this part of the century.
Prereq: FR 192, 196 or consent of Department
Not open to students who have taken FR 245.

FR 363 3C 0.5
Twentieth Century French Literature
This course will trace the development of French literature from 1900 to the present with emphasis on the Novel. Taught in French.
Prereq: FR 192, 196 or consent of Department

FR 371 3C 0.5
French-Canadian Poetry
A study of its evolution from Octave Crémazie to Anne Hébert. Taught in French.
Prereq: FR 192, 196 or consent of Department

FR 372 3C 0.5
Contemporary Quebec Theatre
A study of contemporary Quebec theatre from Gratien Gélinas to Michel Tremblay. Taught in French.

FR 391 3C 0.5
French Women Writers
A study of selected works by women writers in France from the Middle Ages to the twentieth century. The course will focus on the literary features of these works and on their value as reflections of the position of women in French society throughout the period. Taught in French.
General Engineering

Assistant Professor
D.A. Fraser, BASc, MASC, PhD
(Waterloo)

Adjunct Professor
J.W. Church, BSc (Queen's), MASC
(Toronto), PEng

Lecturers/Demonstrators
S.H. Birkett, BSc (London)
J. Lowe, BSc (Carleton), Recipient of
the Distinguished Teacher Award
K. Riepert, BASC (Waterloo)

Course Descriptions

GEN E 010 F, W 1S 0.0
Co-ordination Orientation
Given by the Department of
Co-ordination for students in Year 1
Engineering. Its purpose is to introduce
students to the various features of the
co-operative program and engineering
as a profession.

GEN E 062 F 3C 0.5
Introduction to Human
Communications Systems
The processes involved in man-man,
man-machine and mass communications
will be discussed. Models of communi-
cation systems. The contributions and
points of view of the various disciplines
which make up the spectrum of commu-
nication studies today.
Not open to Year 1 students.

GEN E 115 F 2C, 4L 0.75
Engineering Concepts
An introduction to some of the basic
methods and principles used by engi-
neers including fundamentals of
graphics, projections, spatial co-ordinate
plotting, free-hand sketching, vector
graphics.

GEN E 151 W, S 3C, 2T 0.5
Digital Computation
Introduction to electronic digital
computers, hardware and software
organization; basic features of
FORTRAN and/or PASCAL, examples of
efficient numerical algorithms for basic
scientific computations.

Course Descriptions

General Engineering

FR 410 3C 0.5
Medieval French Literature
An introduction to French literature of
the Middle Ages through the study of
representative texts, including excerpts
from the epic, courtly and satirical
works. Taught in French.
Prereq: FR 192, 196 or consent of
Department.

FR 421 3C 0.5
French Prose of the Renaissance
Readings in sixteenth century literature;
Rabelais, Montaigne, etc. Taught in
French.

FR 422 3C 0.5
French Poetry of the Renaissance
Readings in sixteenth century poetry;
Marot, the Phædra, the baroque poets,
etc. Taught in French.

FR 482 3C 0.5
Study of Individual Authors
Each year a different author is the
subject of an in-depth exploration of his/her literary
qualities. Taught in French.
Prereq: FR 192, 196 or consent of
Department.

FR 490-498 0.5
Senior Tutorial
A small group of students follows a
course of study under the supervision of
a faculty member. For details, inquire of
the Department.

GEN E 123 W, S 3C, 1T, 3L (4 times/term) 0.5
Electrical Engineering
Introduction to electric charge and
fields; ac circuit analysis; Kirchoff's
circuit laws; 2 ports and op-amps; capa-
citance, induced voltage; introduction to
motors and their characteristics.
For Year 1 Chemical, Civil and
Geological Engineering students.

GEN E 124 W, S 3C, 1T, 3L (4 times/term) 0.5
Electrical Engineering
Introduction to electric charge and
fields; ac circuit analysis; Kirchoff's
circuit laws; 2 ports and op-amps; capa-
citance, inductance and impedance;
magnetic force and induced voltage;
Semiconductors. Instrumentation.
For Year 1 Mechanical Engineering
students.

GEN E 301 W, S 4D 0.5
Special Directed Studies
This course is provided to allow enrich-
ment for students in Engineering who
have fulfilled the requirements of 1 or
more of the courses in the 3A term by
means of passing a course or courses
taken during 1 or more work terms. The
course comprises a special project
pursued under the direction of a Faculty
member, normally in the Department of
the student's program.
Prereq: Permission of the Associate
Chairman of the Department in which
the student is registered.

GEN E 302 W, S 4D 0.5
Special Directed Studies
This course is provided to allow enrich-
ment for students in Engineering who
have fulfilled the requirements of 1 or
more of the courses in the 3B term by
means of passing a course or courses
taken during 1 or more work terms. The
course comprises a special project
pursued under the direction of a Faculty
member, normally in the Department of
the student's program.
Prereq: Permission of the Associate
Chairman of the Department in which
the student is registered.
Course Descriptions
Geography

GEOG 200R W 3C 0.5
Food, Agriculture and Integrated Rural Development in the Third World
Population growth and food resources in different areas of the Third World. Focus on possibilities of decelerating population growth and accelerating food production and rural development in selected regions.

GEOG 251 F 3C 0.5
Cities in Canada
An introduction to some basic concepts in urban studies emphasizing a systematic approach to processes and problems of urban development in Canada. Field trip fee $5-$10.

GEOG 275 F,W 2C,2L 0.5
Introductory Air Photo Analysis and Remote Sensing
Basic characteristics of various remote sensing techniques and their application in the broad field of geographic and environmental studies. Emphasis on the analysis and interpretation of air photos in 3 dimensions.

Lab fee $20.

GEOG 300 S 2C,4ldab 0.5
Geomorphology and the Southern Ontario Environment
Field work and field trips in exploring the evolution of S. Ontario landforms. The identification of landforms, landform assemblages and their relationships. The meaning and utility of this information in terms of the contemporary and future environment will be stressed.

Prereq: Third and fourth year students only with GEOG 201 or consent of instructor.

Lab fee $10-$15.

GEOG 303 W 2C,2L 0.5
Geographical Hydrology
Study of the land based hydrological cycle and water balance with Canadian emphasis. Focus on snowcover, glacier ice, ground ice, streams and lakes and their physical, ecological and socio-economic significance.

Prereq: GEOG 201 and one of: GEOG 209 or 209

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 students with ENV S 277/377 or consent of instructor.

Cross-listed as PLAN 307.

Students may receive credit for only one of GEOG 307 and PLAN 307.

GEOG 309 F,S 2C,1D 0.5
Physical Climatology
Principles of physical climatology with emphasis on climate regions of Canada. Topics include radiation and energy balances, general circulation patterns, synoptic development, climatic variability and microclimatology.

Prereq: GEOG 102

GEOG 311 F 3C 0.5
Regional Industrial Development
Manufacturing in the context of economic development at regional and urban scales. Focus on empirical studies and related planning issues in Canada and the United Kingdom.

Prereq: GEOG 202 or consent of instructor.

GEOG 315 F 3C 0.5
Agricultural Geography
The geographical dimensions of agricultural systems. Diffusion of innovations, regional evolution of agricultural structure and vertical integration. Comparative study of programs of government intervention in agriculture in Canada and Europe. Some field trips.

Prereq: GEOG 202 or consent of instructor.

GEOG 316 F 1C,2L 0.5
Multivariate Statistics
The theory and application of multivariate statistics, with particular emphasis upon the use of the computer.

Prereq: ENV S 277/377 or consent of instructor.

Cross-listed as PLAN 316.

Students may receive credit for only one of GEOG 316 and PLAN 316.

GEOG 319 F,S 2C,1L 0.5
Economic and Social Techniques for Regional Planning
Critical appraisal of a selection of descriptive and evaluative regional analysis techniques. Economic considerations of regional development. Reliability and applicability of data; input-output analysis; cost-benefit analysis; planning, programming and budgeting systems, and social area analysis.

Prereq: ECON 101, 102 or consent of instructor.

Cross-listed as PLAN 319.

Students may receive credit for only one of GEOG 319 and PLAN 319.

GEOG 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 325R W 3C 0.5
Special Topics in Development of the Third World
Focuses on geographic perspectives on social planning and participatory approaches to regional/community development using case studies (seminar method). Oriented to providing useful background for students interested in overseas volunteer work programs.

Prereq: First or second year courses related to Third World studies or consent of instructor.

GEOG 330 W 3C 0.5
Cultural Geography
The Geography of culture and the role of cultural factors in environmental relationships.

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 230 or consent of instructor.
water and matter and their effects on
ment.
the subsystems of the natural environ-
landforms along with flows of energy,
Emphasis on the natural environment as
an integrated system. Se&ted aspects
joint eppO&ments
themes.
towards man-land and location analysis
man's cu&~al environment. Directed
applications of geographic analy& to
through a survey of some of the
concepts, methods, techniques and
mater
Prereq: First year Geography students
only or first year Arts students intending
to major in Geography; or consent of
instructor

Asisten Professors
D. Duddy, BA (Waterloo Lutheran),
MA (Waterloo), PhD (London School
of Economics)
C. Dutourmain, BA (Sir George
Williams), MA (Laval), PhD (Toronto)
E.R. Officer, BA (British Columbia) MA
(Wisconsin)

Adjunct Faculty
G. Brannon, CC
D.I. McKenzie, BES, MA (Waterloo)
S. Pala, BSc (Ankara), PhD (Freiburg)

Faculty Members of Geography holding
cross and/or joint appointments to:
1 Planning
2 History
3 Recreation and Leisure Studies

Faculty Members holding cross and/or
joint appointments to Geography from:
4 Renison
5 Recreation and Leisure Studies
6 Environment Studies
7 Planning
8 Environmental Studies

Course Descriptions
Courses not offered in the current
academic year are listed at the end
of this section.

GEOG 101 F.W. 2C,2L 0.5
Introduction to Human Geography
An introduction to human geography
through a survey of some of the
concepts, methods, techniques and
applications of geographic analysis to
man's cultural environment. Directed
towards man-land and location analysis
themes.

GEOG 102 F.W. 2C,2L 0.5
Introduction to Physical Geography
Emphasis on the natural environment as
an integrated system. Selected aspects
of weather-climate, water, soils, biota,
landforms along with flows of energy,
water and matter and their effects on
the subsystems of the natural environ-
ment.

GEOG 110 F 2C,1U 0.5
Introduction to the Field of
Geography
An introduction for first year geographers
to Geography as a profession,
different approaches to solving
geographical problems, research report
writing, and to the Geography program
at the University of Waterloo.
Prereq: A first year geography course.

GEOG 125F. F 3C 0.5
Introduction to the Third World
A study of the Third World. Topics
include: population issues, planning and
practices; education and health in the
social development process; urbaniza-
tion and industrialization; planning for
rural and urban development in Asia,
Africa and Latin America.

GEOG 127 W 2C,2L 0.5
Regional Problems of Europe
An introduction to the Geography of
Europe which examines agricultural,
industrial and urban problems. Lectures,
discussions and visual presentations
based on field experience of instructors.

GEOG 150 W 2C,2L 0.5
Introduction to Cartography and Map
Analysis
Basic concepts involved in the analysis
and use of existing types of carto-
graphic products. Background theory of
the production and reproduction of
topographic and thematic maps,
including historical development, collec-
tion of data and symbolization.
Lab fee $15-$25.

GEOG 201 F.S 3C 0.5
Geomorphology and Soils
The roles of geomorphological and soil
forming processes in creating and modi-
ifying landscapes. The utility of geomor-
phological information in our everyday
lives.
Prereq: GEOG 102

GEOG 202 F.S 3C 0.5
Economic and Urban Geography
The locational structure of economic
activities in the context of regional
development, with the use of case
studies. Basic concepts and tools are
used to analyse the location structure of
primary, secondary and tertiary activities.
Prereq: A first year human geography
course.

GEOG 203 F 2C,2L 0.5
Regional Geography
The approach of the regional geogra-
pher is illustrated using one or more
specific regions. Political, social, and
historical processes are studied as they
affect man's perception of this regional
environment. Example regions used are
Austria, Alpine and Mediterranean.
World, Greece, Hungary, Switzerland.
Prereq: A first year human geography
course.

GEOG 204 W 3C 0.5
Soviet Union
Introduction to the geography of the
Soviet Union, with a focus on selected
problems in urbanization, industrializa-
tion, resource use and regional
economic development in a planned
economy.

GEOG 205 F 2C,2L 0.5
Africa
The geography of modern Africa south
of the Sahara in the context of changing
attitudes to the continent on the part of
the "developed" countries. Attention will
focus on problems of the physical,
social and economic environments.

GEOG 208 W 2C,2L 0.5
Applied Climatology
World climate and weather patterns and
their impact on man. Topics include
atmospheric circulation, climate classifi-
cations, air pollution, urban climate,
climate change and weather modifiia-
tion.
Prereq: GEOG 102

GEOG 220A F 2C,2L 0.5
World Regional Geography
Study in depth of selected areas of the
world's climatic regions, emphasizing
characteristic problems as well as their
physical, cultural and economic interrela-
tionships: resource use, population
pressure, urban and rural land use,
human impact on the earth.

GEOG 220R W 2C,2L 0.5
World Regional Geography
A continuation of GEOG 220A.
Prereq: GEOG 220A

GEOG 221 W 3C 0.5
The United States
Focuses on population shifts, environ-
mental issues, and regional economic
development in the context of the nation
and selected regions.

B. Hyman, BSc, MSc (Macras), MA
(Phoenix), PhD (Pittsburgh)
A.B. Keski, MA, PhD (UMCS-Lublin,
Poland)
E.F. LaDrew, BA (Toronto), MA, PhD
(Colorado)
G.B. Piddle, BA (Western Ontario),
MA, PhD (Clark)
J.B. Robinson, BA (Toronto), MES
(York), PhD (Toronto)
S.L. Smith, BA (Wright State), MA
(Ohio State), PhD (Texas A&M)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Prerequisites</th>
<th>Credits</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 301 F</td>
<td>Field Research</td>
<td>Prereq: GEOG 311</td>
<td>0.5</td>
<td>F, L, lab</td>
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<tr>
<td>GEOG 361</td>
<td>Geography of Manufacturing Firms and Industries</td>
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<tr>
<td>GEOG 411</td>
<td>Geography of Manufacturing Firms and Industries</td>
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<td>0.5</td>
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<tr>
<td>GEOG 412</td>
<td>Advanced Cartography 1</td>
<td>Prereq: GEOG 180, ENV S 277, 377</td>
<td>0.5</td>
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<tr>
<td>GEOG 421A</td>
<td>Europe and the Mediterranean</td>
<td>Prereq: GEOG 421A</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>GEOG 422</td>
<td>Canada</td>
<td>Prereq: GEOG 422</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>GEOG 425</td>
<td>Africa</td>
<td>Prereq: GEOG 425</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>GEOG 450</td>
<td>City and Regional Systems</td>
<td>Prereq: GEOG 450</td>
<td>0.5</td>
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</tr>
<tr>
<td>GEOG 451</td>
<td>Soil Geography</td>
<td>Prereq: GEOG 451</td>
<td>0.5</td>
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</tr>
<tr>
<td>GEOG 452</td>
<td>Problems of Rural Land Use</td>
<td>Prereq: GEOG 452</td>
<td>0.5</td>
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<tr>
<td>GEOG 461</td>
<td>Land Dereliction and Rehabilitation I</td>
<td>Prereq: GEOG 461</td>
<td>0.5</td>
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</tr>
<tr>
<td>GEOG 471</td>
<td>Advanced Remote Sensing</td>
<td>Prereq: GEOG 471</td>
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<tr>
<td>GEOG 481</td>
<td>Frontiers in Geography</td>
<td>Prereq: GEOG 481</td>
<td>0.5</td>
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<tr>
<td>GEOG 482</td>
<td>Geography and Education</td>
<td>Prereq: GEOG 482</td>
<td>0.5</td>
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</tr>
<tr>
<td>GEOG 490A</td>
<td>Environmental Studies</td>
<td>Prereq: GEOG 490A</td>
<td>0.5</td>
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<tr>
<td>GEOG 490B</td>
<td>Environmental Studies</td>
<td>Prereq: GEOG 490B</td>
<td>0.5</td>
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</tr>
</tbody>
</table>

**Estimated cost to student:** $125-$150.
Geological Engineering

Course Descriptions

Geological Engineering
Germanic and Slavic Languages and Literatures

Department of

Professor, Chairman of the Department
S. Hefert, BA, MA, PhD (Toronto)

Associate Professor, Associate
Chairman Graduate Studies
J. Whiton, BA, MA, PhD (Minnesota)

Associate Professor, Associate
Chairman Undergraduate Studies
R. Karpiak, BA, MA (Manitoba), PhD
(Ottawa)

Professors
J.W. Dyck, AB (Bethel), MA (Missouri), PhD (Michigan)

E. Heer, BA, MA (British Columbia), PhD (Michigan) Recipient of the Distinquished Teacher Award

Associate Professors
G. Brude-Finck, Staatssexamen (Berlin), PhD (Yale)

F. Jakobsch, BA, MA (Manitoba), PhD (Waterloo)

D.G. John, BA, MA, PhD (Toronto)

M. Kuxdorf, BA, MA (Waterloo), PhD (Alberta)

H.W. Panethel, BA (Waterloo), MA (Cincinnati), PhD (Waterloo)

M. Richter, Staatssexamen (Berlin and Bonn), MA, PhD (Toronto)

W. Shelest, MA (Ottawa), Dr.Phil. (Munich)

A. Zweers, Doctorandus (Amsterdam), Dr.med. (Groningen)

Assistant Professors
B. Kajne-Sharratt, MA (Warsaw), BA (London), MA (McMaster), PhD (Toronto)

T. Sommer, BA, MA (Waterloo)

Adjunct Faculty
R. Kooistra, BTh (Kampen), Doctorandus of Theology, DTh (Free University of Amsterdam)

Lecturer/DAAD
J. Pankau, Staatssexamen, Dr.phil. (Freiburg)

Geological Engineering

Course Descriptions

Geological Engineering

Germanic and Slavic Languages and Literatures

Professor, Chairman of the Department
S. Hefert, BA, MA, PhD (Toronto)

Associate Professor, Associate
Chairman Graduate Studies
J. Whiton, BA, MA, PhD (Minnesota)

Course Descriptions

Geological Engineering Concepts
An introduction to physical geology and earth processes. Geological time, introduction to earth, air and water processes including volcanism, sedimentation, weathering, lithification, continental drift, radioactive dating, hydrology, pedology, resources, mass wasting, erosion.

Geological Engineering Project I

These 2 courses are designed to serve the role of an undergraduate thesis. Specifically, the student is expected to work with a staff member in Civil Engineering, Earth Sciences, or another appropriate department in identifying and carrying out a suitable short design or research project. The final product will be presented in thesis form and carefully scrutinized by two independent referees chosen for their familiarity with the topic. The subject may be laboratory based, analytic, numerical, or field oriented. The thesis format will follow accepted engineering practice and be of professional quality. Under special circumstances, 2 suitable courses may be substituted for GEO E 400 and 401.

All other courses in the Geological Engineering program are listed under the course descriptions in Earth Sciences or Civil Engineering.

COURSES NOT OFFERED 1986-87

GEOG 125R Development in the Third World
GEOG 225R Urbanization in the Third World
GEOG 318 Spatial Analysis
GEOG 323 Comparative Regional Problems
GEOG 331 Special Topics in Cultural Geography
GEOG 359 Geology of Energy
GEOG 400 Climatic and Periglacial Geomorphology
GEOG 401 Glacial Geomorphology and Contemporary Applications
GEOG 406 Tropical Geomorphology
GEOG 408 Atmospheric Resource Management
GEOG 411 Geomorphology of Manufacturing Firms and Industries
GEOG 430 Physical Geography
GEOG 448 Urban Historical Geography
GEOG 452 Central and Eastern Europe
GEOG 453 Field Research in Regional Geography
GEOG 456 Urban Historical Geography
GEOG 457 Applied Air Photo Interpretation

Geological Engineering

Professor, Chairman of the Geological Engineering Board
M.B. Dusseault, BSc, PhD (Alberta), P.Eng

Professor, Chairman of Earth Sciences
P. Fritz, Dipl. Geol. Dr.i.e.net. (Stuttgart)

Professor, Dean of the Faculty of Engineering, Department of Civil Engineering
W.C. Lennox, BSc, MSc (Waterloo), PhD (Lehigh), P.Eng

Professor, Department of Civil Engineering
E.L. Matyas, BSc (Toronto), DIC, PhD (London), P.Eng

Professors, Department of Earth Sciences
J.A. Cherry, BE (Saskatchewan), MS (California-Berkeley), PhD (Illinois), P.Eng

P.F. Karrow, BSc (Queen's), PhD (Illinois)

Associate Professors, Department of Civil Engineering
N. Knutson, BSc, PhD (Waterloo), P.Eng
B. Leinviere, BEng (West Australia), MASc, PhD (Waterloo), P.Eng
L. Rothenburg, Dipl. Ph. (Moscow) PhD (Carleton), P.Eng
J.C. Thompson, BSc (Toronto), MS, PhD (Illinois), P.Eng

Adjunct Faculty
J.A. Franklin, BSc, Cert. Ed., PhD (London), P.Eng

COURSES NOT OFFERED 1986-87

GEOG 125R Development in the Third World
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COURSES NOT OFFERED 1986-87

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Geological Engineering

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M.B. Dusseault, BSc, PhD (Alberta), P.Eng

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W.C. Lennox, BSc, MSc (Waterloo), PhD (Lehigh), P.Eng

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Professors, Department of Earth Sciences
J.A. Cherry, BE (Saskatchewan), MS (California-Berkeley), PhD (Illinois), P.Eng

P.F. Karrow, BSc (Queen's), PhD (Illinois)
Course Descriptions

GERMAN

Introductory Note
In choosing first year courses, students should read carefully the course descriptions, consult the Department Undergraduate Officer, and check the Department's program section.

GER 101 F,W,S 3C,1L 0.5
First Year German
For students with little or no knowledge of German. The basic elements of German grammar with an emphasis on oral practice and pronunciation. Language laboratory, introduction to aspects of German culture and reading of appropriate graded texts.

GER 101/102 are beginners' courses for students with little or no knowledge of German. Not open to students who have credit for GER 105, 106, 111, 112, Grade 13 or equivalent. If in doubt, consult the Department.

GER 102 F,W,S 3C,1L 0.5
First Year German
As GER 101
Prereq: GER 101

GER 105 F 3C 0.5
German for Reading Knowledge
The elements of German grammar with practice in pronunciation. Selected readings from the humanities and social sciences. This course is designed to assist undergraduate and graduate students in acquiring a reading knowledge of German.

GER 106 W 3C 0.5
German for Reading Knowledge
As GER 105.
Prereq: GER 105

GER 106/106, 111/112 are beginners' courses for students with little or no knowledge of German. Not open to students who have credit for GER 101, 102, Grade 13 or equivalent.

GER 111 F,W,S 3C 0.5
First Year Scientific German
For students with little or no knowledge of German. The basic elements of German grammar and pronunciation with an emphasis on reading and translation of elementary scientific literature from various fields.

GER 112 F,W,S 3C 0.5
First Year Scientific German
As GER 111
Prereq: GER 111

GER 121 F 3C 0.5
Studies in German Literature with Language Practice
An introduction to German literature designed to accomplish the transition from language studies to reading and discussing literary texts. Grammar review, conversation practice, and the reading of selected works.
Prereq: At least Grade 12 High School German, or equivalent

GER 121/122 are first year courses for students who have completed at least Grade 12 High School German or have an equivalent background in the language. If in doubt, consult the Department.

GER 122 W 3C 0.5
Studies in German Literature with Language Practice
As GER 121
Prereq: GER 121, or permission of the instructor

GER 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.
Prereq: At least Grade 12 High School German, or equivalent

GER 151/152 are first year courses for students who have completed at least Grade 12 High School German or have an equivalent background in the language. If in doubt, consult the Department.

GER 152 W 3C 0.5
German Conversation and Grammar Review
As GER 151
Prereq: GER 151, or permission of the instructor

GER 201 F,W 3C 0.5
Second Year German
This course is a continuation of first year GER 101/102. It offers extensive practice in both the spoken and written language. It provides vocabulary building, grammar review, and exercises in pronunciation and comprehension. Language lab.
Prereq: GER 102 or equivalent

GER 202 W 3C 0.5
Second Year German
As GER 201
Prereq: GER 201, or permission of the instructor

GER 251 F 3C 0.5
German Conversation and 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.
Prereq: GER 122, 152 or equivalent

GER 262 W 3C 0.5
German Conversation and Composition
As GER 251
Prereq: GER 251, or equivalent

GER 271 F 3C 0.5
German Thought and Culture
A survey of cultural currents to the 18th century. Lectures will focus on major developments in literature, philosophy, religion, art, architecture, and music as seen against the historical background of the German speaking peoples.
Taught in English

GER 272 W 3C 0.5
German Thought and Culture
A survey of cultural currents from the 18th century to the present. Lectures will focus on major developments in literature, philosophy, religion, art, architecture, and music as seen against the historical background of the German speaking peoples.
Taught in English

GER 281 F 3C 0.5
Post-War Literature
Reading and interpretation of major works since 1945 in prose, drama and poetry. Main authors: Borchert, Böll, Frisch, Dürrenmatt, Grass, Eich, etc.
Prereq: GER 122, 152 or equivalent

GER 282 W 3C 0.5
Post-War Literature
As GER 281

GER 291 F 3C 0.5
Survey of German Literature
Introduction to the major periods of German literature. Reading and interpretation of representative texts.
Prereq: GER 122, 152, 202 or equivalent

GER 292 W 3C 0.5
Survey of German Literature
As GER 291
Prereq: GER 122, 152 or equivalent
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GER 300A-Z</td>
<td>Film and Literature in Germany</td>
<td>This course introduces students to significant aspects of modern German culture through film, and links this study with that of literature. It involves viewing and analyzing films and establishing a connection to related literary and cultural traditions. Taught in English. Open to all students above first year. Cross-listed as FINE 359.</td>
</tr>
<tr>
<td>GER 351 F</td>
<td>Intermediate Conversation and Composition</td>
<td>Conversation on modern topics. Exercises in advanced grammar, stylistics, and composition. Prereq: GER 252 or equivalent.</td>
</tr>
<tr>
<td>GER 352 W</td>
<td>Intermediate Conversation and Composition</td>
<td>As GER 351. Prereq: GER 351 or equivalent.</td>
</tr>
<tr>
<td>GER 361 F</td>
<td>Young Germany and Biedermeier</td>
<td>Reading, interpretation and critical analysis of prescribed prose, drama, and poetry. (Grillparzer, Mörike, Stifter, Gottfried, etc.). Prereq: GER 122, 152 or equivalent.</td>
</tr>
<tr>
<td>GER 362 W</td>
<td>Poetic Realism</td>
<td>Reading, interpretation and critical analysis of prescribed prose, drama, and poetry. (Sturm, Keller, Ludwig, Hebbel, Reahe, Fontane, etc.). Prereq: GER 122, 152 or equivalent.</td>
</tr>
<tr>
<td>GER 391 F</td>
<td>Masterpieces of German Literature in Translation</td>
<td>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 Kant’s Death, Buchner, Marivaux’s Death, Demian (Hesse), Galsl (Breith), and Cat and Mouse (Grass).</td>
</tr>
<tr>
<td>GER 392 W</td>
<td>Masterpieces of German Literature in Translation</td>
<td>As GER 391.</td>
</tr>
<tr>
<td>GER 396 W</td>
<td>Waterloo in Germany Program</td>
<td>Description in Arts program section.</td>
</tr>
<tr>
<td>GER 3952 F</td>
<td>Waterloo in Germany Program</td>
<td>As GER 3962.</td>
</tr>
<tr>
<td>GER 451 F</td>
<td>Advanced Conversation, Grammar and Composition</td>
<td>This course is conducted in German and provides intensive practice in spoken and written German on the advanced level. Prereq: GER 352 or equivalent.</td>
</tr>
<tr>
<td>GER 452 W</td>
<td>Advanced Conversation, Grammar and Composition</td>
<td>As GER 451. Prereq: GER 451 or equivalent.</td>
</tr>
<tr>
<td>GER 462 F</td>
<td>Middle High German Literature</td>
<td>Reading and interpretation of samples from the major works of the MHG period, with emphasis on writers of the first &quot;Blütezeit&quot; in German literature (1170 to 1250); Early Minnesang, Walther von der Vogelweide, Nibelungenlied, Hartmann von Aue, Wotan von Eschenbach, etc.</td>
</tr>
<tr>
<td>GER 472 W</td>
<td>German Poetry</td>
<td>A study of the main thoughts, themes, forms and schools in German poetry from German Romantism to the present.</td>
</tr>
<tr>
<td>GER 495-498</td>
<td>Reading Courses in Approved Topics</td>
<td>Credits: 1.5 for completion of 1. first year Russian: 193, 194, 195 or 2. second year Russian: 293, 294, 295 or 3. third year Russian: 393, 394, 395 or 4. fourth year Russian: 493, 494, 495. The Workshop may be attended more than once. However, a maximum of 15 credits will normally be granted towards a degree.</td>
</tr>
<tr>
<td>DUTCH 101 F</td>
<td>First Year Dutch</td>
<td>The basic elements of Dutch grammar with emphasis on oral practice and pronunciation, along with appropriate texts from Dutch literature. Introduction to aspects of Dutch culture. Open to all students with little or no knowledge of Dutch.</td>
</tr>
<tr>
<td>DUTCH 201 F</td>
<td>Intermediate Dutch</td>
<td>This course will be conducted partly in Dutch and offers advanced study in grammar, composition, and conversation. Special emphasis will be given to comprehension and practice in the spoken language. Prereq: DUTCH 101 or equivalent.</td>
</tr>
<tr>
<td>RUSSIAN</td>
<td>Russian Workshop in the USSR</td>
<td>A &quot;Total Immersion&quot; Russian language workshop for a full month at the Russian Language Seminar in Leningrad. Daily instruction by Russian faculty at the elementary, intermediate, and advanced levels, according to the proficiency of the students. Prereq: At least one year of Russian language at the University level or equivalent. Credits: 1.5 for completion of 1. first year Russian: 193, 194, 195 or 2. second year Russian: 293, 294, 295 or 3. third year Russian: 393, 394, 395 or 4. fourth year Russian: 493, 494, 495. The Workshop may be attended more than once. However, a maximum of 15 credits will normally be granted towards a degree.</td>
</tr>
</tbody>
</table>
RUSS 101 F 3C, 1L 0.5
First Year Russian
A study of Russian grammar and composition with emphasis on oral practice and pronunciation.
Prereq: RUSS 102 or equivalent

RUSS 111 F.S. 3C 0.5
First Year Scientific Russian 1
A rapid, intensive course, designed to enable the students to master reading and translating Russian. Special emphasis on international and scientific terminology, ranging over many of the main branches of science. Notwithstanding its simplified approach, the main features of Russian grammar are treated in full.
Taught in English
Open to all university students with little or no knowledge of Russian, except those who have credit for RUSS 111 or 112

RUSS 112 W 3C, 1L 0.5
First Year Scientific Russian 2
As RUSS 111
Prereq: RUSS 111 or equivalent
Taught in English

RUSS 251 F 3C 0.5
Conversation, Composition, Grammar and Pronunciation
This course is basically a continuation of First-Year Russian. It provides intensive practice in spoken and written Russian. Vocabulary building, comprehension, pronunciation and intonation are stressed.
Prereq: RUSS 102, 112 or equivalent

RUSS 252 W 3C 0.5
Conversation, Composition, Grammar and Phonetics
As RUSS 251
Prereq: RUSS 251 or equivalent

RUSS 261 F 3C 0.5
Introduction to Russian Literary Movements
Reading of representative works from Russian Classicism, Romanticism, 19th Century Realism, and various periods of 20th century Russian literature.
Prereq: RUSS 102 or equivalent

RUSS 262 W 3C 0.5
Introduction to Russian Literary Movements
As RUSS 261
Prereq: RUSS 102 or equivalent

RUSS 271 F, 3C 0.5
Russian Thought and Culture
A survey of cultural history from the beginnings to 1905. Lectures will focus on major developments in literature, philosophy, art, architecture, and music as seen against the background of Russia’s historical past. Discussion will be devoted primarily to works of Russian literature.
Taught in English
Open to all students

RUSS 272 W 3C 0.5
Russian Thought and Culture
A survey of cultural history from 1905 to the present. Lectures will focus on major developments in literature, philosophy, art, and music as seen against the background of Russia’s historical past. Discussion will be devoted primarily to works of Russian literature.
Taught in English
Open to all students

RUSS 351 F 3C 0.5
Intermediate Conversation and Composition
In principle, this course is a continuation of RUSS 251/252. In terms of vocabulary building, apart from the spoken language, the comprehension of the literary language is especially stressed.
Prereq: RUSS 252 or equivalent

RUSS 352 W 3C 0.5
Intermediate Conversation and Composition
As RUSS 351
Prereq: RUSS 351 or equivalent

RUSS 361 F 3C 0.5
Russian Short Story
A study of the form and a detailed examination of Russian short stories by major representative writers. Taught in English
Extra work in Russian required of Russian majors only
Open to all students

RUSS 260 W 3C 0.5
Russian Short Story
As RUSS 361
RUSS 485 F 3C 0.5
History of Russian Literature
This course deals with the emergence of the Russian national literature, emphasizing the cultural and intellectual setting from the beginning to 1917. Literary movements and major representative works not studied in other courses will be discussed.

Taught in English
Extra work in Russian required of Russian majors only
Open to all students

RUSS 496:498 F,W,S,J,A R 0.5
Reading Courses in Approved Topics
Prereq: Approval of the Department

COURSES NOT OFFERED 1986-87
RUSS 201 Intermediate Scientific Russian
RUSS 202 Intermediate Scientific Russian
RUSS 311 Theory of Translation
RUSS 312 Theory of Translation
RUSS 341 Russian Drama
RUSS 342 Russian Drama
RUSS 356 The Stage as Forum: Russian Drama in Translation
RUSS 361 The Peoples of the Soviet Union
RUSS 381 The Peoples of the Soviet Union
RUSS 441 East Slavic Epic Tradition
RUSS 442 Russian Epic Tradition
RUSS 481 Russian Poetry
RUSS 482 Russian Poetry
RUSS 486 History of Russian Literature

UKRAINIAN

UKRAN 101 F 3C,1L 0.5
Beginners' Ukrainian
For students with little or no prior knowledge of Ukrainian. The basic elements of Ukrainian grammar and composition with emphasis on oral practice and pronunciation. Introduction to aspects of Ukrainian culture.

Open to undergraduate students of all departments.
Recommended to graduate students of Russian as a second Slavic language.

UKRAN 102 W 3C,1L 0.5
Beginners' Ukrainian
As UKRAN 101
Prereq: UKRAN 101 or equivalent

UKRAN 301 F 3C 0.5
Introduction to Ukrainian Literature
Reading and critical interpretation of texts chosen from the works of Skovoroda, Kotliarevsky, Shevchenko, Franko, L. Ukrainka and others.

Taught in English
Open to all students

COURSES NOT OFFERED 1986-87
UKRAN 201 Intermediate Ukrainian
UKRAN 202 Intermediate Ukrainian
UKRAN 271 Ukrainian Civilization
UKRAN 302 A Critical Survey of Literary Movements in 20th Century Ukrainian Literature

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.

Taught in English
Open to all university students with little or no knowledge of Polish

POLISH 102 W 3C 0.5
First Year Polish
As POLISH 101
Prereq: POLISH 101 or equivalent

COURSES NOT OFFERED 1986-87
POLISH 201 Intermediate Polish
POLISH 202 Intermediate Polish

Gerontology

Professor, Director of the Program
W.F. Forbes, BSc, PhD, DSc (London)

Professor, Graduate Advisor
B.D. McPherson, MA (Western Ontario), PhD (Wisconsin)

Associate Professors, Undergraduate Advisors
J.C. Carlson, MSc, PhD (Massachusetts)
N.H. Charness, MS, PhD (Carnegie-Melon)

Associate Professor, Part-time Studies Advisor, Dean of St. Jerome's College
P. Naus, PhD (Nijmegen, Netherlands)

Professor
H.S. Coblentz, BA Hons (Durham), MRP (North Carolina), FRTP, AICP, FSS, MES

Adjunct Faculty
C. Kluck Davis, BA (Western Ontario), MA (McMaster)
J.A. Jackson, MA, MB, BCHir (Cambridge)
A. Wister, BA Hons, MA, PhD (Western Ontario)

Course Descriptions
GERON 255 W 0.5
The Biology of Aging
An introductory study of the biological processes of aging at the molecular, cellular and systemic levels. The topics will include an examination of the theories of aging, methods used to study the aging process, the role of diseases and chronological changes in the organism during senescence.

Cross-listed as SCI 255.

GERON 400 S 0.5
Multidisciplinary Seminar on Aging
Faculty members and students from a variety of disciplines meet to discuss individual and population aging from a multidisciplinary perspective. Topics examined include the definition of aging, the demography of aging, evolutionary and genetic factors, aging as a social process, and human aging patterns.
GERON 401A/B  
Directed Studies in Special Topics  
For the student who desires to pursue a particular topic in depth through independent research and/or extensive reading. A faculty member must approve a student's project prior to registration for this course. Open to exceptional students who have permission of the instructor and the director of the program.

GERON 402 W 2C 0.5  
Topics in Mathematical Aspects of Chemistry, Biology and the Medical Sciences II (Epidemiology of Aging)  
Factors contributing to various disease processes will be discussed with special reference to the quantitative evaluation of environmental factors relevant to aging and human disease processes.  
Cross-listed as MTHHEL 402B.

GERON 403 S 2C 0.5  
Topics in Mathematical Aspects of Chemistry, Biology and the Medical Sciences I  
Topics will be selected from the area of epidemiology and mathematical models of disease processes with special reference to heart disease and cancer.  
Cross-listed as MTHHEL 403A.

Department of Health Studies

Associate Professor, Chairman of Department of Health Studies  
A.J.R. Cameron, BA, MA, PhD  
(Waterloo)

Professor, Associate Dean Graduate Affairs, Faculty of Human Kinetics and Leisure Studies  
M.E. Houston, BSc (Toronto), PhD  
(Waterloo)

Assistant Professor, Associate Chairmen Graduate Affairs  
D. Mills, BSAg (Purdue), PhD (Indiana)

Assistant Professor, Associate Chairmen Undergraduate Affairs  
P. Warmwright, BSc (Rhodes, S.A.), MA, PhD (Waterloo)

Professors  
J.A. Best, BA (Queens), PhD (Waterloo)  
V.T. Farewell, BMath, MMath  
(Waterloo), PhD (London)

Associate Professors  
K.S. Brown, BMath, PhD (Waterloo)  
R.P. Schniep, BA (Western Ontario). MSc (Illinois), PhD (Ohio State)  
M.T. Sharratt, BA, MA (Western Ontario), PhD (Wiscosin)

Assistant Professors  
D.E. Evers, BSc (Ottawa), MS (Cornell), PhD (Western)  
M.E. Haight, BSc, MSc, PhD  
(McMaster)

L. Hoffman-Goetz, BA (SUNY, Binghamton), MA, PhD (Michigan)  
R.S. Mckee, BSc (McGill), PhD (Purdue)  
A. Myers, BA (Winnipeg), MA, PhD (York)  
K. Prkachin, BA, MA, PhD (British Columbia)

Research Assistant Professor  
D. Wills, BA (Waterloo), MA (McMaster), PhD (British Columbia)

Adjunct Faculty  
N. Kreiger, BA (Pennsylvania), MPH, PhD  
(Yale)

A.E. LeBlanc, BA (Queen's), MSc, PhD  
(Toronto)

O. Martinez, BS, MNS, PhD (Cornell)  
N. White, MDCM, DPsych (McGill), FRCP (C) (Royal College)

Faculty Members of Health Studies holding cross appointments to:  
1. Psychology  
2. Kinesiology  
3. Statistics  
4. Urban and Regional Planning

Course Descriptions

HLTH 140 F 3C 0.5  
Introduction to Health Sciences I  
A broad overview of current problems and issues concerning promotion of optimal health and reduction of disease. The course will emphasize our understanding of the factors contributing to health and disease, and will present procedures and strategies for reducing health risks. Topical areas will include (1) behavioural factors, (2) nutritional factors and (3) genetic factors.

HLTH 141 W 3C 0.5  
Introduction to Health Sciences II  
The same as HLTH 140, except topical areas will include (1) human reproduction, (2) the central nervous system, and (3) community health.

HLTH 210 W 3C 0.5  
Growth, Development and Aging  
The physiology of human growth, development and aging is examined, with special reference to the influence of diet, environment, exercise and disease on the normal processes.  
Prereq: BIOL 230, 233  
Cross-listed as KIN 210.

HLTH 220 F 3C 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: HLTH 140 and 141

HLTH 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

HLTH 302 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: KIN 116 or first year Chemistry or consent of instructor  
Cross-listed as MTHHEL 302A.
HLTH 303 W 2C 0.5
Introduction to Biomathematics 2
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: HLTH 302
Cross-listed as MTHEL 302B.

HLTH 340 W 3C 0.5
Environmental Health
An examination of the effects of environmental pollutants and occupational hazards on human health. Emphasis will be placed on the biological mechanisms by which environmental toxicants cause human disease and disability.
Prereq: KIN 317 or equivalent

HLTH 341 F 3C 0.5
Disease Process
An introduction to the study of factors governing the occurrence of disease in human populations, using selected diseases to illustrate disease mechanisms and identification of risk factors.
Prereq: BIO 230, 233, KIN 317 or equivalent

HLTH 344 W 3C 0.5
Program Evaluation
A comprehensive and systematic introduction to the key concepts, methodologies, and issues related to program evaluation in general and their application to health programs in particular. Administrative and policy implications as well as the technical/methodological evaluation issues that face individuals involved in administering, planning, implementing, and evaluating health programs will be discussed.
Prereq: Basic courses in Statistics and in Research Design

HLTH 346 W,S 3C 0.5
Nutrition
An elementary course in nutrition with special emphasis on diet for sport and certain physiological conditions.
Cross-listed as KIN 346.

HLTH 348 W,S 3C 0.5
Social Psychology of Health Behaviour
The study and application of basic social psychological processes in relation to selected health-related behaviours (e.g. family planning, overeating, smoking, non-medical drug use, cardiovascular risk factors, patient compliance, medical care utilization).
Prereq: PSYCH 101 or consent of instructor
Cross-listed as KIN 348.

HLTH 349 F,S 3C 0.5
Principles of Behaviour Modification
A course providing a general overview of behaviour modification principles and procedures. Basic principles of reinforcement, punishment, modelling and desensitization are examined as they relate to health behaviour.
Prereq: PSYCH 101 or consent of instructor
Cross-listed as KIN 349.

HLTH 350 F 3C 0.5
Occupational Health
A descriptive analysis of health problems commonly encountered in the workplace and surrounding environment (e.g. pollution). The health effects of chemical toxicants on human organ systems is described, based on the current toxicologic research literature. Methods for detection and control of workplace hazards (especially carcinogens) are also presented.
Prereq: HLTH 340

HLTH 407 W 3C 0.5
Physiology of Coronary Heart Disease
An examination of the pathology, risk factors and rehabilitation programs related to coronary heart disease. Major emphasis is placed on the cardiopulmonary implications of exercise in the rehabilitation process.
Prereq: KIN 300 or permission of instructor
Cross-listed as KIN 407.

HLTH 431 F,W,S 0.5
Research Project
An independent research project on an approved topic, supervised by a faculty member. Includes data collection, data analysis and presentation of results in thesis form.
Prereq: Completion of HLTH 431
Recommended for students planning graduate studies

HLTH 432 F,W,S 0.5
Research Project
An independent research project on an approved topic, supervised by a faculty member. Includes data collection, data analysis and presentation of results in thesis form.
Prereq: Completion of HLTH 431
Recommended for students planning graduate studies

HLTH 433 F 0.5
Advanced Research Project
A course designed to familiarize students with the skills requisite for the formulation, execution and written presentation of an empirical research project. After a general discussion of the pertinent issues, students will be asked to analyse independently a data set related to a topic of interest to Health Studies students and to present this in a thesis format.
Prereq: KIN 222, 330 and CS 316
Students must be enrolled in either 4th year regular or 38 Co-op of the Health Studies program.

HLTH 442 F 3C 0.5
Epidemiology of Chronic Diseases
An investigation of the epidemiology of selected non-communicable diseases. The course emphasizes understanding of epidemiologic methods and identification of risk factors.
Prereq: An introductory statistics course or consent of instructor

HLTH 443 W 3C 0.5
Behaviour and Chronic Disease
A critical analysis of various behavioural strategies for the prevention of coronary heart disease, hypertension, chronic obstructive pulmonary disease, and lung cancer. The role of behaviour in the pathogenesis of disease and the feasibility of behavioural change for prevention of disease will be discussed.
Prereq: HLTH 344, 348, 349

HLTH 445 W 3C 0.5
Seminar in Health Promotion
A study of current issues pertaining to health promotion, health behaviour, and biomedical research. Topics may include pertinent research that is significant to the health of individuals, families and groups, or the community.
Prereq: Health Studies students only
Normally only 4th year students will be admitted.
Department of History

Associate Professor, Chairman of the Department
J.W. Walker, BA (Toronto), MA (Waterloo), PhD (Dalhousie)

Associate Professor, Associate Dean (Special Programs), Faculty of Arts
G.J. Stortz, BA (Waterloo), MA (Dalhousie), PhD (Toronto)

Associate Professor, Undergraduate Officer
D.J. Horton, BA (Waterloo Lutheran), MA (Waterloo), PhD (McGill)

Professors
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 (Collège St. Dominique, France), BD, STM (McGill), PhD (Hartford, Conn.) P
L.T. Guelke, BSc (Cape Town), MA (York), PhD (Toronto)
J.H. Harreng, BA (Trent), AM, PhD (Michigan)
W. Kaassen, BA (McMaster), DPhil (Oxford) G
J.F.H. New, BA, MA (Melbourne), PhD (Toronto), FRHistS
G.M. Ostrander, BA (Columbia), MA, PhD (California-Berkeley)

Associate Professors
D.A. Davies, 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)

S.K. Johannessen, BA (Evangel College), MA, PhD (Missouri)
R.C. Macgillivray, BA (Queen's) AM, PhD (Harvard)
K.M. McLaughlin, BA (Waterloo), MA (Dalhousie), PhD (Toronto) J
W.L. Mitchinson, BA, MA, PhD (York)
W.O. Packull, BA (Guelph), MA (Waterloo), PhD (Queen's) G
E.P. Patterson, BA (Baylor), MA (Kansas), PhD (Washington)
R. Sawatsky, BChEd (CMBC), BA (Bethel College), MA (Minnesota), MA, PhD (Pineconston) G
J.A. Wahl, CR, BA (Western Ontario), MA, PhD (St. Louis) J

Assistant Professors
H.A. MacDougall, BA, MA, PhD (Toronto) G
C.A. Snyder, BA (Waterloo), MA, PhD (McMaster), G
G.J. Stortz, BA, MA (Waterloo), PhD (Guelph), J
D.E. Wright, BA (Cambridge), MA, PhD (McMaster)

Adjunct Faculty
R.P. Fuke, BA (Toronto), MA (Maryland), PhD (Chicago)

Faculty Member holding cross appointment to History from:
1 Geography
G refers to faculty members at Conrad Grebel College
J refers to faculty members at St. Jerome's College
P refers to faculty members at St. Paul's College
R refers to faculty members at Renison College

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes

100 Level: Introductory Courses
Primarily intended for non-History Majors, but open to History Majors.

200-249: Survey Courses
Primarily intended for non-History Majors, but open to History Majors whether or not they have previously taken a history course.

