University of Waterloo
Undergraduate Calendar
1984-1985
The Undergraduate Calendar

The information in this Calendar applies to the 1984-85 academic session which commences in September 1984.

The University of Waterloo publishes:

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

And booklets on the following Faculties:

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

Those marked * would normally appear in the WATBOX.

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

The University has developed a number of services to assist students with physical disabilities. More information is on page 1.10 of this Calendar.

Inquiries

Inquiries and formal applications for admission should be directed to:

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

Telephone (519) 885-1211, ext. 2268

The Registrar's Office is located on the second floor of Ira G. Needles Hall.

Office hours are from 8:30 a.m. to 4:30 p.m. Monday through Friday.

Federated and Affiliated Church Colleges:

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

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

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

St. Paul's College
Westmount Road North
Waterloo, Ontario N2L 3G5
(519) 885-1460
# Undergraduate Calendar 1984-85

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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 sections of the Calendar should be consulted.*
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</table>

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

*These programs normally fulfill the academic requirements for registration in the related professions. Pertinent sections of the Calendar should be consulted.
Glossary of Terms

Antirequisite
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 1.0 is normally assigned to a 26 week (2 term) course; a credit weight of 0.5 is normally assigned to a 13 week (1 term) course. These credit weights are used in the calculation of averages for academic standing. Most courses have credit weights of 0.5 or 1.0, but some have other weights such as 0.25, 0.75, 2.0. Further explanation is on p. 1.7.

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.

Session
Refers to the 8-month (26 week) period of registration for programs and courses extending from September to April. Also used in reference to the 6 week summer session held in July and August.

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 — 1984

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Day</th>
</tr>
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<tbody>
<tr>
<td>Meeting - Senate Executive Committee</td>
<td>March 5</td>
<td>Monday</td>
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<tr>
<td>Preregistration Begins - Undergraduate Programs - Fall Term</td>
<td>March 5</td>
<td>Monday</td>
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<tr>
<td>Preregistration Ends - Undergraduate Programs - Fall Term</td>
<td>March 9</td>
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<tr>
<td>Meeting - University Senate, 7:30 p.m.</td>
<td>March 19</td>
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<tr>
<td>Meeting - Board of Governors Executive Committee</td>
<td>March 20</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Lectures End - Winter Term</td>
<td>March 30</td>
<td>Friday</td>
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<tr>
<td>Examinations Begin - Winter Term</td>
<td>April 2</td>
<td>Monday</td>
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<tr>
<td>Meeting - Senate Executive Committee</td>
<td>April 2</td>
<td>Monday</td>
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<tr>
<td>Meeting - Board of Governors, 10:00 a.m.</td>
<td>April 3</td>
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<tr>
<td>Course-Add Deadline - Correspondence - Spring Term</td>
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<tr>
<td>Meeting - University Senate, 7:30 p.m.</td>
<td>April 16</td>
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<tr>
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<td>April 19</td>
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<td>Friday</td>
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<tr>
<td>Winter Work Term Ends - Co-operative Programs</td>
<td>April 27</td>
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<td>Spring Work Term Begins - Co-operative Programs</td>
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<tr>
<td>Registration - Undergraduate Programs - Spring Term</td>
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<td>Start of Late Fees - Spring Term</td>
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<td>Examinations - Correspondence - Winter Term</td>
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<td>Meeting - Senate Executive Committee</td>
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<td>End of Course Change Period - Spring Term - See Individual Faculty Chapters.</td>
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<td>Victoria Day - University Holiday*</td>
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<td>Spring Convocation</td>
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<td>Meeting - Senate Executive Committee</td>
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<tr>
<td>Final Examination Results Due - Spring; Summer</td>
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*Some University Departments may be open for limited service on these days.*
### Academic Calendar

#### 1984 Continued

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*Some University Departments may be open for limited service on these days.
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<td>Wednesday</td>
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<tr>
<td>Meeting - Senate Executive Committee</td>
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<tr>
<td>Lectures Begin - Engineering Program - Winter Term</td>
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<td>Lectures Begin - Other Programs - Winter Term</td>
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<tr>
<td>Meeting - Senate Executive Committee</td>
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<td>Tuesday</td>
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<td>Study Week Begins - Arts &amp; Environmental Studies</td>
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<td>Meeting - Senate Executive Committee</td>
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<td>Preregistration Begins - Undergraduate Programs - Fall Term</td>
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<tr>
<td>Preregistration Ends - Undergraduate Programs - Fall Term</td>
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<td>Meeting - Board of Governors Executive Committee</td>
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<td>Meeting - Senate Executive Committee</td>
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<td>Registration - Undergraduate &amp; Graduate Programs - Spring Term</td>
<td>April 29</td>
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<td>Lectures Begin - Engineering Program - Spring Term</td>
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<td>Lectures Begin - Other Programs - Spring Term</td>
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<td>Examinations - Correspondence - Winter Term</td>
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<td>Meeting - Senate Executive Committee</td>
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<td>Spring Convocation</td>
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<tr>
<td>Examination Results Due - Correspondence - Winter Term</td>
<td>May 31</td>
<td>Friday</td>
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</table>

*Some University Departments may be open for limited service on these days.*
### 1985 Continued

<table>
<thead>
<tr>
<th>Event</th>
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<tbody>
<tr>
<td>Meeting - Senate Executive Committee</td>
<td>June 3</td>
<td>Monday</td>
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<tr>
<td>Meeting - Board of Governors, 10:00 a.m.</td>
<td>June 4</td>
<td>Tuesday</td>
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<tr>
<td>Preregistration Begins - Co-operative Programs - Winter Term</td>
<td>June 5</td>
<td>Wednesday</td>
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<tr>
<td>Preregistration Ends - Co-operative Programs - Winter Term</td>
<td>June 7</td>
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<tr>
<td>Meeting - University Senate, 7:30 p.m.</td>
<td>June 17</td>
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<tr>
<td>Canada Day - University Holiday*</td>
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<tr>
<td>Registration - Summer Session</td>
<td>July 2</td>
<td>Tuesday</td>
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<tr>
<td>Lectures Begin - Summer Session</td>
<td>July 2</td>
<td>Tuesday</td>
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<tr>
<td>Start of Late Fees - Summer Session</td>
<td>July 3</td>
<td>Wednesday</td>
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<tr>
<td>Lectures End - Spring Term</td>
<td>July 26</td>
<td>Friday</td>
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<tr>
<td>Examinations Begin - Spring Term</td>
<td>July 29</td>
<td>Monday</td>
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<tr>
<td>Civic Holiday - University Holiday*</td>
<td>August 5</td>
<td>Monday</td>
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<tr>
<td>Lectures End - Summer Session</td>
<td>August 9</td>
<td>Friday</td>
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<td>Examinations End - Spring Term</td>
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<td>Examinations - Summer Session</td>
<td>August 10</td>
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<tr>
<td>Examinations - Correspondence - Spring Term</td>
<td>August 10</td>
<td>Saturday</td>
</tr>
<tr>
<td>Final Examination Results Due - Spring; Summer</td>
<td>August 16</td>
<td>Friday</td>
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<tr>
<td>Spring Work Term Ends - Co-operative Programs</td>
<td>August 30</td>
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<tr>
<td>Fall Work Term Begins - Co-operative Programs</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. 7 East signs; then follow the Pkwy. and exit at University Ave. West; drive in a westerly direction on University Ave to University of Waterloo. The second route follows the first route to the Conestoga Pkwy.; enter the Pkwy. following Hwy. 7 & 8 West Stratford; continue on the Pkwy. and exit at Fischer Dr. out off. Turn left at the Fischer-Hallman Dr. traffic lights and continue north west along Fischer. Fischer Dr. becomes Hallman Rd. at Erb St.; continue on Hallman Rd. until you reach Columbia Dr. Turn right on to Columbia and drive easterly until you reach the University of Waterloo.
The University of Waterloo
The Undergraduate Calendar

The Undergraduate Calendar is published once a year by the Office of the Registrar, University of Waterloo. The Calendar serves to provide a current and official list of academic courses and programs, policies, and regulations regarding admissions, examinations, and fees, as well as general information about the University. It also serves as an official and historical record of the University.

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

The Calendar is arranged in chapters which fall into 4 divisions. The first division contains general information about 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.

The information in this Calendar applies to the 1984-85 academic session which commences in September 1984.

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, Integrated Studies, Mathematics, and Science. The University is a member of The Association of Universities and Colleges of Canada and the Association of Commonwealth Universities.

The Campus

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

Since the opening of the first permanent structure on campus in 1958, the University has expanded steadily. More than 40 teaching and service buildings presently on campus include a Computing Centre, a Physical Activities Building, an ice arena, extensive library facilities, 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, guies.

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 insofar as is necessary to ensure the orderly performance of the University’s functions.

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

Academic Organization

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

Full-time enrolment for each Faculty including church colleges and off-campus students (anticipated as of November 1, 1983).

- Faculty of Arts: 3131
- Faculty of Engineering: 3351
- Faculty of Environmental Studies: 1484
- Faculty of Human Kinetics and Leisure Studies: 1177
- Integrated Studies Program: 70
- Faculty of Mathematics: 3714
- Faculty of Science: 2161

Total Undergraduate Enrolment (Full-time): 15088
Graduate Student Enrolment (Full-time): 1340

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.

The College has 2 residences accommodating 100 men and 75 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.

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

Academic offerings at Renison serve students registered in
a) Social Development Studies, and
b) General Arts.

Social Development Studies is an interdisciplinary program of courses in Social Work, Psychology, Sociology and Interdisciplinary Social Science leading to a BA of the University of Waterloo with emphasis on both classroom study and community involvement.

The College also offers courses in 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 75 women.
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, and the dynamics of personality development.

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

The College also offers a number of courses in Religious Studies, which are available for academic credit to any student enrolled in the University.

There is an attempt on the part of the College to integrate its academic life with life in the residence. 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. Members of the College and Associates participate in a vital and enriching community.

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

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

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

The University of Waterloo offers the following graduate degrees:

- Master of Arts  MA
- Master of Applied Science  MASC
- Master of Mathematics  MMATH
- Master of Philosophy  MPhil
- Master of Science  MSc
- Doctor of Philosophy  PhD

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

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

- Doctor of Engineering  DEng
- Doctor of Environmental Studies  DES
- Doctor of Laws  LLD
- Doctor of Letters  DLitt
- Doctor of Mathematics  DMATH
- Doctor of Science  DSc

Systems of Study
The University offers students 2 different systems of study, the Regular System and the Co-operative System. Some programs are offered under 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 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.
Mature Student Services
Mature Student Services provides special programs and services for students, both full time and part time, 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 learning skills packages, a newsletter, a buddy system, and a library of tapes on topics of interest to mature students.