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
Intended for senior History Honours students.

HIST 100 F 0.5
Landmarks in World History
A thematic introduction to the development of the world's major civilizations.

HIST 102A W 0.5
The American Identity 1607-1890
An exploration of some of the questions asked by thinkers on the headings of: The Frontier; Religious Denominationalism; Libertarian Revolution; Black Slavery; New Immigration; Mass Production; The Great Depression; War and Global Americanism.

HIST 102C W 0.5
The Origins of War in the Twentieth Century
An analysis of the diplomatic, political, economic, ideological, social and cultural explanations of the causes of the major wars of this century with special emphasis on Canada.

HIST 102D W 0.5
From Nationalism to Totalitarianism
The growth of nationalism and nation states since the French Revolution with attention to the Industrial Revolution, the World Wars, Fascism, Nazism and Stalinism.

Also offered at Conrad Grebel College.

HIST 102E F, W 0.5
Canadian History
Selected major themes from pioneer life to Canadian involvement in 20th century wars.

Also offered at St. Jerome's College.

HIST 102F W 0.5
An Introduction to Western Intellectual History Since the Renaissance
An exploration of some of the questions and answers posed by thinkers on the human predicament from Renaissance and Reformation times to the modern period. Readings range from Luther to J.P. Sarte, Shakespeare to Marx and Freud.
HIST 102H F 0.5
Early Modern Europe
This course will survey the chief features of early modern European society.
Topics will include the Renaissance and Reformation, Old Regime society, the scientific revolution, the Enlightenment and the French Revolution.

HIST 102K W 0.5
Conflict in the 20th Century through Central America
A study of the historical origins and nature of contemporary problems in the Caribbean and Central America, from colonial times down to the U.S. intervention in Grenada.

HIST 102M W 0.5
Law and Society in the Middle Ages: 500-1000
A study of the laws and legal procedures of the Early Middle Ages. Anglo-Saxon and Germanic law will be examined along with legal procedures and institutions of that era.

HIST 102U W 0.5
Asian History
This course aims to help the student develop a framework for understanding the histories and cultures of India, China, Japan, and Southeast Asia. Two themes given extensive study are the relations issues of imperialism and modernization, the latter here defined as profound changes in the following areas: economic, social, cultural and political.

HIST 130 F,W,S 0.5
The Modern World in Historical Perspective
This course will introduce students, through interrelationships and interaction of selected themes, to the contemporary history of Europe, North America, and the Far East. Its format includes 2 interpretive lectures per week plus major films on 20th century crises and discussion groups.

HIST 200 W 0.5
Twentieth Century History as Documented by Films
A history of the 20th century through films. The First World War, Europe between the Wars, the Second World War, North American society in the 20th century and other political, moral and social themes will be explored.

HIST 201X W 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.

HIST 202X W 0.5
The Individual and the Family in History
A survey of the changes in the quality and structure of life with emphasis on love, marriage and the family in the West since the sixteenth century.

HIST 204X S 0.5
Life on the Ontario Frontier
The course examines the cultural, moral, social and economic adaptations of European settlers to the Upper Canadian frontier environment.

HIST 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.
Offered at St. Jerome's College

HIST 206X F 0.5
History of Canadian Minorities
An introduction to the history of selected racial and regional minorities in Canada. The course examines the emergence of minority communities, and their position in modern Canadian society.

HIST 207X W 0.5
The Cold War: American-Russian Relations Since November, 1917
Traditional and radical historians examine the Cold War: American-Russian rivalry, 19th century: Wilson vs. Lenin, F.D.R., Truman and Stalin; containment, coexistence, and the politics of crisis from 1945 to the present.

HIST 208 F 0.5
Health, Disease and Medicine in Canadian History, 1500-1984
Starting with Amerindian medicine, the course will examine topics such as the rise of the medical and nursing professions, changing public attitudes to health and disease, and the evolution of the Canadian health insurance system.

HIST 210X F 0.5
History of Law
An historical introduction to law in the Ancient world. Babylonian, Assyrian, Hittite and Roman law and legal practices and concepts will be examined.

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.

HIST 212 W 0.5
British History since 1803
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.

HIST 213X F 0.5
Modern Western Popular Culture
This course examines historically the formation of a distinct modern western popular culture, looking primarily at Britain, France, Canada and the United States from around 1850 to the present, and emphasizing such aspects as: industrialism and leisure, the family and sexual attitudes, religion and popular belief, education and literacy, drinking habits, organized sport and mass entertainment.

HIST 215 W 0.5
The Proper Sphere: Canadian Women in Historical Perspective
This course will examine the history of women in Canada from New France to the present day. The course will focus on the inter-relationship between women and their society, particularly as it affects the issues of work, health, reform and legal status.

HIST 218 F 0.5
Irish History: Achievement, Unification, Revolt
Political, social and religious history of Ireland from the beginning of the golden age of Irish medieval civilization to the Act of Union, c.400 to 1800.

HIST 219 W 0.5
Irish History: The Nineteenth and Twentieth Centuries
Political, social and religious history of Ireland emphasizing social change, the struggle for Home Rule and the Republic, 1800 to present.

HIST 219 F 0.5
German History 1740-1945
The development of Germany from the Austrian-Russian rivalry of 1740 through the end of World War II.
Offered at Conrad Grebel College.
HIST 222 F 0.5
History of Modern Revolutions
An introduction to historical explanations of revolutions with a special focus on social change and revolutionary theories. The French, Russian, and Chinese Revolutions will be used as case studies.
Offered at Conrad Grebel College.

HIST 223 F 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.

HIST 224 W 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.

HIST 229 F 0.5
The Catholic Church in Canada: From the French Regime to Confederation
An examination of the Catholic Church in Canada from the time of Brebeuf and the missionaries through the French and British regimes up to and including Confederation.
Offered at St. Jerome's College.

HIST 234 W 0.5
The Catholic Church in Canada Since Confederation
An examination of the Catholic Church in Canada since Confederation, with an emphasis on social and political influences.
Offered at St. Jerome's College.

HIST 235 F 0.5
History of Christianity
The development of Christianity in its Roman Catholic, Eastern Orthodox and Protestant traditions from the time of Christ to the present.
Offered at Conrad Grebel College.
Cross-listed as R S 230.

HIST 236 F 0.5
Ancient Civilization 2
An introduction to the social, political and cultural history of Rome in its development from a Republic to an Empire. Special attention will be placed on the sources of political power.

HIST 239 F 0.5
History of Modern China, 1911 to the Present
Some of the topics studied in this course include: the three stages of warlordism, the May Fourth Movement and the structure of society in the People's Republic of China.

HIST 240 W 0.5
Twentieth-Century Japanese History
This course will examine the historical influences, both domestic and foreign, which led Japan to follow the course which has brought her to the present status of a powerful Asian nation.

HIST 247 W 0.5
Mennonite History: A Survey
This course covers Mennonite origins, teachings, migrations, settlement patterns, divisions, leaders, institutions, and religious and social practices; indeed all facets of Mennonite history in various national settings.
Offered at Conrad Grebel College.

HIST 249 F 0.5
History of Canadian-American Relations to 1914
An examination of the history of relations between the two countries until 1914. Topics of a political, economic, social and cultural nature will be studied.
Offered at St. Jerome's College.

HIST 251X F 0.5
History of Medieval Europe 814-1303
The political, cultural, economic and ecclesiastical development of Europe from Charlemagne to Philip IV of France.

HIST 252X W 0.5
Europe in the Nineteenth Century European social and cultural history, 1815-1871. This course will consider the interrelations between ideas and institutions during a period of industrialization, urbanization and mass education.

HIST 253X F 0.5
Canadian History: The British Period
The evolution of Canadian society in the face of dominant British and American influences.
Also offered at St. Jerome's College.

HIST 254X W 0.5
Canadian History: The National Period
The history of Canada since Confederation. This course will cover the development of Modern Canada. Themes of the course include immigration, industrialization, feminism, labour unrest, and regionalism.
Also offered at St. Jerome's College.

HIST 255 F 0.5
The Expansion of England
An examination of the British Empire down to the American War of Independence, the story of the Tudor seadog, the development of the North American mainland, and the establishment of slave plantations in the Caribbean, and the earliest British enterprises in Africa, Asia and the Pacific.

HIST 257 F 0.5
History of the United States until 1865
The settlement of English North America, British colonial society, the American Revolution, politics and culture in the American Republic, the Civil War. A special emphasis on religious and political culture.

HIST 258 W 0.5
History of the United States since 1860
A survey of American society, politics and thought and of the relations of the United States with the outside world from 1865 to the present.

HIST 300 W 0.5
The Idea of History
The course is an introduction to the Philosophy of History and to the art of historical writing. It deals with the great theoretical issues influencing historical analysis and with the classics of historical literature. It is equally concerned with the practical problems of historical research.

HIST 305 F 0.5
The English Reformation
A course in the English reformation, extensively considered from the beginnings of the European Reformation to the establishment of the Anglican church in the Revolutionary and Restoration periods in the 17th century.

HIST 307 F 0.5
British History 1760-1867
A study of people, power, thought and culture in the world's first industrializing society.

HIST 308 W 0.5
British Since 1867
A study of the British experience and of Britain's part in world history from the 1860's to the 1960's.

HIST 322 F 0.5
The United States in World Affairs
A study of the emergence of the United States as a world power in its international and domestic context, with particular emphasis on the 20th century.
HIST 325 F 0.5
History of Canadian Indians to 1870's
"From Freedom to Conquest". The history of Indian-white contact and its effect on the life and culture of the native Canadians.

HIST 326 W 0.5
History of Canadian Indians since 1870's
"Life under coercion" and the "New Indian". The history of Indians on reserves and under government administration. Contemporary themes and issues of concern to native people are examined.

HIST 329 W 0.5
History of Anglo-American Law
The emphasis will be on the early development of the common law in England and the formation of constitutional law in the United States.

HIST 339 W 0.5
The History of France in the Nineteenth Century
A study of French society and the four revolutions that influenced it, with particular attention to social and institutional forces.

HIST 348 F 0.5
The Radical Reformation
A study of 16th century Anabaptism—a religious Reformation movement dissenting from both Protestantism and Roman Catholicism—its origins, its social, political and theological content; and its relationship to such independent dissenters as Sebastian Franck.

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 19th century.

HIST 356 W 0.5
Russian History since 1825
The course will focus on selected themes in Russia's development in the 19th and 20th centuries, including the Soviet period.

HIST 377 F 0.5
The Historian and the Computer
This course will introduce students to quantitative analysis of historical data. After a brief introduction to basic SPSS statistical programs, students will develop a research scheme and analyze machine-readable historical data.
Italian

Associate Professor
V.F. Golin, BA (McMaster), MA (Colorado), PhD (California-Berkeley)

Assistant Professor
G.A. Niccoli, BA, MA, PhD (UBC)

J refers to faculty members at St. Jerome's College

Course Descriptions

Courses not offered in 1986-87 are listed at the end of this section.

THE FOLLOWING COURSES ARE ADMINISTERED BY ST. JEROME'S COLLEGE.

ITAL 101 F, W 3 CD, L 0.5
Introduction to Italian Language
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.

Prereq: ITAL 101 or consent of instructor

ITAL 191 F 3 CD, L 0.5
Intermediate Italian
Advanced study of grammar. Conversation sessions will be based on intermediate level readings reflecting contemporary Italian life. Short works by modern writers will also be studied.

Prereq: ITAL 101 or consent of instructor

ITAL 192 W 3 CD, L 0.5
Intermediate Italian
A continuation of ITAL 191 with emphasis on discussion of modern texts as illustrations of the creative possibilities and the limitations of the language

Prereq: ITAL 191 or consent of instructor

ITAL 251 F 3 C, L 0.5
Italian Conversation and Composition 1
This course offers extensive practice in idiomatic spoken and written language. Conversation will be based on social, political and cultural aspects of Italian life.

Prereq: ITAL 191 or consent of instructor

ITAL 252 W 3 C, L 0.5
Italian Conversation and Composition 2
A continuation of ITAL 251 with more emphasis on composition based on articles from present day newspapers and magazines.

Prereq: ITAL 251 or consent of instructor

ITAL 291 F 3 C, L 0.5
Italian Culture and Civilization 1
A survey of developments in Italian culture-history, literature, and the arts-up to and including the Renaissance.

Prereq: Second-year standing
Taught in English

ITAL 292 W 3 C, L 0.5
Italian Culture and Civilization 2
A survey of developments in Italian culture-history, literature, painting, and music-in the post-Renaissance period, with emphasis on modern Italy.

Prereq: Second-year standing
Taught in English

ITAL 312 W 3 C, L 0.5
Renaissance Italian Literature
An introduction to the Italian literary production of the 15th and 16th centuries, focusing on selections from the major works of the period, including some by Machiavelli, Ariosto and Tasso.

Prereq: ITAL 191/192 or consent of instructor

ITAL 391 F 2 S, L 0.5
The Modern Italian Novel
A brief study of the development of the Italian novel since Manzoni with concentration on the novels just before and after World War II.

Prereq: ITAL 191 or consent of the instructor

ITAL 396 F 3 R, L 0.5
Special Topics/Directed Readings
This course gives the student an opportunity to study authors and works of special interest which are not covered in other courses.

Prereq: Consent of the instructor
Department of Kinesiology

Associate Professor, Chairman of Department
M.T. Sharratt, BA, MA (Western Ontario), PhD (Wisconsin)

Professor, Dean of the Faculty of Human Kinetics and Leisure Studies
R.G. Marteniuk, BPE, MA (Alberta), EdD (California-Berkeley)

Professor, Associate Dean, Graduate Affairs, Faculty of Human Kinetics and Leisure Studies
M.E. Houston, BSc (Toronto), PhD (Waterloo)

Professor, Associate Dean, Computer Applications and Special Projects, Faculty of Human Kinetics and Leisure Studies
D.A. Winter, BSc, MSc (Queen's), PhD (Dartmouth)

Associate Professor, Associate Chairman, Graduate Affairs
F. Allard, BA, BPE, PhD (Waterloo), Recipient of the Distinguished Teacher Award

Associate Professor, Associate Chairman, Undergraduate Affairs
I.D. Williams, MS, PhD (Illinois)

Associate Professor, Head of School of Anatomy
D.A. Hanney, BA, MD (Toronto), FRCS (England)

Professors
N.J. Ashton, BSc (McGill), MS (Michigan)
H.J. Green, BA, BPH (Queen's), MA (Alberta), PhD (Wisconsin)
B.D. McPherson, BA, MA (Western Ontario), PhD (Wisconsin)

Associate Professors
P.J. Bishop, BSc, RRF (Waterloo), MSc (Western Illinois), PhD (Minnesota)
N. Charness, BA (McGill), MS, PhD (Carnegie-Mellon)
J.E. Curtis, BA, (Sir George Williams), MA (Central Michigan), MA (Cornell)

Assistant Professors
R.L. Hughson, BSc (Western Ontario), MSc (British Columbia), PhD (McMaster)
R.W. Norman, BA, BPE (McMaster), MSc (Alberta), PhD (Pennsylvania State)
N. Theberge, BA (Massachusetts), MA (Boston), PhD (Massachusetts)
W.I. Wiertz, BA (Western Ontario), BPE (McMaster), BPE (California), PhD (Illinois)

Assistant Professors
L.R. Brawley, BPE (Calgary), MSc (Oregon), PhD (Pennsylvania State)
J.S. Frank, BSc, MSc (Waterloo), PhD (Southern California)
C.L. MacKenzie, BSc, MSc, PhD (Waterloo)
A.F. Pata, RTech (Indian Institute of Technology), MSc Eng (New Brunswick), PhD (Simon Fraser)
J.A. Thomson, BA, MSc (McMaster), PhD (Waterloo)
R. Wells, BSc (Manchester), MEng (McMaster), PhD (Manchester)

Adjunct Faculty
K.C. Hayes, Dip PE, MSc, PhD (Massachusetts)
J.A. Israel, MD (Toronto), FRCS (Canada)
D.R. McTavish, MD (Western Ontario), FRCS
G.H. Mann, MB, BS (London), DRCOG (London)
E.A. Roy, BSc (Waterloo), MPE (British Columbia), PhD (Waterloo)

Senior Demonstrators
L.L. Jones, BSc, MSc (Waterloo)
D.C. Painter, BA (Queen's), MSc (Waterloo)
J.C. Pazzack, BSc, MSc (Waterloo)
H.E. Scoggin, BA, MSc (Queen's)

Faculty Members of Kinesiology holding cross and/or joint appointments to:

1. Sociology
2. Psychology
3. Systems Design
4. Health Studies
5. Recreation and Leisure Studies
6. Optometry

Faculty Members holding cross and/or joint appointments to Kinesiology from:

1. Sociology
2. Psychology

Course Descriptions

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.

Psycho-Social Basis of Kinesiology
An introduction to the study of human physical activity from psychological, sociological, anthropological and historical perspectives.

General and Organic Chemistry
An introduction to the chemical concepts of importance in kinesiology and health studies.

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.

Kinesiology, Health Studies and Dance students consent of instructor.

No Year 1 students are admitted.

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.

Kinesiology, Health Studies and Dance students consent of instructor.

Growth and Development, and Aging
The physiological human growth, development and aging is examined with special reference to the influence of diet, environment, exercise and disease on the normal process.

Prereq: KIN 200 or consent of instructor.
KIN 222 F 3C, 2L 0.5
Statistical Techniques Applied to
Kinesiology
An introduction to descriptive and infer-
tential statistics and the interpretation of
data. A major consideration of the
course is the use of statistics in the
solution of problems in Kinesiology and
Health Studies.
Prereq: KIN and Health Studies
students only

KIN 242 W 3C, 2L 0.5
Introduction to Movement Disorders
An introduction to selected movement
disorders and their implications for phys-
ical activity. The movement disorders
examined include those which accompany
neuromuscular and perceptual-motor impairments, mental retardation, cardio-
vascular and respiratory disease.
Prereq: KIN 107 and 110

KIN 252 W, S 3C 0.5
Introduction to the Sociology of
Sport
An introduction to the characteristics, pro-
cesses 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 265 W 3C, 2L 0.5
Introduction to Psychomotor
Behavoiur
An information processing approach is
used to introduce the principles of
learning and performing fine and gross
motor skills. In addition, social psycho-
logical variables are studied as they
relate to the facilitation or decrement in
learning and performance.
Prereq: KIN 103 and PSYCH 101

KIN 300 W, S 3C, 2L 0.5
Physiology of Physical Activity
A study of the effects of physical activ-
ity on the muscular, circulatory and
respiratory systems and the mechanisms
through which the body adapts to
activity and environment.
Prereq: BIOL 230 and 233

KIN 317 W 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 con-
siderations in the qualitative and
quantitative analysis of human move-
ment 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

KIN 330 W, S 3C 0.5
Research Design
An introduction to the basic principles of
scientific inquiry in Kinesiology. A
systematic treatment of the logic and
practice of methods and techniques
employed in research related to physical
activity with an examination of design,
sampling, data gathering and analysis.
Prereq: KIN 222

KIN 335 W, S 3C, 2L 0.5
Evaluation of Human Motor
Performance
The nature and methodology of assess-
ment is reviewed from theoretical and
empirical perspectives. Taxonomies of
motor performance are examined and
principles developed for the measure-
ment of specific constructs in field and
laboratory situations.
Prereq: KIN 222

KIN 340 F 3C, 2L 0.5
Introduction to Sports Medicine
An introductory course to the area of
sports medicine, including the preven-
tion, 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
Select 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 verte-
bral column, internal injuries, heat prob-
lems and the medical and non-medical
use of drugs in sport.
Prereq: KIN 340

KIN 346 W, S 3C 0.5
Nutrition
An elementary course in nutrition with
special emphasis on diet for sport and
certain physiological conditions.
Cross-listed as HILTH 348

KIN 348 W, S 3C 0.5
Social Psychology of Health
Behaviour
The study and application of basic
social psychological processes in rela-
tion to selected health-related behav-
ours (e.g. family planning; overeating;
smoking, non-medical drug use, cardio-
vascular risk factors, patient compliance,
medical care utilization).
Prereq: PSYCH 101 or consent of
instructor
Cross-listed as HILTH 349.

KIN 349 F, S 3C 0.5
Principles of Behaviour Modification
A course providing a general overview
of behaviour modification principles and
procedures. Basic principles of rein-
forcement, punishment, modelling and
desensitization are examined as they
relate to health behaviour.
Prereq: PSYCH 101 or consent of
instructor
Cross-listed as HILTH 349.

KIN 352 F 3C 0.5
Sociology of Aging
An introduction to individual and popula-
tion aging. Topics discussed include:
aging from an historical and compara-
tive perspective; aging in subcultures;
aging and the social structure; aging and
social processes, aging and the
environment; work and retirement; and
aging and leisure patterns.
Prereq: SOC 101 and one other SOC
course
Cross-listed as SOC 344.

KIN 354 W, S 2C, 1T 0.5
Social Psychology and Physical
Activity
An examination of sport and other forms
of physical activity as social situations.
Topics such as social facilitation,
modeling, person perception, expectan-
cies, group structure, unity, motivation,
leadership, conformity, and intergroup
relations are introduced in relation to
motor performance.
Prereq: PSYCH 101
Cross-listed as REC 307.

KIN 356 F 3C 0.5
Information Processing in Human
Perceptual-Motor Performance
An information processing model of
perceptual-motor behaviour is
presented. Human performance theory
is used to study processes mediating
input and output information. Specifi-
cally, the subprocesses of storage of
information in memory, perception,
retrieval of information from memory and
execution of movement are examined.
Prereq: KIN 222, 255
KIN 357 W 3C 0.5
**Motor Learning**
A course focused on the bases and applications of theories of motor learning. Included are selected psychological and neurophysiological processes as they relate to these theories.
*Prereq: KIN 222, 255*

KIN 401 W,S 3C,2L 0.5
**Physiological Adaptations to Physical Activity**
An analysis of the 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, Attitude 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 programs for normally healthy individuals.
*Prereq: KIN 300 and 321*

KIN 407 W 3C 0.5
**The Physiology of Coronary Heart Disease**
An examination of the pathology, risk factors and rehabilitation programs related to coronary heart disease. Major emphasis is placed on the cardiorespiratory implications of exercise in the rehabilitation process.
*Prereq: KIN 300 or equivalent Cross-listed as HLTH 407*

KIN 416 W 3C 0.5
**Neuromuscular Integration**
An examination of the neural processes involved in the maintenance of posture and the control of movement.
*Prereq: KIN 201 or PSYCH 261 or consent of instructor*

KIN 420 W 3C 0.5
**Occupational Biomechanics**
Biomechanical methods are applied to the study of the effect on the human operator of selected work place tasks, personal equipment, and work space layout. Examples include the use of EMG and/or computerized models to analyze low back loading during manual lifting, the design of helmets, shoes and office chairs.
*Prereq: KIN 425 (may be taken concurrently) or consent of instructor*

KIN 425 W 3C,2L 0.5
**Biomechanics of Human Movement**
The quantitative measurement and analysis of the movement of the human musculo skeletal system. Multisegment dynamic movements will be studied using existing computer programs, with emphasis on kinematics, kinetics and energetics, as well as the use of EMG in the assessment of the control of the movement. Examples are presented from pathological, normal and athletic movement.
*Prereq: KIN 321*

KIN 426 F 3C,2L 0.5
**Biophysical Signal Processing and Control Systems**
Basic electricity and electronics required for the understanding of bioelectric recording and electrophysiology. Application of signal processing to biophysical signals encountered in kinesiology. Mathematical modelling of passive and active systems and the control systems (cardiac, respiratory, neuromuscular) associated with human movement.
*Prereq: KIN 321, KIN 300, KIN 367 or consent of instructor*

KIN 431 F,W,S 0.5
**Research Proposal**
An independent paper in the form of a research proposal on an approved topic. The topic may include survey, field, laboratory, theoretical, or applied research, program evaluation, mathematical modelling, fitness appraisal, etc. The format is to be determined with the supervisor and may be in chapters or in journal style.
*Prereq: 4th year Honours Kinesiology*

KIN 432 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 433 F,W,S 0.5
**Research Project**
An independent research project on an approved topic, supervised by a faculty member. This is the completion of the research proposed in KIN 431. The format is to be determined with the supervisor and may be in chapters or in journal style.
*Prereq: KIN 431, it is strongly recommended that students planning graduate studies take KIN 431 and KIN 432*

KIN 434A Biomechanics
KIN 434B Biochemistry
KIN 434C Work Physiology
KIN 434E Psycho Motor Behaviour
KIN 434G Sociology of Sport and Physical Activity
KIN 434J Psychology of Human Movement
KIN 434K Sports Medicine
KIN 434M Anatomy
KIN 434N Movement Disorders
KIN 434O Motor Control
KIN 434P Nutrition
KIN 434Q Gerontology

KIN 435 F,W,S 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 202 or SOC 348
COURSE DESCRIPTIONS

KIN 453 F,S 3C 0.5
The Psychology of Sport and Physical Activity
An introduction to specific psychological topics as they relate to the social psychological behaviour of the individual in motor performance situations. Topics usually examined are personality, anxiety, motivation, attribution.
Prereq: KIN 354

KIN 456 F 3C 0.5
Cognitive Dysfunction and Motor Skill
An examination of issues related to understanding the cerebral organization of motor skill. Discussion of how certain movement disorders are a reflection of disturbances at different stages in the sequence of information processing.
Prereq: One of PSYCH 208, 207, or KIN 356

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: 4th year Honours KIN students

KIN 472 F,W,S 0.5
Directed Study in Special Topics
For the student who desires to pursue a particular topic in depth through guided independent research and/or reading. A faculty member must approve a student's project prior to registration. May be repeated in subsequent terms.
Prereq: Consent of department

KIN 472A/B Biomechanics
KIN 472C/D Work Physiology
KIN 472E/F Psycho-Motor Behaviour
KIN 472G/H Social Sciences: Sociology
KIN 472J Social Sciences: Psychology
KIN 472K/L Sports Medicine
KIN 472M Teaching
KIN 472N Coaching
KIN 472O Anatomy

KIN 480 F,W,S 0.5
Coaching Foundations
A study of the 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.
Prereq: Students must complete 1 Physical Activity course in order to enrol in that particular 480 section

KIN 491 F,W,S 5T 0.5
Clinical Kinesiology - Sports Injuries Assessment
Practical experience in the examination, diagnosis, and treatment of sports injuries under the supervision of a physician and an athletic therapist.
Prereq: KIN students only. Must have at least A- in KIN 200 and 340, first aid and athletic injury experience, and consent of instructor

KIN 492A/B F,W 2T 0.25/0.25
Clinical Kinesiology - Cardiac Rehabilitation Practicum
Practical experience with cardiac patients in a rehabilitation setting; major emphasis is placed on the cardio-respiratory implications of exercise and behaviour modification.
Prereq: KIN 300, 407, 449, and experience with high risk patients, plus consent of instructor
Courses may be taken concurrently.

COURSES NOT OFFERED 1986-87
KIN 402 Hydrospace, Altitude and Aerospace Physiology

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 Program is available. The contents of this program 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 program 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. Hugger, F (odd years)
KIN 381 Elem. Tennis, F,S
KIN 382 Elem. Squash, F
KIN 383 Elem. Golf, F,S
KIN 384 Elem. Racquetball, 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 395A Outdoor Skills Camp, F
KIN 481 Adv. Volleyball, W
KIN 482 Adv. Basketball, F
KIN 483 Adv. Gymnastics, W
KIN 484 Adv. Racquets, 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 495A Ski School, W

Due to budgeting restraints modification of the skills program is under consideration.
Course Descriptions

Course not offered in the current academic year are listed at the end of this section.

M ENV 100  F 2C,1T  0.5
Issue Analysis and Problem Solving for Environmental Studies

Designed to complement the introductory overview of ENV 150, and the introduction to methods and techniques (M ENV 150). Selected themes and case examples are analyzed within a framework of concepts and theories from the natural and social sciences. Students undertake practical exercises in viewing, analyzing, and problem-solving skills.

Prereq: Honours Man-Environment Studies

M ENV 150  F 3C  0.5
Environmental Issues: Methods and Techniques

Course will teach basic research skills to complement the problem-solving skills taught in M ENV 100. Concentration on the "systems approach" and its use in problem solving, with attention to information gathering and organization, quantitative data analysis techniques, and presentation skills. Microcomputers will be used for report generation, information organization, and basic data analysis.

Prereq: Honours Man-Environment Studies

M ENV 290  F 4S  0.5
Environmental Shdies 1

Introduction to Environmental and Social Impact Assessment

An introduction to means of assessing proposed approaches to environmentally and socially significant problems and opportunities. Special emphasis on the nature and limitations of conventional methods of assessing the impacts, and overall desirability of technologies, projects, plans and policies. Close examination of case examples.

Prereq: Consent of instructor

M ENV 291 W 30  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

M ENV 292A/B/C  F,W,WS  2R  0.5
Special Readings

Background reading and study in consultation with Faculty. Typically utilized when a student must study a topic in connection with other work, but no course offering that topic is available.

Prereq: Consent of instructor

M ENV 299  F 4S/wkshp  0.5
Seminar-Workshop

Individual or small group project emphasizing multidisciplinary treatment of environmental problems. Work encouraged on situations of interest to community organizations, government agencies or other groups.

Prereq: Man Environment Studies

A letter grade for M ENV 290 will be submitted only after the completion of M ENV 291.

M ENV 299 W,S  4S/wkshp  0.5
Seminar-Workshop

Continuation of project begun in M ENV 290.

Prereq: M ENV 290

M ENV 295 W 2C,1S  0.5
Development of Environmental Thought

Examination of conflicting positions on how we do and should view the natural world and ourselves, beginning with review of the history of attitudes to the environment and our place in it. Emphasis on evolution of attitudes to human nature and the environment in industrial society, critiques of these attitudes and implications for approaches to modern environmental issues.

Prereq: Man Environment Studies or consent of instructor
### Course Descriptions

#### M ENV 305 W 2C,1T 0.5
**Ecosystem Perspectives and Analyses**
Examination of the concept of the "ecosystem" presented in recent writings about non-equilibrium thermodynamics, ecological paradigms, conservation biology and environmental philosophy. Discussion of the theoretical and practical implications of these contrasting perspectives for issues of research/environmental management and sustainable development.

**Prereq:** M ENV 218 or consent of instructor

#### M ENV 318 W 3C 0.5
**Soft Energy Paths in Canada**
Analysis and evaluation of energy strategies based on energy conservation and renewable energy systems. Technical, economic, ecological, and social aspects will be examined.

**Prereq:** M ENV 218 or consent of instructor

#### M ENV 320 W 2C,1T 0.5
**Environmental Economics**
Evaluation of various economic approaches to the environment. Introduction to various models used to analyse environmental quality and used in the design of environmental policy and management initiatives.

**Prereq:** M ENV 220 or consent of instructor

#### M ENV 337 F 3C 0.5
**Environmental Impact Assessment**
Major problems and issues in the management of environmental impacts stemming from development projects. Synthesis of ecological, economic and institutional aspects. Integrating environmental management with social and economic development policies and programs.

**Prereq:** M ENV 241 or consent of instructor

#### M ENV 338 W 3C 0.5
**Social Impact Assessment**
Introduction to the background, theory and methodology of social impact assessment (SIA). SIA as a type of social science research and as a key element in achieving more informed and responsible decision-making in society. Experience in SIA design for environmentally-relevant cases.

**Prereq:** M ENV 241 or consent of instructor

#### M ENV 360 W 2C, 0.5
**Community Action on Environmental Problems**
The citizen’s role in the solution of environmental problems. The work of various community groups is examined and evaluated. Students select topics of particular interest to them for in depth study.

**Prereq:** Third and fourth year students and consent of instructor

#### M ENV 375A/D/C F,W,G 2R 0.5
**Special Readings or Seminars on Selected Topics**
**Prereq:** Consent of instructor

The letter designation allows this course to be taken more than once for credit

#### M ENV 385 F 3C,1S 0.5
**Technology/Lifestyles for a Conserving Society**
What is a Conserving Society? What must we do to make our society into a Conserving Society? How do we evaluate the appropriateness of a lifestyle or technology for a Conserving Society? Is a Conserving Society realistic? This course will explore these questions, with emphasis on student participation in discussion and in seminar presentations. Lectures will focus on the basics of various technologies and lifestyles, and on quantitative techniques for comparing these.

**Prereq:** Second year or above

#### M ENV 390A F,W 4S,wskshp U.5
**Seminar-Workshop**
Individual or small group project emphasizing multidisciplinary treatment of environmental problems. Work encouraged on situations of interest to community organizations, government agencies or other groups.

**Prereq:** Man-Environment Studies

A letter grade for M ENV 390A will be submitted only after the completion of M ENV 390R

#### M ENV 390B F 8S,wskshp 1.0
**Seminar-Workshop**
Same as M ENV 390A but with additional intensive investigation of the project as warranted by the project and by student ability.

**Prereq:** Man-Environment Studies and consent of faculty

#### M ENV 391A F,W 4S,wskshp 0.5
**Seminar-Workshop**
Continuation of M ENV 390A

**Prereq:** M ENV 390A

#### M ENV 391B W 8S,wskshp 1.0
**Seminar-Workshop**
Continuation of M ENV 390B

**Prereq:** M ENV 390B

#### M ENV 393 W 3C 0.5
**Development of Environmental Thought**
Examination of twentieth century concerns about industrial progress and treatment of people and the environment. Focus on problems and promises of efforts to dominate nature through scientific and technological advance; alternative views on the nature of scientific knowledge and human well-being, and the rise of modern environmentalism. Assessment of alternative futures.

**Prereq:** M ENV 295

#### M ENV 400 F,W 3C 0.5
**Senior Honours Seminar**
Provides practice in applying skills that are useful to people working in different kinds of organizations. Readings, discussions and exercises emphasize problem perceptions and diagnoses, actor system analyses, and planning, management and evaluation activities. Theory and practical aspects of these are covered out by and within organizations. Special attention given to roles that persons having an environmental studies background may be particularly well prepared to develop and refine.

**Prereq:** Third or fourth year Man-Environment Studies or consent of instructor

#### M ENV 418 F 3C 0.5
**Energy Research Seminar**
Detailed examination of specific energy issues emphasizing research skills and policy context. Students will participate in a research project. General areas of research may include social and political analysis of specific soft energy options, environmental impacts of certain energy technologies.

**Prereq:** M ENV 318 or consent of instructor
M ENV 445, W, 3C, 0.5
Impact Assessment and Policy Analysis: Practicum
Students will draw on knowledge and experience gained in the prerequisite theme courses to critique and/or design impact analyses of a variety of ‘real-world’ activities, including policy initiatives, technological choices, environmentally-relevant proposals, economic strategies and others of special interest or significance.
Prereq: M ENV 241, 337 and 338, or consent of instructor

M ENV 454A/B/C, F, W, S, 2R, 0.5 each
Special Readings or Seminar on Selected Topics
See course descriptions under M ENV 275 and 375.
Prereq: Consent of instructor
The letter designation allows this course to be taken more than once for credit.

M ENV 480
Special Topics Seminar

M ENV 490A, F, W, S, 2C, 0.5
Senior Honours Assignment
A project of sufficient scope to demonstrate mastery of problem-solving and communication skills on a selected problem or issue concerning man-environment interrelationships. Credit weights for 490, 491 and 492 vary depending on the amount of work involved and the depth of the subject matter. Study beyond the 490 level requires faculty approval.
Prereq: Honours Man-Environment Studies
A letter grade for M ENV 490A will be submitted only after the completion of M ENV 492B.

M ENV 491A, F, W, S, 4C, 1.0
Senior Honours Assignment
Continuation of M ENV 491A
Prereq: M ENV 491A

M ENV 492A, F, W, S, 6C, 1.5
Senior Honours Assignment
See description for M ENV 490A.
Prereq: Honours Man-Environment Studies
A letter grade for M ENV 492A will be submitted only after the completion of M ENV 492B.

M ENV 492B, F, W, S, 6C, 1.5
Senior Honours Assignment
Continuation of 492A.
Prereq: M ENV 492A

M ENV 493A, F, W, S 6C, 1.5
Senior Honours Assignment
Continuation of 493A.
Prereq: M ENV 493A

M ENV 494A, F, W, S, 6C, 1.5
Senior Honours Assignment
Continuation of 494A.
Prereq: M ENV 494A

M ENV 495A, F, W, S, 6C, 1.5
Senior Honours Assignment
Continuation of 495A.
Prereq: M ENV 495A

M ENV 496A, F, W, S, 6C, 1.5
Senior Honours Assignment
Continuation of 496A.
Prereq: M ENV 496A

M ENV 497A, F, W, S, 6C, 1.5
Senior Honours Assignment
Continuation of 497A.
Prereq: M ENV 497A

Courses Not Offered 1985-87
M ENV 151 Environmental Issues: Methods and Techniques
M ENV 231 Environmental Issues in a Global Perspective
M ENV 351 Organizations and Environmental Management
M ENV 450 Environmental Design
M ENV 470 Environmental Teaching and Learning

Courses Descriptions
Department of Management Sciences

M SCI 211, F, W, S, 3C, 0.5
Organizational Behaviour 1
Introduction to the concepts of learning, person perception, attitudes and motivation in an organization. Consideration of communication, roles, norms and decision making within a group. Discussion of power, control, leadership and management in light of the above concepts.

M SCI 251, F, W, S, 3C, 0.5
Probability and Statistics 1
M SCI 261 F,W,S 2C,1T 0.5
Managerial and Engineering Economics 1
This course is designed to satisfy Engineering Economics requirements of the Canadian Accreditation Board. Price and output decisions. Choosing among alternative inputs and production processes. Evaluating alternative investments, equipment service life, and new products.

M SCI 311 F,W 3C 0.5
Organizational Behaviour 2
Macro theories of organization and organizational processes are discussed. First half of course examines the development of organizational theories. The second half discusses organizational processes such as conflict and communication control. Throughout, an effort is made to relate course material to organizational structures.

M SCI 331 F,W,S 3C 0.5
Operations Research 1

M SCI 431 F,S 3C 0.5
Operations Research 2
Classification of stochastic processes. Recurrent events including both problems and branching processes. Waiting line models and applications. Markov processes and decision problems. Applications include inventory control, reliability, equipment replacement, maintenance, design of service facilities, etc.

M SCI 452 W 2C,1T 0.5
Behavioural Decision Analysis
This course concerns decision making processes within organizations at the individual and group levels. Topics include goals and the measurement of utility, decisions without probabilities and uncertainty reduction: incentives and contributions, and multiple-criteria methods.

M SCI 461 F,W 2C,1T 0.5
Managerial and Engineering Economics 2

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R.G. Lawrence, QC

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3. Pure Mathematics

4. St. Jerome's

5. Management Sciences

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3. Combinatorics and Optimization
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2. St. Jerome's

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2. Accounting Group
3. Chemical Engineering
4. Systems Design Engineering

Faculty Members of Statistics and Actuarial Science holding cross and/or joint appointments to:
5. Recreation and Sociology
6. Psychology
7. Health Studies
8. Accounting Group and Sociology
9. St. Jerome's

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D. Dyment, Department of Computer Science
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### FACULTY OF MATHEMATICS

#### Introductory Notes

1. Courses with the following prefixes are offered by the Faculty of Mathematics: ACTSC (Actuarial Science), AM (Applied Mathematics), C&O (Combinatorics and Optimization), CS (Computer Science), MATH (non-departmental Faculty courses), MTH-2 (Mathematics Elective), PMATH (Pure Mathematics), STAT (Statistics). The course descriptions which follow appear in ascending order by course number within these groups. Unless otherwise indicated with the course description, and provided space is available (see Section 5.3 on page 13.26) these courses are normally open to students in any UW faculty, subject to stated prerequisite requirements (see Section 5.4 on page 13.26).

2. Certain core mathematics courses are offered at three different levels. The Advanced Honours level courses are intended for exceptionally gifted students in an Honours program. A student pursuing an Honours degree may substitute the corresponding Advanced Honours level course(s) for any required Honours level course(s). Similarly, a student pursuing a Pass or General degree may substitute the corresponding Honours level course(s) for any required General level course(s), unless the student has been required by the Standing and Promotions Committee to change from an Honours program to General or Pass. In this case, the student must enrol in General level courses. The following table sets out corresponding Advanced, Honours and General Courses.

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Prerequisites involving these core courses will normally be given in terms of the lowest level acceptable (e.g. ‘Prereq: MATH 230B’ implies that MATH 240B is also acceptable but MATH 220B is not).

3. 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. Courses in this category include: AM 101, 111; CS 100, 102, 117, 210; MATH 100, 104, 105, 110A/B, 111A/B, 113A/B, 114, 115A/B, 210, 211, 212, 213A/B, 215, 216; STAT 202, 204, 304, 311.

### Course Descriptions

**Actuarial Science**

**Course Descriptions**

Courses not offered in the current academic year are listed at the end of this section.

**ACTSC 221** F.W.S 3C 0.5

**Mathematics of Investment**

The theory of rates of interest and discount; annuities and sinking funds with practical applications to mortgage and bond questions. Yield rates.

*Prereq: At least second year standing*

*Antireq: ACTSC 231*

ACTSC 221 cannot be counted for credit toward a BMath Honours Actuarial Science degree.

**ACTSC 222** F.W 3C 0.5

**Contingencies**

An introduction to the mathematical basis underlying insurance and other types of financial programs including uncertain future events and discounting.

*Prereq: ACTSC 221 or 231*

*Antireq: ACTSC 232*

ACTSC 222 cannot be counted for credit toward a BMath Honours Actuarial Science degree.

**ACTSC 231** F.W.S 3C 0.5

**Mathematics of Finance**

The theory of rates of interest and discount including the theoretical continuous case of forces of interest and discount. Annuities and sinking funds, including the continuous case. Practical and theoretical applications, primarily to mortgages and bonds. Yield rates.

*Prereq: MATH 100B*

*Antireq: ACTSC 221*

**ACTSC 232** F.W.S 3C 0.5

**Introduction to Life Contingencies**

Application of probability to problems of life and death. The determination of single premiums for insurances and annuities in both the discrete and continuous case. Multiple decrement theory.

*Prereq: ACTSC 231, MTHEL 305A, STAT 230*

*Antireq: ACTSC 222*

**ACTSC 331** F.S 3C 0.5

**Life Contingencies - Single Lives**

Net annual premiums and net level premium reserves. The effect of expenses. The determination of gross premiums, modified reserves, and non-forfeiture options.

*Prereq: ACTSC 232*
ACTSC 332 W 3C 0.5
Life Contingencies - Multiple Lives
Joint Life, last survivor probabilities, insurances and annuities. Stable and stationary populations. Introduction to pension mathematics.
Prereq: ACTSC 232

ACTSC 335 F 3C 0.5
OR Applications in Actuarial Sciences
Problem formulation and solution techniques in linear programming. Project scheduling with applications in insurance. Introduction to dynamic and integer programming.
Prereq: MATH 234A
Coreq: ACTSC 232
Antireq: C&O 360, 370

ACTSC 338 W 3C 0.5
Graduation of Life Tables
Theory and methods of data graduation with particular reference to life tables.
Prereq: ACTSC 232 or consent of instructor.

ACTSC 431 F.S 3C 0.5
Risk Theory 1
Prereq: ACTSC 232
Coreq: STAT 333

ACTSC 432 W 3C 0.5
Risk Theory 2
Prereq: ACTSC 431, STAT 333

ACTSC 433 F.S 3C 0.5
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 W 3C 0.5
Introduction to Demographic Statistics
Topics in demography with emphasis on population projections, mortality theories, and construction of life tables.
Prereq: ACTSC 232 or consent of instructor

ACTSC 451 F 3C 0.5
Selection of Risks 1
The effects of medical and non-medical risk factors on bodily systems are explored to determine the amount and incidence of additional morbidity and mortality. Techniques for expressing the increased risk in premiums and reserves are investigated.
Prereq: MTHEL 305B, ACTSC 331

ACTSC 453 F 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 453 or consent of instructor

ACTSC 455 W 3C 0.5
Analysis of Financial Statements
Topics in insurance financial reporting including amortization of gains, the Canadian method of actuarial reserves, investment and currency reserves, and the analysis of gains and losses.
Prereq: ACTSC 301 or consent of instructor

ACTSC 456 W 3C 0.5
Taxation of Life Insurance
Taxation of life insurance, insurance companies and employee benefits.
Prereq: ACTSC 332, MTHEL 305B

ACTSC 458 W 3C 0.5
Insurance Law
Topics in Canadian and American Insurance Law.
Prereq: ACTSC 331, MTHEL 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

Course Descriptions
Mathematics:
Actuarial Science
Applied Mathematics

COURSES NOT OFFERED 1986-87
ACTSC 223 Group Life and Health Insurance
ACTSC 337 Finite Differences
ACTSC 391 Topics in Actuarial Mathematics
ACTSC 441 Advanced Topics in Actuarial Mathematics
ACTSC 452 Selection of Risks 2
ACTSC 454 Topics in Casualty Insurance 2
ACTSC 491 Seminar in Actuarial Mathematics 1
ACTSC 492 Seminar in Actuarial Science 2

Applied Mathematics

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

AM 260 F,W 3C 0.5
Mathematical Modelling with Ordinary Differential Equations
Models for population growth, mixtures and diffusion, and motion of a point mass motivate the discussion of linear and non-linear first and second order differential equations.
Prereq: MATH 130B
Antireq: MATH 216, 216

AM 270 F,W 3C 0.5
Modelling with Systems of Differential Equations
Discussion of linear and non-linear systems of ordinary differential equations, including matrix methods, phase-plane analysis, stability; emphasis is on two-dimensional systems. Applications are drawn from mechanical systems in vibration, ecological systems, epidemics and planetary motion. Elements of dimensional analysis, scaling, and perturbation theory are introduced briefly.
Prereq: AM 260, or MATH 230B, or consent of instructor
Antireq: AM 260
AM 280 F, W 3C 0.5
Introduction to Applied Mathematics
Case studies of typical problems in
Applied Mathematics. Dimensional An-
alysis and the Pi theorem. Elementary
group-theoretic methods. Scaling and
perturbation theory.
Prereq: MATH 240A or MATH 230A
and consent of instructor.
Antireq: AM 270

AM 340 W 3C 0.5
Applications of Mathematics
Difference equations. Laplace trans-
forms applied to discrete and contin-
uous mathematical models taken from
ecology, biology, economics and other
fields.
Prereq: MATH 220B or consent of instructor

AM 362 F, S 3C 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. Gaus-
sian curvature and the Gauss-Bonnet
theorem. Co-ordinate transformations
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 230B or consent of instructor
Cross-listed as PMATH 365

AM 365 W 3C 0.5
Introduction to Continuum
Mechanics
Stress and strain tensors; analysis of stress
and strain. Lagrangian and Eulerian
methods for describing flow. Equa-
tions of continuity, motion and energy,
constitutive equations. Navier-Stokes
equation. Basic equations of elasticity.
Various applications.
Prereq: MATH 230R or AM 371 or
consent of instructor
Coreq: MATH 332B (or PMATH 352)

AM 371 F, S 3C 0.5
Partial Differential Equations of
Applied Mathematics 1
First order partial differential equations
and characteristic curves; classification
of linear second order parial differential
equations; the Cauchy initial value
problem; the Dirichlet problem. Solution
the heat equation, wave equation,
and Laplace's equation by separation of
variables; Fourier series; propagation
waves; the maximum principle for
harmonic functions.
Prereq: AM 280. MATH 230B, or
consent of instructor

AM 372 W 3C 0.5
Introduction to General Relativity
Flat space-time and Lorentz transforma-
tions, relativistic mechanics, Maxwell's
equations; curved space-time and the
Einstein field equations, the Schwarz-
schild solution and some experimental
tests of general relativity, the weak field
limit: introduction to black holes and
cosmology.
Prereq: AM 362/PMATH 365 or
consent of instructor

AM 380A F, S 3C 0.5
Introduction to Information Theory
with Applications
Variable length coding. The Shannon
entropy as measure of uncertainty and
expected information. Minimal average
length coding; the Shannon entropy as
lower bound. Source entropy. Channels.
Transinformation. Capacity. Applications
to problem solving, information transmis-
sion, logic, science, linguistics and
communications (TV, music, etc.). Determin-
ation of practical measures of infor-
mation.
Prereq. Consent of instructor
Cross-listed as PMATH 380A

AM 380B W 3C 0.5
Information Theory with Applications
Measures of conditional uncertainty (entropy).
Maximizing conditional entro-
pies. Applications to statistical physics,
statistics, pattern recognition. Special
entropies in questionnaire theory. Design
of optimal questionnaires. Special entro-
pies in dynamical systems. Basics in
dynamical systems.
Prereq. Consent of instructor
Cross-listed as PMATH 380B

AM 381 F, S 3C 0.5
Ordinary Differential Equations 1
Existence and uniqueness theorems; higher
order and systems of equations; series
solutions and special functions.
Laplace transforms. Eigenvalues and
eigenfunction expansions; applications
to mathematical physics. Sturm's
comparison, separation and oscillation
theorems.
Prereq: MATH 230B

AM 389 F 0.5
Reading Course

AM 391 W 3C 0.5
Ordinary Differential Equations 2
Systems of equations with constant or
periodic coefficients. Floquet theory.
Quasi-linear systems. Stability analysis
and Lyapunov functions.
Prereq: AM 381

AM 395 F 3C 0.5
Mechanics
Three-dimensional rigid body motion,
Lagrange's equations of motion, igno-
rable co-ordinates. Hamilton's principle.
Noether's theorem and conservation
laws. Canonical transformations. Lagrangian
transformations. Lagrange and Poisson
bracket relations. Integral invariants.
Prereq: MATH 230B or consent of
instructor

AM 399 W 0.5
Reading Course

AM 420 F 3C 0.5
Applications of Mathematics
Integral equations and integral trans-
forms will be applied to systems with
memory.
Prereq: Consent of instructor

AM 440 W 3C 0.5
Applications of Mathematics
As a project, students will develop a
mathematical model and interpret its
behaviour.
Prereq: Consent of instructor

AM 444 W 3C 0.5
Applications of Algebra
A survey of undergraduate mathematics
with emphasis on the unifying effect of
algebraic concepts. This is a cross-
disciplinary course; theorems of modern
algebra are related to topics chosen
mainly from advanced calculus and
differential geometry.
Prereq: MATH 234B

AM 462 F 3C 0.5
Measure and Integration
The theory of measure and the
Lebesgue integral.
Prereq: PMATH 331 or 351A

AM 464 W 3C 0.5
Topics in General Relativity
Basic ideas of relativistic cosmology
(Friedmann-Robertson-Walker universes,
observation status of cosmological
theories, black hole theory (the Schwarz-
schild and Kerr solutions, their event
horizons and singularities, gravitational
collapse, observable properties of black
holes), and an introduction to gravita-
tional waves. Other topics of current
interest may be discussed.
Prereq: AM 362, 372, or consent of
instructor

AM 489 F 0.5
Reading Course
AM 456A F 3C 0.5
Quantum Mechanics 1
Prereq: Consent of instructor

AM 456B W 3C 0.5
Quantum Mechanics 2
Prereq: AM 456A

AM 468 F 3C 0.5
Fluid Mechanics 1
Fundamental equations of inviscid fluids, compressibility, vorticity; two and three-dimensional irrotational, incompressible flow. Blissius' theorem. Joukowski hypothesis. Water Wave Motion.
Prereq: AM 365

AM 468 F 3C 0.5
Topics in Applied Mathematics
A selection of special topics given by members of the Applied Mathematics Department.
Prereq: Consent of instructor

AM 472 W 3C 0.5
Linear Operators
Linear operators in Hilbert spaces. Compact operators. Introduction to functional analysis.
Prereq: AM 452 or consent of instructor

AM 474 F 3C 0.5%
Topics in Differential Geometry
Grassmann algebra, differential forms, Lie derivatives, isometries, Killing vector fields, application to continuum mechanics, differentiable manifolds and applications of differential forms to physics.
Prereq: AM 362/PMA 365 or consent of instructor

Cross-listed as PMATH 465.

AM 478 W- 3C 0.5
Fluid Mechanics 2
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 3C 0.5
Topics in Applied Mathematics
Same as in AM 468.
Prereq: Consent of instructor

AM 481A F 3C 0.5
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, inverse transforms by contour integration. Applications to physical problems.
Prereq: AM 371, 381, 391, or consent of instructor

AM 481A W 3C 0.5
Partial Differential Equations of Applied Mathematics 3
Variational properties of eigenvalues and eigenfunctions, Rayleigh-Ritz method, special functions, Hankel transforms, Fourier-Bessel series, asymptotic series. Applications to Physical problems.
Prereq: AM 481A

AM 482 F 3C 0.5
Calculus of Variations
Prereq: MATH 336 or consent of instructor

AM 485 F 3C 0.5
Electromagnetism
Applications of Maxwell's equations. Introduction to wave guides and antennae.
Prereq: PHYS 253 or consent of instructor

AM 486 F 3C 0.5
Statistical Mechanics
Equilibrium statistical mechanics is developed from first principles, based on elementary probability theory and quantum theory (classical statistical mechanics is developed later as an appropriate limiting case). Emphasis is placed on the intimate connections between statistical mechanics and thermodynamics. Although it would be useful, prior knowledge of quantum theory is not necessary.
Prereq: Consent of instructor

AM 489 F 0.5
Control Theory
Prereq: Consent of instructor

AM 499 W 0.5
Reading Course

COURSES NOT OFFERED 1986-87
AM 364 Special Relativity
AM 451 Non-Linear Differential Equations
AM 463 Introduction to Differentiable Manifolds

Combinatorics and Optimization

Course Descriptions

INTRODUCTORY NOTE
The following courses are offered in conjunction with the Division of Mathematics for Industry and Commerce: C&O 350, 351, 367, 370, 452 and 454.

C&O 220 W 3C 0.5
Introductory Combinatorics
Elementary principles of enumeration. Principle of inclusion-exclusion, generating functions, recurrence equations. Elementary graph theory and graphical algorithms. Introduction to design theory.
Prereq: C&O 230
C&O 220 cannot be counted for credit toward a BMath Honours degree.
Course Descriptions

Mathematics:

Combinatorics and Optimization

C&O 230 F.W.S 3C 0.5
Introduction to Combinatorics
Introduction to the combinatorics of ordinary generating functions. Introduction to basic graph theory and graphical algorithms.
- Prereq: MATH 1300, 134B
- Antireq: C&O 220
- Also offered at St. Jerome's College in Fall term

C&O 270 F.W.S 3C 0.5
Introduction to Optimization
- Prereq: MATH 1300, 134B
- Antireq: C&O 220
- Also offered at St. Jerome's College in Fall term

C&O 330 F 3C 0.5
Combinatorial Enumeration
The combinatorics of ordinary and exponential generating functions. Matrix methods, and decompositions. The Lagrange theorem. Applications to enumeration of sequences, trees, covers, lattice paths and partitions.
- Prereq: C&O 230

C&O 331 W 3C 0.5
Coding Theory
A first course in error correcting codes. Linear block codes, Hamming-Golay codes and multiple error-correcting BCH codes are studied. Various encoding and decoding schemes are considered.
- Prereq: MATH 224A
- Offered at St. Jerome's College.

C&O 342 F.S 3C 0.5
Graph Theory 1
An introduction to the ideas, methods and applications of graph theory. Finding shortest paths and maximum matchings in weighted graphs. Determining the connectivity of a graph.
- Prereq: MATH 224A, C&O 230

C&O 343 W 3C 0.5
Graph Theory 2
- Prereq: C&O 342

C&O 350 F.W.S 3C 0.5
Linear Programming
- Prereq: MATH 224A
- Antireq: ACTSC 335

C&O 351 F.W.S 3C 0.5
Network Flow Theory
- Prereq: C&O 350

C&O 367 F.W 3C 0.5
Nonlinear Programming
Vector calculus with applications to Newton's method and method of steepest descent. One-dimensional optimization. Introduction to constrained optimization, including the elements of Kuhn-Tucker theory and Lagrange multipliers.
- Prereq: MATH 220A, 224A

C&O 370 F.W 3C 0.5
Deterministic I & II Models
Topics include error correcting codes, quasirandom designs, orthogonal arrays, and the ring of formal Laurent series. Enumeration under group action.
- Prereq: C&O 330

C&O 382 W 3C 0.5
Combinatorial Geometry
An introduction to the combinatorial aspect of the real plane. Main topics covered are the enumeration of various combinatorial objects in the plane, Sylvester's Triad Problem, Pick's Theorem, partitioning the interior of a rectangle into squares of different sizes, an introduction to the theory of convex sets in the plane, Kelly's theorem and certain ramifications will be explored.
- Prereq: MATH 220A, 134A/B

C&O 388 W 3C 0.5
Algorithmic Computation
A course covering a number of applications of computer to combinatorial problems. General procedures: backtracking, and generating permutations, partitions etc., as well as the solution of many specific problems. Includes an introduction to computational complexity.
- Prereq: C&O 230

C&O 389 W 3C 0.5
Topics in Combinatorics
An undergraduate seminar in combinatorics. The primary objective is to study current work in specific areas of combinatorics. Course content may vary from term to term.
- Prereq: Consent of instructor
C&O 440 F 2C 0.5  
**Topics in Graph Theory**  
An in depth study of 1 or 2 topics in graph theory. Course content may vary from term to term. Topics may include planar graphs, extremal graph theory, directed graphs, enumeration, algebraic graph theory, probabilistic graph theory, connectivity, graph embedding, colouring problems.  
*Prereq: C&O 342 or consent of instructor*

C&O 450 F 2C 0.5  
**Combinatorial Optimization**  
*Prereq: C&O 351*

C&O 452 W 2C 0.5  
**Integer Programming**  
A study of several techniques for solving integer (linear) programming problems. Cutting planes, implicit enumeration, branch-and-bound, introduction to Boolean and pseudo-Boolean programming. Applications to problems of optimum routing, site location, set covering and packing, logic and lattice theory.  
*Prereq: C&O 351*

C&O 454 F, S 3C 0.5  
**Scheduling**  
Sequencing algorithms for scheduling tasks on single machines, parallel machines, and flow shops. Applications to scheduling computers and manufacturing facilities. Combinatorial techniques used in algorithm development and convergence proofs.  
*Prereq: C&O 351 or 370*

C&O 455 W, S 3C 0.5  
**Game Theory**  
An introduction to the analysis, through appropriate mathematical models, of competitive situations such as those arising in social, economic, political or military conflict. Emphasis is placed on the theory of two-person games.  
*Prereq: C&O 350*

C&O 458 F 3C 0.5  
**Numerical Linear Programming**  
Methods for the minimization and maximization of piecewise linear functions and linear functions subject to linear constraints, with applications to linear programming and data fitting. Emphasis is on algorithms, numerical considerations and software implementation.  
*Prereq: One of C&O 350, CS 337, 375 or consent of instructor*  
Cross-listed as CS 473.

C&O 459 2C 0.5  
**Topics in Optimization**  
An undergraduate seminar in optimization. The primary objective is to study recent work in specific areas of optimization. Course content may vary from term to term.  
*Prereq: Consent of instructor*

C&O 464 W 2C 0.5  
**Quadratic Programming**  
A detailed presentation of optimality conditions and effective algorithms for the solution of a quadratic programming problem. All concepts are developed as natural extensions of their counterparts in linear programming. Applications from portfolio analysis, engineering plasticity, regression, pattern recognition.  
*Prereq: C&O 350*

C&O 466 F 2C 0.5  
**Continuous Optimization**  
*Prereq: C&O 350, 367*

C&O 480 F 2C 0.5  
**History of Mathematics 1**  
Topics include: famous construction problems, Mascheroni's theorem, amicable pairs, perfect numbers and related numbers, Pythagorean triples; some of Archimedes' great accomplishments: squaring the parabola; estimation of pi; Archimedes' "Method", the volume of the sphere; inscribed regular polygons.  
*Prereq: MATH 1300, 134A/B (220B and 224B are recommended)*  
Although the mathematics for this course is technically elementary, the course is intended for third and fourth-year students, and the mathematical maturity of a senior student will be assumed.
16.96 Course Descriptions
Mathematics:
Computer Science

numbered with a middle digit of 0 through 3.

Where resources permit, students with exceptionally high academic standing in other programs may be considered for admission to CS.

Major courses on an individual basis. To be considered, students should first obtain a written recommendation from their Faculty Advisor and then consult a Computer Science Advisor.

2. The Computer Science Department is experiencing tremendous demand for its courses beyond available resources. Thus, accessibility to Computer Science courses cannot be guaranteed to all students. Even effort will be made to accommodate those students who preregister during published University preregistration periods. While priority will be given to those preregistrants, admission to specific courses cannot be guaranteed and course substitutions may be required to satisfy degree requirements.

3. Regular students will not normally be permitted to enroll in Computer Science courses during the Spring term. (See Section 5.3 on page 132.) Co-op students will not normally be permitted to enroll in Computer Science courses while on a work term. All other part-time students, as well as full-time non-degree and post-degree students, will normally be limited to at most 1 Computer Science course per term from the non-specialist offerings. (Post-degree students on academic leave from their home institution should consult a Computer Science Advisor to arrange an appropriate selection of courses.) For courses that are over-subscribed, however, priority for registration will normally be given to students registered full-time in a degree program.

4. Limits on the number of CS courses students may take concurrently will be published at preregistration time. Normally, all students in first and second year may preregister for at most 1 CS course per term, and students other than Computer Science Majors may preregister for at most 2 CS courses per term in third and fourth year.

5. Computer Science courses may not normally comprise more than one-third of a student's total credits accumulated at the University of Waterloo.

6. Please note that the terms in which courses are offered may deviate from those indicated below. Students are advised to consult the University Course Offerings List published at preregistration time.

7. More detailed course descriptions and course outlines are available upon request from the Computer Science Department. Students in faculties other than Mathematics should take particular note of the following courses: CS 100, 102, 234, 235, 316.

8. For the purposes of prerequisites, the following courses are normally considered to be equivalent: (CS 234 and 240), (CS 235 and 250), (CS 334 and 340), and (CS 355 and 350/354).

9. The prerequisite phrase "x-year standing" means that a student must be registered in year x or higher.

10. The following courses are offered in conjunction with the Division of Mathematics for Industry and Commerce: CS 330, 432, 438, 446, 448 and 492.

Course Descriptions

CS 100 F,W,S 2C,2L 0.5
Introduction to Computer Usage
An introduction to universally applicable computer services. Hands-on experience with common software and hardware, supported by examples of applications and social implications chosen from many disciplines. Topics include: electronic mail, word processing, spreadsheets, record management, and hardware and software concepts.
Antireq: At most, 2 of CS 100, 102, 112, 115, 116, 119
CS 100 cannot be counted for credit toward a BMath degree.

CS 102 F,W,S 3C,2L 0.5
Introduction to Computer Programming
Fundamental techniques of algorithm design and program development. Introduction to a programming language applicable to the student's field of study. Topics include: structured programming, simple data elements, sequential operations, iterative statements, selection statements, data aggregations, functions and subroutines.
Antireq: Computer literacy (e.g. CS 100 or high school computing).

Divisions of the course will be application-oriented: CS 102 COM (commerce), CS 102 SCI (sciences), CS 102 SSO (social sciences), and CS 102 HUM (humanities). Not all divisions will be offered each term.
Antireq: At most, 2 of CS 100, 102, 112, 115, 116, 119
CS 102 cannot be counted for credit toward a BMath degree.

CS 140 F,W,S 3C,2L 0.5
Introduction to Mathematical Problem Solving by Computer
An introduction to the analysis of mathematical problems, development of mathematical models and algorithms for their solution; implementation in a procedure-oriented language (normally FORTRAN). Topics discussed are: solution of equations, computation of integrals, graph plotting, and simulation.
Antireq: Full-time degree registration in the Faculty of Mathematics
Special sections of this course will use PASCAL rather than FORTRAN.

Also offered at St. Jerome's College in the Fall term.

CS 180 F,W 2C,2L 0.5
Introduction to File Processing
Introduction to the use of computers. Concept of algorithm. Language and notation for describing algorithms. Analysis and solution of problems dealing with trees; 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.
Antireq: Full-time degree registration in the Faculty of Mathematics
Also offered at St. Jerome's College in the Fall term.
Course Descriptions
Mathematics:
Computer Science

CS 350 F,W 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: detailed introduction to hardware; representation of data: memory; central processor addressing schemes; input/output; linking and loading.
Prereq: CS 250 or EL E 222, and third-year standing in a Computer Science Major program
CS 360 or EL E 320 is recommended.
Antireq: CS 335

CS 354 F,W 3C 0.5
Software Systems
A study of those software components comprising a computing system, with an emphasis on the management of hardware resources and the support of multiple processes. Topics include: operating system services; file systems; linkers, loaders and libraries; monitors and debuggers; interrupt handling; critical sections; process communication and synchronization.
Prereq: CS 340 and third-year standing in a Computer Science Major program
CS 350 is recommended as a pre/corequisite.

CS 360 F,W 3C 0.5
Introduction to the Theory of Computing
Models of computers including finite automata and Turing machines. Basics of formal languages with applications to syntax of programming languages. Unsolvable problems and their relevance to the semantics of programming. Concepts of computational complexity including algorithm optimality.
Prereq: CS 240, MATH 2340, and third-year standing in a Computer Science Major program

CS 369 F,W,S 3C 0.5
Digital Networks
Prereq: CS 250 or EL E 222, and third-year standing in a Computer Science Major program

CS 375 F,W,S 3C 0.5
Introduction to Numerical Analysis
Pitfalls in computation; solution of linear algebraic equations; polynomial interpolation; least squares; numerical integration and differentiation. The intent is to expose students to the theory behind modern computer techniques for solving mathematical problems.
Prereq: CS 240, MATH 2309, 234A and third-year standing in a Computer Science Major program
Antireq: CS 337, 370/371

CS 400 F 3C 0.5
Applications Software Engineering
An investigation into the role and function of software engineering practice in the construction of computer based systems. Topics include: requirements and specification; documentation techniques; analysis and design; implementation; testing and maintenance; management issues.
Prereq: CS 234 and a CS half-credit labelled CS 330 or higher, and third-year standing.

CS 335 is a recommended pre/corequisite.
CS 430 cannot be counted for credit toward a BMATH Honours Computer Science degree.

CS 432 F,S 3C 0.5
Business Systems Analysis
Prereq: CS 304 or 430, and third-year standing.
Antireq: CS 434, 482

CS 432 cannot be counted for credit toward a BMATH Honours Computer Science degree.

CS 433 F 3C 0.5
Topics in Computing Systems
An overview of some more advanced computer techniques, with an emphasis on their application in the analysis and design of systems. Topics include: data communication; queueing theory fundamentals; 2-D graphics; advanced software and hardware architectures; computer selection.
Prereq: CS 335 and third-year standing

CS 435 W 3C 0.5
Topics in Computing Systems
An overview of some more advanced computer techniques, with an emphasis on their application in the analysis and design of systems. Topics include: data communication; queueing theory fundamentals; 2-D graphics; advanced software and hardware architectures; computer selection.
Prereq: CS 335 and third-year standing

CS 435 cannot be counted for credit toward a BMATH Honours Computer Science degree.

CS 437 W 3C 0.5
Simulation by Computer
An introduction to the basic techniques of simulation. Discrete simulation models; random number generators; the SIMSCRIPT and GPSS languages; analysis of simulation output; continuous simulation models and the CSMP language.
Prereq: CS 334 or 438, STAT 220, and third-year standing
Antireq: CS 487
CS 437 cannot be counted for credit toward a BMATH Honours Computer Science degree.

CS 438 F,W,S 3C 0.5
Computer Applications in Business: Data Bases
A user-oriented approach to the management of large collections of data. Methods used for the storage, selection and presentation of data. Common data base management systems.
Prereq: CS 234 or 330, and third-year standing.
Antireq: CS 448
CS 438 cannot be counted for credit toward a BMATH Honours Computer Science degree.
Formerly: CS 330

CS 442 W 3C 0.5
Comparative Programming Languages
This course is designed to give students a critical understanding of programming language concepts and to provide them with an appreciation for the implications of various language design decisions. Students also learn some fundamentals about language processors.
Prereq: CS 340, 360 and fourth-year standing in a Computer Science Major program

CS 443 F,S 3C 0.5
Functional and Logic Programming
Introduction to the concepts of functional programming, including functional programming by specification, programming without side effects and the use of non-standard control structures. Fundamentals of logic, calculus, model theoretic semantics and proof procedures. Exposure to languages like PROLOG, LISP, HOPE, PP and NIAL.
Prereq: CS 340 and fourth year standing in a Computer Science Major program

CS 540 F,W 3C 0.5

CS 450 F,W,S 3C 0.5

CS 420 W 3C 0.5

CS 425 W 3C 0.5

CS 431 F,S 3C 0.5

CS 432 F,S 3C 0.5

CS 433 F 3C 0.5

CS 434 F 3C 0.5

CS 435 W 3C 0.5

CS 436 W 3C 0.5

CS 437 W 3C 0.5

CS 438 W 3C 0.5

CS 439 W 3C 0.5

CS 440 W 3C 0.5

CS 441 W 3C 0.5

CS 442 W 3C 0.5

CS 443 F,S 3C 0.5

CS 444 W 3C 0.5

CS 445 W 3C 0.5

CS 446 W 3C 0.5

CS 447 W 3C 0.5

CS 448 W 3C 0.5

CS 449 W 3C 0.5

CS 450 W 3C 0.5

CS 451 W 3C 0.5

CS 452 W 3C 0.5

CS 453 W 3C 0.5

CS 454 W 3C 0.5

CS 455 W 3C 0.5

CS 456 W 3C 0.5

CS 457 W 3C 0.5
The need for and use of various control structures and data structures. Features of several high-level languages; techniques for their effective use. Specific topics include structured programming, linked-list processing, recursion, string processing, tree processing, and language development.

Prereq: One of CS 102, 140, 180 or equivalent.
Antireq: CS 240

CS 235 F.W.S 2C,1T 0.5
Introduction to Computers and Computer Systems
To give a basic understanding of what goes on inside a computer, of machine organization, and of machine and assembly-language programming. To introduce students to computer software designed to assist user programs. To make students better users of a computer. Specific topics include: simple machine architecture, assembler-language programming, addressing modes and operating system services.

Prereq: One of CS 102, 140, 180 or equivalent.
Antireq: CS 117, 235

CS 240 F.W.S 2C,2T 0.5
Programming Principles, Languages, and Techniques
To develop a thorough understanding of software as needed for program design. The need for and use of various control structures and data structures. Features of several high-level languages, techniques for their effective use. Specific topics include structured programming, linked-list processing, recursion, string processing, tree processing and language development.

Prereq: CS 250 and second-year standing in a Computer Science Major program.
Antireq: CS 234

CS 250 F.W. 3C,1T 0.5
Fundamentals of Computers and Computer Systems
To give a thorough introduction to what goes on inside a computer, of machine organization, and of machine and assembly-language programming. To introduce students to computer software designed to assist user programs. Specific topics include: addressing modes, subroutines and macros, microcomputer architecture, and operating system components.

Prereq: CS 140 and second-year standing in a Computer Science Major program.
Antireq: CS 117, 235

CS 316 W 3C,1L 0.5
Introduction to Statistical Problem Solving by Computer
This is an applications oriented course which prepares the nonmathematical student to use the computer as a research tool. Topics include aids for statistical analysis and the preparation of documents such as reports and theses. The course provides sufficient background for application to other problems specific to the individual's field.

Prereq: One statistics course and computer literacy (e.g. CS 100 or high school computing), or consent of instructor.

CS 316 cannot be counted for credit toward a BMath degree.

CS 330 F.W.S 3C 0.5
Introduction to Business Systems
A study of application software systems in the business environment. Topics include data models of business functions, file and data base systems, and integrated accounting systems. Students modify an integrated accounting system and also work with a selection of commercially available software systems.

Prereq: One of CS 102, 140, 180, or equivalent, and a knowledge of accounting (e.g. ACC 101/102 or ACC 121/122).

CS 330 cannot be counted for credit toward a BMath Honours Computer Science degree.

CS 334 F.S. 3C 0.5
Data Types and Structures
Top-down design of data structures. Using representation-independent data types. Introduction to commonly used data types, including lists, sets, mappings, and trees. Selection of data representation.

Prereq: CS 234 and third-year standing
Antireq: CS 340

CS 334 cannot be counted for credit toward a BMath Honours Computer Science degree.

CS 335 W 3C 0.5
Computing Systems
A study of those hardware and software components comprising a computing system, with an emphasis on the role of operating systems in the support of programming activities. Topics include: computer architecture, input/output; operating systems; linkers, loaders, and libraries.

Prereq: CS 234, 235 and third-year standing
Antireq: CS 335

CS 335 cannot be counted for credit toward a BMath Honours Computer Science degree.

CS 337 W 3C 0.5
Introduction to Numerical Analysis
Pitfalls in computation; solution of linear algebraic equations, polynomial interpolation; least squares; numerical integration and differentiation. The intent is to expose students to the theory behind modern algorithms for solving mathematical problems.

Prereq: CS 140, MATH 1308, 1348 and third-year standing; MATH 2308, 2344 are recommended.
Antireq: CS 370, 371, 375

CS 337 cannot be counted for credit toward a BMath Honours Computer Science degree.

CS 340 F.W.S 3C 0.5
Data Structures
Levels of data description and their role in the design of structures. Design of data representations for primary and secondary store. Introduction to the analysis of algorithms.

Prereq: CS 240, C&O 230 and third-year standing in a Computer Science Major program.
Antireq: CS 334
CS 446 F.W,S 3C 0.5
**Software System Design and Implementation**
An investigation into the role and function of software engineering practice in the design and implementation of computer based systems. Topics include: structural design; procedural design; testing and reliability; management topics; programming languages and coding; portability techniques; maintenance; performance measurement and analysis.
Prereq: CS 240 and fourth-year standing in a Computer Science Major program
CS 354 is a recommended prerequisite.

CS 448 F.W,S 3C 0.5
**Introduction to Database Management**
The course introduces the student to the techniques that have been developed for processing very large collections of data. The requirement that data be held on secondary storage (disks and tapes) has an enormous impact on the design of algorithms to access that data.
Prereq: CS 340 and fourth-year standing in a Computer Science Major program
Antireq: CS 438

CS 450 F,S 3C 0.5
**Computer Architecture**
The course is intended to prepare the student to choose a suitable computer for a given application. Review of combinational and sequential logic circuits. Discussion of "building block" - central processing units, stores, input/output systems, and bus structures. Case studies of machines.
Prereq: CS 350 or EL E 323, CS 350 and fourth-year standing in a Computer Science Major program

CS 452 F.W,S 3C 0.5
**Real-time Programming**
Intended to give students experience with tools and techniques of real-time programming, this course includes not only issues of microcomputer architecture and a real time programming language and operating system, but also hands-on experience programming a microcomputer for applications such as process control, data acquisition and communication.
Prereq: CS 350, 354 and fourth-year standing in a Computer Science Major program

CS 454 F.W,S 3C 0.5
**Principles of Operating Systems**
A study of operating systems from both architectural and implementation viewpoints. Memory management, processor scheduling, protection and security; atomic actions and system structure, concurrency control. communications reliability and recovery; extensions of basic concepts to distributed systems.
Prereq: CS 360, 364 and fourth-year standing in a Computer Science Major program

CS 456 W 3C 0.5
**Data Communications**
This course is intended to introduce the student to the basic concepts of data communications, the computer-communication interface, and new telecommunications services. Topics include: basic queueing theory, data communications and the telephone network, computer architecture for data communications, protocols, error handling, multiplexing and switching, and packet switching networks.
Prereq: CS 354, STAT 230 and fourth-year standing in a Computer Science Major program
CS 457 is a recommended corequisite.

CS 457 W 3C 0.5
**Queueing Models: Analysis, Simulation, and Computer Applications**
An introduction to the basic results of queueing theory and the techniques of discrete event simulation. Emphasis is placed on the application of queueing models to computer systems and computer communication networks.
Prereq: STAT 231, 333, CS 240, 350 and fourth-year standing in a Computer Science Major program
Antireq: CS 437

CS 458 F.S 3C 0.5
**Design of Microprocessor-Based Systems**
An introduction to the design of digital systems such as those used in microcomputers, control and industrial applications, or those dedicated to specific tasks. Topics include: digital electronics, microprocessors, memory chips and systems, standard and specialized peripheral chips, development and integration systems, and case studies. Laboratory-oriented: small teams design and implement microprocessor-based systems.
Prereq: CS 350, 369 and fourth-year standing in a Computer Science Major program.

CS 462 F 3C 0.5
**Formal Languages and Parsing**
Prereq: CS 360 and fourth-year standing

CS 464 W 3C 0.5
**Computability and Recursive Function Theory**
Models of the computational process as reflected by computers, linguistic systems, functional specifications, transformational systems, formal logic, etc. Equivalence of these models. Computational complexity for specific models and abstractions fitting all models. Formal reducibilities between computational problems, and the complexity of these reducibilities.
Prereq: CS 360 and fourth-year standing

CS 466 F.S 3C 0.5
**Algorithm Design and Analysis**
Design of good algorithms and analysis of the resources they consume. Lower bounds on the resource requirements of algorithms to compute certain functions. Problems from the following areas are discussed in this light: sorting and order statistics, data structures, arithmetic computations, the NP-complete problems.
Prereq: CS 340 and fourth-year standing
CS 360 is recommended.
Course Descriptions
Mathematics: Computer Science
Mathematics

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.

Prefer: CS 360 and fourth-year standing

CS 472 W 3C 0.5

Numerical Linear Algebra

Prefer: CS 337 or 375, and fourth-year standing

CS 473 F 3C 0.5

Numerical Linear Programming
Methods for the minimization and maximization of piecewise linear functions and linear functions subject to linear constraints, with applications to linear programming and data fitting. Emphasis is on algorithms, numerical considerations and software implementation.

Prefer: (1 of CS 337, 375, C&O 350, or consent of instructor) and fourth-year standing

Cross-listed as C&O 458.

CS 474 S 3C 0.5

Numerical Approximation
Existence, uniqueness, and convergence of polynomial approximations obtained by interpolation and by least-squares criteria. Minimax and near minmax approximation by polynomials and rational functions. Efficient algorithms for obtaining approximations, including the fast Fourier transform. The design of built-in functions.

Prefer: CS 337 or 375, MATH 332B, and fourth-year standing

CS 476 W 3C 0.5

Numerical Solution of Ordinary Differential and Integral Equations
Initial value problems; existence and uniqueness of solutions, one step methods, multistep methods, stability, error analysis. Boundary value problems; shooting and discretization methods, implementation problems especially for non-linear equations. Integral equations; correspondence to ordinary differential equations, initial value and boundary value problems, solution techniques.

Prefer: CS 337 or 375, and fourth-year standing

CS 478 W 3C 0.5

Numerical Solution of Partial Differential Equations

Prefer: CS 337 or 375, and fourth-year standing

CS 482 F.W.S. 3C 0.5

Techniques in Systems Analysis
Techniques in organization and management theory. Organization of large software systems. Data base concepts. Implementation of computer-based information systems. Survey of current topics of interest such as distributed processing, microcomputers and on-line systems.

Prefer: CS 340 and fourth-year standing in a Computer Science Major program

Antireq: CS 432, 434

CS 486 F.W.S. 3C 0.5

Introduction to Artificial Intelligence

Prefer: CS 240 and fourth-year standing in a Computer Science Major program

CS 487 W 3C 0.5

Introduction to Symbolic Computation
An introduction to the use of computers for symbolic mathematical computation, involving traditional mathematical computations such as solving linear equations (exactly), analytic differentiation and integration of functions, and analytic solution of differential equations.

Prefer: CS 240, PMATH 334 (or consent of instructor) and fourth-year standing

CS 488 F.W.S. 3C 0.5

Introduction to Computer Graphics
Software and hardware for interactive computer graphics, implementation of device drivers, 3-D transformations, clipping, perspective, and input routines. Data structures, hidden surface removal, color shading techniques, and some additional topics will be covered.

Prefer: CS 340, 350, MATH 234a, and fourth-year standing in a Computer Science Major program

CS 492 W 2C, 1D 0.5

The Social Implications of Computers
This course is designed to consider the problems caused for organizations and society by the advent of computer technology so that constructive solutions to these problems may be discussed.

Prefer: CS 340 and fourth-year standing

CS 498 0.5

Advanced Topics in Computer Science
See the Course Offerings List for topics available.

Prefer: Fourth-year standing in a Computer Science Major program

CS 499 0.5

Readings in Computer Science
This course cannot be used to satisfy any 400-level course requirement in a Computer Science Major program.

COURSES NOT OFFERED 1986-87

CS 116 Introduction to Computing
CS 117 Computers and Microcomputers: Principles of Operation and Programming
CS 434 Computer Auditing

Mathematics

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Note

Students in faculties other than Engineering should consult their faculty advisor regarding how term courses with 0.625 credit weight are counted for degree credit purposes.

MATH 000 F.W. 1C 0.0

Co-op Orientation

MATH 000 is a non-credit orientation course for new Co-op Math students.
MATH 010 F.W.S 0.0
Non-Credit Night Lab
All students enrolled in MATH 130A/B, MATH 134A/B, and/or CS 140/180 are automatically enrolled in a non-credit lab that is scheduled one evening each week from 7:00 to 9:00 p.m. This time slot appears as a MATH 010 entry on student timetables and is reserved for midterm tests in the above courses. This time slot is used only on those evenings when mid-term tests are scheduled.

MATH 103 F 3C,1T 0.5
Introductory Algebra (For students in Arts/Social Sciences)
An introduction to applications of algebra to business, the behavioural sciences, and the social sciences. Topics will be chosen from set theory, permutations and combinations, binomial theorem, probability theory, systems of linear equations, vectors and matrices, mathematical induction.
Prereq: Grade 12 Mathematics, or the equivalent
Not open to students in the Faculty of Mathematics or to students who have credit in Grade 13 Algebra.
Students who have credit in both Grade 13 Calculus and Relations and Functions must obtain permission from the instructor to take MATH 103.

MATH 104 W 3C,1T 0.5
Introductory Calculus (For students in Arts/Social Sciences)
An introduction to applications of calculus in business, the behavioural sciences, and the social sciences. The models chosen will include the study of polynomial, rational, exponential and logarithmic functions; elementary analytic geometry; linear and quadratic systems of equations. The major concepts introduced to solve problems are: rate of change; optimization; growth and decay; and integration.
Prereq: Grade 12 Mathematics, or the equivalent
Not open to students in the Faculty of Mathematics or to students who have credit in Grade 13 Calculus.

MATH 106 F 3C,1T 0.5
Mathematics (For Kinesiology Students)
Algebraic functions and their graphs; exponential and logarithmic functions; elementary differential and integral calculus; applications and problems associated with kinesiology.
Not open to students in the Faculty of Mathematics.
Antireq: MATH 110A, 113A, 115A, 130A, 140A

MATH 110A F 3C,2T 0.625
Calculus 1a (For Engineering Students)
Functions, continuity and derivatives; Trig functions, Related rates, Curve sketching. Exponential and log functions, Integration, Techniques of Integration. Applications to area and volume problems.
Prereq: Grade 13 Calculus
Not open to students in the Faculty of Mathematics.
Antireq: MATH 106, 113A, 115A, 130A, 140A

MATH 110B W. S 3C,2T 0.5
Calculus 1b (For Engineering Students)
Prereq: MATH 110A
Not open to students in the Faculty of Mathematics.
Antireq: MATH 106, 113A, 115A, 130B, 140B

MATH 111A F 3C,1T 0.5
Algebra (For Arts and Science Students)
Elementary Number Theory, number systems, mathematical induction, the Binomial Theorem, complex numbers, polynomials.
Prereq: Grade 13 Algebra is recommended but not required
Not open to students in the Faculty of Mathematics.
Antireq: MATH 113A, 115A, 130A, 144A

MATH 111B W. S 3C,1T 0.5
Linear Algebra and Solid Geometry (For Arts and Science Students)
Determinants, vectors, matrices, elementary solid geometry, systems of linear equations.
Prereq: Grade 13 Algebra is recommended but not required
Not open to students in the Faculty of Mathematics.
Antireq: MATH 113A, 134B, 144B

MATH 113A F 3C,2T 0.5
Calculus (For Arts and Science Students)
The derivative, differentiation, higher order derivatives, implicit functions, differentials, applications of the derivative. The definite integral. Antidifferentiation. Logarithms and exponential functions, hyperbolic and inverse hyperbolic functions.
Prereq: Grade 13 Calculus
Not open to students in the Faculty of Mathematics.
Antireq: MATH 110B, 113B, 130B, 140B

MATH 113B W 3C,2T 0.5
Calculus (For Arts and Science Students)
Prereq: MATH 113A
Not open to students in the Faculty of Mathematics.
Antireq: MATH 110B, 113B, 130B, 140B

MATH 114 F 3C,2T 0.625
Algebra and Vector Geometry (For Engineering Students)
Prereq: Grade 13 Algebra
Not open to students in the Faculty of Mathematics.
Antireq: MATH 111B, 134B, 144B

MATH 115A F 3C,2T 0.5
Calculus (For Co-op Physics and Chemistry)
Real numbers, functions, trig functions. Limits. The derivative, differentiation, higher order derivatives, implicit functions, differentials, applications of the derivative. The definite integral. Antidifferentiation. Logarithms and exponential functions, hyperbolic and inverse hyperbolic functions.
Prereq: Grade 13 Calculus
Not open to students in the Faculty of Mathematics.
Antireq: MATH 106, 110A, 113A, 130A, 140A

MATH 115B W 3C,2T 0.5
Calculus (For Co-op Physics and Chemistry)
Prereq: MATH 115A
Not open to students in the Faculty of Mathematics.
Antireq: MATH 110B, 113B, 130B, 140B
MATH 130A F.W,S 3C,1T 0.5
Calculus
Functions and limits, differentiation of trigonometric, logarithmic and exponential functions, the chain rule, Rolle's theorem, the mean value theorem, extreme value theorem, applications of the derivative, the differential, the definite integral, fundamental theorem of calculus.
Prereq: Grade 13 Calculus
Antireq: MATH 134A, 110B, 113A, 115A, 140A
Also offered at St. Jerome's College in the Fall term.

MATH 130B F.W,S 3C,1T 0.5
Calculus
Techniques of integration, applications of the integral, indeterminate forms, Taylor's theorem, convergence of sequences and series, power series.
Prereq: MATH 130A
Antireq: MATH 110B, 113B, 115B, 134B
Also offered at St. Jerome's College in the Fall term.

MATH 134A F,W 3C,1T 0.5
Algebra
Basic set theory, cardinality, elementary number theory, number systems, polynomials.
Prereq: Grade 13 Algebra (MATH 134A is recommended, but not required)
Antireq: MATH 110B, 114A, 144B
Also offered at St. Jerome's College in the Winter term.

MATH 134B F,W,S 3C,1T 0.5
Linear Algebra 1
Systems of equations, vector spaces, matrices, determinants, geometric applications.
Prereq: Grade 13 Algebra (MATH 134A is recommended, but not required)
Antireq: MATH 111B, 114, 144B
Also offered at St. Jerome's College in the Winter term.

MATH 140A F 3C 0.5
Calculus
MATH 140A is an advanced-level, enriched version of MATH 130A.
Prereq: Grade 13 Calculus and a Grade 13 Math. Average of at least 85% (or permission of instructor)
Antireq: MATH 110B, 113A, 130A

MATH 140B W,S 3C 0.5
Calculus
MATH 140B is an advanced-level, enriched version of MATH 130B.
Prereq: MATH 140A (or permission of instructor)
Antireq: MATH 110B, 113B, 115B, 130B

MATH 144A F 3C 0.5
Algebra
MATH 144A is an advanced-level, enriched version of MATH 134A.
Prereq: Grade 13 Algebra and a Grade 13 Math. Average of at least 85% (or permission of instructor)
Antireq: MATH 111A, 134A

MATH 144B W,S 3C 0.5
Linear Algebra 1
MATH 144B is an advanced-level, enriched version of MATH 134B.
Prereq: MATH 144A (or permission of instructor)
Antireq: MATH 111B, 114, 134B

MATH 210 F.W 3C 0.5
Calculus 2 (For Science Students)
Partial differentiation, the gradient, multiple integrals with applications, line and surface integrals, divergence and curl, theorems of Green and Stokes. Applications to physical problems.
Prereq: MATH 110B
Not open to students in the Faculty of Mathematics.

MATH 211 F.W 3C,1T 0.5
Advanced Calculus for Electrical Engineers 1
Fourier series; Ordinary differential equations; Laplace transform; applications to linear electrical systems.
Prereq: MATH 110B
Not open to students in the Faculty of Mathematics.
Cross-listed as EL E 205.
Antireq: MATH 213A, 220A, 230A, 240A

MATH 212 F,S 3C,1T 0.5
Advanced Calculus for Electrical Engineers 2
Vector differential calculus. Multiple integrals. Line and Surface Integrals.
Complex analysis: analytic functions, complex integrals, residues. Partial differential equations.
Prereq: MATH 211
Not open to students in the Faculty of Mathematics.
Cross-listed as EL E 206.
Antireq: MATH 210, 213B, 220B, 230B, 240B

MATH 213A F 3C 0.5
Calculus 2 (For Science Students)
Infinite series. Partial derivatives, chain rule, total differential, Taylor's theorem, extreme values.
Prereq: MATH 113B or 115B, and MATH 111B, or equivalent
Not open to students in the Faculty of Mathematics.
Antireq: MATH 211, 220A, 230A, 240A

MATH 213B W,S 3C 0.5
Calculus 2 (For Science Students)
Multiple integrals. Vector calculus. gradient, directional derivative, divergence, curl, line integrals and path independence. Green's theorem, Stokes' theorem, and Gauss' theorem.
Prereq: MATH 213A or 220A, or equivalent
Not open to students in the Faculty of Mathematics.
Antireq: MATH 210, 212, 220B, 230B, 240B

MATH 215 F,W 3C 0.5
Differential Equations (For Chemistry Students)
Prereq: MATH 113B or 115B, or equivalent
Not open to students in the Faculty of Mathematics.
Antireq: AM 260, MATH 216

MATH 216 F,S 3C 0.5
Differential Equations (For Physics or Chemical Engineering students)
Prereq: of MATH 110B, 113B, 115B, or equivalent
Not open to students in the Faculty of Mathematics.
Antireq: AM 260, MATH 216

MATH 220A F 3C,1T 0.5
Advanced Calculus
Differential calculus for functions of several variables.
Prereq: MATH 130B
Coreq: MATH 134B
Antireq: MATH 211, 213A, 220A, 240A
Not open to Honours Mathematics students.

MATH 220B W 3C,1T 0.5
Advanced Calculus
Prereq: MATH 220A
Antireq: MATH 210, 212, 213B, 230B, 240B
Not open to Honours Mathematics students.
MATH 224A F 3C 0.5
Linear Algebra 2
Linear transformations, eigenvalues, characteristic polynomials, inner products.
Prereq: MATH 134B
Antireq: MATH 244A, 244B
Not open to Honours Mathematics students.

MATH 224B W 3C 0.5
Abstract Algebra 1
Elementary group and field theory and other topics in algebra.
Prereq: MATH 124A, 224A
Antireq: MATH 244B, 244B
Not open to Honours Mathematics students.

MATH 220A F,W,S 3C,1T 0.5
Advanced Calculus
Differential calculus of functions of several variables; limits and continuity, partial derivatives, differentiability, chain rule, Taylor's formula, extreme values, mappings and Jacobians. Integral calculus of functions of several variables; multiple integrals, iterated integrals, change of variables, applications to area and volume calculations.
Prereq: MATH 120B
Coreq: MATH 114B
Antireq: MATH 211, 213A, 220A, 240A
Also offered at St. Jerome's College in the Fall term.