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 schedule. 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, Stratford, Halton Hills, Walkerton, Orangeville, and Cambridge. 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.

The public is invited to attend off-campus courses as free public lectures. During the first 3 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 the largest university-level distance education program 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
Annex 2, University of Waterloo
Waterloo, Ontario N2L 3G1
(519) 885-1211, ext. 3901

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 the UW Office of Part-Time Studies and Continuing Education.

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)
The University of Waterloo
Cross-registration with Wilfrid Laurier University
Grading System

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

For further details, contact the Registrar's office.

### Grading System

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

Overall standings are reported in all faculties as numeric averages. The weighting factors are used for calculating overall averages for students on the letter grade system, and for converting assigned letter grades, where required, for students whose faculty is on the numeric system.

Please refer to the individual Faculty chapters for a complete explanation of the appropriate grading system.

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<th>Common Weighting Factors</th>
<th>Assigned Percentage</th>
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<td>90-100</td>
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<tr>
<td>A</td>
<td>89</td>
<td>85-89</td>
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<tr>
<td>A-</td>
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*Actual assigned numeric grades are used in calculating averages for students in faculties on the numeric scale.*

### Non-Graded Standings

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<tr>
<td>NCR</td>
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<tr>
<td>INC</td>
<td>Incomplete course work, no credit granted</td>
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<tr>
<td>DNW</td>
<td>Did not write examination, no credit granted</td>
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<tr>
<td>AUD</td>
<td>Audit only, no credit granted</td>
</tr>
<tr>
<td>NMR</td>
<td>No mark reported</td>
</tr>
</tbody>
</table>
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-course 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, Chapter 8-15.

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

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

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

Each term the formal lecture period, as defined by the dates shown on pages 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 with 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.*

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**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**

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

**Objects**

The principal “Objects” of the Federation are:

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

The Students' Council 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 University of Waterloo**

Student and Administrative Services

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**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 Vice-President Operations and Finance** works with the Business Manager to oversee the Federation Budget, the Federation’s Ancillary Services and other services such as Fed Flicks, the Toronto Bus Service, SCOOPS, the Legal Resource Office, Women's Centre, Birth Control Centre, and PEERS Counselling 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, and Internal Liaison Commissions.

**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, Street Dance, pubs, and concerts.

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

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

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

**The Internal Liaison Commission** is an important Commission that co-ordinates and assists activities between the Federation, Societies, Residences, and Clubs.
The 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, 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 885-1211, ext. 3880.

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, to paraphrase an old adage, is of the students, by the students, and for the students at the University of Waterloo. It is not only funded by students, but governed and run by volunteer student staff members. Imprint is located in the Campus Centre, room 140, and publishes weekly in the fall and winter terms, and bi-weekly over the summer.

Imprint continually needs volunteer students to write, draw, take photos, paste-up, manage, and organize. The volunteers need not be qualified newspaper people as training is provided in all the areas.

Imprint can be reached from 9:00 a.m. to 5:00 p.m. at 885-1660, or University ext 2331 Monday through Friday. Inquiries should be directed to the editor-in-chief.

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 level and a recreational level, including such sports as slow-pitch, softball, scuba instruction, 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 of comedy, stage, popular and Chamber Music, children's and special attractions (i.e. The Nylons).

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 take place in this theatre also. 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 this year's Chamber Music series, Oktoberfest, 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 the 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, ext. 2126 or 2127. Free brochures and tickets are available here.

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.

Dean of Women
Room 224, Modern Languages Building
This office serves as a general advisory centre for all students who wish to discuss academic programs, career choices, to sort out personal difficulties, or to find a sounding board for their own ideas. Students are invited to drop by or call ext. 3388 at any time during regular office hours.

Health Services
Health Services Building
Health Services is the Medical clinic centrally located on campus. It provides comprehensive health care to all students and emergency care to anyone on campus. Physicians, nurses and a counsellor are on staff at the clinic which is open Monday to Friday from 8:30 a.m. to 8:00 p.m. (8:30 a.m. - 5:00 p.m. May-August). 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 Health Services. All full-time students are also covered by a Student Supplementary Health Insurance Plan which provides partial payment for prescriptions, eye glasses and other services. For further information on Health Services, obtain a copy of "The People Place" at Health Services or call the clinic at (519) 885-1211, ext. 3541.

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

Office of Research
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; 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 financial monitoring and reporting to researchers and external sponsors.

1. **Research Grants**: Assistance is made available on preparation and forwarding of grant applications. 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 Coordinator 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.,
Room 0104,
Waterloo, Ontario N2L 3E8
or phone (519) 884-0310

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

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

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

The University of Waterloo
Student and Administrative Services

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

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

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

The Library has acquired equipment for use by visually impaired students. This equipment includes a Braille, Kurzweil reading machine, and four-track tape recorders. The staff will also provide assistance for mobility impaired students.

The University has appointed an Advisor on Services for Disabled Persons to assist disabled students to access campus services and facilities, and to provide new items if deficiencies are detected.

For information or assistance, call extension 2130. TDD/TTY users may call 888-6250.

Foreign Student Office
The Foreign Student Office (FSO) located on the second floor of Needles Hall (within Counselling Services) aids foreign students through its special programs. Information is provided on many aspects of living in Canada — immigration regulations, community services, legal problems and cultural adjustment. Programs include Host Families, International Friends, English conversation class, emergency loans, English tutors, and temporary housing.

All students from outside Canada are invited to visit the Foreign Student Office, Needles Hall, Room 2080, ext. 2814. Office hours are 8:30 a.m. to 4:30 p.m., Monday to Friday.

Teaching Resource Office
The Teaching Resource Office of the University of Waterloo was established in 1976, following the recommendation to the Undergraduate Council of Senate by the Vice-President Academic "that the University appoint a person to act as a teaching consultant to the Faculties". Terms of reference for the Teaching Resource Person include providing
assistance to individual Faculty members in improving their teaching performance, offering assistance to Departments on teaching methods and evaluation of learning, and keeping the University community informed about developments and innovations relevant to teaching and learning in higher education. The office, which includes a library of computer-catalogued resource materials, is located in Needles Hall, Room 3005, ext. 2579.

Visitors Reception Centre
The centre, located in Optometry, Room 306, is open daily, Monday to Friday, from 8:30 a.m. to 4:30 p.m. Campus tours leave from the Centre at 10:30 a.m. and 1:30 p.m. and are about 1½ hours long. Students can also arrange to visit specific departments and meet with Faculty members about programs or facilities. Many Faculties have set aside all or several Wednesdays to provide students with the greatest exposure to lectures, other students, and faculty. Visitors to the campus are invited to phone to make arrangements. The number to call is (519) 885-1211, ext. 3614.
Admissions
General Information

Applicants seeking admission to undergraduate programs are required to have suitable and adequate preparation to enable them to successfully undertake studies at the University. Before submitting an application, prospective students should read carefully the description of the 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, full-time, part-time or correspondence, wishing to pursue degree studies.

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, 1984.

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 admission made to an Ontario secondary school student if the applicant fails to complete Grade 13 with a minimum overall average of 60% in 6 Grade 13 credits.

St. Jerome's College

St. Jerome's registers students in the Regular system of study in all Arts and Mathematics subjects and in the Co-op Honours English program. As of January 1983, students may also register in the University of Waterloo Co-op Mathematics program through St. Jerome's College.

Inquiries and correspondence should be directed to:

The Registrar, St. Jerome's College.

Admissions
General Information
General Admission Requirements

Renison College

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

Inquiries and correspondence regarding admissions should be directed to:

The Registrar, Renison College

General Admission Requirements

The minimum admission requirements are expressed in terms of the Ontario Secondary School Grade 13 curriculum.

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

Applicants educated outside of Ontario must submit evidence of having obtained a level of education equivalent to Ontario Grade 13 (see chart on page 2.4-2.6) as well as meeting average requirements.

Normally Grade 13 applicants who are refused admission to a particular program will automatically be considered for admission to other programs for which they satisfy the specific subject and marks requirements. Applicants who are not currently in Grade 13 and who are refused admission to the program to which they applied may be considered to other programs of their choice.
Admissions
Applicants - Ontario Grade 13
Applicants - Other than Ontario Grade 13

Applicants - Ontario Grade 13

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

The 1984-85 Admission Requirements for applicants from Ontario Grade 13 Programs are shown in the chart on page 2.4.

Applicants - Other than Ontario Grade 13

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

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

Applicants applying as adult students are advised to contact the Assistant Registrar of the desired Faculty to discuss admissibility and appropriate qualifying work. Generally, it is recommended that applicants who are applying to enter the University as adult students attempt to obtain standing in at least 1 Ontario Grade 13 level subject or its equivalent. This preparation should relate to the program the applicant wishes to study at the University. Applicants to programs requiring specific Ontario Grade 13 level prerequisites normally must have standing in these required subjects to be considered for admission. Mature students not meeting the requirements for degree candidacy may in certain cases be admitted to degree studies on a part-time probationary basis. Each application is considered on its own merit by the Admissions Committee.

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

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

Transfer Credit
Transfer credit will depend upon the 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.

Text continued on page 2.7.
### Specific Faculty Program Recommendations and Requirements

<table>
<thead>
<tr>
<th>Faculty/Program</th>
<th>Required Grade 13 Subjects and Minimum Averages</th>
<th>Recommendations</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Arts Regular</strong></td>
<td>6 Grade 13 credits.</td>
<td>Applicants should take Grade 13 courses such as English, History, Languages (other than English) English courses, particularly those that stress writing skills, are especially recommended. A Grade 13 Mathematics course is recommended for applicants who are considering social science programs.</td>
<td>In recent years, most students admitted have had Grade 13 averages of 70% or better. A number of students with lower averages, however, are admitted on the basis of other indicators. Admission to Departmental programs occurs following Year 1. An exception is Social Development Studies which generally admits students at the beginning of the first year.</td>
</tr>
<tr>
<td><strong>Co-op (Applied Studies)</strong></td>
<td>6 Grade 13 credits.</td>
<td>Applicants should take Grade 13 courses such as English, History, Science, Mathematics and a second language.</td>
<td>In recent years, most students admitted have had Grade 13 averages of 60% or better. A number of applicants 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.</td>
</tr>
<tr>
<td><strong>Co-op (Accountancy Studies)</strong></td>
<td>6 Grade 13 credits.</td>
<td>Applicants should take Grade 13 courses in English (particularly those that stress writing skills), Algebra and Calculus. Students lacking Algebra and/or Calculus must rectify this deficiency in Year 1.</td>
<td>Applicants with Grade 13 averages over 60% will be given first consideration. Students will register in either Co-op Chartered Accountancy (Economics Option) or Co-op Management Accountancy (Economics Option). Students not admitted to Co-op Accountancy Studies will be considered for the Arts Regular program, and may apply for admission to the Co-op Program after completion of the Fall Term.</td>
</tr>
<tr>
<td><strong>Engineering</strong></td>
<td>Grade 13: Relations &amp; Functions, Calculus, Algebra, Physics, Chemistry, 1 additional credit.</td>
<td>Applicants with high overall standing who are missing 1 or 2 of the 5 specific Grade 13 requirements must contact the Admissions Officer no later than December for September admission. Applicants will be evaluated and advised on the courses of action required to meet the specific requirements. Since Engineering requires considerable writing of reports and reviews as well as the reading of books, articles and journals, the sixth credit for admission should be a subject requiring literary skills such as English, History or Geography.</td>
<td>Year 1 enrolment is limited to 700 students. Approximately 85% of these places are filled by Ontario Grade 13 students. In recent years, most students admitted have had Grade 13 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. The University reserves the right to withdraw offers of early admission for students receiving marks below 60% in any of the 6 credits.</td>
</tr>
<tr>
<td>Faculty/Program</td>
<td>Required Grade 13 Subjects and Minimum Averages</td>
<td>Recommendations</td>
<td>Comments</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>-------------------------------------------------</td>
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</tr>
<tr>
<td><strong>Environmental Studies</strong></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 Grade 13 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 Grade 13 academic records. Admission is based on the results of the interview (including a required portfolio), an English precise-writing exercise designed to test skills of analysis and expression, and on secondary school achievement. The first-year program is limited to 70 students. In recent years, most students admitted have had Grade 13 averages of 75% or better.</td>
</tr>
<tr>
<td>Architecture (pre-professional program)</td>
<td>8 Grade 13 credits including Relations &amp; Functions, Calculus, Physics, English (Français).</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Geography</strong></td>
<td>6 Grade 13 credits.</td>
<td>Applicants should take Grade 13 Geography.</td>
<td>The first-year class consists of approximately 125 students. In 1983, applicants with an average of 70% or better were given first consideration.</td>
</tr>
<tr>
<td><strong>Man-Environment Studies</strong></td>
<td>6 Grade 13 credits.</td>
<td></td>
<td>The first-year class consists of approximately 70 students.</td>
</tr>
<tr>
<td><strong>Urban and Regional Planning</strong></td>
<td>6 Grade 13 credits.</td>
<td>Applicants should include 1 of Grade 13 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 70 students. Applicants with a Grade 12 average of 70% or better are given first consideration. Selected applicants are normally required to come to the University for an interview as part of the admission process. Selection for the interview is based on Grade 12 and Grade 13 marks. Admission is based on the results of the interview, a test of writing ability, and on secondary school achievement.</td>
</tr>
<tr>
<td><strong>Human Kinetics &amp; Leisure Studies</strong></td>
<td>6 Grade 13 credits.</td>
<td>Applicants to the Honours BSc degree program should include Biology, Physics, Functions &amp; Relations, Algebra, and Calculus in their Grade 13 program. Applicants to the General or Honours BA degree program should include English and History in their Grade 13 program.</td>
<td>Applicants living within a reasonable commuting distance of Waterloo should arrange an interview with the Undergraduate Officer regarding admission to the program. Applicants unable to travel to Waterloo should contact the Undergraduate Officer to make other arrangements. Auditions are held at the start of classes for advanced placement in studio courses.</td>
</tr>
<tr>
<td>Dance</td>
<td>6 Grade 13 Credits.</td>
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</tr>
<tr>
<td><strong>Health Studies</strong></td>
<td>6 Grade 13 credits including Biology and Chemistry.</td>
<td>Applicants who lack Grade 13 Chemistry should contact the Undergraduate Officer, Health Studies as soon as possible regarding remedial preparation in Chemistry.</td>
<td>Applicants with overall Grade 13 averages above 70% 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>
<td>6 Grade 13 credits including 1 Grade 13 Mathematics course from Algebra, Calculus, Relations &amp; Functions, 2 Grade 13 Science courses from Biology, Chemistry, Physics, Relations &amp; Functions, Algebra and Calculus. Physics and Calculus are especially recommended.</td>
<td></td>
<td>The Kinesiology program includes required University courses in Calculus, Biology, Chemistry Physics, Computer Science, Psychology and Sociology.</td>
</tr>
</tbody>
</table>
### Admissions
**Specific Faculty Programs**

<table>
<thead>
<tr>
<th>Faculty/Program</th>
<th>Required Grade 13 Subjects and Minimum Averages</th>
<th>Recommendations</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recreation</strong></td>
<td>6 Grade 13 credits including 1 Grade 13 Mathematics course from Algebra, Calculus, Relations &amp; Functions.</td>
<td>Applicants with overall Grade 13 averages above 65% are given first consideration. Applicants may be required to come to the University for an interview as part of the admission process. Admission is based on the results of the interview. If, required, a &quot;Statement of interest&quot; form, letters of reference and secondary school achievement.</td>
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</tr>
<tr>
<td><strong>Integrated Studies</strong></td>
<td>Each applicant to Integrated Studies is considered on the basis of a personal interview with a committee composed of students, resource persons and staff. Those who show an aptitude for self-direction and independent study and the ability to flourish in an unstructured academic setting will be given preference.</td>
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<tr>
<td><strong>Mathematics</strong></td>
<td>6 Grade 13 credits including Calculus, Algebra, and Relations &amp; Functions with a minimum grade of 60% in each of the 3 required Mathematics courses. 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. Since programs in the Mathematics Faculty require considerable writing of reports and reviews as well as the reading of books, articles and journals, one of the non-Mathematics credits for admission should be a subject requiring literary and writing performance such as English, History or Geography.</td>
<td>Competition for admission to Mathematics programs has been keen in recent years with the result that most students admitted have had Grade 13 averages in excess of 75%. Students with lower averages may be admitted if there is evidence to indicate an exceptional aptitude and interest in Mathematics. Students not offered admission to the program of their choice are automatically considered for all other Mathematics programs.</td>
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<tr>
<td><strong>Science All Programs</strong></td>
<td>6 Grade 13 credits including 2 Science courses (1 of which must be Chemistry or Physics), Calculus, 1 of Algebra or Relations &amp; Functions. Students planning to major in Biology or the Earth Sciences/Geography programs, must include both Grade 13 Chemistry. Those planning to major in Chemistry, Optometry or other Earth Sciences programs, must include both Grade 13 Chemistry and Physics. Students planning to major in Physics programs must include Grade 13 Physics. Applicants should include both Grade 13 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, Grade 13 Relations &amp; Functions, and Algebra are both recommended. For the Geophysics Option within Co-operative Applied Earth Sciences, Grade 13 Algebra is recommended.</td>
<td>The most recent minimum Grade 13 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 - 75%. Co-operative Applied Physics - 70% (70% overall required in Physics &amp; Mathematics, with at least 70% in Physics and 70% in Calculus). Total expected enrolment: 600 students.</td>
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</tbody>
</table>
Admissions
Applicants Other Than Ontario Grade 13

Certificate Equivalent to the Ontario Secondary School Honour Graduation Diploma
All applicants are required to hold the specific subject requirements indicated on pages 2.4-2.6 in addition to the equivalent level of education.
Applicants are required to submit official transcripts for all years spent in secondary and post-secondary education. Transcripts must indicate subjects studied, the grades received and an interpretation of the grading system used.

A) Applicants from Other Canadian Provinces
- Alberta: Grade 12
- British Columbia: Grade 12
- Manitoba: Grade 12
- New Brunswick: Grade 12
- Newfoundland: Year 1 Memorial University
- Nova Scotia: Grade 12
- Prince Edward Island: Grade 12
- Quebec: First Year CEGEP program or equivalent
- Saskatchewan: Grade 12

B) Applicants from Other Countries
Equivalent Certificates
Countries following a "British" System of Education
General Certificate of Education or equivalent with passes in at least 5 subjects, 2 of which must be at the Advanced Level. Credits on the 'School Certificate' or subsidiary passes on the 'Higher School Certificate' of recognized examining bodies will be accepted as equivalent to Ordinary level passes on the G.C.E. and Principal or Main passes on the 'Higher School Certificate' as equivalent to Advanced Level passes.

International Baccalaureate
Passes in at least 6 subjects, 3 higher level and 3 subsidiary level with a grade total not less than 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
Baccalaureate 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.

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

Permanent Resident Status
Because of the nature of the co-operative programs at the University, in which a student alternates 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, offered 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.
Admissions
Application Procedures

Application Procedures

1. Applicants who wish to study on a full-time basis must submit their applications through the Ontario University Application Centre (OUAC):

   a) Applicants presently enrolled in an Ontario Secondary School as a full-time day student must complete OUAC form 101 available from the secondary school guidance departments.
   b) All other applicants (e.g. mature applicants, applicants from outside Ontario) must complete OUAC form 105. These forms may be obtained from the Registrar's Office.

2. a) Applicants requesting part-time, or non-degree courses should contact the Registrar's office for the appropriate application forms.
   b) Applicants requesting correspondence courses should write to the Correspondence Program, University of Waterloo, Waterloo, Ontario N2L 3G1 or call (519) 885-1211 extension 3901.