MATH 230F W,S 3C,1T 0.5
Advanced Calculus
Line integrals, Green's theorem and path independence. Sequences and series of functions, uniform convergence and power series. Introduction to ordinary differential equations; first and second order linear equations, power series solutions, applications.
Prereq: MATH 200A
Antireq: MATH 210, 212, 213A, 220B, 240B
Also offered at St. Jerome's College in the Winter term.

MATH 234A F,W,S 3C 0.5
Linear Algebra 2
Linear transformations, eigenvalues, characteristic polynomials, inner products.
Prereq: MATH 134B
Antireq: MATH 224A, 244A
Also offered at St. Jerome's College in the Fall term.

MATH 234B F,W,S 3C 0.5
Abstract Algebra 1
Groups, fields and other topics in abstract algebra.
Prereq: MATH 124A, 244A
Antireq: MATH 224B, 244B
Also offered at St. Jerome's College in the Winter term.

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)
Antireq: MATH 211, 213A, 220A, 230A

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)
Antireq: MATH 210, 212, 213B, 220B, 230B

MATH 244A F 3C 0.5
Linear Algebra 2
MATH 244A is an advanced-level, enriched version of MATH 234A.
Prereq: MATH 144B (or permission of instructor)
Antireq: MATH 224A, 234A

MATH 244B W,S 3C 0.5
Abstract Algebra 1
MATH 244B is an advanced-level, enriched version of MATH 234B.
Prereq: MATH 144A/B (or permission of instructor)
Antireq: MATH 224B, 234B

MATH 222A F 3C 0.5
Introduction to Real Analysis
Sequences and series, functions and continuity, Laplace transforms, Fourier series, applications.
Prereq: MATH 220A (MATH 220B is recommended)
Antireq: PMATH 301, 351A
Not open to Honours Mathematics students.

MATH 322B W 3C 0.5
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
Antireq: MATH 322B, PMATH 322
Not open to Honours Mathematics students.

MATH 324 F 3C 0.5
Abstract Algebra 2
Topics in abstract algebra: groups, rings, fields and applications.
Prereq: MATH 244B
Antireq: PMATH 334, 344
Not open to Honours Mathematics students.

MATH 332B W,S 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 244B
Antireq: PMATH 321, 322, 331

COURSES NOT OFFERED 1986-87
MATH 226 Elementary Differential Equations
Mathematics

Electives

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes

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 2C 0.5
Commercial and Business Law for Mathematics Students

MTHEL 102 W,S 3C 0.5
Uses and Abuses of Statistics
This course provides an appreciation of how to correctly use statistical arguments in a wide variety of applications. Topics include descriptive statistics, sample surveys, experimental design, index numbers, regression models.

MTHEL 206A F,S 2C 0.5
Introduction to Mathematics Education
Current trends in education, professional practices and administration, the role of the department head, lesson planning, techniques of teaching, evaluation of students, special students, extracurricular activities, the relationship between elementary and secondary school mathematics, audio-visual materials.

This course is normally open only to students in the Co-op Math/Teaching Option.

Prereq: Consent of instructor.

MTHEL 305B W,S 3C 0.5
General Life Insurance 1
Identification 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.

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.

Cross-listed as GERON 403

Courses Not Offered 1986-87

MTHEL 302A Introduction to Biomathematics 1

MTHEL 302B Introduction to Biomathematics 2

MTHEL 402B Topics in Mathematical Aspects of Chemistry, Biology and the Medical Sciences 2 (Epidemiology of Aging)

Pure Mathematics

Course Descriptions

Introductory Notes

1. With the exception of the courses listed at the end of this section, the following courses are offered on a regular basis.

2. More detailed course descriptions and course outlines are available upon request from the Pure Mathematics Department.

PMATH 230A 2C,1T 0.5
Introduction to Pure Mathematics
Similar to, but independent of, PMATH 230A.

Prereq: None

Not offered every year

PMATH 331 F,W 3C 0.5
Real Variables
Topology of R^n, continuity, norms, metrics, completeness, Fourier series, and applications, for example, to O.D.E.'s, the heat problem, optimal approximation, the isoperimetric inequality.

Prereq: MATH 230A

Will be of particular interest to students in programs outside of Pure Mathematics.

Antireq: MATH 322A, PMATH 351A

Not available for credit to students in Honours Pure Mathematics Programs.

PMATH 334 F,W,S 3C 0.5
Abstract Algebra 2
Rings, ideals, factor rings, homomorphisms, finite and infinite fields, polynomials and roots, field extensions, algebraic numbers, and applications, for example, to Latin squares, finite geometries, geometrical constructions, error-correcting codes.

Prereq: MATH 234B

Will be of particular interest to students in programs outside of Pure Mathematics.

Antireq: MATH 324, PMATH 344

Not available for credit to students in Honours Pure Mathematics programs.

PMATH 340 W 3C 0.5
Elementary Number Theory
An elementary approach to the theory of numbers; the Euclidean algorithm, congruence equations, multiplicative functions, solutions to Diophantine equations, continued fractions, and rational approximations to real numbers.

Prereq: MATH 224B

Will be of interest to all math students.

Antireq: PMATH 440

PMATH 344 F,S 3C 0.5
Abstract Algebra
Groups, rings, fields and applications.

Prereq: MATH 234B

PMATH 154 may be substituted for 334 whenever this is a requirement in an Honours program.

Antireq: MATH 324, PMATH 334
PMATH 447 F 2C 0.5
Field Theory
Field extensions and Galois theory.
Prereq: PMATH 334 or 344
Next offered in Fall 1987

PMATH 451 F 3C 0.5
Measure and Integration
Lebesgue measure and integral for the real line, general measure and integration theory, convergence theorems, Fubini's theorem, absolute continuity, Hadamard-Nikodym theorem, $L^p$-spaces.
Prereq: PMATH 331 or 351A or consent of instructor.

PMATH 452 W 3C 0.5
Topics in Complex Analysis
The Riemann mapping theorem and several topics such as analytic continuation, harmonic functions, elliptic functions, entire functions, univalent functions, special functions.
Prereq: PMATH 352

PMATH 453 W 3C 0.5
Functional Analysis
Banach spaces, linear operators, geometry of Hilbert spaces, Hahn-Banach theorem, open mapping theorem, compact operators, applications.
Prereq: PMATH 321B or consent of instructor

PMATH 460 F 3C 0.5
Topics in Differential Geometry
Grassman algebras, differential forms, Lie derivatives, isometries, Killing vector fields, applications to continuum mechanics, differentiable manifolds and applications of differential forms to physics.
Prereq: AM 362/PMATH 365 or consent of instructor
Cross-listed as AM 474.

PMATH 461 F 2C 0.5
Topology
Topics from algebraic, combinatorial and geometric topology.
Prereq: PMATH 367, MATH 234B

PMATH 463 F 3C 0.5
Differentiable Manifolds
PMATH 470B Functional Equations

PMATH 464 F 3C 0.5
Finite Geometries

PMATH 465 W 3C 0.5
Differential Equations
Cauchy's, Peiser's, and similar equations. Equations for polynomials and trigonometric functions. Reduction to different equations. Applications.
Prereq: Consent of instructor

PMATH 467 W 3C 0.5
Linear Regression

PMATH 468 W 3C 0.5
Regression Analysis

PMATH 469 W 3C 0.5
Introduction to Analysis

PMATH 478 W 3C 0.5
Introduction to Topology

PMATH 499 W 3C 0.5
Readings in Pure Mathematics

 Courses NOT OFFERED REGULARLY

PMATH 461 Finite Geometries
PMATH 463 Differentiable Manifolds
PMATH 470B Functional Equations

Statistics

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Note
The following courses are offered in conjunction with the Division of Mathematics for Industry and Commerce: STAT 301, 331, 332, 333, 335, 371, 443

STAT 220 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.

For Science students only.

STAT 204 F 2C, 1L 0.5
Statistics for the Physical Sciences 1

For Science students only.

STAT 220 F 3C, 1T 0.5
Introduction to Statistical Methods 1
Probability theory; discrete and continuous random variables. Expectation.
Prereq: MATH 130B

Not open to Honours Mathematics students

STAT 221 W 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

Not open to Honours Mathematics students

STAT 220 F, W, S 3C, 1T 0.5
Probability
The laws of probability, discrete and continuous random variables, expectation, central limit theorem.
Prereq: STAT 220

Not open to Honours Mathematics students

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 220, MATH 230A

Not open to Honours Mathematics students

STAT 304 W 2C, 1L 0.5
Statistics for the Physical Sciences 2
Linear regression. Introduction to the design of experiments. Completely randomized and randomized block designs. Analysis of variance.
Prereq: STAT 220 or 221

For Science students only.

STAT 311 F 3C 0.5
Regression and Sampling Methods for Accounting
Review of tests of significance, confidence intervals, and properties of normal distribution. Normal linear models. Elementary sampling theory.
Prereq: A one-term course in statistics or probability

Open only to students in Honours Arts Accounting Programs.

STAT 321 F 2C 0.5
Applied Regression Analysis
Prereq: STAT 221

Not open to Honours Mathematics students

STAT 322 F 3C 0.5
Application of Sampling Surveys
The planning of surveys; simple random sampling; stratified sampling; ratio and difference estimators; cluster and systematic sampling.
Prereq: STAT 221

Not open to Honours Mathematics students
Course Descriptions

Mechanical Engineering

STAT 467 0.5
Topics in Statistics 2
May not be offered 1986-87.

STAT 468 0.5
Readings in Statistics 1

STAT 469 0.5
Readings in Statistics 2

COURSES NOT OFFERED 1986-87

STAT 454 Sampling Theory and Practice

Department of Mechanical Engineering

Professor, Chairman of the Department
H.W. Kerr, BSc, MASC, PhD (Toronto), PEng

Professor, Vice President Academic
T.A. Brzustowski, BASc (Toronto). AM, PhD (Princeton), PEng

Professor, Associate Dean, Graduate Studies, Faculty of Engineering
A. Plumptre, BASc, PhD (Nottingham), PEng, CEng, FI MechE

Professor, Associate Chairman Graduate Studies
P.R. Slawson, BASc, MASC, PhD (Waterloo), PEng

Professor, Associate Chairman Undergraduate Studies
G.E. Schneider, BASc, MASC, PhD (Waterloo)

Professor, Director, Office of Research Administration
E.L. Holmes, BSc (Bristol), MASC, PhD (Toronto), PEng

Professors:
K.G. Adams, BSc (Queens), MASC, PhD (Waterloo), PEng
G.M. Bragg, BASc (Toronto). PhD (Cambridge), PEng
E. Brundrett, BSc (McMaster, Agricultural College), BASc, MASC, PhD (Toronto), PEng
D.J. Burns, BSc, PhD (Bristol), PEng, CEng
R.N. Dubey, BSc (Hons), Patna), BSc (Eng) (Bihar), PhD (Waterloo), PEng
D. French, BSc (Aston), CEng, PEng
Course Descriptions

Mechanical Engineering

K.G.T. Hollands, BASc (Toronto), PhD (McGill), PEng
J.H.G. Howard, BASc, MSC, PhD (Birmingham), PEng
W.H. Hu, BASc (Peking), PhD, DSc (Southampton)
H.E. Leiphoz, Dipl Eng, Dr Ing, Docent Habilit (Stuttgart), FRSC, PEng, Recipient of the Distinguished Teacher Award
H.R. Martin, BASc, MSC (Queen’s Belfast), PhD (Nottingham), DSc (Queen’s Belfast), PEng
P. Nessett, BASc (McMaster), MASc, PhD (Toronto), PEng
G.F. Pearce, BASc (British Columbia), MASc (Toronto), PEng
H.J. Pick, BASc (British Columbia), MSC (Imperial College), PhD (Waterloo), PEng
G.D. Raitby, BSc, MSc (Western Ontario), PhD (Minnesota), PEng, Recipient of the Distinguished Teacher Award
J.A. Sche, Dipl Ing, CSc (Budapest), PEng
Y.A. Stepanenko, (Moscow Inst. Machine Tool Eng), PhD (Engineering Research Inst., Moscow)
A.B. Strong, BASc (Waterloo), MSC (London), PhD (Waterloo), PEng
H.F. Sullivan, BASc (Waterloo), AM, PhD (Princeton), PEng
J. Thoma, Dipl Phys, Dr Sc Tech, (Swiss Federal Institute of Technology)
M.M. Yovanovich, BASc (Queens), MS (Buffalo), ME, ScD (Massachusetts Institute of Technology)

Associate Professors
G.C. Andrews, BASc, MASc (British Columbia), PhD (Waterloo), PEng
G.A. Davidson, BASc, PhD (Toronto), PEng
A.M. Hale, BSc, MA (New Brunswick), BASc (Toronto), MASc, PhD (Waterloo), PEng
U.H. Mohaupt, BASc, MASc, PhD (Waterloo), PEng

Assistant Professors
R. Hoff, BASc, MASc (Waterloo), PhD (Vanderbilt), NSERC University Research Fellow, PEng
J.A. Huissoon, BSc, PhD (Trinity College, Dublin)
F.M. Ismail, BSc, MSC (Alexandria), PhD (McMaster)
J.B. Medley, BASc, MASc (Waterloo), PhD (Leeds), PEng
M. Randasaki, BSc (Robert), MSc (Middle East Technical), PhD (Northwestern), PEng
G.D. Stobley, BASc (Waterloo), MSc (Stanford), PhD (Waterloo), PEng
R. Varin, MSc, PhD (Warsaw Technical)

D. Weckman, BASc, MASC, PhD (Waterloo), PEng
Adjunct Professors
C. Bengesser, BASc, MASC, PhD (Toronto), PEng
R.G.R. Lawrence, O.C.
K. Piekanski, Dipl Ing (London), PhD (Cambridge), PEng

Faculty Members holding cross appointments to Mechanical Engineering from:
Applied Mathematics
Civil Engineering

Introductory Notes

1. All courses extend over 1 term only, and consist of 3 hours of lectures per week unless otherwise specified.

2. In general, the only prereq is the core courses, unless otherwise specified.

Course Descriptions

M.E 126 W.S 2C, 4L 0.5
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 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

M.E 200 F.W 1C, 1T 0.5
Introduction to Mechanical Engineering
1
Discussion of Structure of Mechanical Engineering curriculum, operation of Department, Faculty, University, technical societies.

M.E 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, Jacobian. Multiple integration; areas, centroids, moments of inertia, centres of gravity. Vector analysis; gradient divergence, curl, Laplacian; integral theorems.

M.E 202 F.W 3C, 1T 0.5
Statistics for Engineers

M.E 203 F.S 3C, 1T 0.5
Ordinary Differential Equations

M.E 212 F.W 3C, 1T 0.5
Dynamics

M.E 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.

M.E 219 F.W 2C, 1D, 1T 0.5
Mechanics of Deformable Solids
1

M.E 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.
M E 262 3C,2T,3L
Introduction to Automation
Number systems, codes and coding, minimization techniques applied to design of logic systems. Component specifications. Discussion of microprocessors, memory and I/O logic elements. Microcomputer structure and operation. I/O modes and interfacing. Machine language and Assembly programming. Design and application of digital systems for data collection and control of pneumatic hydraulic and machine systems. Laboratory work includes the use of microcomputers.

M E 302 W,S 1C 0.0
Introduction to Mechanical Engineering 2
Technical specialties in Mechanical Engineering, discussion of options, curriculum, seminars and technical topics in the various options.

M E 304 W,S 3C,1T 0.5
Numerical Analysis
A survey of numerical procedures with emphasis upon computer implementation using the WATFIV programming language. In particular, the following topics are covered: Interpolation, curve fitting, solution of non-linear equations, numerical integration, numerical solution of ordinary differential equations, matrix algebra and solution of systems of linear equations, and problems in the solution of partial differential equations.

M E 306 W,S 3C,1T 0.5
Partial Differential Equations

M E 321 W,S 3C,1L 0.5
Kinematics and Dynamics of Machines

M E 322 F,W 3C,1T,1L 0.5
Mechanical Design 1
Analysis and synthesis of machine elements. Factors affecting working stresses, fatigue, creep and impact considerations. Design of shafting, springs, screws, clutches, brakes and gears.

M E 330 S,F 3C,3L 0.5
Control of Properties of Materials
Phase equilibria, non-equilibrium behaviour, heat treatment of metals, diffusion strengthening processes, Alloying, composite materials, cold and hot working. Failure of engineering materials; creep, fatigue, corrosion and other environmental degradation processes. Prevention of service failures.

M E 340 F,W 3C,1T 0.5
Manufacturing Processes 1
The principles of manufacturing unit processes including casting, forming, machining and joining. Interactions between design, materials (metals, polymers, ceramics) and processes. Advantages and limitations, relative cost, and production rates of competitive processes.

M E 351 W,S 3C,3L 0.5
Fluid Mechanics 1
Physical properties of fluids and fundamental concepts in fluid mechanics. Hydrostatics. Conservation laws for mass, momentum and energy. Flow similarity and dimensional analysis as applied to engineering problems in fluid mechanics. Laminar and turbulent flow. Engineering applications such as flow measurement, flow in pipes and fluid forces on moving bodies. Introduction to compressible flow.

M E 352 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.
Patenting for Engineers
An overview of intellectual property: copyright, industrial design, trade marks, trade names, and trade secrets. Ownership of intellectual property, Invention optimization. Patenting; history, legal context, infringement, searching, writing and understanding patent claims, preparing patent drawings, patent application preparation, submitting the application to the Canadian or United States patent offices, dealing with the examiner, foreign patents. Setting and licensing technology. Litigation.

Mechanical Design 2
A continuation of the M E 322 course in analysis and synthesis of machinery, including advanced analysis of machine elements such as clutches, brakes, couplings, journal bearings and gears. Advanced machine design concepts such as reliability, optimization and techniques for stimulating innovative design. A synthesis project involving the machine elements studied is usually included.

Physical Metallurgy of Deformation and Fracture
Microscopic origins of elastic and inelastic behaviour. Plastic flow at low and high temperatures with emphasis on the microscopic mechanisms and their application to engineering design. Deformation mechanism maps. Types of fracture and micromechanism fracture maps. Application of fracture mechanics. Fatigue and cyclic hardening behaviour. Environmental effects.

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.

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.

Energy Transfer in Buildings
Thermodynamic properties of moist air; psychrometric charts; humidity measurements; direct water contact processes; heating and cooling of moist air by extended surface coils; solar radiation; heating and cooling of loads on buildings; effects of the thermal environment; air conditioning and calculations; air flow in and around buildings, diffusers.

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.

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 irradiation 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.

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.

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.

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 624 brings together dynamics and stress analysis in an application to design of dynamic machinery. Basic kinematic and dynamic concepts are reviewed and extended. Langrangian 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.

Mechanical Vibrations in Machines
Mechanics of Deformable Solids 3
Analysis of stress and strain in 3 dimensions, plates and shells, stress functions, plastic stress-strain concentrations. Residual stress, thermal stress and creep.
Energy methods.

Physical Metallurgy of Structures and Transformations

Non-metallic Materials

Deformation Processes

Machine Tool Analysis

Metal Casting Processes
The principles of static and continuous casting processes including sand, investment, die and various continuous casting techniques. Review of heat transfer, fluid flow and solidification theory as it applies to casting. Gating, runner, sprue and riser design in static castings. Origin of various casting defects including hot tears, distortion, solidification shrinkage and residual stresses.
16.114 Course Descriptions
Middle East Studies

M E 571 W 3C 0.5
Noise Analysis and Control

M E 560 F.5 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 modeling, wind loading. The course will be oriented to practical design techniques for flow systems, reactors, air pollution control equipment, etc.

M E 571 W 3C 0.5
Air Pollution I
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, thermal jets in stratified flow, radioactive plumes, particulate dispersion instrumentation (micrometeorological), air pollution control techniques and equipment monitoring instrumentation.

Middle East Studies
Associate Professor and Director
D.J. Sahas, BA (Athens), STM (Indianapolis), PhD (Heidelberg), Department of Religious Studies

Associate Professor and Assistant Director
W. Shalikare, BA, BSW (McGill), MSc, DSW (Western Reserve), School of Urban and Regional Planning

Professors
F.H. Epp, BA (Dethel College), MA, PhD (Minnesota), LLB (Brandon), G, Department of History
R.H. Simms, AA Muns, Dip (London), Riba, Mraic, School of Architecture

Associate Professors
J.T. Horton, BA (Wheaton), MA (Northwestern), School of Urban and Regional Planning
A. Kapur, BA (Punjab), MA (George Washington), PhD (Dalton), Department of Political Science
R. Lister, BA, MA, PhD (Toronto), Department of English
J.W. Miller, BA (Ockham), MA (New York), BD (Princeton), ThD (Basel), G, Department of Religious Studies
J.S. North, BA, MA (British Columbia), PhD (Alberta), Department of English

Assistant Professors
J.A. Teichman, BA, MA, PhD (Toronto), Department of Political Science
D.S. Zweig, BA, PhD (Michigan), Department of Political Science

Participating Faculty in Middle East Studies at Wilfrid Laurier

Associate Professor and Director
R.W. Fisher, BA (Duke), BD (Union Theol. Sem.), PhD (Columbia), Department of Religion and Culture

Professor
L.E. Toombs, BA, BSc (Acadie), BD (Halifax), PhD (Drew), Department of Religion and Culture

Assistant Professor
E.F. Lange, BA, BD (WLU), M.Div. (Knox, Toronto), Department of Religion and Culture

Resource Persons

Professors
M.I. Elmasry, BSc, MSc, PhD (Ottawa), PE, Department of Civil Engineering
V.K. Pandit, BSc (Calcutta), BSc (Eng) (London), MSc (Queens), MSc, PhD (Waterloo), PE, Department of Civil Engineering
W.C. Lennox, BASc, MSc (Waterloo), PhD (Lehigh), PE, Department of Engineering
S.D. Saleh, BA (Cairo), MA, PhD (Case Western Reserve), Department of Management Sciences

Course Descriptions
Middle East Studies core courses and approved courses are listed in Chapter 15.

MES 200 F 3C 0.5
Introduction to the Middle East
An interdisciplinary introduction to the phenomenon of the Middle East. Special attention will be given to the sources and methodologies which various disciplines use to examine the geography, history, culture, religious idiosyncrasies, the political diversity, as well as the scientific and human challenges of the area.

Prereq: None

MES 301 0.5
Seminar in Middle East Studies
This is an intense examination of an issue or topic related to the Middle East studied from an interdisciplinary perspective as well as from the perspective of the student's own major discipline.

Prereq: MES 200 and at least one more course from the core list of Middle East Studies courses

For more information regarding scheduling of the course, see the program director.
Music

Assistant Professor, Chairman
L. Erne, ARCT (Toronto), DSM (CMDC), BMus (Wilfrid Laurier), MMus, PhD (Northwestern)

Associate Professors
H. Martens, ARCT (Toronto), LRSM, BA, MA (Minnesota), P.HU (Columbia)
W.R. Maust, BS (EMC), BMus (Peabody Conservatory), MMus, PhD (Indiana)

Assistant Professor
K. Hull, ARCT (Toronto), BA (Waterloo), BMus, MMus (Western Ontario), MFA (Princeton)

Part-time Lecturers
D. Huron, BIS (Waterloo)
G. Holmea, BSc (Columbia)
W. Janzen, BMus (Manitoba), MMus (Wisconsin)
M. Jarrett
C. Johnston, BMus (Queen's), BEd (Western Ontario), MA (Toronto)
P. Leikin, BMus (Manitoba), MA (Mennonite Biblical Seminary), PhD (Toronto)
A. Martin, ARCT, BMus (Toronto), MMus (Eastman)
R. Peters, BSc (Winnipeg), MMus, DMus (Indiana)
V. Sewa, BM (McGill), MM (New England Conservatory, Boston)
C. Weaver, BMus, MMus, DMus (Indiana)
M. Wood

Studio Instructors
Janet Auger, BMus (Toronto); Double Bass
Nina Brickman, BMus (Manhattan School of Music, N.Y.); French Horn
Cedric Coleman, BM, MM (New England Conservatory, Boston); Bassoon
Gisella Depokat, Cello
Lynn Gangbar, Classical Guitar
Katherine Hubley, BMus (Cincinnati); Violin
Kenneth Hull, ARCT (Toronto), BA (Waterloo), BMus, MMus (Western Ontario), MFA (Princeton); Piano
Thomas Key, BM (Boston); H. Lutien Klenecki, BMus (Wilfrid Laurier), Dip in Opera Perf (Toronto); Voice
Eugene Laskiewicz, BMus (Queen's), BEd, MMus (Toronto); Accordion
Peter Maness, Trombone
James Mason, BM (Shenendoah Conservatory); MM (Catholic U., Washington); Oboe
Jane Noyes, Tube
Douglas Pullen, Saxophone
Vincent Sauve, BM (McGill), MM (New England Conservatory, Boston); Clarinet
John Tickner, Trumpet
Dianne Werner, BMus (Toronto), Art Dip (Western Ontario); Piano
Michael Wood, Percussion

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Note
Students should consult their faculty advisor regarding how term courses with credit weights other than 0.5 are counted for degree credit in their program.

MUSIC 100 F,W,S 3C 0.5
Introduction to Music
The techniques, terminology, forms and styles of Western music through lectures and listening, as exemplified by great works from all eras of music history.
Neither MUSIC 150 nor MUSIC 151 may be taken for credit if MUSIC 100 is taken for credit. However, MUSIC 150 and MUSIC 151 together may serve in lieu of MUSIC 100 as prerequisites for upper-level Music courses.

MUSIC 101 F,W,S 2L 0.25
Music Ensemble
The study of selected music literature through rehearsals and performance in one of the Music Department's ensembles: University Choir, Chapel Choir, Chamber Choir, Concert Band, Stage Band, Chamber Ensembles. Regular attendance at rehearsals and performances is required. Offered on a credit/ fail basis.

MUSIC 102 F,W,S 2L 0.25
Music Ensemble
(See MUSIC 101 for course description.)
MUSIC 241 F,W,S 3C 0.5
Principles of Music Therapy
An introduction to the history, theory, and practice of music therapy. Emphasis on the function of music in personal development and the therapeutic application of music for the physically and mentally handicapped, and the socially maladjusted.

MUSIC 250 F,W,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 and simple two-part exercises.
Prereq: A basic knowledge of scales, triads, and musical notation

MUSIC 251 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 harmonies, and of elementary forms, emphasizing Baroque and Classical music. Ear-training and sight-singing lab sessions will cover four-part diatonic exercises.
Prereq: MUSIC 250 or consent of instructor

MUSIC 252 F 3C 0.5
Vocal Literature
A study of the music written for solo voice from the 17th century to the present.
Prereq: MUSIC 100 or consent of instructor

MUSIC 266 F,W,S std 0.5
Music Studio
Individual instruction in Voice, Piano, Organ, Classical Guitar and orchestral instruments. This course is available only to Music majors and minors.
Prereq: Royal Conservatory Grade VIII level and audition with Music Faculty
Studio Fee

MUSIC 267 F,W,S std 0.5
Music Studio
(See MUSIC 266 for course description.)
Prereq: MUSIC 266 and consent of Music Faculty
Studio Fee.

MUSIC 268 F,W,S 3C 0.5
Traditional Folk Music of Canada
A study of the traditional folk music of Canada of both native and immigrant peoples, including traditional instruments, collectors, the ballad in Canada, chanson de Québec, the songs commemorating the great events of Canada's history, and songs of work and pleasure.

MUSIC 269 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 270 W 3C 0.5
Introduction to Jazz
A survey of the development of jazz schools and individual styles as well as a study of melodic, harmonic, and rhythmic improvisation. Styles will be demonstrated through recordings and live performance.

MUSIC 275 S 3C 0.5
Computer Applications in Music
A comprehensive survey of computer applications in the creation, production and study of music.
Prereq: MUSIC 100 or consent of instructor

MUSIC 280 F,W,S 3C 0.5
Music Theory 3 (19th Century)
The study of the various genres of music of the 19th century in the context of the various artistic, political and social movements. The course will include seminars, lectures, listening and analysis.
Prereq: MUSIC 100 or consent of instructor

MUSIC 281 F,W,S std 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 251 or consent of instructor

MUSIC 282 F,W,S 3C 0.5
Music Aesthetics and Criticism
Explores questions about the nature of musical expression, making musical value judgments, whether music has a moral character, the relationship between the composer's life and work. Expressive, symbolic, structural and linguistic approaches to musical meaning will be examined.
Prereq: Consent of instructor

MUSIC 283 F 3C 0.5
Music of the Romantic Period (19th Century)
The study of the music of the 19th century by means of lectures, seminars, reading, and listening to recordings and live performances. Representative composers include Beethoven, Schubert, Chopin, Tchaikovsky, Verdi, and Wagner.
Prereq: MUSIC 100 or consent of instructor

MUSIC 284 F,W,S 3C 0.5
Music of the Twentieth Century
The study of the various genres of music of the 20th century in the context of the various artistic, political and social movements. The course will include seminars, lectures, listening and analysis.
Prereq: MUSIC 100 or consent of instructor

MUSIC 285 W,3S 0.5
Music Study
(See MUSIC 266 for course description.)
Prereq: MUSIC 267 and consent of Music Faculty
Studio Fee.

MUSIC 286 F,W,S std 0.5
Music Study
(See MUSIC 266 for course description.)
Prereq: MUSIC 300 and consent of Music Faculty
Studio Fee.

MUSIC 287 F 3C 0.5
Music Theory 5 (20th Century)
The study of the harmonic, melodic and formal aspects of 20th century music. Ear-training and sight-singing lab sessions will cover chromatic chord progressions and modulatory melodies.
Prereq: MUSIC 251 or consent of instructor

MUSIC 288 W 3C,1L 0.5
Music Theory 6
(See MUSIC 287 for course description.)

MUSIC 289 W 3C,1L 0.5
Music Theory 7
(See MUSIC 287 for course description.)

MUSIC 290 W 3C,1L 0.5
Music Theory 8
(See MUSIC 287 for course description.)

MUSIC 301 F,W,S 2L 0.25
Music Ensemble
(See MUSIC 101 for course description.)

MUSIC 302 F,W,S 2L 0.25
Music Ensemble
(See MUSIC 101 for course description.)

MUSIC 303 W 3C 0.5
Musical Aesthetics and Criticism
Explores questions about the nature of musical expression, making musical value judgments, whether music has a moral character, the relationship between the composer's life and work. Expressive, symbolic, structural and linguistic approaches to musical meaning will be examined.
Prereq: Consent of instructor

MUSIC 304 F 3C 0.5
Music of the Romantic Period (19th Century)
The study of the music of the 19th century by means of lectures, seminars, reading, and listening to recordings and live performances. Representative composers include Beethoven, Schubert, Chopin, Tchaikovsky, Verdi, and Wagner.
Prereq: MUSIC 100 or consent of instructor

MUSIC 305 W,3S 0.5
Music of the Twentieth Century
The study of the various genres of music of the 20th century in the context of the various artistic, political and social movements. The course will include seminars, lectures, listening and analysis.
Prereq: MUSIC 100 or consent of instructor

MUSIC 306 F,W,S std 0.5
Music Study
(See MUSIC 266 for course description.)
Prereq: MUSIC 267 and consent of Music Faculty
Studio Fee.

MUSIC 307 W 3C,1L 0.5
Music Theory 3 (19th Century)
The study of the harmonic, melodic and formal aspects of 19th century music. Ear-training and sight-singing lab sessions will cover chromatic chord progressions and modulatory melodies.
Prereq: MUSIC 251 or consent of instructor

MUSIC 308 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 370

MUSIC 309 F 3C 0.5
Choral Music, Repertoire and Technique 1
A study of conducting techniques, rehearsal procedures and score analysis.
Prereq: MUSIC 100 and 250/251 or consent of instructor
MUSIC 373 W 3C 0.5
Choral Music, Repertoire and Techniques
Continuation of MUSIC 372
Prereq: As in MUSIC 372

MUSIC 375 S 3C 0.5
Electroacoustic Music
The study of electroacoustic music through composition, analysis, and listening. This course also surveys the history of electroacoustic music and the development of techniques and technology. Practical electronic studio experiences is included.
Prereq: MUSIC 371 or consent of instructor
Studio fee

MUSIC 380 F.W 0.5
Directed Study in Music
Prereq: Advanced standing in music and consent of instructor

MUSIC 381 F.W 0.5
Directed Study in Music
Prereq: Advanced standing in music and consent of instructor

MUSIC 390 F.W 3C 0.5
Special Topics in Music 1
Study of a limited field under tutorial guidance.
Prereq: MUSIC 100 and consent of instructor

MUSIC 391 F.W 3C 0.5
Special Topics in Music 2
Study of a limited field under tutorial guidance.
Prereq: MUSIC 100 and consent of instructor

MUSIC 406 F.W std 0.5
Music Studio
(See MUSIC 266 for course description.)
Prereq: MUSIC 367 and consent of Music Faculty
Studio Fee

MUSIC 467 F.W std 0.5
Music Studio
A continuation of Music Studio. A recital is required.
Prereq: MUSIC 466 and consent of Music Faculty
Studio Fee

MUSIC 490A/B F.W.S. 0.50.5
Senior Honours Seminar
A research seminar required of all honours students. The topics will vary from year to year depending on the interests of the students and instructor(s).

COURSES NOT OFFERED 1986-87
MUSIC 253 Medieval and Renaissance Music
MUSIC 254 Baroque and Classical Music
MUSIC 265 Piano Literature
MUSIC 280 Canadian Music
MUSIC 355 Arnold Schoenberg and his Influence
MUSIC 360/361 Music of the Church
MUSIC 374 Composition Seminar

School of Optometry

Professor, Director of School, Associate Dean of Science for Optometry
J.G. Sivak, LScO (Montreal), MS (Indiana), PhD (Cornell), OU (Pennsylvania College of Optometry), FAAO

Professor, Associate Director
A.P. Cullen, Dip Opt (City University-London), MSc (Saskatchewan), OD (Pennsylvania College of Optometry), PhD (City University-London), FAAO, FBCC, DCLP

Associate Professor, Graduate Officer
R.D. Reauchamp, RA (McMaster), MA, PhD (Brown)
Lecturer, Undergraduate Officer
B.E. Robinson, OD (Waterloo), MPH (Washington), FAAO

Professors
W.K. Adrian, Dip-Ing, Dr-ing (TH (Darmstadt)), Dipling (TH (Karlsruhe))
A.R. Remole, BFA (Manitoba), OD (College of Optometry of Ontario), MS, PhD (Indiana), FAAO
T.D. Williams, OD (College of Optometry of Ontario), MS, PhD (Indiana), FAAO, Recipient of the Distinguished Teacher Award
G.C. Woo, OD (College of Optometry of Ontario), MS, PhD (Indiana), FAAO, FBCC, FVCO, FAAO, DipLV
M.E. Woodruff, OD (College of Optometry of Ontario), PhD (Indiana), FAAO

Associate Professors
M.G. Callander, OD (College of Optometry of Ontario), BSc (George Williams), MSc (Waterloo), FAAO
J.V. Lovasik, BSc (McGill), OD, MSc, PhD (Waterloo), FAAO
D.A. Ranney, BA, MD (Toronto), FRCS (England)

R.D. Sein, BA (Queen's), PhD (Waterloo)

Assistant Professors
M.J. Doughty, BSc (London), MSc, PhD (Warwick)
J.G. Penning, BSc (Oxford), PhD (Astony MBCO)
J.G. Strong, OD (College of Optometry of Ontario), MSc (Waterloo), Chief of Clinics

Assistant Research Professor
M.C. Campbell, BSc (Toronto), MSc (Waterloo), PhD (ANU), NSERC University Research Fellow

Adjunct Faculty
I. Baker, OD (College of Optometry of Ontario), FAAO
E.L. Buchanan, OD (College of Optometry of Ontario)
E.J. Fisher, BA, MA (Toronto), DSc (Pennsylvania College of Optometry), FAAO
P. Foster, OD, MSc (Waterloo)
S. Hoffman, MD, DPH (Toronto)
P.K. Kaiser, BA (Adelphi), MA, PhD (UCLA)
R.G.R. Lawrence, O.C.
W.M. Lyle, OD (College of Optometry of Ontario), MS, PhD (Indiana), FAAO
R.D. Pellow, OD (Waterloo)
W.D. Wright, BSc, DIC, PhD, DSc (Imperial College, London), ARCS

Lecturers
B.P. Chou, BSc (Toronto), OD, MSc (Waterloo), FAAO
M.M. Spafford, OD, MSc (Waterloo)

Clinical Faculty
D.B. Buck, OD (College of Optometry of Ontario), FAAO
K.A. Dumblopton, BSc (Oxford) (UMIST), MBCO
R. Pace, OD (Waterloo), FAAO
A.D. Pottkin, BS (Adelphi), OD (Pennsylvania College of Optometry)
K.M. Robertson, OD (College of Optometry of Ontario), MSc, FAAO

R. Sorbera, OD (Waterloo)
R.C. Trevino, BA (Maryland), OD (Illinois College of Optometry)
R. Wiggins, BS, OD (Indiana), FAAO

Senior Demonstrator
D.J.H. Thompson, BA (Waterloo)

Faculty Members of Optometry holding cross appointments to:
1Biology
2Systems Design Engineering
### Course Descriptions

#### Introduction Note

Students in other disciplines may register for Optometry courses only upon the approval of the Director of the School of Optometry.

#### 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 102 F 3C, 3L 0.5**

#### Anatomy of the Eye and Associated Structures

The gross, microscopic and ultrastructure of ocular tissues. The embryology and comparative anatomy of the eye will be emphasized. The relationship of the eye to the vascular supply of the head and the nervous system will be studied. This course is credited only upon completion of OPTOM 114.

**OPTOM 104 F 3C, 3L 0.5**

#### Geometrical Optics


**OPTOM 116 W 3C, 3L 0.5**

#### Anatomy of the Eye and Associated Structures

A continuation of OPTOM 104.

**OPTOM 114 W 3C, 3L 0.5**

#### General Pathology

Basic disease processes, including inflammation, degeneration, neoplasia; pathologic microbiology and related diseases; immunity and hypersensitivity; disease caused by physical agents; diseases of the organ systems.

**OPTOM 105 F 3C, 3L 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. Neurological mechanisms underlying binocular depth perception, the accommodative response and eye movements.

**OPTOM 242 F 3C, 3L 0.5**

#### Ocular Motility

Lectures and laboratories on clinical techniques for examination of the optical properties of the eye.

**OPTOM 115 W 3C, 3L 0.5**

#### Optical Physics

Ocular motility: Kinematics of eye movements, muscle actions, measurements of eye movements, types of eye movements, innervation systems subserving eye movements, clinical application.

**OPTOM 241 F 3C, 3L 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 109 F 2C, 1T 0.5**

#### Physiological Optics


**OPTOM 111 W 3C, 3L 0.5**

#### Ophthalmic Optics 1

Properties of optical glass and plastic, single vision lenses and prisms, lens combinations. Optics of contact lenses and clinical instruments. Ophthalmic laboratory procedures.

**OPTOM 106**

#### Ophthalmic Optics 2


**OPTOM 245 F 3C 0.5**

#### Ophthalmic Optics 3


**OPTOM 246 F 3C, 3L 0.5**

#### Clinical Optometry

Lectures and laboratories on clinical techniques for examination of the optical properties of the eye.
OPTOM 231 W 3C,3L 0.5
Physiological Optics
Prereq: OPTOM 241

OPTOM 252 W 3C,3L 0.5
Clinical Optometry
Clinical techniques for the examination of the binocular relations of the nonstrabismic patient, with particular emphasis on the study of the relationship between accommodation and convergence. Techniques of photometry, prism vergence tests, relative accommodation tests, retinoscopy, and monocular and binocular corneal cylinder tests.
Prereq: OPTOM 241/242

OPTOM 254 W 2C,2L 0.5
Physiology of the Eye and Ocular Adnexa
The physiology of the smooth muscles of the eye, the extraocular 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 intracocular pressure. The vascular supply of the eye.
Prereq: OPTOM 104

OPTOM 255 W 3C,2L 0.5
Ocular Pathology
A continuation of 245
Prereq: OPTOM 245

OPTOM 256 F 3C,3L 0.5
Physiological Optics

OPTOM 274 W 2C 0.5
Genetics for Optometrists
A brief review of Mendelian genetics, and the molecular basis of modern genetics. Inherited conditions of particular interest, e.g., colour vision, albinism, aniridia, refractive error, retinoblastoma. Genetic counselling, and the detection of carriers.
Prereq: OPTOM 245

OPTOM 342 F 3C,2L 0.5
Clinical Optometry: Case Analysis
Methods of analysing clinical data emphasizing differential diagnosis, scientific control of psycho-physical measurements, prognosis, recommended therapies, and the clinical applications of the visual sciences.
Prereq: OPTOM 252

OPTOM 344 F 2C 0.5
Sensory Physiology
Peripheral and central nervous system pathways. The skin senses, pain and adaptation to pain, especially as they relate to cornea. The vestibular sense and its influence on eye-movements, muscle sensory organs, including those in extra-ocular muscles, audition, olfaction, taste, visceral sensations and the origin of headaches.

OPTOM 346 F 2C,4L 0.5
Optometric Optics 3
The lecture course deals with problems involved in selecting, preparing and fitting ophthalmic materials. Optical, cosmetic and comfort requirements, and patient counselling are considered. Labs provide experience in preparing and fitting materials to patients.
Prereq: OPTOM 116, 246

OPTOM 347 F 3C,2L 0.5
Optometric Specialties: Contact Lenses
A series of lectures and laboratories on the principles and procedures of prescribing and fitting contact lenses.

OPTOM 348A/B F,W 0 Clinic 0.5/0.5
Optometry Clinic
Students are assigned to various areas within the clinic, where, under direct clinical faculty supervision, they participate in the provision of optometric services to clinic patients. In addition to primary care, they are exposed to the provision of contact lens, binocular vision, ocular health and optical services.
Prereq: OPTOM 242, 252

OPTOM 350 W 4C 0.5
Optometrical Jurisprudence and Practice Management

OPTOM 351 W 3C,3L 0.5
Physiological Optics
Prereq: OPTOM 261

OPTOM 352 W 3C,2L 0.5
Clinical Optometry: Strabismus and Orthoptics
Detection and evaluation of sensory and motor characteristics of vision in strabismus. Classifications, diagnosis, prognosis, modes of therapy for strabismus and amblyopia.
Prereq: OPTOM 242, 252, 342

OPTOM 353 W 2C 0.5
Optometric Communication
A series of lectures and role-playing exercises designed to enhance the student's skills in verbal and written communication with patients and other professionals.

OPTOM 355 W 2C,2L 0.5
Optometric Specialties
A. Low Vision. A series of lectures and labs demonstrating the optometric assessment and management of low vision patients. Optical characteristics of various aids will be included (2/3 term).
B. Aniseikonia. The theory, assessment and treatment of aniseikonia is outlined (1/3 term).
Prereq: OPTOM 342

OPTOM 356 W 3 Clinic 1.0
Each student is required to complete 120 hours of clinical practice during the Spring.
Prereq: Successful completion of Year 3

OPTOM 356 F 4C,1L 0.5
Ocular Pharmacology
Principles of drug action on the eye. Drug absorption, distribution and elimination. Action of drugs on nerve transmission. Action of drugs applied topically to the eye and administered systemically on ocular physiology and vision, including wanted and unwanted effects. Application of proprietary preparations to the eye including contact lens products.
Prereq: OPTOM 245, 255
Course Descriptions
Optometry
Peace and Conflict Studies

OPTOM 372 W 2C 0.5
Pediatric Optometry
Special aspects of the management of vision problems of infants and young children.
Prereq: OPTOM 242, 252

OPTOM 440 F 2C 0.5
Optometric Practice Management
A continuation of the practice management section of OPTOM 380.

OPTOM 441 F 3L 0.5
Optometry Research Project
Students with an interest in research may arrange with a professor to undertake a research project of mutual interest.
This course serves as an alternative to PSYCH 367. Contact the course coordinator for details.

OPTOM 442 F 3C 0.5
Advanced Contact Lens Practice
A series of lectures and practical demonstrations of the principles and procedures of advanced contact lens materials and resources, including their physiological implications.
Prereq: OPTOM 347

OPTOM 448A/B F,W 24 Clinic 0.5/0.5
Optometry Clinic
Optometry students are taught how to provide full scope optometric care within a clinical environment. In addition to primary care, students are instructed in the provision of ocular health, electrodiagnostic, binocular vision, contact lens, anisokonia, low vision and optical services to the clinic patient population.
Students also take part in a variety of outreach programs which provide optometric services to special populations including geriatric, preschool and mentally retarded groups. Practical and oral comprehensive examinations in clinical optometry are held in the final examination period of the winter term. These exams may be considered by the Council of the College of Optometrists of Ontario to constitute part of the Ontario licensure requirements.
Prereq: OPTOM 340 A/B, 368

OPTOM 449 F 4C 0.5
Special Populations
A. Visual Aspects of Learning Difficulties. The aspects of visual problems related to learning difficulty including tests and measurements taken by optometrists. The role of the optometrist in conjunction with the parents, teachers, and psychologists in assisting children to achieve is discussed.
B. Elderly or Mentally Retarded Populations. The optometrical management of problems of the elderly, and of mentally retarded individuals. The effect of aging on the visual system. Special vision problems associated with mental retardation.
Prereq: OPTOM 342, 352; PSYCH 101

OPTOM 459 W 4C 0.5
Environmental Vision
Aspects of prevention of accidents and injury to the visual system. The production of efficient and comfortable vision at work and recreation.

OPTOM 488 F Clinic 0.0
Vision Care Projects
Between the third and fourth professional years, students will be required to participate in vision care projects of varying durations. These will be arranged by faculty.
Prereq: Successful completion of OPTOM 340, 368

OPTOM 490 F 2S 0.5
Senior Seminar
An opportunity for discussion of clinical cases, new techniques and instruments. Presentations by students, visiting lecturers and faculty.

OPTOM 490 W 2S 0.5
Senior Seminar
A continuation of OPTOM 480.