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

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

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

<table>
<thead>
<tr>
<th>Session/Term starting</th>
<th>Last date for application</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 1, 1984</td>
<td>March 1, 1984</td>
</tr>
<tr>
<td>July 3, 1984</td>
<td>June 1, 1984</td>
</tr>
<tr>
<td>*September 4, 1984</td>
<td>July 1, 1984</td>
</tr>
<tr>
<td>January 2, 1985</td>
<td>November 1, 1984</td>
</tr>
</tbody>
</table>

   Correspondence Program

   Fall Term 1984       August 10, 1984
   Winter Term 1985     October 19, 1984
   Spring Term 1985     February 15, 1985

   *Applications and all supporting documentation must be received no later than May 1, 1984 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.
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 Grade 13 applicants will be notified on or after June 15, 1984 of the status of their application for admission. Grade 13 applicants who do not receive an offer of admission at this time will have their applications deferred until the final Grade 13 marks are received by the University. When these marks have been received, qualified applicants will be admitted until the remaining places are filled. Ontario Grade 13 applicants who complete their studies in the Fall semester will be considered when final grades are received.

Ontario Grade 13 applicants who receive an early offer of admission on June 15, 1984 are encouraged to confirm as soon as possible, but are not required to respond before June 29, 1984.

Applicants who are not currently enrolled in an Ontario Grade 13 program can expect to wait several weeks before receiving a decision on their application. 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.

Registration and Fees

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

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

Once admitted to the University, students are advised to preregister for their courses well in advance of the beginning of lectures. First year students select their courses in conjunction with a member of the Dean’s office; advanced year students select their courses on the advice of the departmental undergraduate advisor. Students registering through Renison or St. Jerome’s select their courses with the appropriate advisor at the College. Information regarding pre-registration is forwarded when the student is admitted. Students are encouraged, where possible, to preregister and pay their fees by mail. For those students who do not register by mail, a registration period is held on campus immediately prior to the beginning of lectures each term.

A schedule of fees is outlined on page 3.5 of this calendar.

Release of Academic Information

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

**Preregistration**
Preregistration is the process of choosing courses, having them approved by the appropriate advisor and recorded with the Registrar's Office before classes begin. All students must preregister for courses as follows:

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

B) **NEWLY ADMITTED STUDENTS:**
As soon as possible after academic admission.

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

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

**Assessment**
Fees are assessed as follows: (Foreign Students - see note 4 on page 3.6.)

A) **CO-OPERATIVE PROGRAMS:**
1. *All Terms*
   a) Engineering and Architecture
      Students are assessed on a program 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 Incidental Fees.

B) **REGULAR PROGRAMS:**
1. *Fall/Winter Session*
   a) Architecture Year 1, Integrated Studies and Optometry
      Students are assessed on a program basis for the Total Tuition and Incidental Fees shown on the Schedule of Fees.

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 sessional students unable to pay fees in full prior to the first day of lectures in September, the University will allow payment of fees in 2 instalments, the first payable before the start of lectures in September, and the second payable by the start of lectures in January. Instalment values are as follows:

The first instalment amount will include the total Incidental Fees plus either the total of Unit Course Fees ('') for the courses taken in the Fall Term or one-half of the Total Tuition Fees (''), whichever is the lesser amount.

(*) For Total Tuition Fees and Unit Course Fee see Schedule of Fees.
Fees and Registration
Pre-Registration, Registration, Fees

3.3

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.

3. General Information
   i) Fees should be paid with cash, money order or cheque payable to "University of Waterloo".
   ii) Fee payments by scholarships or bursaries not administered by the University or methods other than those outlined must be authorized in writing by Student Accounts, Financial Services.
   iii) Students who have received a "Notice of Assessment" under the Ontario Student Assistance Program may arrange payment of fees using this source of funds.
   iv) For the 1984/85 year, the University will accept post-dated cheques as an arrangement for the payment of fees. Students choosing this method of payment must post-date the cheque as follows:

<table>
<thead>
<tr>
<th>Session/Term Starting</th>
<th>Cheque must be dated not later than</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 1984</td>
<td>26 August 1984</td>
</tr>
<tr>
<td>January 1985</td>
<td>16 December 1984</td>
</tr>
<tr>
<td>May 1985</td>
<td>20 April 1985</td>
</tr>
</tbody>
</table>

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

   viii) Students who fail to fulfill fee payment arrangements will be assessed a 5% surcharge on the total fees outstanding plus 1½% per month service charge applied to the balance outstanding and calculated from the due date.
   ix) 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 or dates when late fees start. Students will not be allowed to register after the dates shown below:

<table>
<thead>
<tr>
<th>Session/Term Starting</th>
<th>Last Date to Register</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 1984</td>
<td>29 June 1984</td>
</tr>
<tr>
<td>July 1984</td>
<td>27 July 1984</td>
</tr>
<tr>
<td>September 1984</td>
<td>31 October 1984</td>
</tr>
<tr>
<td>January 1985</td>
<td>31 January 1985</td>
</tr>
<tr>
<td>May 1985</td>
<td>28 June 1985</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% of 1 term fee plus the second term payment, if applicable.

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

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 is refundable 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 is not refundable.

i) Certain scholarships and bursaries are given on the condition of completion of the term or session involved. Any withdrawal refunds will be credited to the agency as required.

Drop/Adds

For students assessed on the per course basis, net drop/add activity may change the fee assessment. In general, a net add is assessed at the full rate while a net drop is assessed on the same basis as a withdrawal. It is the student's responsibility to ensure the necessary payment for added courses is made promptly. Failure to do so will result in penalty charges being assessed.
## Schedule of Fees - Undergraduate Programs - Tuition & Incidentals for all Years — Canadian Citizens and Permanent Residents.

Foreign Students on Student Authorizations should refer to page 3.6 for fee information.

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Session/Co-op Term (Note 1)</th>
<th>Basic Fee (Note 2)</th>
<th>Co-op Fee (Note 2)</th>
<th>Total Tuition Fees</th>
<th>Total Incidental Fees</th>
<th>Total Fees (Note 12)</th>
<th>Unit Course Fee (Note 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Architecture</strong></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>- Yr 1</td>
<td>Session</td>
<td>1256.00</td>
<td>1256.00</td>
<td>158.61</td>
<td>1414.61</td>
<td>254.00</td>
<td>127.00</td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td>628.00</td>
<td>115.29</td>
<td>743.29</td>
<td>83.57</td>
<td>826.86</td>
<td>127.00</td>
</tr>
<tr>
<td>- Upper Yr, Co-op</td>
<td>Term</td>
<td>628.00</td>
<td>115.29</td>
<td>743.29</td>
<td>83.57</td>
<td>826.86</td>
<td>127.00</td>
</tr>
<tr>
<td><strong>Arts</strong></td>
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<tr>
<td>- Regular</td>
<td>Session</td>
<td>1157.00</td>
<td>1157.00</td>
<td>153.61</td>
<td>1310.61</td>
<td>254.00</td>
<td>127.00</td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td>578.50</td>
<td>578.50</td>
<td>70.87</td>
<td>649.37</td>
<td>127.00</td>
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</tr>
<tr>
<td>- Winter, Spring</td>
<td>Term</td>
<td>578.50</td>
<td>578.50</td>
<td>70.87</td>
<td>649.37</td>
<td>127.00</td>
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<tr>
<td>- Co-op</td>
<td>Term</td>
<td>578.50</td>
<td>578.50</td>
<td>70.87</td>
<td>649.37</td>
<td>127.00</td>
<td>127.00</td>
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<tr>
<td><strong>Engineering</strong></td>
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<tr>
<td>- Co-op</td>
<td>Term</td>
<td>628.00</td>
<td>115.29</td>
<td>743.29</td>
<td>89.57</td>
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<td><strong>Environmental Studies</strong></td>
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<td>154.61</td>
<td>1305.61</td>
<td>254.00</td>
<td>127.00</td>
</tr>
<tr>
<td></td>
<td>Term</td>
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<td>578.50</td>
<td>71.62</td>
<td>650.12</td>
<td>127.00</td>
<td>127.00</td>
</tr>
<tr>
<td>- Winter, Spring</td>
<td>Term</td>
<td>578.50</td>
<td>578.50</td>
<td>71.62</td>
<td>650.12</td>
<td>127.00</td>
<td>127.00</td>
</tr>
<tr>
<td>- Co-op</td>
<td>Term</td>
<td>578.50</td>
<td>578.50</td>
<td>71.62</td>
<td>650.12</td>
<td>127.00</td>
<td>127.00</td>
</tr>
<tr>
<td><strong>Human Kinetics &amp; Leisure Studies</strong></td>
<td></td>
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</tr>
<tr>
<td>- Regular</td>
<td>Session</td>
<td>1157.00</td>
<td>1157.00</td>
<td>156.61</td>
<td>1305.61</td>
<td>254.00</td>
<td>127.00</td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td>578.50</td>
<td>578.50</td>
<td>72.62</td>
<td>662.12</td>
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<td>127.00</td>
</tr>
<tr>
<td>- Winter, Spring</td>
<td>Term</td>
<td>578.50</td>
<td>578.50</td>
<td>72.62</td>
<td>662.12</td>
<td>127.00</td>
<td>127.00</td>
</tr>
<tr>
<td>- Co-op</td>
<td>Term</td>
<td>578.50</td>
<td>578.50</td>
<td>72.62</td>
<td>662.12</td>
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</tr>
<tr>
<td><strong>Integrated Studies</strong></td>
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</tr>
<tr>
<td>- Regular</td>
<td>Session</td>
<td>1157.00</td>
<td>1157.00</td>
<td>158.61</td>
<td>1318.61</td>
<td>254.00</td>
<td>127.00</td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td>578.50</td>
<td>578.50</td>
<td>73.62</td>
<td>682.12</td>
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<td>127.00</td>
</tr>
<tr>
<td>- Winter, Spring</td>
<td>Term</td>
<td>578.50</td>
<td>578.50</td>
<td>73.62</td>
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<td>127.00</td>
<td>127.00</td>
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<tr>
<td>- Co-op</td>
<td>Term</td>
<td>578.50</td>
<td>578.50</td>
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<td>682.12</td>
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<tr>
<td><strong>Mathematics</strong></td>
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<td></td>
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<tr>
<td>- Regular</td>
<td>Session</td>
<td>1157.00</td>
<td>1157.00</td>
<td>159.61</td>
<td>1321.61</td>
<td>254.00</td>
<td>127.00</td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td>578.50</td>
<td>578.50</td>
<td>74.62</td>
<td>693.12</td>
<td>127.00</td>
<td>127.00</td>
</tr>
<tr>
<td>- Winter, Spring</td>
<td>Term</td>
<td>578.50</td>
<td>578.50</td>
<td>74.62</td>
<td>693.12</td>
<td>127.00</td>
<td>127.00</td>
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<tr>
<td>- Co-op</td>
<td>Term</td>
<td>578.50</td>
<td>578.50</td>
<td>74.62</td>
<td>693.12</td>
<td>127.00</td>
<td>127.00</td>
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<tr>
<td><strong>Optometry</strong></td>
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<tr>
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<td>1256.00</td>
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<td><strong>Science</strong></td>
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<tr>
<td>- Regular</td>
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<td>1157.00</td>
<td>1157.00</td>
<td>161.61</td>
<td>1421.61</td>
<td>254.00</td>
<td>127.00</td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td>578.50</td>
<td>578.50</td>
<td>75.62</td>
<td>694.12</td>
<td>127.00</td>
<td>127.00</td>
</tr>
<tr>
<td>- Winter, Spring</td>
<td>Term</td>
<td>578.50</td>
<td>578.50</td>
<td>75.62</td>
<td>694.12</td>
<td>127.00</td>
<td>127.00</td>
</tr>
<tr>
<td>- Co-op</td>
<td>Term</td>
<td>578.50</td>
<td>578.50</td>
<td>75.62</td>
<td>694.12</td>
<td>127.00</td>
<td>127.00</td>
</tr>
<tr>
<td><strong>Summer Session</strong></td>
<td>Half Course</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Full Course</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Schedule of fees effective May 1, 1984.

Registration in Co-operative programs is available only to students who are Canadian Citizens or Permanent Residents.
Fees for Foreign Students with Student Authorizations (see also Note 4)

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 $2414.00 per session or $1207.00 per term plus incidental fees as shown below. The Unit Course Fee is $482.80 per Full Course or $241.40 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 $3969.00 per session or $1984.50 per term plus incidental fees as shown on the reverse side. The Unit Course Fee is $793.80 per Full Course or $396.90 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:

   Registration in an undergraduate program* in Architecture, Engineering, or Optometry:

   Regular program fees are $7115.00 per session or $3557.50 per term plus incidental fees as shown below. The Unit Course Fee is $1423.00 per Full Course or $711.50 per Term Course.

   Registration in any other undergraduate program:

   Regular program fees are $4366.00 per session or $2183.00 per term plus incidental fees as shown on the reverse side. The Unit Course Fee is $873.20 per Full Course or $436.60 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>Incidental Fees</th>
<th>Session</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercollegiate Athletics</td>
<td>$40.00</td>
<td>$20.00</td>
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<tr>
<td>Health Insurance</td>
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<tr>
<td>- Regular</td>
<td>$34.11</td>
<td>$11.37</td>
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<tr>
<td>- Co-op</td>
<td>$ —</td>
<td>$21.32</td>
</tr>
<tr>
<td>Recreational Facilities</td>
<td>$20.00</td>
<td>$10.00</td>
</tr>
<tr>
<td>Photo I.D. Cards</td>
<td>(See Note 12)</td>
<td></td>
</tr>
</tbody>
</table>

Fees and Registration
Schedule of Fees

The following incidental fees must be paid on registration but are refundable on request from the organization listed below within three (3) weeks after the start of lectures for the session or term:

<table>
<thead>
<tr>
<th>Student Society (see Note 7)</th>
<th>Session</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Architecture</td>
<td>$10.00</td>
<td>$5.00</td>
</tr>
<tr>
<td>- Arts</td>
<td>$ 5.00</td>
<td>$ 2.50</td>
</tr>
<tr>
<td>- Engineering</td>
<td>$ —</td>
<td>$ 8.50</td>
</tr>
<tr>
<td>- Env. Studies</td>
<td>$ 4.50</td>
<td>$ 2.25</td>
</tr>
<tr>
<td>- HKLS</td>
<td>$ 6.00</td>
<td>$ 3.00</td>
</tr>
<tr>
<td>- Int. Studies</td>
<td>$ —</td>
<td>$ —</td>
</tr>
<tr>
<td>- Mathematics</td>
<td>$10.00</td>
<td>$ 5.00</td>
</tr>
<tr>
<td>- Optometry</td>
<td>$ 4.00</td>
<td>$ 2.00</td>
</tr>
<tr>
<td>- Science</td>
<td>$ 8.00</td>
<td>$ 4.00</td>
</tr>
</tbody>
</table>

The following incidental fees are voluntary, not a requirement of registration and are refundable on request from the organization listed below within three (3) weeks after the start of lectures for the session or term:

<table>
<thead>
<tr>
<th>Incidental Fees</th>
<th>Session</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>WPIRG (see Note 7)</td>
<td>$ 5.00</td>
<td>$ 2.50</td>
</tr>
<tr>
<td>Sanford Fleming Foundation</td>
<td>$ —</td>
<td>$ 2.50</td>
</tr>
<tr>
<td>Radio Waterloo (see Note 9)</td>
<td>$ 7.00</td>
<td>$ 3.50</td>
</tr>
<tr>
<td>Imprint (see Note 10)</td>
<td>$ 4.50</td>
<td>$ 2.25</td>
</tr>
</tbody>
</table>

The Federation of Students' fees must be paid on registration but are refundable, as shown below, on request from the Federation, within three (3) weeks after the start of lectures for the session or term as indicated on pages 7 to 10 of this Calendar.

<table>
<thead>
<tr>
<th>Federation Fees</th>
<th>Session</th>
<th>Term</th>
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</thead>
<tbody>
<tr>
<td>Jan. 1984 Refundable</td>
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</tr>
<tr>
<td>May 1984 Refundable</td>
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<td>$11.50</td>
</tr>
<tr>
<td>Sept. 1984 Refundable</td>
<td>$23.00</td>
<td>$11.50</td>
</tr>
<tr>
<td>Non-Refundable</td>
<td>$15.00</td>
<td>$ 7.50</td>
</tr>
</tbody>
</table>

*This non-refundable fee being assessed starting Fall term 1984 was assessed by student referendum in 1983.

Note 1 - Session/Term
Session refers to the eight month (September-April) period of study. Term refers to the 4 month period of study for students registered in a) Co-operative programs, and b) the Winter or Spring terms of Regular programs.

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

Note 3 - Unit Course Fee
The fee assessed at $242.00 for each full course at a weight of 1.0; at $121.00 for each half or term-course at a weight of 0.5; and at a prorated value for other course weights. The Unit Course Fee for Foreign Students with Student Authorizations is shown above.

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

1. A citizen of Canada within the meaning of the Canadian Citizenship Act or a person registered as an Indian within the meaning of the Indian Act;
2. A Permanent Resident within the meaning of the Immigration Act, 1976;
3. A visitor admitted to and remaining in Canada under clause 10(c) of the Immigration Act, 1976 who has entered Canada or is in Canada to carry out his official duties as a diplomatic or consular officer or representative or official properly accredited of a country other than Canada, or of the United Nations or any of its agencies or of any intergovernmental organizations in which Canada participates or as a member of the staff of any such diplomat, consular officer, representative or official;
4. A dependent of a visitor 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 $15.46 for a Regular student per term and $28.98 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 8 - Society Fees
Payment of the Society Fee is required at registration, but a student who does not wish to participate may obtain a refund by applying to the respective society within three (3) weeks after the start of lectures for the term or session as indicated on pages 7 to 10 of this Calendar.

Note 7 - WPIRG (Waterloo Public Interest Research Group)
A student funded environmental and social research group:

This fee is voluntary, refundable, and not a requirement for registration. Requests for refunds or questions concerning WPIRG should be directed to the on-campus WPIRG office within three (3) weeks after the start of lectures for the term or session as indicated on pages 7 to 10 of this Calendar.
Note 8 - 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 9 - Radio Waterloo
The on-campus student radio station.

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

Note 10 - Imprint
The student newspaper.

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

Note 11 - Recreational Facility
A non-refundable fee approved by student referendum for construction of the Columbia Ice Field (Ice Arena North Campus).

Note 12 - Photo I.D. Cards
Effective with the January 1984 registration, all undergraduate students will pay 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.

Note 13 - 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 similar expenses.

Fees and Registration
Schedule of Fees

<table>
<thead>
<tr>
<th>Miscellaneous</th>
<th>$10.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplemental Examination - Each Paper</td>
<td>$10.00</td>
</tr>
<tr>
<td>Presiding Fee</td>
<td>$15.00</td>
</tr>
<tr>
<td>(at outside centre half day)</td>
<td>$15.00</td>
</tr>
<tr>
<td>Returned Cheques - Handling charge (plus late registration penalty as applicable)</td>
<td>$15.00</td>
</tr>
<tr>
<td>Duplicate Fee Statement or Tax Receipt (per request)</td>
<td>$2.00</td>
</tr>
<tr>
<td>Replacement of lost or stolen Identification Card</td>
<td>$5.00</td>
</tr>
<tr>
<td>Replacement of lost or stolen Health Insurance Card</td>
<td>$5.00</td>
</tr>
<tr>
<td>Transcript of Record</td>
<td></td>
</tr>
<tr>
<td>— $3.00 for first copy</td>
<td></td>
</tr>
<tr>
<td>— $1.50 for each additional copy ordered at the same time as the first copy</td>
<td></td>
</tr>
</tbody>
</table>

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 1984 to 30 April 1985 will be available after 1 March 1985.

- 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 1985).
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 Exam.
Scholarships and Prizes, Bursaries and Financial Aid
University of Waterloo Entrance Scholarships

Alfred Armbrus Memorial Scholarship
This $1000 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 the student who has the highest academic standing in Grade 13 examinations and 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. 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.

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.

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.

SCIENCE FACULTY SCHOLARSHIPS
A limited number of entrance scholarships are 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 an examination 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 test, 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
A number of special entrance scholarships are awarded to outstanding students entering the University from the Waterloo County secondary schools. These awards are normally valued at $1000 for Year 1 and some may be renewed for Year 2.

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

Gladys and Norman Ralter Memorial Scholarships
A number of entrance scholarships are awarded to the top eligible student 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.

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 and require the recommendation of the candidate's Department. Part-time students may be eligible for awards of $100 after completing at least 10 half credits at UW.

Arts Associate Dean's Undergraduate Prize
The award is presented to the Faculty of Arts student with the highest overall average in courses taken at the University of Waterloo. The recipient must be in good standing, have completed Year 2 and be continuing in a Year 3 or Year 4 full-time undergraduate degree program.