OPTOM 499A-F W,S
Comprehensive Examinations
Written comprehensive examinations in Anatomy and Physiology, Pathology and Pharmacology, Physiological Optics, Ophthalmic Optics, and Optometry are held in the final exam period of the winter term, fourth professional year.
Graduation in Optometry is contingent upon the successful completion of these examinations which may be considered by the Council of the College of Optometrists of Ontario to constitute part of the Ontario licensure requirements.
Prereq: Successful completion of all previous Optometry courses

Peace and Conflict Studies

Assistant Professor, Director of the Program
C.A. Snyder, BA (Waterloo), MA, PhD (McMaster), G
Lecturer, Undergraduate Officer
T.R. Yoder Neufeld, BA (Manitoba), MDiv (Harvard) G

Members of the Peace and Conflict Studies Faculty Group:

Professors
K. Westhues, BA (Conception), MA, PhD (Vanderbilt)

Associate Professors
C.C. Brunk, BA (Wheaton), MA, PhD (Northwestern) G
J.G. Holmes, BA, MA (Carleton), PhD (North Carolina)
S. Kumar, BSc, MSc (Punjab), MA, PhD (Toronto)
M.F. McDonald, BA (Toronto), MA, PhD (Pittsburgh)
R.J. Sawatsky, BA (Bethel), MA (Minnesota), PhD (Princeton) G
J.C. Stubbs, BA (Toronto), MSc Econ (London), DPhil (Oxford)
A.F. Thomson, BA (Toronto), BTh (Huron), MA (Western Ontario), STM, PhD (McGill)
Assistant Professors
W.B. Moul, BA, MA, PhD (British Columbia)
M. Smyth, BA (Toronto), MA, PhD (York) R
C.A. Snyder, BA (Waterloo), MA, PhD (McMaster), G

Research Associate, Institute of Peace and Conflict Studies
E.E. Riegert, BA (Waterloo), Funded by Project Roughtshores G

Members of the Peace and Conflict Studies Faculty Group:
Course Descriptions

A) CORE COURSES

PACS 201 F 2C.1D 0.5

Hosts of Conflict and Violence
An examination of the influential theories of the nature and roots of human conflict on both the interpersonal and intergroup level. Contributions of the behavioural and social sciences, as well as the humanities, will be explored.

PACS 202 W 2C.1D 0.5

Conflict Resolution
Special emphasis on the means of conflict resolution or management. Included are critical assessments of negotiation, arbitration, confrontation, litigation, violence and nonviolent resistance, and other models of conflict resolution.

PACS 301A-F F 3S 0.5

Special Topics in Peace and Conflict Studies 1
A seminar course investigating special issues related to peace and conflict. The content of this and PACS 302 will vary from year to year as specialists in various aspects of these issues are invited to teach the courses.

PACS 302A-F W 3S 0.5

Special Topics in Peace and Conflict Studies 2
(Same as 301, above)

PACS 498 F T 0.5

Senior Honours Seminar 1
Each Honours student will work on a research paper and will meet regularly with other students working on similar projects to discuss and evaluate their own work.

PACS 499 W T 0.5

Senior Honours Seminar 2
Continuation of PACS 498.

PACS 250 F 3S 0.5

The Nuclear Crisis
A team-taught analysis of the characteristics, capabilities and environmental implications of nuclear weapons; of historical and contemporary origins of the arms race and disarmament efforts; and of psychological and philosophical issues related to the arms race, deterrence and disarmament.

PACS 271 F 3S 0.5

Introduction to Peace Research 1
A study of current research in the developing field of "peace research" including studies of personality and aggression, international tension, causes and predictability of war, United Nations voting patterns, disarmament studies and peace activism.

PACS 272 W 3S 0.5

Introduction to Peace Research 2
A continuation of PACS 271, above.

PACS 398/399 R 0.5/0.5

Directed Readings in Peace and Conflict Studies
Students may arrange independent studies in the area of peace and conflict studies on problems of special interest. Students may also register under these numbers in order to repeat PACS 301 and/or 302.

B) INTERDISCIPLINARY PACS COURSES

PACS 230 F 3S 0.5

The Politics of Nonviolence
An examination of the possibilities of a nonviolent approach to resolving human conflict with special emphasis on the nature and uses of power, the nature of the nation state and the problem of relating a personal ideal to the realities of communal life.

Personnel and Administrative Studies

Associate Professor, Course Director and Undergraduate Advisor
E.S. Lucy BA (Hobart)

Course Descriptions

PAS 200 F 1L.2T 0.5

Basic Personnel Administration
Examines the management environment in which personnel administration takes place. Includes some of the organizational theories and motivational theories upon which personnel administration is based. Students have the opportunity to develop operational skills in the basic technical areas of personnel administration, and to examine the organizational development responsibilities often assigned to Personnel Departments.

PAS 300 W 3S 0.5

Concepts and Issues in Personnel Administration
Offers students an opportunity to converse, in a seminar setting, with people who have achieved a senior leadership role in the fields of personnel, management, government, labour relations, and organizational change. Each seminar will address a major conceptual, social or policy issue in the broad field of employee relations.

Prerequisite: PAS 200 or permission of the instructor.
Department of Philosophy

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes

1. Students must consult the Department before preregistering in upper-year courses. Final details of the courses which will actually be offered in the next academic year, including special subject courses, are available at preregistration time.

2. Any two term courses in philosophy can be used to satisfy the Group A(i) requirements.

3. Courses suffixed with "J" are administered by St. Jerome's College.

PHIL 100J F,W,S 3C 0.5
Introduction to Philosophy
A broad selection of the main problems in philosophy will be considered. For example: How can we know whether anything is right or wrong? How can we know about things we cannot directly observe? Can we know whether there is a God? Is mind in any sense distinct from matter?

PHIL 101X F,W,S 3C 0.5
Introduction to Philosophy
A general introduction, designed to provide the student with an understanding of the major problems of classical and contemporary philosophy.

PHIL 102A F,W 3C 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 102B F,W 3C 0.5
Introduction to Social and Political Philosophy
An introduction to basic concepts and principles in classic and contemporary social and political philosophy. Differing views on basic questions are examined, with applications to such issues as capital punishment, welfare provisions, taxation, natural resource ownership, and terrorism.

PHIL 102C F,W 3C 0.5
Philosophy of Life
"Was am I?" "What can I hope for after death?" "How can I tell what to do?" "What can I know?" are questions that have led many to philosophize. The course will examine what lifestyles and attitudes major philosophers, stoics, skeptics, pleasure-seekers, mystics, pragmatists, etc. have promoted, and why.

PHIL 120J F 3C 0.5
Philosophy of Life and Death
A study of what some of the great philosophers have said about the meaning of life and death and the transition from life to death. Students are urged to raise questions and help direct discussion.

PHIL 130J W 3C 0.5
Philosophy of Discontent
A study of what some of the great philosophers have said about the causes of discontent. Social disobedience and the extent to which ethical principles can be altered to accommodate changing conditions are possible topics for discussion.

PHIL 140 F,W,S 3C 0.5
Introduction to Formal Logic
Elementary sentence and predicate logic. Translation from English into formalism, decision methods and deductions. This course is a preparation for courses in the foundations of mathematics, scientific methods, and more advanced logic courses.

PHIL 145 F,W,S 3C 0.5
Critical Thinking
An analysis of basic types of reasoning, structure of arguments, critical assessment of information, common fallacies, problems of clarity and meaning.

PHIL 200A/B
Great Works of Western Philosophy
An examination of some of the greatest writings in Western Philosophy. Students will be encouraged to come to a critical appreciation of such masterworks as Plato's Republic, Descartes' Discourse on Method, Hobbes' Leviathan, Hume's Enquiry, Kant's Prolegomena, Nietzsche's Zarathustra, and an outstanding work in contemporary philosophy.

PHIL 200A F,S 3C 0.5
Great Works of Western Philosophy: Part 1
Outstanding works from the ancient and medieval periods.
This course critically examines how
operates by purpose or chance.
account for change, whether there is
more than one cause, whether nature
accounts of the natural world. Problems
include whether matter alone can
exist, whether there is
more than one cause, whether nature
operates by purpose or chance.

Either PHIL 200A or PHIL 200B may be
taken separately.

PHIL 200J F 3C 0.5
Intentional Logic
An introduction to the understanding of
how words are used, the formation of
propositions, the construction of arguments and the examination of fallacies
to help the student argue with order,
fact and without error.

PHIL 201 3C 0.5
Love
A philosophical analysis of different
forms and functions of love. Among the
topics to be considered: love and sexuality, religious love, love and knowledge.
Classical and contemporary sources will be
studied.

PHIL 202F W 3C 0.5
Philosophy of Women
A study of some philosophical issues concerning women; the sexes, gender, and androgyny; the position of women in the work force, public life and family; marriage and its alternatives; sexuality, childbearing.

PHIL 203 3C 0.5
Philosophical Perspectives on Death
This course critically examines how philosophers from the pre-Socratics to Wittgenstein have analyzed the concept of death. The course is also concerned with topics like the concept of a person, personal identity, and survival after death.

PHIL 205 3C 0.5
Science, Technology and Society
Alternative philosophical perspectives on problems raised by scientific and technological developments including moral issues (e.g. privacy and data-gathering, "clean" vs. "dirty" energy). Also an examination of the nature and scope of scientific and technical knowledge as it bears on the responsibilities of scientists and engineers.

PHIL 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 210 F 3C 0.5
Philosophy in Literature
Philosophical themes (such as alienation, freedom and responsibility) will be
explored through appropriate literary works (for example, works by Aeschylus, Dostoevsky, Kafka, and Twain).

PHIL 210J 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 210F W 3C 0.5
Professional and Business Ethics
Study of ethical and moral issues that typically arise in professional and business activity. What responsibilities to society at large do people in such business and professional activities as teaching, engineering, planning, architecture and accounting have? How far should professional autonomy extend?

PHIL 216 W 3C 0.5
Rational Behaviour and Decision-Making
An elementary introduction to the subject of 'rational' behaviour and decision-making for individuals and groups. Emphasis is on the definition and measurement of utility functions and various criteria employed in models of decision-making. This course is intended to help those whose work will involve them in making decisions in either the public or private sectors.

PHIL 218F 3C 0.5
Ethical Theory
A normative approach, employing several of the classic Western traditions of rational thought, to general ethics. The various schools of ethical thought will be discussed.

PHIL 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.

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 I
This course is intended to be both a
history of and an introduction to moral philosophy. Views on the foundations of ethics of the great philosophers from classical antiquity to about 1900 are systematically examined. Writers studied include: Plato, Aristotle, Aquinas, Kant, Mill and Nietzsche.

PHIL 224 W 3C 0.5
Mankind and Nature
A philosophical study of the relationship between mankind and nature; historical and current philosophies of the natural world, including the place and responsibilities of human beings; problems of ecological imbalance and collapse.

PHIL 225 3C 0.5
Social and Political Philosophy: Canadian Problems
Basic ideological perspectives—conservative, socialist, and liberal—and Canadian problems such as native rights, nationalism, separatism, and regionalism are philosophically presented and assessed.

Preferre: PHIL 102B or consent of the instructor

PHIL 226 F 3C 0.5
Ethics and the Life Sciences
An investigation of some critical ethical issues in human research and therapy. Includes discussions of the right to life and the right to die, behaviour control (e.g. psychosurgery, behaviour modification and psychotherapy), human experimentation (including "informed consent" and fetal research) and genetic engineering.

PHIL 226 F 3C 0.5
Magic, Mysticism, and the Occult
A critical philosophical discussion of reports of several kinds of extraordinary experiences, such as magic, extrasensory perception, mysticism, and divination will lead us to discussion of such concepts as insanity, irrationality, the supernatural, and the miraculous.

PHIL 227 3C 0.5
Introduction to the Philosophy of Religion
A critical discussion of basic religious concepts. Among the topics covered will be faith, miracles, religious experience, immortality, and arguments for the existence of God.
PHIL 241 F.W 3C 0.5
Intermediate Logic
Axiom systems of logic are developed and compared with natural deduction procedures. Then certain properties of these logical systems, such as consistency, completeness and compactness, will be investigated.
Prereq: PHIL 140 or consent of the instructor.

PHIL 242 W 3C 0.5
Extensions and Applications of Elementary Logic
The classical logic introduced in PHIL 140 will be extended to form systems of modal logic, including logics of obligation, belief and knowledge, necessity, and temporal order. Essentialism, future contingencies, proofs for the existence of God will be discussed.
Prereq: PHIL 140 or consent of the instructor.

PHIL 243 C 0.5
Conflict, Contract and Choice
Basic concepts of game and decision theory are introduced and applied to ethical theory and problems in social philosophy.
Prereq: PHIL 140, 145 or consent of instructor.

PHIL 258 F.J 3C 0.5
Introduction to the Philosophy of Science
A discussion of the fundamental concepts on which science is based. Consideration is given to such topics as scientific theories, the nature of lawlikeness, the grounds for scientific confirmation, and the debate between rationalism and empiricism in science.

PHIL 260J A 0.5
Issues in Higher Education
Why go to university? What are the present realities in Canada? What is the role of the liberal arts? The primary interest will be upon what can be done in practice rather than upon ideal schemes.

PHIL 265 F.J 3C 0.5
The Existentialist Experience
An introduction to the existentialist view of man using both literary and philosophical texts from such authors as Kierkegaard, Unamuno, Nietzsche, Ortega y Gasset, Camus, Sartre, Heidegger and others.

PHIL 300X F 3C 0.5
Sources of Twentieth-Century Thought
An examination of major writings that have shaped present-day consciousness. Works by such thinkers as Marx, Darwin, Freud, Nietzsche and Mill will be included.

PHIL 301J W 3C 0.5
The Western Philosophical Tradition (1600 to present)
Descartes to Existentialism.
Prereq: Second year standing

PHIL 302 3C 0.5
Modern Feminism
An examination of contemporary feminist thought, de Beauvoir through to the present. Positions taken on various issues will be compared and critically assessed.
Prereq: Second year standing or PHIL 202

PHIL 311 F 3C 0.5
Philosophy of Education 1
A philosophical analysis of classical and contemporary theories of education, with a view to formulating a clear workable concept of education, its aims and methods.
Prereq: At least second year standing or consent of instructor

PHIL 312 W 3C 0.5
Philosophy of Education 2
An introduction to current work in the field. Issues to be considered may include: the desirability and content of a core curriculum, methods of moral development, the problem of indoctrination, gender and education, computers and education, and peace education.

PHIL 315 W 3C 0.5
Ethics and the Engineering Profession
An analysis from the standpoint of philosophical ethics of moral issues arising in professional engineering practice. Issues include the social responsibility of engineers, conflict of interest and obligation, morally acceptable levels of risk, and moral implications of technology. Cross-listed as GEN E 412

PHIL 322 W 3C 0.5
Contemporary Ethical Theory
Continues the history and discussion of ethics begun in PHIL 221 with writings from 1900 to the present. Theories such as intuitionism, emotivism, utilitarianism, and relativism are examined via the writings of such people as Moore, Hare and Warnock.
Prereq: PHIL 221 recommended

PHIL 327A 3C 0.5
Philosophy of Law: Part 1
An investigation of alternative views of law and legal reasoning forms the core of this course. Law's relations to morality, social practice, and politics are considered. Authors to be studied include Aquinas, Kant, Austin and Hart.
This is a required course for the Legal Studies Option.

PHIL 327B 3C 0.5
Philosophy of Law: Part 2
An examination of areas within the law in which philosophical problems and methods are featured prominently. Topics such as liberty, responsibility and liability, punishment, rights and possessions are considered.
Prereq: PHIL 327A or consent of the instructor

PHIL 329 W 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 102B or 322 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: Two term courses in Philosophy or consent of instructor

PHIL 350 3C 0.5
Epistemology 1
An examination of such problems as meaning criteria, primary data, and the importance of certainty to knowledge.
Prereq. Two term courses in philosophy

PHIL 351 3C 0.5
Epistemology 2
An examination of the problem of defining knowledge, of naturalized epistemology, and of such problems as a priori knowledge and the existence of other minds.
Prereq: Two term courses in philosophy
PHIL 359 W 3C 0.5
**Philosophy of the Formal Sciences**
A study of philosophical problems concerning mathematics. Topics discussed include formalism, intuitionism, logicism, the mathematical paradoxes, and other topics in foundations and metamathematics.
Prereq: At least second year standing or consent of instructor

PHIL 362 W 3C 0.5
**Philosophy of the Social Sciences**
Problems about the fundamental methods and aims of the social sciences generally, and problems specific to Psychology, Sociology, Political Science, etc., and their relations to one another will be considered.
Cross-listed as SOC 371.

PHIL 365 J F 3C 0.5
**History of Modern Philosophy 1**
From the beginnings to Plato.
Prereq: One term course in Philosophy or consent of instructor
Cross-listed as C CIV 361.

PHIL 366 W 3C 0.5
**History of Modern Philosophy 2**
Later period including Hume and Kant.
Prereq: One term course in Philosophy or consent of instructor

PHIL 367 W 3C 0.5
**18th Century Philosophy**
The 18th century Philosophers covered may include Hegel, Mill, Schopenhauer, James and Kierkegaard.
Prereq: One term course in Philosophy or consent of instructor

PHIL 367 W 3C 0.5
**20th Century Philosophy**
A study of major themes of 20th century philosophy through representative works of Russell, Moore, Carnap, Wittgenstein, Husserl and others.
Prereq: One term course in Philosophy or consent of instructor

PHIL 368 F 3C 0.5
**The Thomistic Tradition in Philosophy**
An examination of the work of Thomas Aquinas, his philosophical relation to his time, and the revival of Thomism in the modern era.
Prereq: Two term courses in Philosophy and third year standing, or consent of instructor

PHIL 371 J F W 0.5 each (242, 441, 442, 443, 444)
**Studies in Ethics**
Special topics in ethics, as announced by the Department.
Prereq: One term course or consent of instructor

PHIL 375 J F 3C 0.5
**Political Philosophy 1**
Philosophical analysis of central concepts in political theory and its relation to moral and metaphysical problems of various periods.
Prereq: At least one term course in ethics

PHIL 400 F 3C 0.5
**Logical Theory**
A rigorous and general development of the propositional and predicate calculus within which alternative calculi are examined. Study of such concepts as completeness, consistency, extensionality, and modality from both formal and philosophical points of view. Intended primarily for those interested in philosophical issues connected with logic.
Prereq: At least one term course in formal logic, or consent of instructor

PHIL 400 A/B
**Logic**
The second part of PHIL 440.
Prereq: At least one of: PHIL 241, 242, 440A, 440B, P MATH 430A

PHIL 405 W 3C 0.5
**Being and Existence**
An advanced course for the serious student, delving into the notions of reality, being, essence, existence, analogy, etc. The techniques of linguistic analysis will be employed. Also, the very possibility of any kind of metaphysics will be discussed.
Prereq: Third year standing or consent of instructor

PHIL 415 3C 0.5
**Metaphysics 1: Ontology**
Studies in the nature of being, with special emphasis on material objects and their properties, and on causation.
Prereq: Consent of instructor

PHIL 416 3C 0.5
**Metaphysics 2: Cosmology**
Metaphysical problems in the areas of space, time and motion.
Prereq: Consent of instructor

PHIL 420 3C 0.5
**Philosophy of Language**
Issues in the philosophy of language, such as synonymy, propositions, meaning, semantics, reference.
Prereq: At least two term courses in philosophy or consent of instructor
PHIL 464 3C 0.5
Philosophy as Linguistic Analysis
A consideration of ordinary language analysis as a method for solving philosophical problems, and a comparison of it with structural linguistics.
Prereq: At least two term courses in philosophy or consent of instructor

PHIL 465 3C 0.5
Existential Philosophy
An in-depth study of the thoughts of a major figure such as Kierkegaard, Nietzsche, Heidegger, Sartre, Camus, Marcel, Jaspers, Ortega y Gasset.
Prereq: Consent of instructor

PHIL 470 3C 0.5
Phenomenology
A critical examination of the issues and methods of phenomenology, including the attempts to understand the uses and ramifications of phenomenological methods through the working out of particular analyses. The basic writings of phenomenologists such as Husserl and Merleau-Ponty will be used.
Prereq: Two term courses in philosophy or consent of instructor

PHIL 471-484 3C 0.5
Special Subjects
One or more term courses will be offered at different times, as announced by the Department.
Prereq: Consent of instructor

PHIL 485 W 2C 0.5
Undergraduate Seminar
Advanced study of recent works or selected areas of philosophy. The topic will be announced each year.
Restricted to undergraduates.

PHIL 493J-497J F.W.S 0.5 each
Special Topics/Directed Readings
A series of readings and/or seminars on 1 or 2 topics or thinkers, with periodic reports and discussions.
Prereq: Consent of instructor and permission of College Discipline Coordinator

PHIL 498A/B F.W.S R 0.5
Directed Reading in Special Area
Prereq: Consent of instructor

PHIL 499J F.W.S 0.5
Tutorial and Honours Essay
Students wishing to enrol in 499J should consult the St. Jerome's College Discipline Coordinator.
Prereq: PHIL 499A

COU RSES NOT OFFERED 1986-87

PHIL 204J Philosophy and Culture
PHIL 205J Philosophy of Science
PHIL 206J God and Philosophy
PHIL 237J Ethics and Society
PHIL 246J Issues in Higher Education
PHIL 300J The Western Philosophical Tradition (to 1600)
PHIL 318J Philosophy of the Family
PHIL 333J Contemporary Philosophical Problems in Art

DEPARTMENT OF
PHYSICS

Professor, Chairman of the Department
J. Grindlay, BSc (Glasgow), DPhil (Oxford)

Associate professors
Chairman of the Department
H.M. Morrison, BSc, PhD (Edinburgh)

Professor, Dean of the Faculty of Science
D.E. Bode, BSc, MSc, PhD (McMaster)

Professor, Graduate Officer
I.R. Dagg, BSc (Manitoba), MS (Pennsylvania State), PhD (Toronto)

Associate Professor, Graduate Officer
J.K. Brandon, BSc, PhD (McMaster), MA (Cambridge)

Professor, Undergraduate Officer
J.A. Cowan, DSc (Manitoba), MA, PhD (Toronto)

Associate Professor, Undergraduate Officer
K.A. Woolner, BSc (London)

Professors
A. Anderson, MA, DPhil (Oxford)
R.A. Aziz, BA, MA, PhD (Toronto)
G.A. Bakos, MA (Bratislava), MA, PhD (Toronto)
F.W. Boswell, BA, MA, PhD (Toronto)
S.G. Davison, PhD, DSc (Manchester)
M.P. Fitzgerald, BSc, MSc (Toronto)
PhD (Case)

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J. Knowles, BSc (Waterloo), PhD (Western Ontario)
J.W. Leech, BS, PhD (London), FirstP
J.D. Leslie, BSc, PhD (Toronto), MS, PhD (Illinois)
R.A. Moore, BSc, MSc (McMaster), PhD (Alberta)
A.D.S. Nagi, BA, BSc, MSc, PhD (Panjab), PhD (Delhi)
J.L. Orci, BSc, PhD (Toronto), MS, PhD (Iowa)
R.K. Pathria, BSc, MSc (Panjab), PhD (Delhi), Recipient of the Distinguished Teacher Award
H.T. Smith, BSc, PhD (London)
M.M. Pintar,6 BSc, MSc, PhD (Lubliana)
L.W. Reeves,6 BSc, PhD, DSc (Bristol), FRSC, RSC
G. Scelles,4 BSc, PhD (Geneva)
R.A. Snyder, BSc, PhD (Western Ontario)
S.F. Wang, DSc (Nagoya)

Associate Professors
J.M. Corbett, BSc (Toronto), MSc, PhD (Waterloo)
A.E. Dixon, BSc (Mt. Allison), MSc (Dalhousie), PhD (McMaster)
P.C. Eastman, BSc, MSc (McMaster), PhD (British Columbia)
H.K. Ellenton, BSc (Western Ontario), MA (Toronto)
D. Hemming, BSc, MSc (Bristol)
J.R. Lepock,1 BS, MS (W. Virginia), PhD (Pennsylvania State)
S.P. Lipshitz,4 BSc (Natal), MSc (South Africa), PhD (Witwatersrand)
B.H. Torrie, BSc (Toronto, PhD (McMaster)
J. Vanderkooy, BEng, MSc (McMaster)
P.S. Wesson, BSc (London), PhD (Cambridge), FRAS

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Research Assistant Professor
J.W. Hepburn,6 BSc (Waterloo), PhD (Toronto), NSERC University Research Fellow

Adjunct Faculty
J.A. Blackburn, BSc (Manitoba), MSc, PhD (Waterloo)
W.E. Harris, BSc, MBA, MSc, PhD (Toronto)
C.G. Lim, BA (DePaul), MA (Nebraska), PhD (Toronto)
J. Lit, BSc, DipEd (Hong Kong), DC (Laval)
C.J. Moore, BSc, MSc, PhD (Waterloo)

1. Associate Professor, Undergraduate Officer
2. Associate Professor, Graduate Officer
3. Associate Professor, Department of Physics
4. Assistant Professor, Department of Physics
5. Associate Professor, Department of Physics
6. Associate Professor, Department of Physics
7. Associate Professor, Department of Physics
8. Associate Professor, Department of Physics
9. Associate Professor, Department of Physics
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<td>PHYS 222 F</td>
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**Electrical Science**

- Basic electricity, magnetism and electronics. An introduction to the physical principles required for an understanding of the electrical instruments used in Kinesiology.
  - **Prereq:** PHYS 103
  - **Lab alternate weeks, optional tutorial.**

**Physics for the Life Sciences 1**

- An introduction to physics for students intending to concentrate their future studies in the physical sciences, optometry or mathematics; includes particle kinematics and dynamics, conservation of energy and linear momentum, rotational kinematics and dynamics, and conservation of angular momentum.
  - **Prereq:** Ontario Grade 13 Mathematics; Functions and Relations, and Calculus: Ontario Grade 13 Physics recommended.

**Physics for the Life Sciences 2**

- A continuation of PHYS 111; includes wave motion, normal modes of vibration, sound, hearing, temperature, heat, kinetic theory of gases, thermodynamics, electrostatic force and potential, electric current and power, DC circuits, magnetic fields and induction.
  - **Prereq:** PHYS 111

**Physics for the Life Sciences 2 Laboratory**

- For students taking PHYS 112.
  - **Lab alternate weeks.**

**Mechanics for Engineers**

- Oscillations; simple harmonic motion. Wave motion, travelling and standing waves; transverse and longitudinal waves, including sound. Geometrical optics; reflection and refraction. Physical optics, interference and diffraction. Quantum physics; quantization of radiation; hydrogen atom.
  - **Prereq:** PHYS 115

**Electricity and Magnetism 1**

- Coulomb's law, electric field, Gauss's law, potential, capacitance, properties of dielectrics, current, resistance, electromotive force, DC circuits and instruments.
  - **Prereq:** First year physics and calculus.

**Note:** Courses not offered in the current academic year are listed at the end of this section.
PHYS 223 W 0.5
Electricity and Magnetism II
Magnetic fields, induced electromotive forces, magnetic properties of matter, alternating currents, electromagnetic waves.
Prereq: PHYS 222
Not for Honours Physics students
Offered by Correspondence only in 1986-87

PHYS 226 F 2C, 1T 0.5
Geometrical Optics
Reflection and refraction at plane and curved surfaces, thin and thick lenses, optical instruments.
Prereq: First year physics and calculus
Not for Honours Physics students
Physics Majors must take PHYS 226L with this course.

PHYS 226L F 3L 0.25
Geometrical Optics Laboratory
For students taking PHYS 226.
Lab alternate weeks.

PHYS 246 W 3C, 1T 0.5
Physical Optics
Prereq: First year physics and calculus.
Coreq: PHYS 246L

PHYS 246L F 3S 3C 0.5
Introduction to Waves and Diffraction
Prereq: First year physics
Antireq: PHYS 245, PHYS 256, PHYS 259
For students in Honours Chemistry, Regular and Co-operative Applied

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 physics and calculus
Antireq: PHYS 275
Offered by Correspondence only in 1986-87

PHYS 251 F 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 physics and calculus
Offered by Correspondence only in 1986-87

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, induction, magnetization, Maxwell’s equations, electromagnetic waves. Forms a basis for the understanding of most of today’s electronic and electrical technology.
Prereq: First year physics and calculus, MATH 216
Physics majors must take 253L with this course.
Recommended for students in Honours programs.

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, elasticity.
Prereq: First year physics and calculus
Recommended for students in Honours programs.

PHYS 256 F 3C 0.5
Geometrical and Physical Optics
Prereq: First year physics and calculus
Physics majors must take 256L with this course.
Recommended for students in Honours programs.

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 263 W 3L 0.25
Classical Mechanics and Special Relativity
Newtonian dynamics and particles and systems of particles; Lagrangian dynamics and generalized coordinates, the Lorentz transformation and relativistic dynamics.
Prereq: First year physics, calculus and differential equations

PHYS 270 F 3L 0.25
Laboratory
Further experiments in optics and properties of matter, for students taking PHYS 256.
Lab alternate weeks.
PHYS 365 W 3C 0.5  
**Mathematical Physics 2**


**Prereq:** MATH 213A/B and 216

Primarily intended for Honours Physics students.

PHYS 366 F 2C 0.5  
**Geophysics 1**


**Prereq:** First year physics and calculus

Cross-listed as EARTH 366.

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. Corals effects. Some idealized current regimes.

**Prereq:** First year physics and calculus

Cross-listed as EARTH 369.

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 371C W 3L 0.25  
**Intermediate Laboratory**

Microprocessor Interface Course. A project laboratory course in which the student will interface some common microcomputers (e.g. PET, VIC20, Apple) to a variety of parallel and serial devices (e.g. terminal, D.V.M.).

**Prereq:** PHYS 353

PHYS 375 W 3C 0.5  
**Astrophysics 2 - Stellar Astronomy**

Stellar spectra, spectral classification. Observational techniques, motions of stars, properties of stars, stellar distances, open clusters, globular clusters, stellar populations, gas, dust, the galactic plane, the galactic halo, galactic rotation. Statistical methods. Stellar evolution.

**Prereq:** PHYS 275 or consent of instructor

The content and level of the core material of PHYS 375 will remain the same. Additional material will change from year to year to keep students abreast of current developments in the subject.

PHYS 380 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 433A/B 6L 0.50.5  
**Experimental Research Project**

An experimental research project. This course is designed for students in the Honours Physics program and in the Co-operative Applied Physics program.

**Prereq:** Either PHYS 433 or PHYS 437.

Although students in the Co-operative Applied Physics (Hons) program are encouraged to take 1 of these courses, enrolment may be limited.

PHYS 437A 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.

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 437A F 3C 0.5  
**Introductory Quantum Mechanics**


**Prereq:** PHYS 354, 364, and 360

PHYS 437F C 3C 0.5  
**Solid State Physics**

Introductory concepts in crystal diffraction and the reciprocal lattice. Crystal bonding. Lattice vibrations, thermal properties of insulators, free-electron theory of metals, band theory. Semiconductors.

**Prereq:** Completion of Year 3 Honours Physics

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 program must take either PHYS 437A or PHYS 433.

Although students in the Co-operative Applied Physics (Hons) program are encouraged to take 1 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.

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 441A/B 3C 0.5/0.5
Electromagnetic Theory
A generalized treatment of the basic laws of electricity and magnetism, mathematical techniques for the problems of electrodynamics, solution of Maxwell's equations in free space and the study of plan waves, theory of waveguides and introduction to radiation.
Prereq: PHYS 253, PHYS 264-265
No credit or grade is given for the first term course unless the two term sequence, PHYS 441A/B, is completed.

PHYS 442 W 3C 0.5
Structure of Solids
Prereq: PHYS 345

PHYS 443 W 3C 0.5
Continuum Mechanics
Prereq: PHYS 364-365

PHYS 444 W 3C 0.5
Nuclear and Particle Physics
Prereq: PHYS 455, and PHYS 434

PHYS 445 F 3C 0.5
Modern Optics
Prereq: PHYS 256 and PHYS 354

PHYS 453 W 3C 0.5
Advanced Analogue Electronics
A variety of topics in the operation of systems, Transistors, modern circuit techniques, noise, stability under feedback, introduction to theory, and possible student motivated topics. Includes laboratory demonstrations.
Prereq: PHYS 363/363

PHYS 454 W 3C 0.5
Quantum Mechanics
Prereq: PHYS 434
PHYS 454 is strongly recommended for students intending to do graduate work.

PHYS 455 F 3C 0.5
Nuclear and Particle Physics
Nuclear structure, interactions of nuclear radiations with matter, radioactive decay, nuclear reactions, nuclear force, elementary particles.
Prereq: PHYS 354

PHYS 464 F 3C 0.5
Mathematical Physics 3
Applications to Physics of the theory of functions of a complex variable.
Prereq: PHYS 364/365

PHYS 465 W 3C 0.5
Mathematical Physics 4
Theory and applications of integral transforms, integral equations and Green's functions. Asymptotic analysis.
Prereq: PHYS 464

PHYS 475 F 3C 0.5
Astrophysics 3 - Extragalactic Astronomy
Ordinary galaxies, dynamics of galaxies, galactic haloes and disks, evolution of galaxies, peculiar galaxies, active galaxies, interacting galaxies, quasars, the Local Group, clusters of galaxies, observational cosmology, theoretical cosmology, the origin of the Universe.
Prereq: PHYS 375 or consent of instructor
The content and level of the core material of PHYS 475 will remain the same. Additional material will change from year to year to keep students abreast of current developments in the subject.
School of Urban and Regional Planning

Professor, Director
L.O. Gertler, BA (Queen’s), MA (Toronto), FCIP

Associate Professor, Associate Director,
L.H.G. Martin, BA (Queen’s), MA, MHP, PhD (Syracuse), MCP

Associate Professor, Associate Dean,
R.T. Newkirk, BSc, MSc, PhD (Western Ontario)

Professor, Graduate Officer
G.G. Gertler, BLA (Guelph), MSc (Bonn), PhD (Dehli)

Assistant Professor, Undergraduate Officer
M.E. Haight, BSc, MSc, PhD (McMaster)

Professors
H.S. Cobenzl, BA (Hons. (Durham), MRP (North Carolina), FRTRI, AICP, FGS, MES
R.S. Domey, BSc, MSc, PhD (Wisconsin), MCP
K. Izhiz, BArch (Manitoba), MCP (Massachusetts Institute of Technology), ARC, FRAIC, CMAOP
R.R. Krueger, BA, MA (Western Ontario), PhD (Indiana)
H.P. Nash, BA, MA (California-Los Angeles), CE (Grenoble), MPA, MPA, PhD (Harvard), AICP, MCP
J.G. Nelson, BA (McMaster), MA (Colorado), PhD (Johns Hopkins)
L.H. Russwurm, BA, MA (Western Ontario), PhD (Illinois)
J.R. Thibeau, BScA (Guelph), MSc (Toronto), PhD (British Columbia)
D.F. Walker, BSc (London), MA, PhD (Toronto)
S.M. Weaver, BA, MA, PhD (Toronto)

Associate Professors
S. Herzog, BArch (Toronto), MRAIC
J.T. Horton, BA (Wheaton), MA (Northwestern)
N.E.P. Pressman, BArch (McGill), MArch, Urb des (Cornell), Cert USP (Manchester), MCP, AICP, AIJ
G.B. Priddle, BA (Western Ontario), MA, PhD (Clark)
S.G. Rich, MCP, MRAIC, ARIBA, AICP
J.B. Robinson, BA (Toronto), MES (York), PhD (Toronto)
W.I. Shalinsky, BA, BSW (McGill), MSc, DSW (Western Reserve)
R.C. Suffling, BSc, Hons (Wales), PhD (Guelph)

Assistant Professors
P. Filion, BA, MA (Leval), PhD (Kent)
J.M. Lazzerovich, BA (Saskatchewan), MA, MCP, PhD (Cincinnati), AICP
B. Moore Moors, BA (McGill), MA (Montreal), PhD (British Columbia)
J.E. Robinson, BSc (Waterloo), MES (York)

Adjunct Faculty
S. Garrod, BA (McMaster), LLB, MES (York)
S.W. Hoffman, BSA, MSA (Toronto), PhD (Waterloo)
J.S. Wolfe, BA (Oxford), MA (Pittsburgh), PhD (McMaster)

Planning Graphics Resource Person
K. Hammond, BIA (Guelph)

Faculty Members holding cross and/or joint appointments to:

\[ \text{Anthropology} \]

\[ \text{Geography} \]

\[ \text{Health Studies} \]

\[ \text{Environmental Studies} \]

Prereq: Planning students only
Estimated additional cost to student: $20

PLAN 100B W 4C, 1D 0.5
Introduction to Urban and Regional Planning Concepts and Techniques 2
Continuation of PLAN 100A.
Prereq: PLAN 100A. Planning students only
Estimated additional cost to student: $20

PLAN 156 F,W 2C, 1D 0.5
Introduction to Urban and Regional Planning Concepts

Course Descriptions
Courses not offered in the current academic year are listed at the end of this section.

PLAN 100A F 4C, 1D 0.5
Introduction to Urban and Regional Planning Concepts and Techniques 1

The development of contemporary planning concepts and principles; the nature, purpose and scope of urban planning, the planning process and decision-making in a democratic society. Methodological aspects of designing a planning program: identification of objectives and constraints, conduct of basic surveys and analyses, plans and policies preparation, evaluation and implementation.

Prereq: Planning students only
Estimated additional cost to student: $20

PLAN 100B W 4C, 1D 0.5
Introduction to Urban and Regional Planning Concepts and Techniques 2
Continuation of PLAN 100A.
Prereq: PLAN 100A. Planning students only
Estimated additional cost to student: $20

PLAN 156 F,W 2C, 1D 0.5
Introduction to Urban and Regional Planning Concepts

Course Descriptions
Courses not offered in the current academic year are listed at the end of this section.

PLAN 100A F 4C, 1D 0.5
Introduction to Urban and Regional Planning Concepts and Techniques 1

The development of contemporary planning concepts and principles; the nature, purpose and scope of urban planning, the planning process and decision-making in a democratic society. Methodological aspects of designing a planning program: identification of objectives and constraints, conduct of basic surveys and analyses, plans and policies preparation, evaluation and implementation.

Prereq: Planning students only
Estimated additional cost to student: $20

PLAN 100B W 4C, 1D 0.5
Introduction to Urban and Regional Planning Concepts and Techniques 2
Continuation of PLAN 100A.
Prereq: PLAN 100A. Planning students only
Estimated additional cost to student: $20

PLAN 156 F,W 2C, 1D 0.5
Introduction to Urban and Regional Planning Concepts

Course Descriptions
Courses not offered in the current academic year are listed at the end of this section.

PLAN 100A F 4C, 1D 0.5
Introduction to Urban and Regional Planning Concepts and Techniques 1

The development of contemporary planning concepts and principles; the nature, purpose and scope of urban planning, the planning process and decision-making in a democratic society. Methodological aspects of designing a planning program: identification of objectives and constraints, conduct of basic surveys and analyses, plans and policies preparation, evaluation and implementation.

Prereq: Planning students only
Estimated additional cost to student: $20

PLAN 100B W 4C, 1D 0.5
Introduction to Urban and Regional Planning Concepts and Techniques 2
Continuation of PLAN 100A.
Prereq: PLAN 100A. Planning students only
Estimated additional cost to student: $20

PLAN 156 F,W 2C, 1D 0.5
Introduction to Urban and Regional Planning Concepts

Course Descriptions
Courses not offered in the current academic year are listed at the end of this section.

PLAN 100A F 4C, 1D 0.5
Introduction to Urban and Regional Planning Concepts and Techniques 1

The development of contemporary planning concepts and principles; the nature, purpose and scope of urban planning, the planning process and decision-making in a democratic society. Methodological aspects of designing a planning program: identification of objectives and constraints, conduct of basic surveys and analyses, plans and policies preparation, evaluation and implementation.

Prereq: Planning students only
Estimated additional cost to student: $20

PLAN 100B W 4C, 1D 0.5
Introduction to Urban and Regional Planning Concepts and Techniques 2
Continuation of PLAN 100A.
Prereq: PLAN 100A. Planning students only
Estimated additional cost to student: $20

PLAN 156 F,W 2C, 1D 0.5
Introduction to Urban and Regional Planning Concepts

Course Descriptions
Courses not offered in the current academic year are listed at the end of this section.

PLAN 100A F 4C, 1D 0.5
Introduction to Urban and Regional Planning Concepts and Techniques 1

The development of contemporary planning concepts and principles; the nature, purpose and scope of urban planning, the planning process and decision-making in a democratic society. Methodological aspects of designing a planning program: identification of objectives and constraints, conduct of basic surveys and analyses, plans and policies preparation, evaluation and implementation.

Prereq: Planning students only
Estimated additional cost to student: $20

PLAN 100B W 4C, 1D 0.5
Introduction to Urban and Regional Planning Concepts and Techniques 2
Continuation of PLAN 100A.
Prereq: PLAN 100A. Planning students only
Estimated additional cost to student: $20

PLAN 156 F,W 2C, 1D 0.5
Introduction to Urban and Regional Planning Concepts

Course Descriptions
Courses not offered in the current academic year are listed at the end of this section.

PLAN 100A F 4C, 1D 0.5
Introduction to Urban and Regional Planning Concepts and Techniques 1

The development of contemporary planning concepts and principles; the nature, purpose and scope of urban planning, the planning process and decision-making in a democratic society. Methodological aspects of designing a planning program: identification of objectives and constraints, conduct of basic surveys and analyses, plans and policies preparation, evaluation and implementation.

Prereq: Planning students only
Estimated additional cost to student: $20

PLAN 100B W 4C, 1D 0.5
Introduction to Urban and Regional Planning Concepts and Techniques 2
Continuation of PLAN 100A.
Prereq: PLAN 100A. Planning students only
Estimated additional cost to student: $20

PLAN 156 F,W 2C, 1D 0.5
Environmental Design 2
Continuation of PLAN 256A.

PLAN 256A F 2C.5 Environmental Design 1
Design concepts in Urban and Regional Planning illustrated by recent work. Individual and group projects in planning design in urban and regional settings, using graphic, model and verbal presentations.

Prereq. Second year Planning or Environmental Studies students with consent of instructor

PLAN 256B W 2C.2wkshp 0.5 Environmental Design 2
Continuation of PLAN 256A.

Prereq. PLAN 256A

PLAN 259 W 2C.2wkshp 0.5 Regional Planning and Development
The relationship of economic planning to regional planning. Theory and practice of regional planning and development to urban control, broad socio-economic, and frontier regions. A series of workshops focus upon the social and economic problems of a particular Canadian region and the role of federal, provincial and local governments in formulating and applying remedial policies in other nations.

Prereq. One of PLAN 100, 156 or consent of instructor

PLAN 270 W 2C.5 Concepts and Ideas in Contemporary Urban Planning
An overview of the modern movements and philosophic roots underlying urban planning and civic design. Philosophies and contributions of those who have significantly influenced modern historical thought. Development of planning trends and ideas in North America and abroad emphasizing relevance to contemporary concerns.

Prereq. Planning students or consent of instructor

PLAN 270A/B/C F,W 3R.5 Readings and Research Planning
Special readings and research on planning topics chosen in consultation with an instructor. This course gives the opportunity for supervised individual reading and study of planning or related topics in which the student is particularly interested.

Prereq. PLAN 100 or consent of instructor

Prior to registering for this course, students must arrange with a faculty member to serve as advisor.

The letter designation allows this course to be taken more than once for credit

Prereq. Second or third year Planning students only

Estimated additional cost to student: $70

PLAN 300B W 6wkshp,2wkstlp 1.0 Seminar/Workshop Project in Urban and Regional Planning I
An integrated approach to the analysis of communities; identification and synthesis of factors related to function, structure, environmental context, regional framework, etc., in the preparation of comprehensive development programs. A major project undertaken in small project groups. Project reports summarizing findings are completed and presented at end of term. Field trip related to theme of problems includes follow-up discussion, assignments and preparation of individual research paper.

Prereq. Third-year Planning students only

PLAN 300A F 4std 0.5 Urban Design
A study of the design of the environment in urban and regional contexts through lectures and studio projects.

Prereq. Planning students or consent of instructor

PLAN 307 F 2C,1D 0.5 Social Survey Techniques in Planning
Social research and the planning process; interview and self-administered surveys; questionnaire design; profile data; data processing; sampling, non-survey data collection techniques; practical applications.

Prereq. Second or third year Planning students with ENV S 277; other ENV S students with consent of instructor

Cross-listed as GEOG 307

Students may receive credit for only one of PLAN 307 and GEOG 307
This course looks at social planning as a
Consultation and Resource
and planning of recreational resources.

PLAN 357 F,W 4C 0.5

Nonparametric Statistics
The theory and application of nonparametric statistics, with particular emphasis upon social science problems.
Prereq: ENS S 277/377 or consent of instructor
Cross-listed as GEOG 319.
Students may receive credit for only one of PLAN 316 and GEOG 316

PLAN 317 W 3C 0.5

Nonparametric Statistics
The theory and application of nonparametric statistics, with particular emphasis upon social science problems.
Prereq: ENS S 277/377 or consent of instructor
Cross-listed as GEOG 319.
Students may receive credit for only one of PLAN 317 and GEOG 317

PLAN 319 F 2C,1L 0.5

Economic and Social Techniques for Regional Planning
Critical appraisal of a selection of descriptive and evaluative regional analysis techniques. Economic considerations of regional development. Reliability and applicability of data: input-output analysis; cost-benefit analysis; planning; programming and budgeting systems; and social area analysis.
Prereq: ECON 101, 102 or consent of instructor
Cross-listed as GEOG 319.
Students may receive credit for only one of PLAN 319 and GEOG 319

PLAN 330 W,S 2C,1S 0.5

Urban Social Planning
This course looks at social planning as a way of attacking urban social problems. Will examine the different types of social planning and the relationship between physical and social planning.
Prereq: SOC 101 or consent of instructor

PLAN 367 F,W 4C 0.5

Conservation and Resource Management
History of the conservation movement; ecological principles of conservation and resource management. Analysis, use and planning of recreational resources.
Prereq: ENV S 200
Cross-listed as GEOG 357.
Estimated additional cost to students: $10.
Students may receive credit for only one of PLAN 357 and GEOG 357

PLAN 360 W 3C 0.5

Technology in Urban and Regional Planning
The influence of transportation, communications, and water and sewage systems on the form, function and development of cities and regions; the application of this knowledge in urban and regional planning.

PLAN 372 W 2C 0.5

Land Development Planning
An examination of planning issues related to the economics and financing of public and private development projects including shopping plazas, residential subdivisions, and new towns. The course focuses on sources of financing, financial programming, effects of planning decisions on land values, and techniques of project evaluation.
Prereq: PLAN 255 or consent of instructor

PLAN 380 S (Oxford) 3C 1.0

Theory and Practice of Planning in the U.K.
Familiarization with the contribution of U.K. theory and practice to Canadian planning. A study of development of U.K. planning from mid-eighteenth century to present with reference to new town and urban redevelopment
Prereq: Third year planning students or consent of instructor. Students register on a Letter of Permission. Additional course fee.