ENGINEERING FACULTY SCHOLARSHIPS
Upper year awards called Undergraduate Research Scholarships and Undergraduate Research Assistantships, are valued at $600 per term and provide an opportunity for undergraduates to participate in original engineering research. These are available to first class honours students in the 2A - 4A terms. The scholarships are normally awarded automatically at the beginning of each term. To be eligible for an Assistantship a student must apply at the beginning of the term and show 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 $200 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.

MATHEMATICS FACULTY SCHOLARSHIPS
Rene 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.

SCIENCE FACULTY SCHOLARSHIPS
A limited number of scholarships are 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 amount 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
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 Year 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 $500 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.

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

**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.

**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. The recipients should not be receiving any other scholarships for the academic year.

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

**Bemell Clinical Optometry Award**
The award is given annually to a senior student for excellence in clinical optometry. The award consists of selected Bremell instruments valued at $250.
Bernell Freshman Scholarship Award
This award is available each year to a second year Optometry student for outstanding scholastic achievement at the completion of the first year. The award consists of selected Bernell instruments valued at $250.

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 an 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 are also given strong consideration.

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 are also given strong consideration.

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 practical 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.

Scholarships and Prizes, Bursaries and Financial Aid
Undergraduate Scholarships

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.
Allergan Canada Ltd., Pointe Clair, Que.
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.
Superlite Optical Ltd., Toronto, 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.

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.

Dr. John H. Chapman Memorial Prize in Communications Engineering
A prize of $1000 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 Canada's space programs". The prize will be awarded to the fourth year student with the highest academic standing in the Electrical Engineering Communications Option.
Scholarships and Prizes, Bursaries and Financial Aid
Undergraduate Scholarships

**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 $50 gift, 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 should be submitted during the 3B term.

**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 the 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.

**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.

**Datacrown 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.

**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.

**Digital Equipment of Canada Ltd. Award of Merit**
A medal and a cash award of $100 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 extra-curricular activities. Applications should be submitted during the 3B term.

**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.

**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 Optometrical 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 Fевreau Memorial Award**
A $500 award has been established in memory of Scott Kelsey Fевreau, 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 under-graduates. 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 his undergraduate program.

**Sandford Fleming Medal for Co-operative Program Proficiency**
The Sandford Fleming Foundation has established 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 Coordination.

**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 Board of Directors, College of Optometrists of Ontario is awarded to the final year student in the School of Optometry ranking highest in general proficiency.

**The 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 November 30.

**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 $1200, being $300 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 Sydney Hermant, valued at $500 and $250, are awarded to the final year students in the School of Optometry ranking first and second in general proficiency.

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

**Lynn Holmes Memorial Award**
An award of $400 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 Prizes**
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.

**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 La Courciere 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.

**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 R. Matthews offer an annual $200 prize to the student who graduates from the Honours Biology (or Biology/Chemistry) 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 workterm 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 extracurricular interests in the Hispanic Area: 1 in Peninsular Spanish Studies and 1 in Spanish American Studies. Applications should be submitted no later than February.

Mediacom Inc. Scholarship
An annual scholarship of $250 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.

Murata Erie North America, Inc. Award
Two awards totalling $600 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.

Norcen Energy Scholarships
Six awards of $2000 each are given to students in Chemical and Mechanical Engineering, Earth Sciences and the Information Systems Option in Computer Science who are entering third year and have an interest in the energy field. The decision will be based on academic performance and an assessment of the applicant's reasons for applying for the award. Applications should be submitted during the 2B 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 $200 is based on studio performance in second year and overall performance up to the second year.

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

Petro-Canada Engineering Scholarship
The $800 scholarship will be awarded annually to an outstanding student in Chemical or Mechanical Engineering.

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

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.
Scholarships and Prizes, Bursaries and Financial Aid
Undergraduate Scholarships

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

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.

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

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

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

Saskatchewan Optometric Association Scholarships
The Saskatchewan Optometric Association presents 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
   Anne Fiedtkou
   David Lamb
   Robert G. Sommerville

Smale Fellowship
The award of $500 is based on work in the fourth year (BArch) program, leadership ability and academic and design excellence.

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

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

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.

J.C. Thompson Memorial Prize
The $125 Award of the Alumni Association in memory of the late Dean J.C. Thompson is made to the final year student in the School of Optometry who has ranked highest in Optometry (Optometry 242, 252, etc.).

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

University of Waterloo Alumni Association Gold Medals
The University of Waterloo Alumni Association is providing a maximum of 6 gold medals annually to be awarded in recognition of academic excellence. Each
Scholarships and Prizes, Bursaries and Financial Aid
Work-Term Report Awards

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.

John Weir Scholarships
The John Weir Scholarships of $250 will be awarded to 2 Optometry students with high academic standing who are participating in vision research during their period of undergraduate study. These awards will be made annually, on the recommendation of the School of Optometry’s graduate committee.

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 at 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 1 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.

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 Electrical 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.

Copolymer Group 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 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.

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.

**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.

**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 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.

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**Bursaries**

Bursaries are awarded to full-time undergraduates experiencing financial difficulties and normally maintaining a B average. Students with Student Authorizations who have not been in Canada for more than 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.

**Barnes-Hind Canada Bursary**
This $400 Bursary may be awarded to a student in the Optometry program on the basis of academic excellence and financial need. The recipient must not be receiving any other award in that year.

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

**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.

**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 support.
assistance. Preference will be given to women not holding tuition scholarships. Mature women students meeting these requirements are encouraged to apply. A Bursary Fund has also been established for mature women students studying on a part-time basis. Candidates must be working toward an undergraduate degree through part-time studies and need financial assistance.

Central Optical Bursary
A bursary in the amount of $1500 will be awarded to a student who has successfully completed 1 or more years of the professional program. The award is to support student research under the direction of a faculty member of the School of Optometry. Application should be made through the Awards Officer of the University of Waterloo during March or April.

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

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 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.

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

**Bursaries**

**K-W Professional Engineers Wives Association Bursary**
One award of $150 per year will be given to a student in first year Engineering experiencing financial difficulties and maintaining a 70% average or better.

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

**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 Moser Bursary Fund**
Bursaries will be awarded to deserving third and fourth year students who have financial need, an exemplary academic record, and who have achieved a high level of accomplishment in extra-curricular activities. A bursary application plus a resume should be directed to the Associate Dean, Faculty of Human Kinetics and Leisure Studies. Application deadline is January 15.

**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 first-year Computer Science at the University of Waterloo. The awards are presented on the basis of financial need and academic standing.

**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 $150 is offered annually by Procor Limited. The bursary is to be awarded to students in the Faculty of Engineering who are in need of financial assistance and who have satisfactory academic standing.

**Procter & Gamble Student Bursary Fund**
A number of bursaries are awarded to students in any year or faculty on the basis of academic standing and financial need.
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 $100 bursary has been established by Samuel Malenfant, Bachelor of Integrated Studies 1976. The bursary will be awarded to a full-time undergraduate registered in Integrated 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 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-Nicoll Memorial Loan Fund
This fund was established by the Sandford Fleming Foundation in memory of Professors Alpay and Nicoll, Department of Mechanical Engineering, from funds contributed by faculty, staff and others. Emergency loans are made available to students in the Faculty of Engineering.

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 the 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.

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.

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 $200 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 $200 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 60% or less of a normal full course load. This Plan is intended for individuals who are unemployed, receiving social assistance, or have a low family income. A personal interview is required.
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.

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

Photo courtesy Ontario Hydro
Department of Co-ordination and Placement

CO-OPERATIVE EDUCATION

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

Program Administrators
T. H. Fitzgerald, BA (St. Lawrence)
R. A. Fuller, BA (Western Ontario)
J. W. Hoag, BArch (Toronto)
R. A. Klawitter, BA (Western Ontario)
R. A. Pullin, BSA (Toronto)
J. F. Westlake, BASc, MASc, PhD (Waterloo), PEng

Operations Administrator
D. J. Beaupre, BComm (Loyola), CA

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

Co-ordinators, Co-operative Education
G. P. Berthin, BSc (Manitoba), PEng
L. R. Bricker, BSc, MSc (Waterloo)
W. G. Clapham, BMath (Waterloo), MBA (York)
P. H. Critchley, BES, BArch (Waterloo)
W. G. Dailey, BArch (Liverpool)
G. G. Ellsworth, BA (Princeton)
R. A. Grant, BSc (Queen's), PEng
D. S. Harris, BEng (McGill), PEng
R. A. Harshaw, BASc (Waterloo), MBA (York), PEng
B. G. House, BBA (Wisconsin)
E. M. Johnson, BA (Queen's)
K. B. Kenning, BA (Wilfrid Laurier University)
A. L. Lind, BSc (Queen's)
A. F. MacKinnon, BComm (Acadia)
R. Mateyk, BASc (Toronto), PEng
P. J. Mazzei, BSc, MSc (Queen's)
R. McDowell, BSc (Saskatchewan), PEng
M. A. McMartin, BA (Western Ontario)
R. Parker, BSc (Montreal), MBA (Toronto)
L. I. Pinaud, BASc, MSc (Queen's)
A. M. Prins, BA (McMaster)
R. H. Roach, BSc (Waterloo)
J. Ross-Edmison, BA (Waterloo)
W. A. Runge, BSc (Queen's), PEng
J. R. Scouler, BSc, MBA (McMaster)
P. V. Solomonian, BMath (Waterloo), MBA (Wilfrid Laurier)
V. E. Sparrow, BA (Waterloo)
G. Subasic, BASc (Washington), PEng
D. N. Thomas, BSc (Guelph), MBA (McMaster)
C. J. Webster, BSc (Guelph)

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 rather a complement to, the academic studies.

The motivation, responsibility and opportunity for insight gained through Co-operative education can be of inestimable value to the student's future. The Co-operative concept enables those with a career orientation to become full-time students of their subject, both during the academic terms and during the related work terms, and not in a random and uncertain manner, but within a structure of organized purpose and serious study.

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

The Work-Study Sequence
All Year 1 students enrol in September and spend the first term together at the University. 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. Precise dates for the beginning and end of various terms are shown in the Academic Calendar.
## Work-Study Sequence

**Program (By Faculty)**

<table>
<thead>
<tr>
<th>Arts</th>
<th>Applied Studies (with Honours Major in most disciplines)</th>
<th>1A 1B * 2A * 2B * 3A * 3B * 4A * 4B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chartered Accountancy (Economics Option), Management Accountancy (Economics Option)</td>
<td>1A 1B * 2A * 2B * 3A * 3B * 4A * 4B</td>
</tr>
<tr>
<td></td>
<td>Stream 8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stream 4 (Mgt. Acc. only)</td>
<td>1A * 1B * 2A * 2B * 3A * 3B * 4A * 4B</td>
</tr>
<tr>
<td></td>
<td>English</td>
<td>Regular off term 2A * 2B * 3A * 3B * 4A * 4B</td>
</tr>
<tr>
<td></td>
<td>Anthropology</td>
<td>Regular off term Reg 2B * 3A * 3B * 4A * 4B</td>
</tr>
<tr>
<td></td>
<td>Political Science</td>
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<td>Psychology</td>
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<td></td>
<td>Sociology</td>
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<td></td>
<td>Engineering</td>
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<tr>
<td></td>
<td>Chemical, Civil, Electrical, Mechanical</td>
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</tr>
<tr>
<td></td>
<td>Stream 8</td>
<td>1A 1B * 2A * 2B * 3A * 3B * 4A * 4B</td>
</tr>
<tr>
<td></td>
<td>Stream 4</td>
<td>1A * 1B * 2A * 2B * 3A * 3B * 4A * 4B</td>
</tr>
<tr>
<td></td>
<td>Environmental Studies</td>
<td></td>
</tr>
</tbody>
</table>
|      | Architecture                                       | Regular off term 2A * 2B * 3A * 3B * 4A * 4B *
|      | Geography                                          | Regular off term 2A * 2B * 3A * 3B * 4A * 4B |
|      | Man-Environment Studies                            | Reg 1B * 2A * 2B * 3A * 3B * 4A * 4B |
|      | Human Kinetics and Leisure Studies                  |                                        |
|      | Health Studies, Kinesiology, Recreation            |                                        |
|      | Mathematics                                         |                                        |
|      | Stream 8                                            | 1A 1B * 2A * 2B * 3A * 3B * 4A * 4B |
|      | Stream 4                                            | 1A * 1B * 2A * 2B * 3A * 3B * 4A * 4B |
|      | Math Teaching Option                                | 1A * 1B * 2A * 2B * 3A * 3B * 4A * 4B |
|      | Science                                             |                                        |
|      | Biology, Biology and Chemistry (Biochemistry). Applied Chemistry Stream 8 | 1A 1B * 2A * 2B * 3A * 3B * 4A 4B |
|      | Stream 4                                            | 1A * 1B * 2A * 2B * 3A * 3B * 4A 4B |
|      | Applied Physics                                     | 1A 1B * 2A * 2B * 3A * 3B * 4A 4B |
|      | Stream 4                                            | 1A * 1B * 2A * 2B * 3A * 3B * 4A 4B |

* Denotes work term.

V Admission occurs by January for the 2B term.
X Although the Co-op program begins in 2A, admission is made to the program at the time of the initial application to the university.
S Students seeking admission must have satisfactorily completed two work-terms in another Co-op Math program.
T Teaching Term.
S Admission occurs at the time of selection of 2nd year courses. Students cannot be admitted to Co-op in 1st year.

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**Denotes work term.
The 4-month academic term is at Althouse College of Education, London.
Students seeking admission must have satisfactorily completed two work-terms in another Co-op Math program.
Teaching Term.**
5.4

Co-ordination and Placement

Seeking Employment and Employer Interviews

Work Terms

Employment

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

Seeking Employment and Employer Interviews

Seeking Employment

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

Release of Information

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

Missing Interviews

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

Ranking Employers

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

Deleting Job Choices

Normally students may delete up to 2 unacceptable job rankings prior to submitting rankings for the placement process. If extenuating circumstances prevail, a student may delete more than 2 job rankings. In all circumstances, students must discuss the situation with a Co-ordinator prior to eliminating any rankings. Failure to discuss ranking deletions may result in the student being placed “On Own” by the Department of Co-ordination and Placement. Note that there may be instances where a student is not given a ranking by the employer because of an obvious mismatch of the student and the job which is discovered at the interview.

Work Terms

Quantity

Upon entry to a Co-op program a student is expected to follow the work-term/academic-term sequence appropriate for that particular program. In some cases this may include as many as 6 work terms. A student may, for one reason or another, fail to complete satisfactorily the complement of work terms. Allowance can be made for personal consideration, 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.

Registration Through Final Term

All work terms must be completed before the final academic term and the last work report must be submitted not later than the beginning of the final academic term. In all Co-op 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 where a student may have enough credits to be able to register as a part-time student in the final term.
Performance Evaluation
Evaluation grades are recorded on the Employer Evaluation of Co-operative Student form or on a special form developed in conjunction with a professional licensing body.

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

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

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

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

Commitment
Normally, a minimum of 2 consecutive work terms with an employer is expected. Provision is allowed for such situations as: one-term jobs, economic uncertainty, relevance of the second term to a student's progress, and Co-ordinator discretion. Non-compliance with this requirement may result in a failed work term with a notation on the Co-operative Student Record: "Failed work term caused by refusal to honour a previous agreement".

Unsatisfactory Performance
Unsatisfactory performance by a student on a work term is investigated by the student's Co-ordinator. As a result of this investigation, if benefits from further professional training are questionable, the student may be required to withdraw from the 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:
This indicates a condition where an on-own term is granted to a student for personal reasons. It may also be used to indicate that a student was unable to obtain suitable employment through the normal placement processes. If the student subsequently finds suitable employment, the Co-operative Student Record will be changed to record this fact.

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

Standings and Appeals
Applicable to sections "Seeking Employment and Employer Interviews", and "Work Terms". The Department of Co-ordination and Placement which administers these Regulations and Procedures will first present any notation of "Failed Work Term", "On Own - Imposed by Department", or "Required to Withdraw" (as a result of unsatisfactory work term performance) to the appropriate Faculty examinations, promotions or standings committee for a decision made by the committee. The decision may be appealed through the normal appeal channels within the Faculty.

Work Reports

Quantity
Normally the minimum number of satisfactory work reports required for graduation is 4. Where other than 4 are required by the University, this is stated in the calendar or in the individual student's file. However, employers may require additional reports from students as part of the job. Normally for a report to be considered as satisfactory, it must have been written during the work term and must be written as the result of or be related to the work-term activity.

Grading
Work reports are graded as "Outstanding", "Satisfactory" or "Unsatisfactory". Provision is made for students to upgrade Unsatisfactory work reports for re-evaluation by the beginning of the next academic term.
Graduation Requirements for Co-operative Programs

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. In some cases this may include as many as 6 work terms. A student may, for one reason or another, fail to satisfactorily complete the full complement of work terms. For these students, and for students given advanced admission to a Co-op 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-op programs, the minimum number of related work terms required for a Co-operative degree is normally 4. In those Faculties offering only the Co-op 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.

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

In programs where there is no stated minimum, the number of satisfactory work terms can be one less than the number of work terms remaining in the program from point of entry, provided that the number of work terms available to the student is greater than 5; otherwise all work terms must be satisfactory.

Work Reports
Quantity and Grading
In most programs the submission of work reports is a requisite for graduation and generally the minimum number is 4 and these 4 must be graded as satisfactory or better. Provision is made for students to upgrade unsatisfactory reports or submit new reports. Also provided for are situations where there are less than 4 work terms available to the students, as well as other special conditions which might arise.

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

Co-operative Degree Designation
Since Architecture and Engineering are mandatory Co-op 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.

J. M. Belcher, (President)
Federal Ministry of Transport

A. Niitenberg, (Past-President)
Ontario Hydro

S. Gendron, (Vice-President)
Inco Metals Co.

J. E. Hunt, (Secretary)
Concord Scientific Corporation

D. J. Bernstein, (Public Relations)
Imperial Oil Limited

R. G. Taylor, (Membership)
Noradex Investments Inc.

A. Beaumont
Ontario Ministry of Municipal Affairs and Housing

D. W. Brown
Consultant for Air Canada

F. G. Brown
IBM Canada Limited

D. M. Caughey
Mitel Corporation

D. A. Galloway
Harlequin Enterprises Limited

G. A. Hooper
Thorne, Riddell & Co.

A. M. Levine
Allan Levine, Architect

J. D. MacDonald
Northern Telecom Limited

J. D. Miller
Dow Chemical Canada Inc.

R. E. Secord
Ontario Ministry of Tourism and Recreation

G. F. Sekely
Canadian Pacific

S. Sharzer
The Globe and Mail

R. C. Steele
Proctor & Redfern Limited

J. E. Urbanic
General Motors of Canada Limited
CAREER PLANNING
(Graduate Placement)

Director, Career Planning
R. J. Wieser, B.E. (Saskatchewan), PEng

Career Advisor
F. M. Ruszer, B.A., MSc. (Guelph)

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

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

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

The following is a list of employers who participated in Waterloo's co-operative pro-
grams in 1983. The list does not acknowledge the many hun-
dreds of individual departments within the organizations who
participated.

AAF Ltee.
Abitibi Price Inc.
Ahsco Aeronautics Limited
Acco Canadian Material Handling Systems
Accuflex Industrial Hose Ltd.
Accograph Corporation Courtyard
Acres Consulting Services Ltd.
ACT Computer Services
Adams Masin & Tilley
Adamson Associates
Addiction Research Foundation
Adrian Systems Limited
Adult Occupational Centre
AEA Electronic Ltd.
AEL Microtel Ltd.
AES Data Limited
Agnew Associates
Agnew Peckham & Associates Ltd.
Agriculture Canada
Air Canada
Akos Frick
Ala-Kantti Associates
Albert College
Alberta Auditor Generals Office
Alberta Environment
Alberta Hospitals and Medical Care
Alberta Oil Sands Technology & Research Authority
Alberta Power Ltd.
Alberta Research Council
Alberta Transportation
Alcan Canada Products Limited
Alcan Smelters & Chemicals Ltd.
Alchem Inc.
All Trans Canada Inc.
Allan Crawford Associates Ltd.
Loftus A. Allen & Co.
Allinson-Rosa Corp.
R.M. Allison
Allstate Insurance Company of Canada
Almag Aluminium Ltd.
Alumni Computer Group Ltd.
John J. Ambrus
Amadahl Limited
Americia Bell Inc.
American Express Canada Inc.
Amoco Canada Petroleum Company Ltd.