PLAN 414 F 2C 0.5

Issues in Housing
Focus on Canadian housing policies and programs, particularly with regard to the housing of low and moderate income families. Economic, political, physical and social considerations underlying these policies will be examined in detail. Some consideration is given to housing problems and programs in the United States and developing countries.
Prereq: PLAN 255A/B or consent of instructor
Estimated additional cost to student: $20

PLAN 420 W 2C 0.5

Health, Environment, and Planning
A seminar course on the environmental sources and causes of disease and illness, the concepts of health, e.g., medical, scientific, economic, political, etc., the health services and facilities and related technologies and the role and responsibility of urban and regional planners in the creation of a more "healthful" environment.
Prereq: Third and fourth year planning students or consent of instructor

PLAN 430 F 3C 0.5

Social Policy Planning
A systems approach to change and development of change strategies by integrating social goals, plans, policies and programs. Case studies are used to measure the quality and performance of plans, policies and programs.

PLAN 434 W 2S 0.5

Planning with Native Peoples
A seminar course on problems confronting native peoples in Canada with particular emphasis on basic societal conditions and how community planning and development can assist in ameliorating these conditions in a collaborative manner with reference to the development of social policy.

PLAN 435 W 2C,2nd 0.5

Site Planning
A design studio workshop involving site planning projects which integrate design and the natural processes of landscape and climate. Topics will vary.
Prereq: PLAN 256, 357 or consent of instructor

PLAN 454 F 2S 0.5

Professional Practice in Planning
This course is intended for undergraduate planning students in their final year who will be starting professional practice on graduation. The course discusses professional responsibility, administrative tools and methods, office organization and similar topics. Concepts and techniques in other courses will be dealt with from the point of view of the practitioner.
Prereq: fourth-year planning students or consent of instructor

PLAN 456A F 3C 0.5

Political and Administrative Processes in Urban and Regional Planning 1
Political and administrative frameworks for planning and the formulation of urban/regional policy in an intergovernmental setting. Study of the process and substance of planning in relation to politics, administration, policy, decision-making, legislation, plan preparation and implementation in Canada.
Prereq: Fourth-year Planning students or fourth-year Environmental Studies students with consent of instructor

PLAN 456B W 3C 0.5

Political and Administrative Processes in Urban and Regional Planning 2
Continuation of PLAN 456A.
Prereq: PLAN 456A
Department of Political Science

Assistant Professor, Chairman of the Department
T.J. Downey, BA (Waterloo), MA, PhD (Western Ontario)

Associate Professor, Graduate Officer
A.D. Nelson, AB, AM, PhD (Chicago)

Professor, Undergraduate Officer
T.H. Quaker, BA (New Zealand), PhD (London)

Professors

L. Campbell, BA (Carleton), MSc (London) R
A. Kapur, BA (Punjab), MA (George Washington), PhD (Carleton)
J.E. Kersell, MA (Queen’s) PhD (London)
J.M. Wilson, BA, MA (Toronto)

Associate Professors

R.J. Williams, BA, MA (McMaster), PhD (Toronto)

Assistant Professors

G.D. Durl, BA, MA (Waterloo), PhD (York)
A.F. Cooper, BA, MA (Waterloo), DPhil (Oxford)
W.B. Moul, BA, MA, PhD (British Columbia)
R.A. Nutbrown, BA (Bishop’s), MA, PhD (Carleton)
J.A. Teichman, BA, MA, PhD (Toronto)
R.P. Woolstencroft, BA, PhD (Alberta)
D.S. Zwieg, BA, PhD (Michigan)

Adjunct Faculty

G.W. Corby, BA (Wilfrid Laurier), LLB (Western Ontario), LLM (London)
W.W. Johnston, OC, BA (Memorial), LLB (Queen’s)
W.J. Morrison, OC, BA (Western Ontario), LLB (Diploooe)
J.E. Surich, BA, MA (Waterloo)

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Note

Extensive descriptions of the content of Political Science courses are available in the Department at the time of preregistration.

P SCI 101A F 0.5
Introduction to Politics 1

An introduction to the nature of politics and to the conflict of political ideas within the setting of a liberal democracy. The purpose is a clearer understanding of conservatism, liberalism and socialism.

P SCI 101M F 0.5
Introduction to Public Policy

This course is an introduction to the process of policy making. Students will be given an opportunity to examine, in the context of several examples, the factors affecting choices among policy alternatives. In addition, questions about the range of alternatives and the implementation of policies will be addressed.

P SCI 102 consists of a series of courses dealing with different aspects of politics. Students should select the course which most closely corresponds to their interest.

First-year winter term courses will be drawn from the following list.

P SCI 101B 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 3contending models in the political process - the liberal- democratic or popular rule model, the pluralist model, and the elitist model.

P SCI 102E W 0.5

Political Rights and Obligations

An introductory examination of the idea of individual rights as a limitation on legitimate governmental authority, the possible grounds for such claimed rights, and their relationships to political obligations (duties).

P SCI 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 102N W 0.5
The Arab-Israeli Conflict
This course familiarizes students with the Arab-Israeli conflict in its local, regional and international dimensions. The course looks at the historical roots of the conflict, the confrontation of Zionist and Palestinian nationalism and the forces leading to the establishment of the State of Israel. The course will also examine the role of the superpowers in the conflict.

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
Students who have taken or are taking a course of similar content in another discipline should check with their Undergraduate Officer or the Arts Registrar's Office to determine if credit will be granted for both courses.

P SCI 225 F 2C.1T 0.5
The History of Political Theory 1
A survey of the principal ideas of Western political theorists from the earliest times to the 17th century.
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 17th century.
Prereq: Second year standing

P SCI 231 F.W 0.5
Government and Business in Canada
An examination of the political environment in which business functions in Canada with particular emphasis on the constraints and opportunities conditioned by government intervention in and interaction with the private sector.
Prereq: Second year standing

P SCI 255 F.W 0.5
The Politics of Western Industrial Nations
A systematic introduction to the political processes of industrial countries. The central focus will be on Western Europe and North America. Some attention, however, will be devoted to the Antipodes, the Mediterranean countries, South Africa and Japan.
Prereq: Second year standing

P SCI 256 W 0.5
The Politics of Western Industrial Nations II
This course will examine a number of ways by which developed countries have tried to overcome the contemporary "crisis". Topics to be discussed include economic planning and participation, wage controls, corporatism, decentralization and authoritarianism.
Prereq: Second year standing

P SCI 260A F.S 2C.1D 0.5
Canadian Government and Politics 1
An analysis of the political environment in which the Canadian political system operates, including discussion of the Canadian political culture, federalism, the constitution, federal-provincial relations, and the role of the Governor General.
No prereq for students in the second year and above.

P SCI 260B W.S 2C.1D 0.5
Canadian Government and Politics 2
An analysis of the decision-making machinery of the Canadian political system, including discussion of cabinet government, the role of the House of Commons, interest groups, the electoral system, the party system and voting behaviour.
Prereq: P SCI 260A or consent of instructor

P SCI 264 F 2C.5
American Government and Politics
The theory and practice of the American political system as revealed by the institutions and operations of American national government.
No prereq for students in the second year and above.

P SCI 268 W 2C.1T 0.5
British Government and Politics
An examination of the uniquely British characteristics of the British political system.
No prereq for students in the second year and above.

P SCI 271 F 2C.1L 0.5
Political Behaviour 1
Empirical approaches to the study of politics are examined in light of their assumptions, aspirations, and critics.
No prereq for students in the second year and above.

P SCI 281 F 2C 0.5
International Politics
This course studies the transformation of the international system stressing East-West, Rich-Poor, and North-South perspectives and interactions.
No prereq for students in the second year and above.

P SCI 282 W 2C 0.5
Foreign Policy
This course studies the roots of foreign policy behaviour of selected western and non-western (particularly Asian) states.
Prereq: P SCI 281 or consent of instructor

P SCI 291 F.S 3C 0.5
The Canadian Legal Process
An analysis of the manner in which the Common Law functions together with an examination of the structure and jurisdiction of the Canadian court systems. Taught by a member of the legal profession.
Prereq: Open to all students in the second year and above.

P SCI 292 W.S 3C 0.5
Issues in Canadian Criminal Law
Rational principles and concepts applicable to current emotional criminal issues are analyzed by a practising crown attorney, for example, abortion, euthanasia, pornography, seat belts, homosexuality, mariquana, police power, civil rights, criminal trials, jury, capital punishment, prisons, etc.
Prereq: Open to all students in the second year and above.

P SCI 295 F 0.5
Public Sector Management
This course examines the functions of management with major emphasis placed on employee relations, communication, motivation and team management.
Prereq: Second-year or consent of instructor
Research Design in Political Science
Introduction to the logic and limitations of experimental and non-experimental research designs. Selected studies of politics are examined to demonstrate how plausible threats to validity are made less plausible with appropriate design and data analysis.
Prereq: P SCI 214 or consent of instructor

P SCI 321 F, S 0.5
Marxist Theory
A basic introduction to the political and social thought of Karl Marx from the early writings to capital.
Prereq: None

P SCI 322 W 0.5
Marxism and Revolution after Marx
A selective study of developments in Marxist theory and political movements after Marx.
Prereq: P SCI 321

P SCI 323 0.5
Ancient Political Philosophy
A selective examination of political philosophy during the classical period in Greece.
Prereq: Consent of the instructor

P SCI 324 0.5
Modern Political Philosophy
A selective examination of political philosophy in the modern period.
Prereq: Consent of instructor

P SCI 331 F, 2C 0.5
Public Administration 1
An introduction to the principles of public administration illustrated by the study of Canadian institutions largely at the federal level, but including provincial and municipal examples.
Prereq: P SCI 260A and 260B or consent of instructor

P SCI 332 W,S 2S 0.5
Public Administration 2
Analysis of problems and issues in the field applying the knowledge gained in P SCI 331.
Prereq: P SCI 331 or consent of instructor

P SCI 333 W 0.5
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 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 260A and 260B 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 1 previous course in Political Science.

P SCI 344 W 2C, IT 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 350A F 3C 0.5
The Politics of the Developing Areas 1
An introduction to the politics of Asia, Africa and Latin America focusing upon the political roots of poverty in the developing areas. Topics include the impact of world trade, colonization, multinationals and foreign aid.
No prereq for students in the third year and above.

P SCI 350B W 3C 0.5
The Politics of the Developing Areas 2
An examination of the politics of the developing areas with emphasis on the political behaviour of peasants, the urban poor, organized labour, and the military.
No prereq for students in the third year and above.

P SCI 351 F 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 354 W 0.5
The Politics of Rural Development
The course addresses socio-economic and political change affecting rural society worldwide in the last four millennia. We will study pre-capitalist peasant society, peasants and revolution, and agriculture under developing and developed capitalism, and the socialist state.

P SCI 356 F 0.5
Chinese Politics
An analysis of the historical development, contemporary politics and future directions of the People’s Republic of China emphasizing the role of ideology, political institutions, citizen participation and policy-making in selected areas.
Prereq: Consent of the instructor

P SCI 357 W 0.5
The Politics of Self-Management
An examination of the participation of citizens in decision making, both at work and in politics. The self-management system of Yugoslavia will be studied in detail.
Prereq: Second year standing or above

P SCI 360A W 0.5
World Politics 1
An examination of the structure of the world capitalist system concentrating upon warfare between core states during 1815-1945 and assessing the impact of the nuclear revolution. A number of classic theories of imperialism are considered.
Open only to students in the third year and above

P SCI 361 F 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 366 F 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 375 W 0.5
Political Philosophy
An introduction to the principles of political philosophy.
Prereq: Consent of instructor

P SCI 376 W 0.5
The Politics of Self-Management
An examination of the participation of citizens in decision making, both at work and in politics. The self-management system of Yugoslavia will be studied in detail.
Prereq: Second year standing or above

P SCI 380A F 0.5
World Politics 2
An examination of the structure of the world capitalist system concentrating upon warfare between core states during 1815-1945 and assessing the impact of the nuclear revolution. A number of classic theories of imperialism are considered.
Open only to students in the third year and above

P SCI 380B W 0.5
World Politics 2
An examination of the structure of the world capitalist system concentrating upon warfare between core states during 1815-1945 and assessing the impact of the nuclear revolution. A number of classic theories of imperialism are considered.
Prereq: Open only to students in the third year and above

P SCI 380C W 0.5
World Politics 3
An examination of the structure of the world capitalist system concentrating upon warfare between core states during 1815-1945 and assessing the impact of the nuclear revolution. A number of classic theories of imperialism are considered.
Prereq: Open only to students in the third year and above

P SCI 380D W 0.5
World Politics 4
An examination of the structure of the world capitalist system concentrating upon warfare between core states during 1815-1945 and assessing the impact of the nuclear revolution. A number of classic theories of imperialism are considered.
Prereq: Open only to students in the third year and above
P SCI 381 W 0.5
Foreign Policies of South Asian States
The course (1) defines the central issues in each country's foreign policy; (2) discusses the factors which shape the decision-making processes; and (3) evaluates the impact of these policies on regional and international thinking.

P SCI 390/398 0.5
Special Studies
From time to time courses of special study may be added to the program at the third year level. Students wishing to take such courses should consult the Department's Undergraduate Officer.

P SCI 422 0.5
Conflict of Political Ideas in Canada
A course designed to introduce students to some of the major ideas about politics and democracy which Canadians have developed in the course of this century. Conservatism, liberalism, socialism, agrarian protest politics, and nationalism will be considered in their historical context. In particular, the course will address the issues of democracy and industrialization in Canada and will examine closely the conflicting liberal, socialist and conservative notions of progress and political community.

P SCI 426 0.5
Selected Subjects in Political Philosophy
A selective treatment of basic themes in political philosophy in the modern and pre-modern times.
Prereq: For third year Political Science students, but open to others with prereq of P SCI 225, 226, 323, or 324, or consent of instructor

P SCI 427 F 0.5
Special Topics in Political Philosophy
A selective examination of basic problems in political philosophy in the modern and pre-modern periods.
Prereq: P SCI 225, 226, 323, or 324

P SCI 428 F 3S 0.5
State and Economic Life
An analytical and comparative study of the growth of government intervention in the economic process, and of the development of the welfare state.
Prereq: Consent of the instructor

P SCI 431 F 0.5
Canadian Public Policy
An examination of the way that policy processes and institutions have responded to the problems of governing, especially at the federal level in Canada.
Prereq: P SCI 280A and 280B and consent of instructor

P SCI 433 0.5
Public Policy and Underdevelopment in the Third World
An examination of industrial strategies, agricultural programs and energy policies of selected Third World countries focusing upon the political obstacles, both domestic and foreign, to the achievement of the long term integrated planning required for the alleviation of poverty in the Third World.
Prereq: Fourth year standing or consent of instructor

P SCI 435 W 2S 0.5
The Politics of Canadian Resource Development
A seminar focusing on the strategies of resource development policies, with an emphasis on the economic, political, environmental and cultural implications of oil, natural gas, and mineral exploitation.
Prereq: Fourth year standing or consent of instructor

P SCI 436 F 3S 0.5
Comparative Public Policy: The Politics of Food
The Politics of Food
P SCI 436 will introduce the actors and the framework of norms, rules and practices that control the global food regime. The course will then proceed to deal with selected problems in the politics of food.
Prereq: Consent of the instructor

P SCI 437 W 3S 0.5
The Politics of International Resources
An examination of the politics of international resources. Attention will be given to the set of issues relating to minerals, water, oceanic fisheries, oil energy, timber and labour.
Prereq: Consent of the instructor

P SCI 442 W 3S 0.5
Politics in Ontario
A critical examination of the distinctive elements of government and politics in the Province of Ontario.
Prereq: P SCI 260A and 260B or 341 or consent of instructor

P SCI 443 2S 0.5
Politics in Western Canada
A critical examination of the distinctive elements of government and politics in the provinces of Manitoba, Saskatchewan, Alberta and British Columbia.
Prereq: P SCI 280 or 341 or consent of instructor

P SCI 451 W 3S 0.5
Comparative Communist Systems
This course, which will focus on the Soviet Union, China and Cuba (with reference to Yugoslavia), will familiarize students with the differences and similarities that exist among communist countries.
Prereq: Third year standing and consent of instructor

P SCI 453 F 3S 0.5
Comparative Politics of Latin America
A critical examination of Latin America, focussing upon the interplay between external ties and internal processes. Topics include comparative studies of class alliances, the establishment of bureaucratic authoritarian regimes and revolutionary movements.
Prereq: Fourth year standing or consent of instructor

P SCI 454 W 3S 0.5
Comparative Politics
Selected topics in the politics of the Third World.
Prereq: Fourth year standing or consent of instructor

P SCI 461 F 2C.1S 0.5
Problems in Canadian Politics 1
Selected aspects of Canadian national politics.
Prereq: Fourth year standing or consent of instructor

P SCI 462 W 0.5
Problems in Canadian Politics 2
Selected aspects of Canadian provincial politics.
Prereq: Fourth year standing or consent of instructor

P SCI 471 0.5
Public Opinion and Propaganda
A detailed study of the nature of public opinion and the attempt to control it through propaganda.
Prereq: Consent of the instructor

P SCI 473 2S 0.5
Voting Behaviour
Prereq: P SCI 214, 373 or consent of instructor
P SCI 475 F 2S 0.5
Political Socialization
A study of the 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 0.6
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 on the relationships between the society and the coercive apparatus of the state.
Prereq: Third or fourth year standing

P SCI 481 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
The theory course examines the evolution of the international system; the capacity of the system of states to cope with the demands on it; meanings of international and regional power and order.
Prereq: Fourth year standing or consent of instructor

P SCI 484 W 3G 0.5
Contemporary Strategies: Theories and Policies
The course examines strategic studies and their premises. The evolution of strategic thinking, the role of national policies of military power. Strategic concepts are studied with specific reference to military policies of regional powers.
Prereq: Fourth year standing or consent of instructor

P SCI 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 instructor

P SCI 490-495 0.5 each
Special Subjects
From time to time courses of special study may be added to the program at the fourth year level. Students wishing to add such courses should consult the Department's Undergraduate Officer.

P SCI 496A/B F W 0.5/0.5
Special Honours Essay
Students wishing to undertake a special honors essay in their fourth year should consult the Department's Undergraduate Officer.
A letter grade for P SCI 496A will be submitted only after the completion of PSCI 496B

COURSES NOT OFFERED 1986-87
P SCI 102A Imperialism in International Relations
P SCI 102C Politics in Action
P SCI 102D Politics in the Third World
P SCI 102H Citizen Participation in Canada
P SCI 102L Political Influences in Ontario
P SCI 253 Comparative Communism 1
P SCI 254 Comparative Communism 2
P SCI 311 Methodology of Political Science: The Foundations
P SCI 312 Approaches to Survey Analysis in Political Science
P SCI 327 Political Science and Political Values
P SCI 341 Provincial Politics
P SCI 342 Politics in Quebec
P SCI 352 Comparative Legislative Systems
P SCI 362 Soviet Government and Politics
P SCI 373 Political Parties
P SCI 374 Interest Group Politics
P SCI 375 The Politics of Self-Management
P SCI 411 Theories and Methods of Political Science
P SCI 424 Contemporary Socialist and Communist Thought
P SCI 429 Labour Organization in Advanced Capitalist Society
P SCI 433 Public Policy and Underdevelopment in the Third World
P SCI 476 Research Seminar in Political Behaviour

Course Descriptions
Political Science

Department of Psychology

Professor, Chairman of the Department
P.A. Menkies, BA (Knox), MA, PhD (Virginia)

Professor, Dean of the Faculty of Arts
R.K. Banks, BA, MA, PhD (Toronto)

Associate Professor, Advisor on interdisciplinary Programs to the Vice President Academic; Associate Dean for Computing, Faculty of Arts
G.A. Griffin, BA (Colgate), MA, PhD (Wisconsin), Recipient of the Distinguished Teacher Award

Associate Professor, Deputy Chairman
J.G. Holmes, BA, MA (Carleton), PhD (North Carolina)

Professor, Associate Chairman, Graduate Affairs
M.D. Vogel-Sprott, BA (McMaster), MA, PhD (Toronto)

Professor, Associate Chairman, Undergraduate Affairs
M.P. Zanna, BA, PhD (Yale)

Professors
K.S. Bowers, BA, PhD (Illinois)
M.P. Bryden, BS (MIT), MSc, PhD (McGill)
W.C. Corning, BA (Heidelberg), PhD (Rochester)
D.P. Crowne, BA (Antioch College) EdM (Rochester), PhD (Purdue)
J.A. Dyal, BA (Oklahoma), PhD (Illinois)
C.K. Knapper, BA (Sheffield), PhD (Saskatchewan)
H.M. Lefcourt, BA (Antioch College), MA, PhD (Ohio State)
M.J. Lerner, BA, MA (Ohio State), PhD (New York)
R.G. Marteniuk, BPE, MA (Alberta), EdD (California)
D. Meichenbaum, AB (City College of New York), MA, PhD (Illinois)
S. Reins, MD, PhD (Chicago)
H. Ross, BA (Toronto), PhD (North Carolina)
M.A. Ross, BA (Toronto), MA, PhD (North Carolina)
P.M. Rowe, BA (Toronto), MA, PhD (Dahlhouse), PhD (McGill)
K.H. Rubin, BA (McGill), MS, PhD (Penn State)
D.A. Sprott, BA, MA, PhD (Toronto), PhD (Toronto)
R.A. Stiffy, RA (Alabama), MA, PhD (Illinois)
Course Descriptions
Psychology

D.L. Wehrenstein, BS (Alma College), Ph.D (California, Irvine)
T.G. Weller, BS, MS (Southern Mississippi), PhD (Vanderbilt)

Associate Professors
R.J. Alpack, BA (Scranton), MA, PhD (Duquesne), J
D.M. Amoroso, BA, MA (Toronto), PhD (Waterloo)
J.M. Anglin, BA (Toronto), PhD (Harvard)
P.F. Rowles, RA (Queens), MA, PhD (Illinois)
T.E. Cadell, BA (British Columbia), MA (McGill), PhD (Winnipeg)
A.J.R. Cameron, BA, MA, PhD (Waterloo)
N. Charmass, BA (McGill), MG, PhD (Carnegie-Mellon)
J.A. Cheyne, BA (Waterloo Lutheran), MA, PhD (Waterloo)
J.M. Cornell, BA, MSc, PhD (Washington)
R.H. Lahué, BSc (Fordham), PhD (Waterloo), H
G.E. MacKinnon, BA (Queen's), PhD (John Hopkins)
P.J. Naus, BA, PhD (Nijmegen), J
J.E. Orlando, BA (Western Ontario), MA (Detroit), MA, PhD (Michigan), J
R.D. Seim, BA (Queen's), BA (Waterloo)
J.A. Van Evra, BA (Valparaiso), MA (Bowing Green), PhD (Michigan State), J
E.E. Ware, BA, MA (Richmond), PhD (Illinois)

Assistant Professors
S.F. Cronshaw, BA, BComm (Saskatchewan), MA, PhD (Akron)
S. Hyman, BSc, MA, PhD (Illinois)
P. Jolicoeur, BSc (McGill), PhD (Harvard)
R.L. Silver BA, PhD (Northwestern)
J. Thea, BA (Western Ontario), MA (Notre Dame), PhD (Windsor), J
E.Z. Woody, BA (Reed), MS (Oxford), PhD (Duke)

Research Assistant Professors
D. Desner, BA (Loyola College), MSc (Memorial), PhD (Reading), NSERC University Research Fellow
C.M. Kristiansen, BSc (Toronto), MSc, PhD (Exeter), SSHRC University Research Fellow

Adjunct Faculty
J.R. Arndt, BA (Portland State), MA, PhD (Denmark)
D.S. Barnes, BA, MD (Western Ontario)
R.J. Dert, BS (Washington), MA, PhD (Waterloo)
B.S. Francis, BS (Ursuline), MA, PhD (Arizona)
J.J. Hartford, MD (Toronto)
C.B. Lowry, BA (McGill), MA, PhD (Michigan State)

S.L.S. Quan, BA (Waterloo), BEd (Western Ontario), MSc (Guelph)
G. Sumner-Smith, MRCS, BVSc (Liverpool), FR-CVS, MSc (Guelph)
J.L. Williams BA, MA (Alberta), PhD (Missouri)

Faculty Members of Psychology holding cross appointments to:
1. Optometry
2. Kinesiology

Faculty Members holding cross appointments to Psychology from:
3. Environmental Studies
4. Kinesiology
5. Statistics
6. leath Studies

J refers to faculty members at St. Jerome's College
R refers to faculty members at Renison College

Course Descriptions

Introductory Note
See departmental course listing catalogue for specific terms of the various course offerings in 1986-87.

PSYCH 101 3C 0.5
Introductory Psychology
A general survey course designed to provide the student with an understanding of the basic concepts and techniques of modern psychology as a behavioural science.
Students may receive credit for only one of PSYCH 101 or PSYCH 120.
Also offered at St. Jerome's College.

PSYCH 102 3C 0.5
Introductory Psychology Special Topics
An in depth study of selected broad issues and problems introduced in PSYCH 101.
Students may receive credit for only one of PSYCH 102 or PSYCH 121R.
Also offered at St. Jerome's College.

PSYCH 102A 3C 0.5
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 3C 0.5
Nature, Nurture and Human Behaviour
The role of heredity and environment in the development of intelligence, personality and personality disorders, and on conflict and aggression.

PSYCH 102C 3C 0.5
Culture's Influence on Behaviour
The role of culture on the development of Perception, Cognition, Learning and Memory, cultural influences on personality and personality disorders, and on conflict and aggression.

PSYCH 102D 3C 0.5
Psychology of Consciousness
Modes of thinking, emotion, creativity, and altered states of consciousness.

PSYCH 102E 3C 0.5
Psychological Intervention
Applications of Psychology to human coping problems and growth with emphasis on analyzing critically current treatment methods.

Offered at St. Jerome's College.

PSYCH 102F 3C 0.5
Personal Adjustment
Factors on research which investigates the everyday task of coping with ourselves, our environment, and the people we encounter. Topics will focus on the themes of knowing the self, interpersonal relationships, and of the way in which our social and physical environment affects our behaviour.

PSYCH 102G 3C 0.5
Introduction to Neuroscience
The relation between brain as a substrate and mind as a process is an important scientific and philosophical problem. In this course, those biological aspects of brain function will be discussed which are directly related to the functioning of the human mind.

PSYCH 200 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 203 3C 0.5
Learning and Motivation
This course is designed to introduce the student to theories in Learning and Motivation and to provide the student with an understanding of the experimental techniques in these areas.

Pre Req: PSYCH 101
PSYCH 206 3C 0.5
Perceptual Processes
An examination of data and theory concerning perceptual processes. Topics will include the perception of form and space, perceptual learning and a consideration of the effect of personality variables in perception.
Prereq: PSYCH 101

PSYCH 207 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 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 3C 0.5
Educational Psychology
A consideration of the main variables affecting learning in the classroom with special focus upon the conditions essential to efficient learning.
Prereq: PSYCH 101
Also offered at St. Jerome's College

PSYCH 213 3C 0.5
Exceptional Children
Educational problems associated with mental retardation, emotional disturbances, sensory and physical impairments and intellectural giftedness.
Prereq: PSYCH 101

PSYCH 214 3C 0.5
Psychology of Adolescence
A study of the psychological processes in the second decade of human development. Consideration is given to such areas as intellectual, emotional and social growth and identity formation.
Current concepts, issues, and research are stressed.
Prereq: PSYCH 211
Also offered at St. Jerome's College

PSYCH 217 3C 0.5
Aging and Basic Psychological Processes
What processes change as adults age? Is the idea of age-related decline in functioning a myth? The course deals with processes such as memory, perception, intelligence, and problem-solving. It also outlines the problems in interpretative developmental research.
Prereq: PSYCH 101

PSYCH 218 3C 0.5
Aging, Dying and Death
An examination of the psychological aspects of aging and the traditional and recent literature relating to various views on the reality of death in the life of man.
Therapy with dying individuals is reviewed and evaluated.
Prereq: PSYCH 101
Offered at St. Jerome's College

PSYCH 231 3C 0.5
Psychology of Religious Experience
Approaches of traditional psychological theories and especially of a modern psychology of consciousness toward phenomena of religious experience, mysticism and meditation are examined.
The transcendent phenomena are compared with other altered states of consciousness.
Prereq: PSYCH 101

PSYCH 235 3C 0.5
Psychological Perspectives on Gender and Sex
The course focuses on the existence of and bases for sex and gender differences with emphasis on biological, psychological and cultural issues.

PSYCH 236 3C 0.5
A Psychological Analysis of Human Sexuality
This course will examine psychological and social psychological theories and empirical investigations of human sexuality.
Prereq: PSYCH 101 or permission of instructor
Offered at St. Jerome's College

PSYCH 253 3C 0.5
Social Psychology
An introduction to the scientific study of social behaviour and social influences on behaviour. Theories and research on such topics as attitude change and persuasion, stereotypes and prejudice, conformity and obedience to authority, altruism, conflict, attraction and love will be introduced.
Students may receive credit for only one of PSYCH 253 or PSYCH 220R
Prereq: PSYCH 101
Cross-listed as PSYCH 220R

PSYCH 254 3C 0.5
Interpersonal Relations
A psychological analysis of social interaction. The development of interpersonal attraction from first impressions to long-term relationships. The roots of hostility, conflict and communication problems.
Students may receive credit for only one of PSYCH 254 or PSYCH 221R
Prereq: PSYCH 253
Cross-listed as PSYCH 221R

PSYCH 258 X 0.5
Psychoanalytic Thought
This course expresses the fundamental psychoanalytic vision as articulated by Sigmund Freud, and its relevance to the humanities. The theme is to understand the potentially liberating spirit which is at the root of psychoanalysis.
Prereq: PSYCH 101
Offered at St. Jerome's College

PSYCH 261 3C 0.5
Physiological Psychology
Introduction to brain, basic physiological processes, and their roles in behaviour.
Course covers sensing and perceiving; neural bases of action; motivation; learning and memory; and consciousness. Both experimental and clinical data are considered.
Prereq: PSYCH 101 or permission of instructor

PSYCH 271 3C 0.5
Animal Behaviour
Survey of mechanisms, development, adaptive value and evaluation of behaviour in non-human animals. Covers ethology, sociobiology and experimental comparative psychology. Emphasis on principles of research with laboratory and wild animals as well as methods of observing behaviour.
Prereq: PSYCH 101 or permission of instructor

PSYCH 291 3C.IL 0.5
Basic Research Methods
An introduction to the methods used in psychological research. Methods for observing behaviour and the procedures used to summarize these observations are emphasized.
Prereq: PSYCH 101 and second year Honours standing in Psychology

PSYCH 292 3C.IL 0.5
Basic Data Analysis
An introduction to the logic and methods of inferential statistics with emphasis on application in Psychology. Also included is a more detailed treatment of the methods and projects introduced in PSYCH 120.
Prereq: PSYCH 291 and second year Honours standing in Psychology
See overlapping content note (Grading Systems, Item 6) on page 8.7.

PSYCH 305 2C.2L 0.5
Sensory Processes
A consideration of data and theory concerning sensory processes. Topics will include psychophysical methodology, sensory mechanisms, and the neuropsychological basis of perceptions.
Prereq: PSYCH 206
PSYCH 307 3C 0.5
Cognitive Neurology
An introduction to current human experimental neuropsychology. This course will review evidence for brain-behaviour interactions obtained from studies of human brain damage and from investigations of the normal brain. Topics such as the representation of language, hemispheric specialization, memory, spatial ability, dyslexia, movement disorders and affective disorders will be considered.
Prereq: One of PSYCH 205, 207, 261, or KIN 366

PSYCH 310 3C 0.5
Social Development
This course will be concerned with contemporary issues in psychological study of social development. The course will be organized around a few central issues such as those of continuity and discontinuities of development and the relations between social and cognitive development.
Prereq: PSYCH 211

PSYCH 311 3C 0.5
Behaviour and Development of Human Infants
The purposes of this course are to study the behaviour and development of human infants, to gain direct experience with infants, and to examine community attitudes and resources available for infant care.
Prereq: PSYCH 211 or permission of instructor

PSYCH 312 3C 0.5
Learning Disabilities
A critical examination of the concept of learning disability and of current issues in the assessment and remediation of learning problems.
Prereq: PSYCH 211, 212, or 213
Also offered at St. Jerome's College.

PSYCH 314 3C 0.5
Cognitive Development
A consideration of psychological research and theory concerned with the origins and development of cognition in humans. Traces the development of such cognitive skills as problem solving, memory, concept formation, language, and other symbolic capacities from birth to adulthood. Cultural influences on cognitive development will also be considered.
Prereq: PSYCH 101

PSYCH 315 3C 0.5
Moral Development
A consideration of psychological theory and research dealing with the nature and origin of moral development, developmental differences in moral judgement, and various approaches to teaching moral behaviour with its consequent effects on the individual.
Prereq: PSYCH 211
Also offered at St. Jerome's College

PSYCH 317 3C 0.5
The Emotionally Disturbed Child
An examination of children's psychological disorders from several major perspectives with an emphasis on current research findings. Theoretical and clinical issues are considered.
Prereq: PSYCH 211
Offered at St. Jerome's College.

PSYCH 322A/B F.W 0.5/0.5
Principles and Practice in Early Childhood Education 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
A letter grade for PSYCH 322A will be submitted only after completion of PSYCH 322B

PSYCH 322A/B F.W 0.5/0.5
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 322A/B.
Prereq: Acceptance into the Early Childhood Education and Care Option
A letter grade for PSYCH 322A will be submitted only after completion of PSYCH 322B

PSYCH 325A/B F.W 0.0/0.5
Practicum in Early Childhood Education A
Directed supervision with young children in group settings. The course requires 3 hours of field work per week over 2 terms. In addition, students are required to complete 4 full-weeks in block placements during the academic year. Must be taken concurrently with PSYCH 322A/B.
Prereq: Acceptance into the Early Childhood Education and Care Option (General)
Pass/Fail Grading.
A grade for PSYCH 325A will be submitted only after the completion of PSYCH 325B

PSYCH 333 3C 0.5
Industrial/Organizational Psychology
An introduction to the methods and problems in industrial Psychology.
Prereq: PSYCH 101

PSYCH 334 F,W,S 3C 0.5
Theories of Individual Counselling Psychology
An introduction to the methods, theories and problems in individual counselling Psychology.
Prereq: PSYCH 101
Also offered at Renison College and St. Jerome's College.

PSYCH 335 3C 0.5
Personality and Behaviour Change
Forms of psychological intervention that produce important changes in the way people think, feel and behave including psychoanalysis, behaviour therapy, brainwashing, cult conversions, deprogramming, hypnosis, biofeedback and meditation.
Prereq: PSYCH 101

PSYCH 336 3C 0.5
Personnel Psychology
An examination of the following major topics in personnel psychology: employment planning, selection and recruitment, selection techniques, career development, performance appraisal, training programs, labour relations, compensation systems.
Prereq: PSYCH 333
PSYCH 240 3C 0.5
Community Psychology
Theory and practice are integrated in an attempt to identify and to understand the social factors which inhibit or facilitate healthy development of the individual. The adequacy of existing social structures and institutions in the treatment of various personal problems is assessed.
Prereq: PSYCH 253
Offered at St. Jerome's College.

PSYCH 341 3C 0.5
Psychology of Early Childhood Education
An introduction to theories and issues in early childhood education. Topics include issues differentiating preschool programs and application of psychological theory/research in early education.
Prereq: PSYCH 211

PSYCH 344 3C 0.5
Theories of Group Counselling
Contemporary theories on the therapeutic application of group processes. Issues such as group development, leader skills and training, selection of members; problems encountered in both process and outcome research will be examined.
Prereq: PSYCH 101
Offered at St. Jerome's College.

PSYCH 353 3C 0.5
Aggression and Social Conflict
This course will examine the genetic, physiological, and social causes of aggression, with the emphasis on social-psychological causes.
Prereq: PSYCH 253

PSYCH 354 3C 0.5
Interpersonal Processes in Critical Situations
The course will examine reactions to victims of misfortunes such as serious physical and mental illness, natural disaster, poverty and discrimination.
Prereq: PSYCH 253

PSYCH 355 3C 0.5
Personality Theory
An examination and evaluation of some of the outstanding theories of personality.
Students may receive credit for only one of PSYCH 355 or PSYCH 322R
Prereq: PSYCH 101
Cross-listed as PSYCH 322R.

PSYCH 356 3C 0.5
Contemporary Approaches to the Study of Personality
An examination and evaluation of current research in Personality focusing on such topics as intrinsic motivation, self concept, emotion, locus of control, etc.
Prereq: PSYCH 355

PSYCH 357 3C 0.5
Psychopathology
The nature and origin of deviant behaviour.
Students may receive credit for only one of PSYCH 367 or PSYCH 323R
Prereq: PSYCH 101
Cross-listed as PSYCH 323R.
Also offered at St. Jerome's College.

PSYCH 361 3C 0.5
Advanced Physiological Psychology
This course continues and extends PSYCH 261 (Physiological Psychology). Topics include the control of movement; emotions and the endocrine system; developmental processes; learning and memory; the biological basis of language and communication; and abnormal brain functions producing cognitive and personality disorders. Human brain function is emphasized.
Prereq: PSYCH 261 or permission of the instructor.

PSYCH 363 (A-Z) - 366 (A-Z) 3C 0.5
Special Subjects
One or more term courses will be offered at different times as announced by the Department.
(Departmental listing of special subjects courses for 1986-87 should be consulted.)
Prereq: Consent of instructor.

PSYCH 370 3C 0.5
Cross-Cultural Psychology
An examination of the influence of cultural differences on perceptual-cognitive processes, personality characteristics, and psychopathology.
Prereq: A minimum of 2 half courses in Psychology.

PSYCH 372 3C 0.5
Environmental Psychology
This course is intended to increase the awareness and understanding of the impact of the environment on human behaviour and experience. Topics to be discussed include: spacing, temporality, crowding, subjective impressions of environments, and research paradigms.
Prereq: PSYCH 101 or permission of instructor.

PSYCH 391 3C,1L 0.5
Advanced Data Analysis
An examination of the effective use and interpretation of statistics in complex research designs. Topics include an introduction to multivariate analysis, analysis of variance, and applied psychological research.
Prereq: PSYCH 292 and third year Honours standing in Psychology
See overlapping content note (Grading Systems, item 6) on page 87.

PSYCH 392 3C,1L 0.5
Psychological Measurement
An introduction to the logic of measurement in Psychology with special emphasis placed on the use of psychological tests to assess individual and group differences.
Prereq: PSYCH 391 and Honours standing.

PSYCH 393 2C,2L 0.5
Research in Developmental Psychology
Open only to students in a Psychology Honours Program.
Prereq: PSYCH 211 and 391 (acceptable as a corequisite).

PSYCH 394 2C,2L 0.5
Research in Perceptual and Cognitive Processes
Open only to students in a Psychology Honours Program.
Prereq: PSYCH 206 or 207 and 391 (acceptable as a corequisite).

PSYCH 395 2C,2L 0.5
Research in Social Psychology
Open only to students in a Psychology Honours Program.
Prereq: PSYCH 253 and 391 (acceptable as a corequisite).

PSYCH 396 2C,2L 0.5
Research in Biopsychology
Open only to students in a Psychology Honours Program.
Prereq: PSYCH 261 and 391 (acceptable as a corequisite).

PSYCH 397 2C,2L 0.5
Research in Personality and Psychopathology
Open only to students in a Psychology Honours Program.
Prereq: PSYCH 355 or 357 and 391 (acceptable as a corequisite).

PSYCH 398 2C,2L 0.5
Research in Learning and Motivation
Open only to students in a Psychology Honours Program.
Prereq: PSYCH 203 or 271 and 391 (acceptable as a corequisite).
PSYCH 110 3C 0.5
History and Systems
An examination of current theoretical approaches to psychological problems presented in an historical context.

PSYCH 422A/B F,W 0.5/0.5
Principles and Practice in Early Childhood Education II
An examination of the various aspects of planning and administration in early childhood education programs. Topics include: Practical applications of Piaget's theory; parent education.
Prereq: PSYCH 322A/B and 323A/B or 325A/B.
A letter grade for PSYCH 422A will be submitted only after the completion of PSYCH 422B.

PSYCH 423A/B F,W 0.0/0.5
Practicum in Early Childhood Education II
Practicum for advanced students in early childhood education. The course requires 8 hours of field work per week in preschool, kindergarten, or daycare settings.
Prereq: PSYCH 322A/B and 323A/B.
Pass/Fail grading. Must be taken concurrently with PSYCH 422A/B.
A grade for PSYCH 423A will be submitted only after the completion of PSYCH 423B.

PSYCH 425A/B F,W 1.0/1.0
Practicum in Early Childhood Education B
For advanced students in early childhood education. The course requires 8 hours of field work per week in preschool, daycare, or kindergarten settings over 2 terms. In addition, students are required to participate in 6 complete weeks (full days) in block placements during the academic year.
Prereq: PSYCH 322A/B and 325A/B.
Pass/Fail grading. A grade for PSYCH 425A will be submitted only after the completion of PSYCH 425B.

PSYCH 440A/B F,W 0.5/0.5
Group and Individual Counselling
The practice of counselling in terms of current psychological theories and research. The demonstration and development of these concepts are aided by personal participation, exercises, role play and videotape simulation.
Prereq: PSYCH 334 and 344 or suitable alternative and permission of instructor.
Offered at St. Jerome's College.

HONOURS SEMINARS
Departmental listing of seminar offerings for 1986-87 should be consulted.

PSYCH 451 25 0.5
Senior Honours Seminar in Learning Admision by consent of instructor.

PSYCH 452 25 0.5
Senior Honours Seminar in Perception
Admission by consent of instructor.

PSYCH 453 25 0.5
Senior Honours Seminar in Developmental Psychology
Admission by consent of instructor.

PSYCH 454 25 0.5
Senior Honours Seminar in Educational Psychology
Admission by consent of instructor.

PSYCH 455 25 0.5
Senior Honours Seminar in Social Psychology
Admission by consent of instructor.

PSYCH 456 25 0.5
Senior Honours Seminar in Personality
Admission by consent of instructor. Also offered at St. Jerome's College.

PSYCH 457 25 0.5
Senior Honours Seminar in Clinical Psychology
Admission by consent of instructor. Also offered at St. Jerome's College.

PSYCH 458 25 0.5
Senior Honours Seminar in Cognitive Processes
Admission by consent of instructor.

PSYCH 459 25 0.5
Senior Honours Seminar in Motivation
Admission by consent of instructor.

PSYCH 460 25 0.5
Senior Honours Seminar in Physiological Psychology
Admission by consent of instructor.

PSYCH 462 25 0.5
Senior Honours Seminar in Animal Behaviour
Admission by consent of instructor.

PSYCH 463 (A-Z) - 466 (A-Z) 25 0.5
Senior Honours Seminar in Special Topics
One or more term seminars will be offered at different times as announced by the Department.
Admission by consent of instructor.

PSYCH 480A/B F,W, S R 0.5/0.5
Directed Studies in Special Topics
For the student who desires to pursue a particular topic in depth through independent experimental research and/or extensive reading. A faculty member must approve a student's project prior to registration for this course. Open to exceptional students with permission of the instructor and the Department.

PSYCH 499A/B 0.5/0.5
Senior Honours Thesis
Each student will conduct a study under the direction of a member of the department on a Research Project. The project will involve an empirical study and/or a critical integrative review of some issue or issues in the research literature of Psychology. The result of this investigation will be presented by the student in the form of a thesis which will be examined critically by members of the department.
Open to fourth year Honours or Makeup only.
A letter grade for PSYCH 499A will be submitted only after the completion of PSYCH 499B.

The following courses are administered by Renison College. Since these courses are intended primarily for students in the Social Development Studies program, students planning a General or Honours Psychology program must consult their faculty advisor concerning Psychology major credit for these courses.

PSYCH 120R F 3C 0.5
Introductory Psychology

PSYCH 121R W 3C 0.5
Introductory Psychology (Special Topics)

PSYCH 220R F 3C 0.5
Social Psychology
Cross-listed as PSYCH 253.

PSYCH 221R W 3C 0.5
Interpersonal Interaction
Cross-listed as PSYCH 254.

PSYCH 322R F 3C 0.5
Personality Theory
Cross-listed as PSYCH 359.

PSYCH 323R W 3C 0.5
Abnormal Psychology
Cross-listed as PSYCH 357.

PSYCH 437 300R Special Topics in Psychology

- The page contains descriptions of various psychology courses offered at a university, including course names, codes, credits, and descriptions.
- The courses cover a range of topics from history and systems to special topics in psychology.
- Each course includes prerequisites and specific requirements, such as field work or participation in block placements.
- Some courses require consent of instructors or permit options such as pass/fail grading.
- The document highlights the importance of independent research and the availability of courses for advanced study.

Overall, the document provides a comprehensive overview of the psychology curriculum, covering a wide range of theoretical and practical aspects of the field.
Department of Recreation and Leisure Studies

B. Smale, BA, MA (Waterloo), PhD (Western)
Lecturer

A. Gilbert, BA, MA (Waterloo)

Faculty Members of Recreation and Leisure Studies holding cross appointments to:
1. Sociology
2. Geography

Faculty Members holding cross appointments to Recreation and Leisure Studies from:
3. Kinesiology
4. Statistics and Actuarial Science
5. Geography

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

REC 100 F 3C 0.5
Introduction to the Study of Leisure and Recreation and Leisure Services. An overview of the field of recreation emphasizing the understanding of leisure phenomena as well as an introduction to various leisure service resources.

REC 200 F/W 3C 0.5
Theories of Play. A critical analysis of definitions, concepts and assumptions of classical, recent and modern theories of play with implications for research strategies, programming and planning for play.

REC 201 F 3C 0.5
Leisure and the Social Sciences. Examination of modern methodological and theoretical approaches to the study of leisure behaviour with emphasis upon the socio-cultural, socio-psychological and economic dimensions.

REC 203 W,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.

REC 204 S 3C 0.5
Leisure and Recreation in Historical Perspective. Analysis of socio-cultural determinants which have influenced Canadian leisure behaviour.

REC 210 F 3C 0.5
Organization and Administration of Recreation Services. The organization and administration of recreation on federal, provincial and municipal levels, legislation, financing, budgeting, problem solving, public relations, administrative practices and departmental organization with particular emphasis on the municipal level.

REC 220 W,S 2C,2L 0.5
Program Management in Leisure Services. A study of the scope of recreation programs and the factors involved in program management. Emphasis will be placed on the goals in recreation for the leader and participant, effective leadership of individuals and groups, individual and group creativity.

REC 230 F 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 F 3C,3L 0.5
Administration of Camping and Outdoor Education. The philosophy and objectives of camping and outdoor education, administration, organizing, planning, staff relationships, leadership training, trends in camping and outdoor education. The emphasis in this course will be the place of the resident camp in education and recreation.

REC 250 F 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.


**Course Descriptions**

**Recreation and Leisure Studies**

**REC 270A**  
F,W 3C 0.5  
*Research Design Applicable to Leisure Studies*  
An introduction to the methods and techniques of research as applied to leisure studies and services. General consideration will be given to the technical problems involved in various stages of research methodology with emphasis on the logic underlying the research process.

**REC 300 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** F,S 3C 0.5  
*Sociology of Leisure*  
Nature and extent of leisure phenomena in contemporary society. Examination of institutional and formal organizational aspects, social role, social research strategies employed in the study of leisure.  
Prereq: Two item courses in Sociology.  
Cross-listed as SCC 347.

**REC 305 W** 3C,1L 0.5  
*Social Psychology of Leisure*  
A study of the effects of personality and social factors in shaping how people perceive, experience and respond to recreational time. Current theory and research focusing on the impact of leisure on the socio-psychological adjustment of the individual, and applications to human problems associated with leisure will be examined.  
Prereq: PSYCH 101 and REC 201.

**REC 307 W.S** 2C,1T 0.5  
*Social Psychology and Physical Activity*  
An examination of sport and other forms of physical activities as social situations. Topics such as social facilitation, modelling, person perception, expectancies, group structure, unity, motivation, leadership, conformity, and intergroup relations are introduced in relation to motor performance.  
Prereq: PSYCH 101.

**REC 310 F** 3C 0.5  
*Commercial Recreation Business Development*  
Students will develop an idea for a small recreation business and will then determine whether or not the idea is feasible. The course emphasizes marketing, organizational structure, short and long range planning, financial analysis, and promotions.  
Prereq: REC 210 and BUS 121, or consent of instructor.

**REC 311 S** 3C 0.5  
*School Recreation*  
An analysis of the relationship between recreation and education with particular emphasis on the sponsoring of community recreation programs by education authorities including leisure education and co-curriculum activities.  
Prereq: REC 210.

**REC 312 W** 3C 0.5  
*Recreation and Community Action*  
The role of the citizen in recreation systems with regard to social change. Students will examine models for social change which interact with recreation systems and power relationships between citizen's groups and recreation systems.  
Prereq: REC 210.

**REC 317 F.S** 2C,3L 0.5  
*Introduction to Museum Management*  
Overview of organization and structure of federal, provincial, and local Canadian heritage institutions, i.e., museums, art galleries, historic sites, and parks, etc. Examination of staff-personnel functions with respect to policy and program, income and expenditure, micro-environmental issues, computerized information holdings, etc. Laboratory work and field trips.  
Prereq: Introductory management course, or consent of the instructor.

**REC 320 F.S** 2C,2L 0.5  
*Evaluation of Recreational Programs*  
Evaluation procedures and techniques applicable to recreation programs are examined in detail. Specification of objectives, development of practical recording procedures and experimental analyses are stressed. Students conduct field evaluations in local community agencies.  
Prereq: REC 371A.

**REC 321-329** 0.5  
*Selected Topics in Recreation and Leisure Studies*  

**REC 321** 0.5  
*Analysis of Tourism and Recreation*  

**REC 322** 0.5  
*Technology and Leisure*  

**REC 327A** 0.5  
*Leisure and Mass Media*  

**REC 328** 0.5  
*Area Tourism Development*  

**REC 331 F,2C,2L 0.5**  
*Outdoor Education*  
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 F,2C,2L 0.5**  
*Applied Methods in Outdoor Recreation*  
Emphasis on methods and techniques for the selection, development, and implementation of programs and projects through the utilization of diverse and unique natural settings and environments.  
Prereq: REC 230.
REO 330 F 3C 0.5
Recreation Geography
The environmental implications of existing and potential recreational demands. Recreation travel, site capability, economic and ecological impact models will be considered as well as the behavioural aspects of amenity resources.
Cross-listed as GEOG 333.

REO 332 W,S 3C 0.5
Recreation and Physical Disabilities
The psycho-social aspects of physical disabilities will be analyzed, with special focus given to the planning, implementing and evaluating of recreational programs.
Prereq: REC 250, PSYCH 312.

REO 334 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.

REO 353 W,S X 0.5
Recreational Systems
A critical examination of the applications of market and non-market segmentation, valuation, and related concepts to recreation and leisure. Course content is based on recent research methods and findings from the field of leisure studies.
Prereq: Third year standing and ECON 101 or permission from instructor.

REO 354 F,S 3C 0.5
Colloquium on Religion and Leisure
Theological notions as they relate to theories of leisure. Contemporary trends and behaviour which affect organized religion and other leisure-related institutions.
Prereq: REC 332 or consent of instructor.

REO 371 F,W 3C 0.5
Statistical Techniques Applied to Leisure Studies
An introduction to descriptive and inferential statistics and the interpretation of data. A major consideration of the course is the use of statistics in the solution of problems in recreation and leisure.

REO 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 1 term statistics course and computer literacy (e.g. CS100 or high school computing).

REO 401 F 3C 0.5
The Economics of Recreation
A critical examination of the applications of market and non-market segmentation, valuation, and related concepts to recreation and leisure. Course content is based on recent research methods and findings from the field of leisure studies.
Prereq: Third year standing and ECON 101 or permission from instructor.

REO 402 F 3C 0.5
Comparative Recreational Systems
A study of multi-national recreation systems. Course meets on campus and in the field in other countries. Full term study over a period of 6-8 weeks. Laboratory fee varies with field observation.

REO 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.

REO 429 W 2C,2L 0.5
Computer Applications in Leisure Services
Theory and application in leisure service management and programming. Examination of computer impact on leisure service industry.
Prereq: Fourth year standing or consent of instructor.

REO 432 F 3C,1L 0.5
Interpretation
Concepts, philosophy and practices of interpretation related to understanding the use of cultural and natural heritage resources.
Prereq: REC 332 or consent of instructor.

REO 433 W 3C,2st 0.5
People in Natural Areas
Designing and managing for people in natural areas. Behavioural research and its relevance to the design and operation of natural areas and facilities will be emphasized. Means of understanding and involving neighbouring and visiting publics and indigenous people in the design and management of natural areas will be studied.
Prereq: REC 334/ENV 334.

REO 434 W 3C 0.5
Advanced Park Planning and Management
A study of policies, procedures, and practices relative to the management of natural resources in parks. Emphasis is placed on an ecological systems approach to management as it relates to parks at all levels of government.
Prereq: REC 334/ENV 334.

Cross-listed as ENV S 334.
Department of Religious Studies

Associate Professor and Chairperson
J.W. Miller, BA (Goshen), MA (New York), BD (Princeton), ThD (Basel) G

Associate Professor and Undergraduate Officer
M.D. Bryan, BA (Concordia College), STR (Harvard), MA, PhD (St Michael's) R

Professor
W. Klaassen, BA (McMaster), BD (McMaster Divinity School), PhD (Oxford) G

Associate Professors
W.J. Bubleyen, BA (Western Ontario), STB (Gregorian), MA (Windsor), STD (Angelicum) J
M.S. Bird, BA, MA, PhD (Iowa) R
A.L. Evans, BA (Toronto), BD (Emmanuel), STM (McGill), DMin (Andover-Newton) P
F.C. Gerar, MA (College St. Dominique, France), BD, STM (McGill), PhD (Hartford Seminary Foundation) P
R.D. Legge, BA (Transylvania), STB (Harvard), PhD (McMaster) P
D. Sahas, BD (Athens), STM (Christian Theological Seminary), PhD (Hartford Seminary Foundation)
R.J. Sawatsky, BA (Bethel, Kansas), MA (Minnesota), MA, PhD (Princeton), G
A.F. Thompson, BA (Toronto), BTh (Huron), MA (Western Ontario), STM, PhD (McGill)

Assistant Professors
M. Higgins, BA (St. Francis Xavier), MA, PhD (York), J
M. Kelley, BA (Boston), STM, PhD (Harvard) J
A.J. Reimer, BA (Manitoba), MA (Toronto), MA, PhD (St. Michael's) G

Lecturers
R. Koosstra, BTh (Kampen), DTh (Amsterdam) P
S.A. Macdonald, BA, STB (Western Ontario), MA (San Francisco) J
T. Yoder Neufeld, BA (Manitoba), MDIV (Harvard) G

Faculty designated with suffixes G
(Conrad Grebel), J (St. Jerome's), P (St. Paul's), and R (Renison) are located in the respective Colleges.

Faculty Members of Religious Studies holding cross appointments to:

1. Fine Arts
2. History
3. Peace and Conflict Studies
4. Social Development Studies
5. Studies in Personality and Religion
6. Middle East Studies

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Note

Numbers below the course description indicate the area of Religious Studies to which the course belongs. Explanation is provided in the Arts program section.

RS 100A-K Introduction to Religion
An introduction to Religion, religious phenomena, beliefs, ideas, practices and experience through the study of material and examples from the various fields in Religious Studies.

RS 100A S, F, 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

RS 100B S, F, W 3C 0.5 Religions of the West
Encounter with Judaism, Christianity and Islam: the characteristics and interaction of the 3 major religious traditions originating in the Middle East that have shaped the image of the Western World.

Area 1

RS 100C F 3C 0.5 Religious 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

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
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Credits</th>
<th>Title</th>
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<tbody>
<tr>
<td>RS 100E</td>
<td>F,W</td>
<td>3C 0.5</td>
<td>Biblical Studies 1</td>
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<td>A survey of the literature, history and religion of ancient Israel as</td>
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<td>seen in its cultural setting in the ancient Near East.</td>
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<td>Area 3</td>
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<td>RS 100F</td>
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<td>Biblical Studies 2</td>
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<td>A survey of the literature, history and religious thought of the</td>
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<td>Christian community during the New Testament period as seen in</td>
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<td>its cultural setting in the Greco-Roman world.</td>
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<td>RS 100H</td>
<td>S,F,W</td>
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<td>Catholic Theology</td>
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<td>A study of the principal teachings of the Christian Faith affecting</td>
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<td>Topics will include Bible and Tradition; worship and</td>
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<td>sacraments; authority; changing views concerning deity, women,</td>
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<td>ministry, and sacramentian.</td>
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<td>RS 100K</td>
<td>S,F</td>
<td>3C 0.5</td>
<td>Christian Theology: A Protestant Perspective</td>
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<td>An introduction to the study of the sources and issues of</td>
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<td>traditional and contemporary, liberal and conservative Protestant-</td>
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<td>RS 105A</td>
<td>F</td>
<td>3C 0.5</td>
<td>Elementary Biblical Hebrew</td>
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<td>An introductory course designed to teach the reading knowledge of</td>
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<td>Biblical Hebrew; the sounds and forms of the language followed by</td>
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<td>the Hebrew Bible.</td>
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<td>Cross-listed as R&amp;C 140-3C</td>
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<td>RS 105B</td>
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<td>3C 0.5</td>
<td>Elementary Biblical Hebrew</td>
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<td>A continuation of the introduction to biblical Hebrew.</td>
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<td>RS 200</td>
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<td>3C 0.5</td>
<td>The Study of Religion</td>
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<td>An exploration of the nature of religion through: 1) the study of</td>
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<td>the study of religion, 2) exposure to varying methods and</td>
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<td>ways of approaching religious phenomena, and 3) consideration of</td>
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<td>accounts of religious experience.</td>
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<td>RS 205</td>
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<td>3C 0.5</td>
<td>The Hebrew Prophets</td>
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<td>A study of the prophetic movement from Amos to Malachi in the</td>
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<td>historical, social, and religious context of Israel and the ancient</td>
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<td>Near East.</td>
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<td>RS 206</td>
<td>F</td>
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<td>Modern Study of Jesus</td>
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<td>An examination of recent approaches to the study of Jesus of</td>
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<td>Nazareth to determine his significance for the beginnings of the</td>
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<td>Christian Church and for modern man.</td>
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<tr>
<td>RS 209</td>
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<td>3C 0.5</td>
<td>The Apostle Paul: Life and Letters</td>
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<td>An examination of the career and thought of Paul as seen in his</td>
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<td>Area 3</td>
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<td>RS 214</td>
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<td>3C 0.5</td>
<td>Buddhism</td>
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<td>An introduction to the unifying beliefs and philosophical</td>
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<td>presuppositions of the Buddhist world-view, and an overview of the</td>
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<td>diverse forms of Buddhism in South and South-East Asia, Tibet,</td>
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<td>China and Japan.</td>
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<td>Area 1</td>
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<tr>
<td>RS 216</td>
<td>S,F</td>
<td>3C 0.5</td>
<td>Islam</td>
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<td>An introduction to the Islamic faith and practice, with a review</td>
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<td>of the development, achievements and impact of the Muslim</td>
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<td>community from Muhammad the Prophet to the present day.</td>
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<td>RS 220</td>
<td>F</td>
<td>3C 0.5</td>
<td>Evangelical Christianity</td>
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<td>A descriptive, historical and theological review of the wing of</td>
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<td>North American Christianity known as evangelicalism,</td>
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<td>fundamentalism, or revivalism.</td>
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<td>Area 2</td>
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<td>RS 221</td>
<td>F,W</td>
<td>3C 0.5</td>
<td>Sects, Cults and New Religious Movements</td>
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<td>An analysis of minority religions considered deviant by the</td>
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<td>dominant society such as the Amish, Mormons, and Jehovah's</td>
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<td>Witnesses with special consideration of the recent new religious</td>
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<td>movements including Unification (Moonies), Scientology and</td>
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<td>Krishna consciousness.</td>
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<td>Area 5</td>
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<tr>
<td>RS 225</td>
<td>S</td>
<td>3C 0.5</td>
<td>The History and Culture of the Orthodox Church</td>
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<td>The purpose of the course is to introduce the student to the</td>
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<td>religious tradition of Easter Christianity. Topics will include</td>
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<td>the origins of the Christian Church, the Byzantine Empire,</td>
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<td>Orthodoxy behind the Iron Curtain, the liturgy, the</td>
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<td>celebration of life and the place of Orthodoxy in the world today.</td>
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<td>Area 2</td>
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<td>RS 230</td>
<td>F,W</td>
<td>3C 0.5</td>
<td>History of Christianity</td>
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<td>The development of Christianity in its Roman Catholic, Eastern</td>
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<td>Orthodox and Protestant traditions from the time of Christ</td>
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<td>to the present.</td>
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<td>RS 231</td>
<td>F,W</td>
<td>3C 0.5</td>
<td>History of Christian Thought</td>
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<td>An analysis of the major theological developments in the</td>
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<td>Christian traditions from the apostolic era to the present.</td>
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<td>Area 4</td>
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<tr>
<td>RS 232A</td>
<td>F</td>
<td>3C 0.5</td>
<td>Jesus Christ in Contemporary Perspective</td>
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<td>A study of the major theological developments in the</td>
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<td>Christian traditions from the apostolic era to the present.</td>
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<td>Cross-listed as MST 235.</td>
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<td>RS 236</td>
<td>S,F,W</td>
<td>3C 1D</td>
<td>Human Sexuality and Christian Morality</td>
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<td>An investigation of the moral implications of an evolving</td>
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<td>sexual consciousness in the Christian tradition.</td>
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<td>Pre req: Second year standing or consent of instructor.</td>
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R S 238 W 3C 0.5
The Ecumenical Movement
A study of those unitive efforts which marked the history of the Christian Church, emphasizing developments from the Reformation to the present.
Area 4

R S 253 F 3C 0.5
The Bible and Peace
An examination of the unity and diversity of biblical views of peace with attention to their relevance for the various dimensions of the contemporary quest for peace.
Area 4

R S 254 W 3C 0.5
War and Peace in Christian Theology
The Contemporary Discussion. A survey of Christian teaching on war and peace, focusing on the twentieth century discussion.
Area 4

R S 255 F 3C 0.5
Christian Ethics
An examination of the development of Christian ethics, the Christian Doctrine of Man, Christian ethics and society, and faith and reason in ethical decision.
Area 4

R S 256 W 3C 0.5
Current Ethical Issues
An examination of specific current individual and social problems such as human sexuality, social justice, urban decay, and human rights, in the light of Christian moral consciousness.
Area 4

R S 260 W 3C 0.5
Issues in Science, Technology and Religion
A study of the questions raised by the interaction of religious faith with modern scientific and technological approaches to understanding the physical, social, and psychological dimensions of our world.
Area 5

R S 266 F 2C,1S 0.5
Film and the Quest for Meaning 1
An exploration of spiritual themes and issues in the cinema. An assessment of film's special characteristics as an art form capable of addressing the human quest for a significant existence. Emphasis upon the films of Ingmar Bergman.
Cross-listed as FINE 252.
Film fee $5.00.
Area 5

R S 267 W 2C,1S 0.5
Film and the Quest for Meaning 2
A consideration of selected themes - death, evil, guilt, fate, alienation, courage, love, redemption - in the films of several of today's leading directors. Emphasis upon a variety of directors from divergent cultural backgrounds.
Cross-listed as FINE 253.
Film fee $5.00.
Area 5

R S 268A S 3C 0.5
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

R S 268B W 3C 0.5
Religious Perspectives in Contemporary Canadian Literature
A discussion of religious perspectives, focused on salvation and survival motifs, in recent Canadian poets and novelists. Uniquely Canadian aspects of the larger tradition in the 20th century will be examined.
Area 5

R S 269 S 3C 0.5
Myth and 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

R S 270 F 3C 0.5
Psychology of Religion
A study of theories of the psychological nature of religious experience, the sources of religious belief and the religious significance of psychological phenomena. Topics include faith, doubt, evangelism, conversion, faith healing, mysticism, drugs and religious experience, tongues-speaking.
Area 5

R S 271 F W 3C 0.5
Personality and Religion
A study of the psychology of personality in its relationship between personality and religious thought, experience and behaviour.
Area 5

R S 282 F.W 2C,1D 0.5
New Perspectives in Sacramental Theology
A discussion of sacramental theology in the light of the ongoing renewal, inaugurated by the Second Vatican Council, through a study of the individual sacraments and their role as meaningful cultic signs in contemporary Roman Catholicism.
Prereq: Second year standing or consent of instructor
Area 4

R S 290A-K
Studies in Church and Society

R S 290D J 3C 1.0
Women and the Church
A multi-disciplinary examination of the evolution of the relationship between women and the church in the Christian tradition.
Area 5

R S 296 Directed Reading in Special Subjects

R S 302 F.W 3C 0.5
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

R S 305 A.R. F.W 3C 0.5
Intermediate New Testament Greek
Prereq: R S 100 or consent of instructor.
Area 3

R S 309 F 3C 0.5
New Testament Themes
A comparative study of the distinctive ways in which New Testament writers view key issues in the early Church; e.g., freedom and authority, social responsibility, the role of law, relations with the Jewish religion, the person of Jesus. An attempt will be made to relate their views to issues facing Christianity today.
Prereq: R S 100F or consent of instructor.
Area 3
RS 311 W 3C 0.5  
**Hindu Scriptures**  
Selected Vedic Hymns and Upanishads as well as the Bhagavad Gita and Ramayana will be read in translation and critically analyzed with the help of a variety of modern commentaries.  
Prereq: RS 100A or 213  
Area 1

RS 322 F 3C 0.5  
**Radical Reformation**  
A study of Anabaptism and its place in the history of the Christian Church and of the Reformation period.  
Prereq: Second year standing  
Area 2

RS 331 A F 3C 0.5  
**The Church in the Modern World**  
A study of the recent transformation of the Roman Catholic Church through the events, movements, personalities, and historical realities of the past fifty years.  
Area 2

RS 331 B W 3C 0.5  
**The Church in the Modern World**  
A critical study of the church's role in contemporary secular society.  
Area 2

RS 335 W 3C 0.5  
**Modern Theology**  
A study of modern thinkers (for example, Kant, Hegel, Schleiermacher and Kierkegaard), with special emphasis on their influence on nineteenth century theology.  
Prereq: R S 230 or 231 or consent of instructor

RS 350 F 3C 0.5  
**Christian Spirituality and Mysticism**  
A study of the spiritual experience and mystical knowledge of great Christian mystics, from the desert Fathers and Hebraists in the Eastern Orthodox tradition to the mystical schools of the Western Catholic tradition.  
Prereq: R S 230 or 231 or consent of instructor  
Area 2

RS 370 F 3C 0.5  
**Dreams in Religious Experience**  
The course examines the place of dreams in religious experience from ancient to modern times. Present day advances in understanding dream symbols will be explored, as well as the possibility of incorporating the use of dreams in one's personal religious growth and development.  
Prereq: R S 271 or consent of instructor  
Area 5

RS 371 W 3C 0.5  
**Religion and Suicidal Behaviour**  
A study of self-destructive behaviour and its relation to relevant religious concepts. The range of experience from illness to suicide will be explored and related to the concepts of guilt, hope and meaning in the Christian faith.  
Prereq: R S 271 or consent of instructor  
Area 5

RS 382 J W 3C 0.5  
**Theology of Marriage**  
A study of the development of the theology of marriage in the Christian tradition.  
Prereq: R S 306/320 or 291/292 or consent of instructor  
Area 4

RS 396-399  
**Directed Reading in Special Subjects**

RS 400 A-H  
**Special Topics in Religious Studies**  
Special topics will be offered in 1986-87. Consult department.

RS 400 E W 0.5  
**Feminism and Christian Theology**  
The seminar will explore the critique of Christian theology developed by Christian feminists to give a new direction to Christian theology.  
Area 4

RS 450 A W 2.5  
**Study Term Abroad**  
A tutor-arranged term of study in Israel designed to acquaint students with various facets of the monotheistic faiths of that region and especially their hopes for the future.  
Prereq: R S 100B, 3rd or 4th year standing, or permission of the instructor  
Area 1

RS 490 A S, F, W 0.5  
**Honours Seminar**  
A course of study and research designed to provide the student with guidance and supervision towards completing an Honours research assignment.  
Prereq: Fourth-year standing and consent of the Undergraduate Officer

RS 490 B S, F, W 0.5  
**Honours Seminar**  
A continuation of the above.

Every student in the Honours R 5 Program is required to take R S 490A and 490B.

RS 500-597 F, W R 0.5  
**Directed Research in Special Subjects for Graduate Students**

RS 596-599 R 0.5  
**Directed Research in Special Subjects for Graduate Students**

**COURSES NOT OFFERED 1986-87**

R S 203 W 3C 0.5  
**Wesleyan Literature in the Old Testament**

R S 208 F 3C 0.5  
**The Parables of Jesus**

R S 217 W 3C 0.5  
**Judaism**

R S 218 A-D  
**Studies in the History of Religion**

R S 251 W 3C 0.5  
**Religion in the Canadian Experience**

R S 263 W 3C 0.5  
**Religion in the Canadian Experience**

R S 265 W 3C 0.5  
**Religion in the Canadian Experience**

R S 274 W 3C 0.5  
**Religion in the Canadian Experience**

R S 275 W 3C 0.5  
**Religion in the Canadian Experience**

R S 281 W 3C 0.5  
**Religion in the Canadian Experience**

R S 282 W 3C 0.5  
**Religion in the Canadian Experience**

R S 283 W 3C 0.5  
**Religion in the Canadian Experience**

R S 284 W 3C 0.5  
**Religion in the Canadian Experience**

R S 285 W 3C 0.5  
**Religion in the Canadian Experience**

R S 286 W 3C 0.5  
**Religion in the Canadian Experience**

R S 287 W 3C 0.5  
**Religion in the Canadian Experience**

R S 288 W 3C 0.5  
**Religion in the Canadian Experience**

R S 289 W 3C 0.5  
**Religion in the Canadian Experience**

R S 290 W 3C 0.5  
**Religion in the Canadian Experience**

R S 291A-D  
**Studies in the History of Religion**

R S 300 W 3C 0.5  
**Selected Topics in Biblical Studies**

R S 310 F 3C 0.5  
**The Sacred Book of Islam**

R S 313 W 3C 0.5  
**Indian Spirituality in the Modern Era**

R S 314 W 3C 0.5  
**Zen Buddhism**

R S 315 W 3C 0.5  
**The Narrative Expression of Canadian Native Religions**

R S 316 W 3C 0.5  
**Canadian Native Religious Traditions**

R S 318 W 3C 0.5  
**Islam and Christianity**
Faculty of Science

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes

1. 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.

2. Normally, no more than 3 of the Science credits may be applied towards any Science degree program.

SCI 111 W 3C 0.5
From Matter to Man
Chemistry: The nature of matter, atomic and nuclear reactions, chemical bond and the formation of molecules.
6 Weeks
Biology and Biophysics: Biological macromolecules, D.N.A. genetic code, protein synthesis, organic evolution. Photosynthesis, enzymes and A.T.P. Cells, Organelles, specialization, nerve and muscle cells.

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.

SCI 206 F.W. 3C 0.5
Physics of High Fidelity Sound
Reproduction
Applies elementary physical principles to the study of the components of high fidelity systems. Will convey an appreciation of the physics of such systems and an understanding of the specifications of modern equipment. Includes several evening clinics during which interested students can measure their own or available systems using laboratory measuring equipment.
Prereq: At least 1 year of Secondary School Physics

SCI 209 F.W. 2C 0.5
Technical Writing and Speaking
Retrieving information and imparting the information you have to others; the art of speaking and writing; modern aids to producing scientific papers, reports, letters, etc.; and common errors in writing.

SCI 219 F.2C 0.5
Chemistry in Modern Society
The impact of chemistry on modern society will be considered by discussion of a number of topics including: marijuana and other non-medical drugs; food additives; birth control; cancer-causing chemicals; pesticides and other chemical methods to control insects; chemical warfare.
Prereq: At least 1 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 on overcoming the pollution will be discussed with emphasis on the Chemistry. (Open to all interested students.)
Prereq: At least 1 year of Secondary School Chemistry

SCI 237 F 3C 0.5
Descriptive Astronomy
A survey course in astronomy intended for non-Science students (primarily Arts, Environmental Studies, Human Kinetics and Leisure Studies students). The solar system, the Sun and planets, stars, the Milky Way, galaxies and the universe.

Open to first year or upper year students.
Not for Engineering, Mathematics or Science students.

SCI 238 W 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, the Sun and planets, stars, the Milky Way, galaxies and cosmology.
Open to first year or upper year students in all faculties.

Students interested in the above courses in Astronomy (i.e. SCI 237, 238) should note that because of overlapping material both courses may not be taken for credit, only the one most suitable to their background. Students with a weak background in Physics and/or Mathematics may well find it advisable to take SCI 238 before taking PHYS 275.

SCI 250 W 3C 0.5
Environmental Geology
The influence of geological factors on the natural environmental: natural hazards; efforts of engineering works on the environment; geological aspects of water resources and water disposal with particular attention to solid waste (garbage) and deep well injection of liquid wastes.
Prereq: Students will find a course in Physical Geography or Earth Sciences to be an advantage. Students whose major field is Earth Sciences may not take this course for credit.

SCI 251 F 2C 0.5
Human Genetics
An examination of recent advances in human heredity including the genetics, cytological and biochemical aspects of individual inheritance. The principles of human population genetics will be discussed. The social implications of some of the modern discoveries will be stressed.

Students whose major field is Biology may not take this course for credit. Offered only by Correspondence for 1986-87.

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. Offered only by Correspondence for 1986-87.
SCI 250 W 2C, 1T 0.5
The Biology of Aging
An introduction to the biological mechanisms of aging at the molecular, cellular and systemic levels. Topics to be discussed will include the theories of aging, methods for studying the aging process, the role of diseases in aging and chronological changes in organisms during aging.
Cross-listed as GERON 255.
Students whose major field is Biology may not take this course for credit.

SCI 260 W 2C 0.5
The Science of Senses
Vision, hearing and smell. A multidisciplinary view of some of the basic principles underlying these, with emphasis upon concepts which are common to the three senses. Various aspects of the senses (e.g. social consequences of sensory impairment, esthetics, historical theories of sensory function) are discussed and demonstrated.

SCI 261 W 3C 0.5
Models in Science
Origins and rise of some important scientific models. Resistance to and acceptance of new models. Strengths and weaknesses of some current models. Examples will be drawn from three different areas of science, and may vary from year to year.

SCI 263 F 3C 0.5
Science and Society
Social and economic impacts of science. Analysis of biotechnology as an area of science expected to have substantial impacts on modern society. All aspects of this issue will be critically examined in this team-taught, multidisciplinary course.
Prereq: Successful completion of 1 year of Honours or General studies. Year 1 students will not be admitted to this course.

SCI 265 W 3C 0.5
Scientists and the Science Community
Professionalism, ethical and political issues, and other aspects of how science is done will be raised. Memoirs and other writings of scientists about their science will be included in the readings.
Prereq: Successful completion of one year of honours or general studies.

SCI 267 F 3C 0.5
Topics in History and Philosophy of Science
Selected areas or cases chosen may vary from year to year.

SCI 280 A-Z
Experimental Course
Occasional courses, for example taught by a visiting faculty member, or under development for future permanent status.

SCI 289 F, W 1T 0.5
Major Paper and General Examination
Details available from the Liberal Science Office. For students in their final year of Liberal Science only.

SCI 270 W 2C 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 1 year Secondary School Chemistry or Physics

SCI 312 F 3C 0.5
Physics of Music
A discussion of the nature of musical sounds. The mathematical basis of harmony, musical scales. Sound production by various instruments, including the human voice, radiated power, sound spectrum. Acoustics of auditorium; amplifier and speaker systems
Recommended for any student who understands logarithms and who is interested in both Music and Physics.

SCI 351 F, W, S T 0.5
Human Biology 1
An introduction to selected topics in human physiology and consideration of factors that influence normal physiological function. Topics discussed include the structure and mechanisms of action of nerves, muscles, the cardiovascular and respiratory systems.
Antireq: B IOL 233
Offered only by Correspondence for 1986-87.

SCI 352 F, W, S T 0.5
Human Biology 2
An introduction to selected topics in human physiology. Attention will be given to the areas of homeostasis, nutrition, digestion, reproduction and the endocrine hormones.
Antireq: B IOL 233
Offered only by Correspondence for 1986-87.

SCI 355 F 2C 0.5
Biology of Cancer
An introduction to cellular and developmental biology in relation to cancer in the human body.
Offered in 1987-88 and alternate years thereafter.

SCI 410 0.5
Technical Report
[for Students in Co-op Applied Chemistry, Co-op Applied Physics, Co-op Applied Earth Sciences, Co-op Biology and Co-op Biochemistry (Biology and Chemistry) only]
Technical reports covering work-term assignments are submitted by all Co-op Science students. These will be carefully evaluated for technical content and writing ability. Students admitted to a Co-op program with advanced standing should consult with the Department of Co-ordination and Placement regarding sequence of work terms and satisfaction of work report requirements. A word.

SCI 453 F 2C 0.5
The Essays and Man's Effects Upon Them
Study of the oceans from a biological point of view, and consideration of the effects of exploitation and pollution upon the animals and plants that inhabit them.

SCI 454 W 2C 0.5
The Inland Waters and Man's Effects Upon Them
Study of lakes, rivers and streams from a biological point of view, and consideration of the effects of pollution upon the animals and plants that inhabit them.

SCI 462 F 2C 0.5
Biology of Food Production
A survey of world food production from the biologist's viewpoint. Topics: nutrition; food chains; origins of agriculture; basic plants and animal food crops; primitive and modern scientific agricultural practices; and the environmental implications of each.
COURSES NOT OFFERED 1986-87

SCI 201 Contemporary Science 2
SCI 202 Energy
SCI 350 Canadian Non-Renewable Natural Resources
SCI 400A/B History of Science

Social Development Studies

Professor, Principal of Renison College
I.L. Campbell,a BA (Carleton), MSc (Econ) (London), R

Assistant Professor, Undergraduate Officer
M. Smyth, BA (Toronto), MA, PHD (York), R

Professor Emeritus
D.G.S. M'Timkulu, BA, MA (South Africa), MA (Yale), PhD (Natal), R

Assistant Professor, Co-ordinator of English Language Programs
J. Miller, BA, BLS (McGill), MA, MPhil (Waterloo), PhD (York), R

Adjunct Assistant Professor, Co-ordinator of Placements, Diploma Program
K. Bailey-Robinson, BA (MacMurray College), MSW (WLU), R

Professor
J.O. Towler, BA (Toronto), MEd, PhD (Alberta), R

Associate Professors
M.S. Berd,a BA, MA, PhD (Iowa), R
M.D. Bryant,a BA (Concordia College),
STB (Harvard), MA, PhD (St. Michael's), R
J.T. Harris, BMus (Temple), MSW (Pennsylvania), R
B. Hyma,b BSc, MSc, MAC (McGill),
MA (Sheffield), PhD (Pittsburgh), R
R. Lahr,b BSc (Fordham), PhD
(Waterloo), R
M.I. Nagler,a BA (British Columbia), MA
(Chicago), PhD (Stirling), R
M. Zentner, BA (Temple), MSW
(Kansas), R

Adjunct Faculty
B. Abbott, BA (Waterloo), MSW (WLU), R
J. Bambrook, BA, MA (Guelph), PhD
(Windsor), R
A. Broos, BA (Waterloo), MSW (WLU), R

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

INTERDISCIPLINARY SOCIAL SCIENCE

ISS 131R F,W,S 3C 0.5
Social Ideas, Social Policy and Political Practice 1
An introduction to some of the major social and political ideas of Western civilization. Attention is given to the influence and applicability of these ideas to social policy and political practice in contemporary Canada.

ISS 150R F,W,S 3C 0.5
Life-span Processes: The Normal Events
An examination of the significant psychosocial events during the lifespan with consideration of the impact of crises. Topics may include attachment, loss, stress, identity crisis, role change, mid-life transition.

ISS 220R F,W,S 3C 0.5
Changing Concepts of Childhood
Childhood has changed as a social and cultural concept. This course will trace these changes, examining sociological, psychological, cross-cultural, historical and political factors. Art and literature will also be used to reflect attitudes about childhood.

ISS 250R F 3C 0.5
Social Statistics
This introductory level statistics course will emphasize the collection, manipulation, descriptive presentation and statistical analysis of social research data using a variety of qualitative and quantitative methods.

Prereq: Second year standing and at least 2 term courses in the social sciences or consent of the instructor.

See overlapping content note (Grading Systems, item 6) on page 8.7

ISS 251R W 3C 0.5
Social Research
Introduction to the philosophy and methodology of applied social science research including treatment of the problems and strategies of research design and execution.

Prereq: Second year standing and at least 2 term courses in the social sciences or consent of the instructor.

ISS 250R or its equivalent also recommended.

ISS 300R F 3C 0.5
Critical Encounter with the Nature of Man
An attempt to increase students' understanding of human nature and deepen their awareness of some fundamental issues in the life of 20th century man. The approach is interdisciplinary with emphasis on such themes as the meaning of self-knowledge, loneliness and anxiety, freedom and purpose in human life, and the nature of human happiness.

Prereq: Courses in at least one of the Social Sciences or Philosophy, or consent of instructor.

ISS 350C W 3C 0.5
Children in Difficulty: Biosocial Perspectives
A multidisciplinary introduction to recent advances in theory, diagnosis, classification, and remedial strategies for children who have achieved "problematical" status. An examination of social and family characteristics and the symptoms of the problematical child with an overview of major therapeutic strategies.
ISS 350D W 3C 0.5
Adult Life Crises and Events
A study of normal events occurring during the adult years, why they happen and how we cope with them. Relying on research, popular literature, and life experiences, students examine social change, the future, adult development and adjustment.
Prereq: ISS 150R or consent of instructor

ISS 350E F.S 3C 0.5
Family Law and Social Work
Consideration of the court system; investigation of divorce mediation, court mandated custody, access and juvenile predispositional assessment, child welfare, psychiatric advocacy, corrections, and highlighting of professional, ethical, confidentiality, civil and criminal liability issues for social workers.
Prereq: Second year standing

ISS 350H S.F 3C 0.5
Values and the Contemporary Family
An exploration of how religious, economic, political and other social institutions shape values in our society, and what impact society's changing values are having upon marriage and the family.
Prereq: At least 2 social science courses

ISS 398R/399R F.S.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 program's faculty members.
Prereq: Permission of Undergraduate Officer

ISS 499A/B T 0.5/0.5
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 program.
Prereq: Open to senior honours students only.
A letter grade for ISS 499A will be submitted only after the completion of ISS 499B

PSYCHOLOGY

PSYCH 120R F 3C 0.5
Introductory Psychology
Basic concepts and techniques of modern psychology as a behavioural science, with special emphasis on social aspects of behaviour. Topics may include the nervous system, perception, learning, memory, cognition, motivation, emotion, development, personality, social influences, psychopathology and psychotherapy.
Students may receive credit for only one of PSYCH 120R or PSYCH 101

PSYCH 121R W 3C 0.5
Introductory Psychology (Special Topics)
A continuation of PSYCH 120R with in-depth study of some selected topics.
Prereq: PSYCH 120R
Students may receive credit for only one of PSYCH 121R or PSYCH 102

PSYCH 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.
Prereq: An Introductory Psychology course
Cross-listed as PSYCH 253
Students may receive credit for only one of PSYCH 220R or PSYCH 253

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.
Prereq: PSYCH 220R or PSYCH 253
Cross-listed as PSYCH 254
Students may receive credit for only one of PSYCH 221R or PSYCH 254

PSYCH 322R F 3C 0.5
Abnormal Psychology
A survey of concepts, theory, and research dealing with the nature and etiology of behavioural abnormality. Topics include neurosis, schizophrenia, depression, psychophysiological and behavioural disorders.
Prereq: An introductory Psychology course
Cross-listed as PSYCH 357
Students may receive credit for only one of PSYCH 322R or PSYCH 357

PSYCH 334 F.W,3 3C 0.5
Theories of Individual Counselling Psychology
An introduction to the methods, theories and problems in individual Counselling Psychology.
Prereq: An introductory Psychology course

PSYCH 367R/369R S.F.W R 0.5/0.5
Independent Study
An independent in depth study of a selected area of concern to the student within the discipline of Psychology. Available to individuals or small groups of third or fourth year Social Development Studies majors and arranged with one of the faculty members from the program.
Prereq: Permission of Undergraduate Officer

SOCIAL WORK

SOCWK 001 W S 0.0
Counsellor-Technique Seminar
A required non-credit seminar for Social Work Diploma students. Includes further consideration of topics introduced in SOCWK 350E and ongoing discussion of students' practicum experiences.
Social Work Diploma students only

SOCWK 120R F.W.S 3C 0.5
Introduction to Social Work
Presentation of the value, knowledge, and skill base, principles and purposes of the profession, and an examination of methods of practice. Traditional and innovative social work settings are discussed. Historic development of Social Work and its influence on contemporary practice is reviewed.
SOCWK 221R F,W,S 3C 0.5
Social Casework 1
A presentation of some of the theoretical constructs necessary for the understanding of the individual in the casework relationship, as well as an introduction to some appropriate casework interventions. Emphasis in the course will be theoretical.
Prereq: SOCWK 120R or consent of instructor

SOCWK 221R F.W.S 3C 0.5
Social Group Work
Presentation of some of the theoretical constructs necessary for an understanding of social group work as well as an introduction to methodology and interventions.
Prereq: SOCWK 120R or consent of instructor

SOCWK 222R F.S 3C 0.5
Community Organization 1
An examination of social work practice as it relates to functional and geographical communities. The course will explore the theoretical foundations of organization practice as well as a variety of models.
Prereq: SOCWK 120R or consent of instructor

SOCWK 230R W 3C 0.5
Religion and Social Work Practice
The course explores the relevancy and impact of the Christian faith in social work practice and examines some of the ethical issues and value conflicts facing the Christian and non-Christian social worker in practice today.
Prereq: SOCWK 120R or consent of instructor

SOCWK 230R W 3C 0.5
Social Casework 2
Considers some of the intellectual components of the social work skills necessary for working with individuals. Social work theories of the individual will be examined in order for the student to learn some clinical applications relevant to the casework relationship.
Prereq: SOCWK 220R or consent of instructor

SOCWK 321R F.W,S 3C 0.5
Social Work with Families
Presentation of some of the theoretical constructs necessary for an understanding of the family in the social work relationship as well as an introduction to methodology and interventions.
Prereq: SOCWK 120R or consent of instructor

SOCWK 322R W 3C 0.5
Community Organization 2
An investigation of methods and models of social work intervention used in the process of change as it affects functional and geographical communities. Canadian examples of organizational processes and collective action of citizen groups, neighbourhoods, welfare recipients, ethnic minorities, employees, political parties and public housing tenants.
Prereq: SOCWK 222R

SOCWK 326R W 3C 0.5
Philosophy and History of Social Welfare
Social welfare from early civilization to the present. The effects of religious, political, economic, and cultural factors on social welfare development and the continuing influence of inherent attitudes, philosophies and values on this complex organization. Focus on the Canadian social welfare system.
Prereq: SOCWK 120R or consent of instructor

SOCWK 350B W 3C 0.5
Child Abuse Issues and Principles of Mental Health
The experience of abused, neglected and deprived children and their families will be examined with reference to basic principles of healthy psychological and emotional adjustment. Core issues of child abuse will be related to the roles of stress, interactions of personality with environment, adjustment, and failures of adjustment. Presentation of medical, psychogenic and sociogenic models for understanding successes and failures of adjustment will provide a framework for consideration of specific programs for treatment and prevention. The welfare of the child will be discussed with reference to current social policy.
Prereq: At least four upper level SOCWK courses including SOCWK 350R

SOCWK 350D F,W 3C 0.5
Social Casework 3
Casework treatment issues categorized according to the character styles of clients will be examined in depth. The client's mode of functioning and symptom presentation and appropriate treatment strategies will be assessed through readings, clinical example and process recordings.

SOCWK 350E F 3C 0.5
Social Casework Techniques
Theoretical and practical consideration of conceptual and interpersonal techniques relevant to the practice of clinical social work. Topics may include formation and use of case histories, interviewing, treatment plans, therapist-client contracts, process-recording, client disengagement.

SOCWK 365R F,W,S 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 identifying cases of this social problem and to explore current methods of management and treatment of persons involved in child abuse situations.
Prereq: SOCWK 120R or consent of instructor

SOCWK 385R F,S 3C 0.5
Mental Retardation and the Family
A critical application of social work theory to real situations involving the social, emotional and physical functioning of the family that has a mentally retarded member. Will also include consideration of the impact of current social policies.
Prereq: SOCWK 120R or consent of instructor

SOCWK 385R F,S 3C 0.5
Medical Social Work
Analysis of social work in the medical setting, concentrating on identification and treatment of emotional, family, and community aspects of illness. Emphasis is on the concrete application of professional social work to health care while comparing medical and social work values and concepts of illness.
Prereq: SOCWK 120R or consent of instructor

SOCWK 387R W,S 3C 0.5
Social Work with the Elderly
An examination of social work theory and practice concerning the needs of the elderly. Social work strategies of intervention with the healthy and frail aged will be considered from the individual, group, family, community, and bureaucratic perspectives.
Prereq: SOCWK 120R or consent of instructor
SOCIOLOGY

SOC 120R W 3C 0.5
Fundamentals of Sociology
An examination of the fundamental concepts of Sociology and their application in seeking to understand the changing patterns and life-styles taking place specifically in Canada, and in general, within North American society. Students may receive credit for only one of SOC 120R or SOC 101

SOC 29R F-S 3C 0.5
Deviance: Perspectives and Processes
The deviance-making process is examined in a variety of social contexts. Examines the emergence of rules and control agencies, the processes by which persons become involved in deviant activities, and the contingencies affecting persons' careers as deviants.

SOC 38R 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.

SOC 38R 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.

SOC 38F/38R F-W,S 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 students and arranged with one of the faculty members from the program.

SOC 38F/39R F-W,S 0.5/0.5
Independent Study
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.

SOC 39F/39R F-W,S 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 program.

STV 100 0.5
Society, Technology and Values: An Introduction
This is the introductory course in the STV Option. An examination of the implications of technological innovation, with emphasis on the experience of work as a major theme, will be undertaken. This course will be team taught.

STV 200 0.5
Society, Technology and Values: Projects Course
The second course in the STV sequence is structured as a self-directed group learning exercise focusing on the intensive study of a particular technology in its societal context or, alternatively, on an intensive study of a commonly held value and its interaction with one or several technologies.

STV 400 0.5
Society, Technology and Values: A Senior Project
In this, the final course in the STV Option, students will undertake an independent but supervised research project at the level of a senior honours essay or equivalent level.

STV 100 0.5
Society, Technology and Values: An Introduction
This is the introductory course in the STV Option. An examination of the implications of technological innovation, with emphasis on the experience of work as a major theme, will be undertaken. This course will be team taught.

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Society, Technology and Values: Projects Course
The second course in the STV sequence is structured as a self-directed group learning exercise focusing on the intensive study of a particular technology in its societal context or, alternatively, on an intensive study of a commonly held value and its interaction with one or several technologies.

STV 400 0.5
Society, Technology and Values: A Senior Project
In this, the final course in the STV Option, students will undertake an independent but supervised research project at the level of a senior honours essay or equivalent level.

STV 200 0.5
Society, Technology and Values: Projects Course
The second course in the STV sequence is structured as a self-directed group learning exercise focusing on the intensive study of a particular technology in its societal context or, alternatively, on an intensive study of a commonly held value and its interaction with one or several technologies.

STV 400 0.5
Society, Technology and Values: A Senior Project
In this, the final course in the STV Option, students will undertake an independent but supervised research project at the level of a senior honours essay or equivalent level.
Course Descriptions

Sociology

Course Descriptions

Sociology

Department of Sociology

Professor, Chairman
D. Kubat, MA (Kansas), PhD (L. Maximilian, Munich)

Professor, Associate Chairman for Graduate Studies
H.J. Failing, BA, BSc, MA (Sydney), PhD (Australian National), FRSC

Associate Professor, Associate Chairman for Undergraduate Studies
R.C. Prus, BA (Manitoba), MA, PhD (Iowa)

Professors
W.F. Forbes, BSc, PhD, DSc (London), DJC, ARCS
B.D. McPherson, BA, MA (Western Ontario), PhD (Wisconsin)
C. Redekop, BA (Goshen), MA (Minnesota), PhD (Chicago) G
E.W. Vaz, BA, MA (McGill), PhD (Indiana)
K. Westhues, BA (Conception), MA, PhD (Vanderbilt), Recipient of the Distin-

guished Teacher Award
J. Zuzanek, MA (Moscow State University), CSc (Prague Institute of Soci-

ology), PhD (Charles University, Prague)

Associate Professors
J.E. Curtis, BA (Sir George Williams), MA (Central Michigan), MA (Cornell)
F. Desroches, BA (Waterloo), MA (Toronto), PhD (Waterloo), J
F.A. Faack, BA (Pennysylvania State), MA, PhD (Columbia)
J. Goyder, RA (Bishop's), MA, PhD (McMaster)
R.D. Lambert, BA, MA (McMaster), PhD (Michigan)
S.A. McDaniel, BA (Massachusetts), MA (Cornell), PhD (Albany), Recipient of the Distin-

guished Teacher Award
M.L. Nagler, BA (British Columbia), MA (Chicago), PhD (Stirling), R
M. Shimpo, BA (International Christian, Japan), MA, PhD (British Columbia) J
J.B. Whitney, BA (Western Ontario), MA, PhD (Toronto)
A. Wupper, BA, MA (McGill), PhD (California, Berkeley)

Assistant Professors
P.J. Carrington, BA (Harvard), MA, PhD (Toronto)
N. Theberge, BA (Massachusetts), MA (Boston), PhD (Massachusetts)

G.K. Warner, BA (British Columbia), MA (Wisconsin), PhD (British Columbia)

Research Assistant Professors
A.J. Perras, BA (Waterloo), MA (McMaster), PhD (Victoria, New Zealand), SSHRC Private Scholar
A.V. Wister, BA, MA, PhD (Western Ontario), SSHRC Post-doctoral Fellow

Adjunct Faculty
L.A. Costa-Pinto, BA, Lic. Doctor in Sociology (Federal University of Brazil)
G.L. DeGre, BSS (City College, N.Y.), MA, PhD (Columbia), Cated Hon (San Marcos, Lima)
W.G. Scott, BA (Western Ontario), MA (Toronto)

Faculty Member of Sociology holding cross appointment to:

1. Sociology

Faculty Members holding cross appointments to Sociology from:

2. Statistics and Actuarial Science

3. Kinesiology

4. Recreation and Leisure Studies

Human Kinetics and Leisure Studies

5. Statistics and Actuarial Science

G refers to faculty members at Conrad Grebel College

J refers to faculty members at St. Jerome's College

R refers to faculty members at Renison College

Course Descriptions

SOC 101 F,W 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(U), 101(m), 101(w) or SOC 120. 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(w) is especially designed for Planning students.

Also offered at Conrad Grebel, Renison and St. Jerome's Colleges.

SOC 102 F,W 2C 0.5

Social Problems

An examination of cultural forces that create social problems and failures in personal and institutional adjustments. Specific attention is paid to the problems of poverty, delinquency and ethnic relations in Canadian society.

SOC 200 F,W 2C 0.5

Marriage and the Family

A survey of sociological perspectives on marriage and the family in urban-industrial societies. Special attention is given to marriage and the family in Canada. Comparisons with U.S and Britain will be undertaken.

Pre req: SOC 101 or consent of instructor

Also offered at St. Jerome's College

SOC 204 2C 0.5

Sociology of Adolescence

The social definitions of adolescence in cross-cultural and historical perspective. Social roles of adolescents in the institutional structures of urban-industrial societies with special emphasis on the family, education, and the economy. The relationship of adolescents' social roles to processes of social change and stability.

Pre req: SOC 101 or consent of instructor

SOC 206 2C 0.5

Gender Roles

An examination of male and female roles in contemporary Canadian society. Current and past roles of both sexes in different societies are considered. Selected topics of interest include sex role identity and its development, male role change, media images of men and women and men's and women's liberation.

Pre req: SOC 101 or consent of instructor

SOC 207 2C 0.5

Sociology of Education

Attention will be focused on the concepts and theories of sociology as they apply especially to the educational system. This course is designed for Co-op and Regular students who plan to enter the teaching field.

Pre req: SOC 101 or consent of instructor

Offered at Conrad Grebel College.
SOC 208 3C 0.5
Education and Native Peoples
An examination of some of the limitations and alternatives to formal schooling employed mainly by Canadian and Australian indigenous groups (Indian, Inuit, and other aboriginal groups). Special emphasis is placed on skill training and the group's search for identity.
Offered at St. Jerome's College

SOC 209 2C 0.5
Family Origin and Personal Identity
This course focuses on the intersection of biography and social structure within the family. Application of sociological theory and methods to students' own family backgrounds will be used to illustrate the social bases of identity.
Prereq: SOC 101 or consent of instructor
Also offered at St. Jerome's College

SOC 214 2C 0.5
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 219 3C 0.5
Catholic Sociological Thought
An analysis of the distinctive emphasis and perspectives which characterize contemporary sociological theory in Catholic cultures. The course will focus on theories of the family, the community, human sexuality, politics and the economy.
Offered at St. Jerome's College

SOC 220 F,W 3C 0.5
Sociology of Business Management
A study of the structure, stratification and social roles in the organization, operation and management of small businesses. Attention will also be given to decision making, labour-management relations, the institutionalization of value systems, and job satisfaction.
Offered at Conrad Grebel College

SOC 221 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. Formerly SOC 103

SOC 222 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,S 2C 0.5
Deviance: Perspectives and Processes
The deviance-making process is examined in a variety of social contexts. Examines the emergence of rules and control agencies, the processes by which people become involved in deviant activities, and the contingencies affecting their careers as deviants.
Prereq: SOC 101 or consent of instructor
Also offered at Renison College.

SOC 224 2C 0.5
Law and Order: Regulating Deviance
Focusing on the "processes and phenomena 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 225 F 3C 0.5
Sects, Cults and New Religious Movements
An analysis of minority religions considered deviant by the dominant society such as the Amish, Mormons, and Jehovah's Witnesses, with special consideration of the recent new religious movements including Unification (Moonies), Scientology and Krishna consciousness. Cross-listed as REL 221.
Offered at Conrad Grebel College

SOC 227 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, burglary and homicide in contemporary society. Special attention is given to Canadian data.
Prereq: SOC 101 or consent of instructor

SOC 228 0.5
Sociology of Corrections
Decisions to process offenders and the role of social factors in the Canadian criminal justice system are critically examined. Focal issues include police discretion, the legal profession and prison systems.
Prereq: SOC 101

SOC 232 0.5
Technology and Social Change
This course will relate the prospect of social change to issues such as the division of labour, automation, technology and ecology, "post-industrial" society, small scale technology, workers' control and the domination of nature.
Prereq: SOC 101

SOC 233 2C 0.5
Social Psychology of Beliefs and Attitudes
Examines the sources, organization and distribution of beliefs and attitudes and their significance for the individual and society.
Prereq: SOC 101 or PSYCH 101 or consent of instructor

SOC 234 2C 0.5
Social Psychology and Everyday Life
Introducing students to symbolic interaction, a sociological social psychology, this course examines: the impact of culture on socialization experiences, the development of self-identities and social reputations, and interaction patterns in a variety of casual, occupational and deviant contexts.
Prereq: SOC 101 or consent of instructor
Formally SOC 104

SOC 236 2C 0.6
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 238 2C 0.5
Social Movements
The analysis of varieties of social movements and their relationships to social organization and social change.
Prereq: SOC 101 or consent of instructor
SOC 237 2C 0.5
Collective Behaviour
The sociological analysis of the behaviour of crowds, mobs, publics and related phenomena and their relationships to social organization and social change.
Prereq: SOC 101 or consent of instructor
Formerly SOC 106

SOC 238 2C 0.5
Sociology of Marketing and Sales
This course considers the (social) processes by which people "do business". Focusing on day to day exchanges, ongoing relationships within the business and consumer community are examined from an interactionist perspective.
Prereq: SOC 101 or consent of instructor

SOC 242 2C 0.5
Industrial Sociology
Special emphasis is given in lectures, reading and assignments to the particular problems facing industrial Canada, especially in reference to regionalism, elitism, the multinational enterprise and the problem of foreign ownership.
Prereq: SOC 101 or consent of instructor

SOC 243 S 2C 0.5
Occupational Sociology
An introduction to the study of work and occupations: the problems of occupational choice, occupational socialization and identification; the concepts of career and career mobility; the professionalization process, the nature of professions; the impact of occupation on life styles, leisure and retirement.
Prereq: SOC 101 or consent of instructor

SOC 247 2C 0.5
Death and Social Structure
The course is based on the current literature on death and dying; also, with the sociological implications of institutional housing of 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 2C 0.5
Health, Illness and Society
This course focuses on the social aspects of health and illness, including social causes of illness, the social process of becoming ill, and the social consequences of being defined as ill.
Prereq: SOC 101 or consent of instructor

SOC 249 3C 0.5
Sociology of Mental 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, aftercare and rehabilitation, and the epidemiology of mental illness will be examined.
Prereq: SOC 101 or permission of the instructor
Offered at St. Jerome's College.

SOC 252 2C 0.5
Migration and Society
An overview of international migration, particularly during this century; a survey of statistical sources and theoretical explanations of migration. A section of the course will be on the history of immigration to Canada, migration within Canada, and Canadian immigration policies in the context of world migration.
Prereq: SOC 101 or consent of instructor

SOC 253 2C 0.5
Population in Canadian Society
Study of the basic demographic processes in the population of Canada. Demographic implications for selected social institutions. Use of Canadian enumeration and registration data.
Prereq: SOC 101 or consent of instructor

SOC 255 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 2C 0.5
Ethnic and Racial Relations
Relations between different racial and cultural groups, analysis of majority-minority group status with special reference to Canada.
Prereq: SOC 101 or consent of instructor

SOC 259 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 2C 0.5
Political Sociology
The sociological analysis of the institutionalization of power, political movements, parties, conflict and its accommodation.
Prereq: SOC 101 or consent of instructor

SOC 267 2C 0.5
Sociology of the Contemporary University
How have recent demographic and economic changes in North America affected the organization and goals of higher learning? This course explores occupational crises and various attempts at containing and managing them.
Prereq: SOC 101 or consent of instructor

SOC 271 2C 0.5
Introductory Sociological Theory
An examination of the object and function of sociological theory in social research. Types of sociological theories. Discussion of selected classics of sociological theory.
Prereq: SOC 101 or consent of instructor

SOC 275 F 2C 0.5
The Mennonites as a Sociological Community
A case study of the Waterloo County Mennonites as a social system. Attention is paid to a methodology for studying a religious-cultural group by engaging in direct field studies. The community, charter resources, integration, family system, life ceremonies, adaptation to change, and survival techniques will be examined.
Prereq: An introductory social science course
Offered at Conrad Grebel College.
instructor environments.
ships between small groups and their turat perspective. The study of processes of internal differentiition, inte-
experimental groups from a social strut and studied in depth on a seminar basis.

SOC 310 W 2C 0.5
Community, Communities and Utopias
Using communes and the writings of utopia visionaries as case studies, the nature and definition of community, the place and problem of community in modern societies, and the function of community in local and worldwide societal harmony will be analysed. Offered at Conrad Grebel College

SOC 340 2C 0.5
Complex Organizations
Examines the role of large-scale organizations in industrial society, and their impact and influence. Illustrations will be drawn from commerce and industry, as well as education, health services, and government.
Prereq: SOC 101 and SOC 242

SOC 341 2C 0.5
Sociology of Industrial Relations
Using sociological concepts and theories, the course will examine the nature of the relationship between employers and employees, current issues facing unions and management, and the character of accommodation which may be realized between the two.
Prereq: SOC 101 and SOC 242

SOC 342 2C 0.5
Sociology of Health Care
Examination of the organizations which provide health care, including assumptions under which they operate, interactive roles played by all members, including patients, alternative arrangements for providing health care, and the social positions held by health professionals.
Prereq: SOC 101 or consent of instructor

SOC 343 2C 0.5
Sociology of Aging
An introduction to individual and population aging. Topics discussed include: aging from an historical and comparative perspective; aging in subcultures; aging and the social structure; aging and social processes; aging and the environment; work and retirement, and aging and leisure patterns.
Prereq: SOC 101 and 1 other Sociology course
Cross-listed as KIN 352.

SOC 347 3C 0.5
Sociology of Leisure
Nature and extent of leisure phenomena in contemporary society. Examination of institutional and formal organization aspects, social role, social research strategies employed in the study of leisure.
Prereq: 2 term courses in sociology
Cross-listed as RFC 301

SOC 290 F,W 2C,2L 0.5
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
See overlapping content note (Grading Systems, item B) on page 8.7

SOC 296 W 2C 0.5
Sociology of Ecology
A study of the interaction between social organization and ecological factors such as pollution, energy and land resources.
Offered at Conrad Grebel College

SOC 250 W 2C 0.5
Community, Communes and Utopias
Using communes and the writings of utopia visionaries as case studies, the nature and definition of community, the place and problem of community in modern societies, and the function of community in local and worldwide societal harmony will be analysed. Offered at Conrad Grebel College

SOC 257 W 2C 0.5
Problems in Contemporary Education
A study of problems arising from the interplay between institutionalized education and the forces of rapid social change in the contemporary society. It emphasizes the changing roles of the learners and instructors and social dimensions of newer learning theories and programs. Themes will be selected and studied in depth on a seminar basis.
Prereq: SOC 101 and 207
Offered at Conrad Grebel College.

SOC 310 2S 0.5
Seminar in Group Dynamics
An analysis of naturally occurring and experimental groups from a social structural perspective. The study of processes of internal differentiation, integration, authority, etc; and the relationship between small groups and their environments.
Prereq: SOC 101 or consent of instructor

SOC 321 F,C 0.5
Methods 1
An introductory survey of the research techniques employed by sociologists. The formulation of research designs appropriate to various kinds of intellectual problems in social science is stressed.
Prereq: SOC 101 or consent of instructor

SOC 322 W 2C 0.5
Methods 2
Continuation of Methods 1. The course involves seminar meetings emphasizing the critical evaluation of research techniques.
Prereq: SOC 321 or consent of instructor

SOC 326 2C 0.5
Issues in Third-World Development
A study of, and sensitization for possible careers in, Third-World development and modernization with special emphasis on poverty issues, minority group problems and the roles of governmental and voluntary agencies.
Prereq: SOC 255 or permission of the instructor
Offered at Conrad Grebel College.

SOC 329 2C 0.5
Crime as Business
Examines the inter-relatedness of crime and business, looking not only at the extent to which (1) crime represents business for its practitioners and (2) the criminal activities of legitimate business people, but also (3) the agencies regulating crime.
Prereq: SOC 101 and 1 Sociology course in the 220 series

SOC 333 2C 0.5
Canadian Multiculturalism
A seminar dealing with multicultural attitudes and beliefs in Canadian society, especially within the majority English and French Canadian populations.
Prereq: An introductory course in a Social Science

SOC 336 2C 0.5
Sociology of Professions
An examination of the distinctive nature of professions; professional recruitment, socialization and identification; professional careers; the professionalization of occupations; relationship to government; professional specialization; status, power and mobility of professionals.
Prereq: SOC 101
SOC 348 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.
Preq: SOC 101 and 1 other Sociology course
Cross-listed as REC 203 and KIN 252.

SOC 354 2C 0.5
World Population Problems
Comparative analysis of population problems across societies. Focus is on social institutions and their relationships to population. Emphasis on fertility and family planning.
Preq: SOC 101

SOC 360 2C 0.5
Social Psychology and Political Participation
A seminar examining the relations between the social psychological characteristics of Canadians and their political behaviour, with an emphasis on public opinion and voting.
Preq: SOC 101 or consent of instructor

SOC 364 2C 0.5
Social Change
A systematic review and analysis of sources, patterns, processes, and consequences of social change in developing countries, the role of ideas, and the breakdown and reorganization of social structure.
Preq: SOC 101 and 1 other Sociology course
Also offered at St. Jerome’s College.

SOC 366 2C 0.5
Urban Sociology
The comparative study of urbanization as a process; the culture and organization of cities, urban problems; special attention is given to industrial cities of Canada, with comparative reference to the principal cities of Western societies.
Preq: SOC 101 and 1 other Sociology course

SOC 370 2C 0.5
Sociology of Law
Special attention will be paid to the growing public awareness of the failure of law to provide justice or social control in a number of situations. Local judges, lawyers and police officials are invited to discuss such issues as the jury system, police and violence, civil rights and mass media.
Preq: Third year standing or by permission
Offered at Conrad Grebel College.

SOC 371 3C 0.5
Philosophy of Social Science
Problems about the fundamental methods and aims of the social sciences generally, the problems specific to Psychology, Sociology, Political Science, etc., and their relations to one another will be considered.
Preq: Some previous work in a Social Science or in Philosophy
Cross-listed as PHIL 362.

SOC 377 2C 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.
Preq: Permission of the instructor
Offered at Conrad Grebel College.

SOC 380 2C 0.5
Qualitative Methods: Field Research
An application of symbolic interactionist theory, this course examines the contingencies affecting data collection and analysis of ongoing group life. While doing field work, students have an opportunity to examine basic features of interactionist thought.
Preq: SOC 101

SOC 381 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.
Preq: SOC 101 and SOC 280

SOC 405 F 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.
Preq: SOC 101 and 1 other Sociology course (SOC 271 is recommended)

SOC 406 W 2C 0.5
Contemporary Sociological Theory
Development of sociological theory in the 20th century. Included is discussion of current theoretical work.
Preq: SOC 101 and 1 other Sociology course (SOC 271 is recommended)

SOC 440X F,W,S 0.5
Directed Readings
Selected readings and essay assignments under the direction of a faculty member.
Preq: Fourth year standing in Sociology

SOC 440A F,W,S 0.5
Directed Readings in Deviance, Criminology, and Corrections.

SOC 440B F,W,S 0.5
Directed Readings in Social Psychology

SOC 440C F,W,S 0.5
Directed Readings in Social Inequality

SOC 440D F,W,S 0.5
Directed Readings in Quantitative Methods and Statistics

SOC 440E F,W,S 0.5
Directed Readings in Social Theory

SOC 440H F,W,S 0.5
Directed Readings in the Family

SOC 440J F,W,S 0.5
Directed Readings in the Marketplace

SOC 440K F,W,S 0.5
Directed Readings in Industry, Work and Complex Organizations

SOC 440M F,W,S 0.5
Directed Readings in Religion

SOC 440N F,W,S 0.5
Directed Readings in Demography

SOC 440S F,W,S 0.5
Directed Readings in Developing Nations

SOC 440V F,W,S 0.5
Directed Readings in Sex Roles

SOC 440X F,W,S 0.5
Directed Readings in Medical Sociology
Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

SPAN 101 F,W,S 3C,1L 0.5
Introduction to Spanish 1
Intensive drill in the fundamentals of grammar, comprehension and speaking. Some reading, translation and composition. The language laboratory is used as an integral part of the course.
For students with no previous knowledge of Spanish.
Cannot be taken concurrently with SPAN 111.
( WLU 101/151-40).

SPAN 102 W,S 3C,1L 0.5
Introduction to Spanish 2
A continuation of SPAN 101.
Prereq: SPAN 101 or consent of Department.
( WLU 101/152-40).

SPAN 111 F 3C,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.
Cannot be taken concurrently with SPAN 101.
(WLU 111/151-40).

SPAN 201A F, 3C,1L 0.5
Intermediate Spanish 1
For students with some knowledge of Spanish. Seeks to reinforce the language, both oral and written, through selections from literary works and grammar review. Language laboratory also used to increase understanding and speaking skills.
Prereq: SPAN 102 or consent of Department.
(WLU 121/171-30).

SPAN 201B W, 3C,1L 0.5
Intermediate Spanish 2
A continuation of SPAN 201A.
Prereq: SPAN 201A or consent of Department.
(WLU 122/172-30).

SPAN 203 F 3C 0.5
Spanish Civilization 1
Development of Spanish Civilizatii and culture from the earliest times to the present.
Taught in English.
(WLU 203/223-30).

SPAN 204 W 3C 0.5
Spanish Civilization 2
A continuation of SPAN 203.
Taught in English.
(WLU 213/263-03).

SPAN 205 F 3C 0.5
Survey of Spanish Literature 1
Readings of major authors and study of the main literary trends from the middle ages to the 18th century.
Prereq: SPAN 201B.
(WLU 205/255-30).

SPAN 206 W 3C 0.5
Survey of Spanish Literature 2
A continuation of SPAN 205 from the 18th century to the present.
Prereq: SPAN 206.
(WLU 206/256-30).

SPAN 217 F 3C 0.5
Spanish American Civilization 1
A survey of the geography, history and problems of Spanish America from pre-Columbian times to the present.
Taught in English.
(WLU 223/273-30).

SPAN 218 W 3C 0.5
Spanish American Civilization 2
A survey of the art, music and literature of Spanish America from pre-Columbian times to the present.
Taught in English.
(WLU 223/283-30).

SPAN 227 F 3C 0.5
Survey of Spanish American Literature 1
Literary trends and most significant works from the conquest to the 19th century.
Prereq: SPAN 201B.
(WLU 206/258-30).

SPAN 228 W 3C 0.5
Survey of Spanish American Literature 2
A continuation of SPAN 227.
Prereq: SPAN 227.
(WLU 209/259-30).

SPAN 251 A F 3C 0.5
Composition and Conversation 1
Intensive language study based on literary texts, including vocabulary, grammar and syntax. Introduction to commercial Spanish. Essay writing, translation and discussion.
Prereq: SPAN 208 or consent of Department.
(WLU 211/261-30).
SPAN 251B W 2C 0.5
Composition and Conversation 2
A continuation of SPAN 251A.
Prereq. SPAN 251A
(WLU 212/262-03).

SPAN 304 F 2C 0.5
Romanticism in Spain
Readings of selected 19th century
plays, poetry and novels.
Prereq. SPAN 206
(WLU 304/364-30).

SPAN 305 W 2C 0.5
The Spanish Realist Novel
Study of the fundamental narrative tech-
niques and ideology in some of the
most representative realist novels of the
19th century.
Prereq. SPAN 206
(WLU 305/365-03).

SPAN 311A F 2C 0.5
Applied Spanish Stylistics 1
A workshop-type course designed to
develop advanced oral-aural skills,
comparative translation and composition.
Written and oral translation of journalistic
material. Frequent class presentations
are required of students.
Prereq. SPAN 351A/351B
(WLU 311/461-22).

SPAN 311B W 2C 0.5
Applied Spanish Stylistics 2
A continuation of SPAN 311A.
Prereq. SPAN 311A
(WLU 311/461-22).

SPAN 322 F 2C 0.5
The Generation of '98: Fiction
A study of selected works of Valle-
Inclán, Azorín, Baroja and Unamuno.
Prereq. SPAN 206
(WLU 322/480-20).

SPAN 325 W 2C 0.5
Contemporary Spanish Novel
Influences on the novel and literary
tendencies, with stress on Cela, Matute,
Lafuente, Angel de Lera and Carlos
Rojas.
Prereq. SPAN 206
(WLU 325/473-02).

SPAN 327 F 2C 0.5
The Spanish Golden Age: Don Quijote
A literary analysis of Don Quijote
through diverse criticism of the master-
piece.
Prereq. SPAN 206
(WLU 327/477-20).

SPAN 333 F 2C 0.5
Modern Spanish American Poetry
A study in depth of major poets and
movements since Modernism.
(WLU 319/469-20).

SPAN 334 W 2C 0.5
Modern Spanish American Prose
A critical study of masterpieces in prose
from Sanmartino to the present.
(WLU 308/369-02).

SPAN 344 F.W.S 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 317/476-20).

SPAN 351A F 2C 0.5
Advanced Composition and
Conversation 1
Writing of essays and discussion based
on selected themes or topics relating to
Spain or Spanish America.
Prereq. SPAN 251B
(WLU 301/351-20).

SPAN 351B W 2C 0.5
Advanced Composition and
Conversation 2
A continuation of SPAN 351A.
Prereq. SPAN 351A
(WLU 302/352-02).

SPAN 445 W 2C 0.5
History of the Spanish Language
Origin and development from pre-Roman
times through vulgar Latin to old
Spanish and thence to modern Spanish.
Basic sound and grammatical changes
as well as word order and vocabulary.
Prereq. SPAN 351B
(WLU 312/462-20).

SPAN 446 W 2C 0.5
The Novel in Mexico
This course will trace the development
of the novel in Mexico through its most
prominent and representative authors,
Azuela's Los de abajo, Rufio's Pedro
Pa(cueto)ramo and Fuentes' La muerte
de Artemio Cruz will be analyzed. These
works will be approached both as an art
form and as a social document, and will
be examined within a broad cultural
context.
Prereq. SPAN 228 or consent of
Department
(WLU 328/478-02).

SPAN 265 The Spanish Short Story
SPAN 266 The Spanish American Short
Story
SPAN 324 Contemporary Spanish
Theatre and Poetry
SPAN 325 The Spanish Golden Age:
Theatre and Poetry
SPAN 331 Contemporary Spanish
Essay
SPAN 337 Women and Spanish
American Literature
SPAN 388 Contemporary Spanish
American Theatre
SPAN 446 Medieval Spanish Literature
SPAN 497 The Novel in South America

COURSES NOT OFFERED 1994-97

SPAN 255
SPAN 304
SPAN 324
SPAN 325
SPAN 331
SPAN 337
SPAN 388
SPAN 446
SPAN 497

Department of
Systems Design
Engineering

Professor, Chairman
K. Huseyn, MSc (Istanbul), PhD
(London), DSc (Eng)(London), PEng
Recipient of the Distinguished
Teacher Award

Professor, President of the University
D.T. Wright, BASc (Toronto), MS (Illinois),
PhD (Cambridge), DEng (Carleton),
LLD (Brock) DSc (Memorial), LLD
(Concordia), LHD (Northeastern),
PEng

Professor, Associate Dean,
Undergraduate Studies, Faculty of
Engineering
P.H.O'N. Roa, BASc (Toronto), MASC,
PhD (Waterloo), PEng

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

Professor, Associate Chairman,
Graduate Studies
M. Chandra, BASc, Techn Institute of Technology, Kanpur), MASC,
PhD (Waterloo), PEng

Professor, Associate Chairman,
Graduate Studies
K.W. Hipel, BASc, MASC, PhD
(Waterloo), PEng

Professors
W.K. Adrian, Dipl Ing (TH Darmstadt),
Dr habil, apl Professor (Karlsruhe)
Course Descriptions

Introductory Notes

1. The numbering of Systems Design Engineering courses is as follows:

a. If the course is given in the "A" term, the number in the units place is odd; otherwise, it is even.

b. The number in the 10's place refers to the field of the subject matter of the course, according to the following codes:

1. topics in applied mathematics
2. computer systems
3. socio-economic systems
4. human systems
5. physical systems
6. the design of engineering systems
7. communication and information systems
8. engineering sciences
9. laboratories

c. The number in the 100's place refers to the year in the program in which the student will encounter the course.

2. The majority of Systems Design courses are given on the basis of 3 formal lectures and 1 tutorial hour each week. The department endeavors to ensure that the formal course schedule remains below 30 hours per week in each term. Beyond this, other, less formally scheduled meetings between students and faculty are required. It is expected that the average student will spend, in total, between 45 and 55 hours per week on his/her studies.

SY DE 111 F 3C,1T 0.5
Calculus 1

SY DE 112 S 3C,1T 0.5
Calculus 2

SY DE 113 F 3C,1T 0.5
Linear Algebra

SY DE 121 F 3C,1T 0.5
Digital Computation
Introduction to electronic digital computers; hardware and software organization, basic features of Pascal and/or Fortran, examples of efficient algorithms for engineering computation.

SY DE 122 S 3C,1T 0.5
Introduction to Computer Systems
Binary variables and basic logic circuits; computer architecture and machine instructions for small computers; assembly language programming; interfacing with peripheral equipment; current engineering applications of microcomputers.

SY DE 131 F 3C,1T 0.5
Engineering Economics
Cost-benefit analysis, critical path methods, interest, project economics, decision making, utility theory, project organizational theory.

SY DE 142 S 2C,2T 0.5
Introduction to Engineering
The man-machine environment complex; the nature of the operational environment; human sensory processes, human information processing; motor function; human work, thermal regulation and metabolism, skill, fatigue; shift work and circadian rhythms, problems of acoustic noise, vibration, heat, cold, needs of ventilation and lighting, information displays and control systems.
**Course Descriptions**

**Systems Design Engineering**

**SY DE 161**  
**F 3C,3L 0.5**  
**Introduction to Systems Design Engineering**  
Introduction to the ideas and techniques of systems analysis and design. Fundamentals of graphic techniques. The use of graphics as an aid to idea generation in design. Principles of planning, innovation, creation of design solutions, feasibility analysis, solution evaluation and selection. The systems approach to value and utility.

**SY DE 181**  
**F 3C,1T 0.5**  
**Statics**  

**SY DE 182**  
**S 3C,1T 0.5**  
**Dynamics**  

**SY DE 184**  
**S 2C,1T 0.5**  
**Introduction to Chemical Systems**  
Concepts of electronic structure, bonding; shapes of molecules, especially in covalent molecules; reactivity, energetics, chemical behaviour as a consequence. Acidity, basicity and buffer solutions. Organic Chemistry - systems of nomenclature, functionality and common relations. Important systems of natural and synthetic polymers and biomolecules.

**SY DE 201/202**  
**W,F 1C 0.0**  
**Tutorial**  
Systems Design second year students will meet a faculty member designated as their class professor. Performance in assignments, conceptual difficulties with courses, internreiation of coursework, later work and engineering practice will be discussed. Non-credit courses.

**SY DE 211**  
**W 3C,1T 0.5**  
**Differential Equations**  
First order differential equations, integrating factor, higher order differential equations. Complex variables, forced and free solutions to differential equations, transient and steady state solutions, applications. Laplace transforms and applications.

**SY DE 212**  
**F 3C,1T 0.5**  
**Applicable Mathematics for Systems Design 2**  
Models and analysis of linear systems. Discrete time systems, continuous time systems; convergence and differential equations; impulse and frequency response. Complex frequency, functions of complex variables, transform domain techniques; Z transform; Fourier analysis, Laplace transform. Transfer functions and frequency response, frequency domain analysis of linear systems; sampling theory, stability, and linear filters.

**SY DE 213**  
**W 3C,1T 0.5**  
**Theory and Applications of Probability**  

**SY DE 214**  
**F 3C,1T 0.5**  
**Theory and Applications of Statistics**  

**SY DE 252**  
**F 3C,1T 0.5**  
**Physical Systems 1**  
Component models, interconnection models, systems equations and their rank properties and solutions. These concepts are developed with respect to electrical systems.

**SY DE 261**  
**W 1C,3L 0.5**  
**Systems Design Workshop 1**  
A problem and project oriented course wherein emphasis is placed on designing and presenting creative solutions to real-life problems. The problems are related to cover all disciplines. Both the problems and the student's work are expected to increase in sophistication through the Workshop course sequence.

**SY DE 262**  
**F 1C,3L 0.5**  
**Systems Design Workshop 2**  
A continuation of the Systems Design Workshop sequence.

**SY DE 281**  
**W 3C,1T 0.5**  
**Mechanics of Deformable Solids**  

**SY DE 283**  
**W 3C,1T 0.5**  
**Electricity, Magnetism and Networks**  
Introduction to the fundamental laws of electricity and magnetism; properties of dielectrics, conductors and semiconductors and terminal characteristics of passive and active components; Kirchoff's laws; step response of first and second order networks; ansausal steady state analysis using phasors. Applications.

**SY DE 292**  
**F 2C,3L 0.5**  
**Digital Circuits and Systems Laboratory**  
Digital systems design, an introduction to digital logic with emphasis on the use and characteristics of integrated circuits. Design of logic systems involving gates, counters, registers, flipflops and arithmetic logic units. An introduction to microprocessor components.

**SY DE 301/302**  
**S,W 1C 0.0**  
**Tutorial**  
Systems Design third year students will meet with a faculty member designated as their class professor. Performance in assignments, conceptual difficulties with courses, internreiation of coursework, later work and engineering practice will be discussed. Non-credit courses.

**SY DE 311**  
**S 3C,1T 0.5**  
**Introduction to Optimization**  
Deterministic operations research models. Topics will include mathematical techniques of unconstrained and constrained optimization, followed by the construction, evaluation and applicability of various models in allocation, inventory, replacement, sequencing and related problems.
**Course Descriptions**

**Systems Design Engineering**

**SY DE 321**  S  3C,1T  0.5  
**Numerical Analysis and Computer Methods**
Introduction to numerical techniques for engineering problems. Topics covered include: source of computational error; solutions to linear and non-linear equations; matrix factorization; eigenvalue problems; numerical integration and approximation; numerical integration solution of ordinary and partial differential equations; introduction to data structures and their application.

**SY DE 322**  W  3C,1T  0.5  
**Computer Simulation of Systems**
System modelling, system simulation techniques, digital computer methods, fundamentals of analog and computation, digital simulation and analog computers; block-oriented languages, introduction to systems simulation using hybrid computers.

**SY DE 332**  W  3C,1T  0.5  
**Mathematical Programming**
Theory and algorithms for non-linear constrained optimization problems: convex set, convex functions, convex programming, Kuhn-Tucker conditions, duality, quadratic programming, quasi-Newton methods, geometric programming, dynamic programming.

**SY DE 333**  S  3C  0.5  
**Applied Statistics**
Multiple regression analysis. Assumptions, use of indicator variables, variable selection techniques, analysis of variance. Introduction to experimental design, including block designs, factorial arrangements of treatments.

**SY DE 341**  S  2C,1L  0.5  
**Introduction to Occupational Hygiene**
History and development of occupational hygiene. Review of organic chemical terminology. Recognition, evaluation, and control of, and human response to, hazardous chemical and physical agents in the environment.

**SY DE 351**  S  3C,1T  0.5  
**Physical Systems 2**
The subject matter is similar to SY DE 252 except that the development is based on other physical systems such as mechanical and hydraulic systems. Mixed nodal, state formulation and solution. Relationship to classical approaches to modeling of systems from other physical systems.

**SY DE 352**  W  3C  0.5  
**Algorithms for Computer-Aided Systems Analysis**
Techniques for tree selection, manipulation of topological information, evaluation of the exponential function of a matrix, etc. The emphasis is on the algorithms but students will be expected to implement them on the computers. A survey of the capabilities of existing programs for system analysis.

**SY DE 353**  S  3C,1T  0.5  
**Introduction to Linear Control Systems**
Application of systems theory to the problems of control. The course integrates this study with an exposition of classical control theory.

**SY DE 362**  W  1C,3L  0.5  
**Systems Design Workshop 3**
A continuation of the Systems Design Workshop sequence for third year students.

**SY DE 364**  W  3C,1T  0.5  
**Manufacturing Science**

**SY DE 366**  W  2C,1T  0.5  
**Aesthetic and Perceptual Aspects of Design**
Presentation and discussion of appropriate and possible methods for the designing of systems or artifacts in which aesthetic characteristics and visual form are primary requirements of the design.

**SY DE 372**  W  3C,1T  0.5  
**Introduction to Pattern Recognition**
Pattern recognition as a process of data analysis. Pattern features as components in a random vector representation. Classification techniques: distance measures in feature space, probabilistic (Bayesian) decision theory, linear discriminants. Clustering and feature extraction. Applications: optical character recognition, speech recognition, industrial robot vision, medical diagnosis, remote sensing and satellite image analysis, fault detection and diagnosis in complex systems such as nuclear reactors.

**SY DE 381**  S  3C,1T  0.5  
**Thermodynamics**
An introductory course in engineering thermodynamics structured for students in Systems Design. Classical thermodynamics is presented as the systematic study of energy: its use, degradation, and waste. Applications focus on problems of energy and environment. The concepts of statistical thermodynamics are introduced briefly and their connections with information theory are described.

**SY DE 384**  W  3C,1T,2L  0.5  
**Materials Engineering**
An introduction to the understanding of the properties and applications of engineering materials. Atomic bonding and packing; crystal defects and microstructure; elasticity, plasticity, strength and fracture; strengthening methods and transformations, fast fracture, toughness, fatigue and creep; oxidation and corrosion; case studies of materials in design.

**SY DE 389**  S  2C,3L  0.5  
**Analog Circuits and Systems Laboratory**
Analog systems design, signal conditioning systems: attenuation, amplification, oscillation, modulation and detection; linear filters. Input-output relationships, transfer functions and frequency response of linear systems. Application to measurement instrumentation.

**SY DE 392**  W  2C,3L  0.5  
**Control Systems Laboratory**
This course serves as a focus for the complete lab program sequence. The emphasis is on major experiments which are themselves complete systems requiring the application of previous acquired knowledge in areas of sensing, synthesis, control, measurement and evaluation. Experiments are drawn from the digital control or computer control environment and from the analog control environment.

**SY DE 401/402**  F,W  1C  0.0  
**Tutorial**
Systems Design fourth year students will meet with a faculty member designated as their class professor. Conceptual difficulties, the interrelation of course work and engineering practice will be discussed. Non-credit courses.
SY DE 411 F 3C,1T 0.5
Probabilistic Modelling
A continuation of SY DE 311, with an emphasis on stochastic operations research models. Topics will include decision making under uncertainty, queuing models and related probabilistic techniques, feedback control, probabilistic inventory, competitive strategies and related topics.

SY DE 413 F 3C,1T 0.5
Linear Graph Theory and Applications
Important concepts in graph theory, their properties, relationships among them and useful graph algorithms are given in the context of various applications. Applications include but are not restricted to number of variables for electrical network equations, graph theoretic solutions to electrical network equations, sparse matrix techniques, graph models for fault diagnosis, optimum distribution of traffic through network and other network flow problems.

SY DE 421 F 3C,1T 0.5
Computer Aided Design
Issues and directions in computer aided design (CAD); fundamental principles and concepts required in design and building of CAD systems; architecture of CAD systems. The usefulness of areas such as knowledge based systems and expert systems will be discussed.

SY DE 422 W 3C,1T 0.5
Machine Intelligence
The objective of this course is to introduce the students to current intelligent system concepts. Artificial intelligence systems in areas such as natural language understanding, speech understanding, machine vision and learning will be discussed. Methods and tools for building expert systems will be introduced.

Prereq. SY DE 352

SY DE 432 W 3C,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 3C 0.5
Conflict Analysis
Techniques from game theory for assessing the social and political influences in engineering decision making. Topics include metagame analysis, games with mistaken information, sensitivity analysis, dynamic games, probabilistic considerations, bargaining and real-world applications of all the foregoing concepts.

SY DE 442 W 2C,1T 0.5
Occupational and Environmental Systems Safety

SY DE 443 F 2C,1T 0.5
Human Function
The structure and function of man in relation to the design of man-machine systems with specific emphasis on human physiology and bioengineering. The cell as micro-system and man as a complex of systems and sub-systems.

SY DE 453 F 3C 0.5
Time Domain Models for Physical Systems
State equations for two-terminal component systems; time varying and non-linear components; analytical solutions for state models; numerical and analog methods for solution.

SY DE 454 W 3C,1T 0.5
Topics in Physical Systems Theory
This course applies physical systems theory to problems where the physical process is continuously distributed throughout a medium. The course contents include introduction to field and continuum problems; overview of approximate solution methods - including the finite difference method and the finite element method; identification of field variables; spatial discretization; modeling the field characteristics; formulations and computer solutions; applications of multi-terminal representations.

SY DE 456 W 3C,1T 0.5
Large Scale Engineering Systems: Maximum Entropy Principle (MEP), Jayne’s formalism, applications to thermodynamics, derivation of some common probability distributions on the basis of MEP, spectral analysis and state estimation. The intent of the course is to spell out a systems methodology for probabilistic systems from an information-theoretic point of view.

SY DE 481 F 1C,5L 0.5
Systems Design Workshop 4

SY DE 482 W 1C,1T 0.5
Systems Design Workshop 5
A continuation of the Systems Design Workshop sequence for fourth-year students.

SY DE 466 W 3C 0.5
Technological Innovation and Its Management
Factors influencing technological innovation. The environment for technological innovation in Canada. Technological innovation in the corporations. The role of governments and universities. International comparisons.

SY DE 468 W 3C,1T 0.5
Structures and Design
Structural forms. Structural requirements. Statically determinate and indeterminate structures. Basic theorems of linear elastic structures. Methods of analysis: slope-deflection, moment distribution, etc. Applications of Graph Theory to the analysis of structural systems.

SY DE 472 W 2C,1T 0.5
Man-Machine Communications
The nature and design of machine-mediated human communication systems. Displays; computer graphics, computer-aided instruction and mass communication media (film, T.V., radio, print). A systems approach will be adopted with special attention to the socio-economic aspects of such systems.
SY DE 474 W 3C 1T 0.5

Image Processing

Beginning with a discussion of quantitative models of imaging systems, this course moves on to apply methods of linear systems theory and signal processing to image processing. Simple spatial domain techniques as well as special frequency domain methods and digital filter design for image enhancement and restoration are discussed. Special topics in application areas of machine vision (segmentation and feature extraction), remote sensing, medical imaging and vision models are presented throughout the term.

Prerequisite: SY DE 212 or equivalent

SY DE 525 F 3C 0.5

Computer-Aided Simulation and Design

System modeling and simulation techniques, fundamentals of analog computation, time and magnitude scaling; continuous system simulation on the digital computer; advantages and disadvantages of digital and analog simulation techniques; discrete-event system simulation on the digital computer; system simulation; examples and problems.

SY DE 535 F 3C 0.5

Selected Topics for Socio-Economic Systems Design

This course is intended for students who, with little prior background, are interested in enlarging their knowledge of Systems Design. The emphasis is on the quantitative methods applicable to the design of engineering systems wherein the criteria concerning social, environmental and economic considerations are important. Both deterministic and probabilistic situations are discussed.

SY DE 543 W 3C 0.5

Human Engineering

Man-machine systems concepts; functional man-machine interfaces; presentation of required operating information; control/display design parameters; workspace configuration and dimensioning; human engineering analysis and simulation; human performance experimentation and human engineering measurements during systems R&D evaluation.

SY DE 544 F 3C 0.5

Ergonomics

Significance of ergonomics; man-machine-environment complex; physiology of work, human information processing, fatigue, circadian rhythms and the health consequences of shift work; environmental factors in industry; noise, vibration, vision, illumination, heat, cold, toxic chemicals, industrial safety.

SY DE 555 W 3C 0.5

Introduction to Physical Systems

This course introduces students to a unified approach to Physical System Theory, using a graph-theoretical modeling technique. Specific topics include: component modeling, the system graph and its matrices, system modeling by the branch, chord and branch-chord methods power, energy, Telegen's theorem, multi-terminal representations, piecewise analysis of systems through subsystems, multipoint representations, formulation and solutions of state models. Introduction to advanced topics.

SY DE 566 F 3C 0.5

Introduction to Design Organization and Systems Behaviour

The basic aim of the course is to introduce the student to the study and understanding of systems, and to broaden systems concepts and the techniques used in applying these concepts in a variety of fields. The course will also introduce students to the process of design, that is need analysis and generation of problem statements, generation of solution sets, feasibility determination, selection of optimal solution, and communication. The process will be examined from the operational, organizational and behavioural viewpoints.

Women's Studies

Lecturer, Director of Women's Studies
L. Donley, BA, MA (Louisville) J J refers to Faculty Member at St. Jerome's College

Members of the Women's Studies Advisory Committee

Professors
P. Farisby, AB (Mount Holyoke), MA, PhD (Toronto)
M.E. Thompson, BSc (Toronto), MSc, PhD (Illinois)

Associate Professors
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R. Hyme, BS, MS (Madras), MA (Sheffield), PhD (Pittsburgh)
R. Listler, BA, MA, PhD (Toronto)
A.C. Minas, BA (Radjoffe), MA, PhD (Harvard)
W. Mitchellon, BA, MA, PhD (York)
G.A. Peterson, BSc, MSc (Alberta), PhD (California, Davis)
A.F. Thompson, BA (Toronto), BTh (Huron), MA (Western Ontario), STM, PhD (McGill)
A. Wipper, BA, MA, PhD (Toronto), PhD (Carleton-Brantley)

Assistant Professors
S.D. Burt, BA, MA (Waterloo), PhD (York), Chairperson of the Advisory Committee
M. van Dijk, BA, MA (Wellington), PhD (Toronto)
H.S. Fournier, BA (Toronto), MA, PhD (Western Ontario)
M.C. Howard, BA, MA (Lancaster), PhD (Lancaster)
S.K. Jahnnesen, BA (Evangel College), MA, PhD (Massou)
E. Kiman, MA, PhD (Toronto)
J.A. Legault, BSc, MSc (Toronto), PhD (Ottawa), PhD (Ottawa)
G.O. Michalenko, BA, PhD (Saskatchewan)
J. Miller, BA, BLS (McGill), MA, MPhil (Waterloo), PhD (York)
G. Nicoli, BA, MA, PhD (British Columbia)
N. Theberte, BA (Massachusetts), MA (Boston), PhD (Massachusetts)
A.C. Zeller, BSc (Trinity), MA, PhD (Western Ontario)
Course Descriptions

Women’s Studies

Lecturers
S.P. Gunz, BA, LLB, MA (Sydney), MBA (Manchester)
R.L. Walker, BSc, MSc (Western Ontario)

Instructor
J. Lowe, BSc (Carleton), Recipient of the Distinguished Teacher Award

Dean of Women position presently unfilled.

Dean of Students, Conrad Grebel College
G. Eby, BA (Goshen College)

Library
S. Bellingham, BA (Waterloo Lutheran), MLS (Western Ontario)

Independent Studies
A. Dagg, BA, MA (Toronto), PhD (Waterloo)

University of Waterloo
Since WS 200, the core course of the Joint Option, is an interdisciplinary introductory course to Women’s Studies, this course is a team-taught effort. The participating lecturers from other disciplines of Art, Sociology, Psychology, Philosophy, Religious Studies, Economics, Political Science and English may vary each term.

Wilfrid Laurier University

Associate Professors
A. Guinsburg, BA (Valparaiso), AM, PhD (Stanford)

Course Descriptions

WS 200
Introduction to Women’s Studies
An interdisciplinary survey which introduces students to the questions which have been posed concerning women’s nature, roles, problems and accomplishments. Special emphasis will be given to the methodologies which a variety of disciplines in the Arts and Sciences use to examine these questions.

WS 300
Seminar in Women’s Studies
A seminar in which students will examine the origins and course of the women’s movement from an interdisciplinary perspective, with special attention to topics such as the Canadian woman.

Women’s Studies core courses and approved courses are listed in the Interdisciplinary Options, Chapter 15.
Governing Bodies and Staff
The Board of Governors

The Board of Governors acts as the governing body of the University and as such has the power to control UW's property and revenues, and the conduct of its business and affairs. Planning and implementation of the physical and operational development of the University, establishment and enforcement of rules and regulations with respect to University property, and designation of University funds are included under the jurisdiction of the Board of Governors.

The membership of the Board of Governors consists of representatives from the University faculty, staff and student bodies, and the community-at-large, as well as appointees from the Lieutenant-Governor-in-Council, and a number of ex-officio members.

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