Anaconda Canada Exploration Ltd.
Anatek Electronics Ltd.
Arthur Andersen & Company
Andrew Antenna Company Limited
H.H. Angus & Associates Ltd.
ANR Resources Ltd.
Apotex Inc.
Brian D. Appleton Management Consultants Inc.
Applewood Heights Secondary School Applied Tribology Ltd.
Syl Apps Youth Centre
The Architectural Association
Anco Associates
Arctec Canada Limited
Argo Plastics a Div. of Grandview Industries Ltd.
Amco Canada Limited
Arriscraft Corporation
Arrowhead Metals Limited
Art & Engineering
Artec Canada Limited
Associated Tube Industries Ltd.
Association of Municipal Clerks & Treasurers of Ontario
ASW Computer Systems Ltd.
Atikwa Resources Ltd.
Atkemix Inc.
Atlantic Packaging Products Ltd.
Atlantis Scientific Systems Group Inc.
Atlas Supply Company of Canada Ltd.
Atomic Energy Control Board
Atomic Energy of Canada Ltd.
Automotive Hardware Limited
Avco Financial Services Canada Limited
Ayres Dechert
B.C. Coal Ltd.
RMG CompuScience Canada Ltd.
BMI Division of Canadian Medical Labs
B.P. Canada Inc.
BAC Systems Inc.
Bahlula Clifford
Bailey & Rose Ltd.
Baird Sampson Associates
Bakelite Thermosets Limited
Balderson Mielke & Co.
Baldwin & Franklin
Kenneth W. Ball & Company
Roy Ball Associates Ltd.
Ballard Research Inc.
Christopher Ballyn Architect
Balmorel Hall
Brian Bancroft Architect
Bank of Canada
Bank of Montreal
Bank of Nova Scotia
Bard Canada Inc.
Barrie Public Utilities Commission
Barringer Magneta Ltd.
Barton Myers
BASF Canada Inc.
Bata Engineering
Bata Limited

Bate Chemical Corp. Ltd.
Eddie Bauer Expedition Outfitter
Bausch & Lomb
Baycrest Hospital
Bayly Engineering Ltd.
Bayview Wildwood Resorts
Beallor Beallor & Burns
Beaton & Willis
Beaver Engineering Limited
Beaver Lumber Company Limited
Becker Milk Company Limited
Beckers Lay-Tech Inc.
Beechgrove Childrens Reg. Centre
Bell Canada
Bell Northern Research Ltd.
Belleville PUC
G.E. Bemi & Associates
Bustek Micro Devices & Systems Inc.
Bethesda Home
Big V Pharmacies
Binney & Smith
The Binomial Group Ltd.
Biokinetics and Associates Limited
Birkbeck Thoburn & Kertes
Birnbaum Frenich Stekel & Co.
Bishop Strachan School
Blackstone Industrial Products Ltd.
Blood Houghton Hughes Marshall
Bicoverview Childrens Hospital
Blue Mountain Resorts Limited
Bluewater Centre for the Developmentally Handicapped
Bo Pep Nursery Products
Boeing of Canada Limited
Joseph Bogdan
Boise Cascade Canada Ltd.
Borden Chemical Co. (Can.) Ltd.
Borg-Werner (Canada) Ltd.
Borough of Etobicoke
Borough of Scarborough
Bouris Wilson Scott & Proctor
Brampton Hydro Electric Commission
Branksome Hall
Brant County Board of Education
Breolution Enterprise
Brewers' Warehousing Co. Ltd.
Bridge & Tank Co. of Canada Ltd.
Bristol-Myers Canada Inc.
Brock University
Brock Carruthers & Shaw
Brookside School
Drouwer Turf Equipment Limited
Brown Boveri Howden Inc.
Browndale Incorporated
Brunton Browning Day
Building Society of Eastern Ontario
Bulloch Systems
Bundy of Canada Limited
Bata Limited
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<td>Connaught Research Institute</td>
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<td>Consumers Gas Company Limited</td>
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<td>Cox Hyatt &amp; Company</td>
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<td>Cox Snowdon Scott &amp; Merritt</td>
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<td>Creative Solutions Computer Serv.</td>
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<td>Croydon Furniture Systems Inc.</td>
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<td>Cryovac Division Grace Chemicals Limited</td>
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<td>G.G. Cunningham &amp; Associates</td>
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<td>Dacoma Research Ltd.</td>
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<td>John Deere Limited</td>
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<td>Delta-Banco-Cascade Ltd.</td>
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<td>Department of National Defence</td>
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<td>Designed Power Ltd.</td>
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<td>Developcon Electronics Ltd.</td>
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<td>Dexter-Lawson Products Ltd.</td>
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<td>Diagnostic Chemicals Ltd.</td>
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<td>Dial-A-Dex Communications</td>
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<td>A.J. Diamond Associates</td>
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<td>Digital Equipment of Canada Ltd.</td>
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<td>Digital Video Systems Ltd.</td>
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<td>M.M. Dillon Ltd.</td>
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<td>Diversified Research Laboratories</td>
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<td>Dyer/Brown &amp; Associates</td>
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<td>The T. Eaton Company Limited</td>
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<td>Elkem Metal Products Ltd.</td>
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<td>The Empire Life Insurance Co.</td>
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<td>The Environmental Applications Group Limited</td>
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<td>Epsilorn Data Systems</td>
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<td>Equitable Life Insurance Co. of Canada</td>
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<td>Erco Industries Limited</td>
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<td>Arthur Erickson</td>
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<td>Erinvale Secondary School</td>
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<td>Ernst &amp; Whinney</td>
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<td>Ernst Leitz (Canada) Ltd.</td>
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<td>Esso Resources Canada Ltd.</td>
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<td>Etobicoke Board of Education</td>
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<td>Evans &amp; Martin Rycroft Clark</td>
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<td>Excellor Life Insurance Company</td>
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<td>Export Development Corporation</td>
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<td>Facelle Company Limited</td>
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<td>Falconbridge Limited</td>
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<td>Family &amp; Children’s Services</td>
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<td>Family Life Assurance Group</td>
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<td>Family Service Association</td>
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<td>Fanne &amp; Co.</td>
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<tr>
<td>Fanshawe College of Applied Arts &amp; Technology</td>
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</tbody>
</table>
Co-ordination and Placement
Organizations Employing Co-operative Students

Federal Pioneer Limited
Ferranti-Packard Electronics Ltd.
Ferranti-Packard Transformers Ltd.
Fiberglas Canada Limited
Financial Models Co.
Firemen's Fund Insurance Company of Canada
Firestone Textiles Co.
Firestone Tire & Rubber Company of Canada Limited
Fleischbach & Moore of Canada Ltd.
Fisheries & Oceans Canada
The Fitness Institute
Flax Canada Limited
Fleck Manufacturing Company
Fileless Gates McGowan Easton
Foothills Hospital
Ford Keast Giles Smith & Phillips
Ford Motor Company of Canada Ltd.
Fording Coal Limited
Forest City Kiwanis Community Centre
Forest Valley Day Camp
Forintek Canada Corp.
Fox Glicksman & Company
Frame Neckwear Company Limited
Francis Hankin & Company Ltd.
Fraser & Browne
Fraser Inc.
W.A. Fraser
Frederick Parker (Canada) Limited
Frito Lay Canada Limited
Fullarton Sherwood Engineering Ltd.
Gabor & Popper
Gage Publishing Ltd.
Gallery/Stratford
Galitaco Inc.
Gamsby & Mannerow Limited
Gandalf Data Communications Limited
Garmoise & Associates
Garrett Manufacturing Limited
Gaviller & Company
GEAC Canada Limited
GEC Canada Ltd.
Gelman Hayward & Partners Ltd.
General Foods Limited
General instruments of Canada Ltd.
General Mills Limited
General Motors of Canada Limited
General Publishing Co. Ltd.
Genesta Manufacturing Ltd.
Geocanex
Geologic Testing Consultants Ltd.
Georgian College of Applied Arts & Technology
Geoscan Consultants Ltd.
Goesco Distributing Ltd.
Getty Mines Limited
Gilfils Associates Ltd.
Gilvesy Construction Limited
Ginsberg Gluzman Fage & Levitz
Glaxo Canada Ltd.
Global Travel Computer Services
GO Transit
J.E. Goodwin FCA
Goebbels Wagner Macadam
Gold Fields Mining Corp.
B.F. Goodnich Canada Inc.
G. Gordon
Gordon Graydon Memorial Secondary School
Gotaverken Energy Systems
Gould Shawmut Company
Govan Kaminker Keenleyside Wilson
Milne Pratourius Slaunwhite
Government Northwest Territories
Housing Corporation
Graham Bacon Wetter
Graham Fiber Glass Ltd.
Graphics Controls Limited
R.G. Gray & Associates
The Gray Engineering Group
Great Lakes College of Toronto
Great Lakes Forest Products Ltd.
Greater Niagara General Hospital
Greenwood Cook & Company
Greenwood Meltz Silverstein & Herlick
Greer Flaming & Rolland
Grey-Bruce District Health Council
Griff Harendorf Lebane Hoffman & Merrich
Griffith Laboratories Ltd.
Group Eight Engineering Ltd.
Gualph Hydro
Guertin Brothers Coatings & Sealants Ltd.
Gulf Canada Limited
Gulf Canada Products Co.
Gulf Canada Resources Inc.
H.S. Steel Fabricators
Hai-Jon Controls
Halldimand Norfolk District Health Council
Harry Halls
Hamilton Board of Education
The Hamilton Harbour Commissioners
Hamilton Psychiatric Hospital
Hammond Manufacturing Co. Limited
Harbison Mining Group
Harlequin Enterprises Limited
Harris Media Systems Limited
Hart & Wasserman
Hartz Canada Inc.
Bev Hatch Industries Limited
H.J. Heinz Co. of Canada Ltd.
Henderson Peddon & Associates Ltd.
John T. Hemby Limited
Hercules Canada Limited
Heron Cable Industries Ltd.
Hewlett-Packard (Canada) Ltd.
High Park Physiotherapy & Sports Medicine Clinic
Hill & Borgal
C.M. Hinks Treatment Centre
Hiram Walker & Sons Limited
Home Computer Centre
Home Oil Company Limited
Honeywell Information Systems
Honeywell Limited
Horseshoe Valley Resort
Horton Ball Walter Fedy McCargar
Hachborn
Horton CBI Limited
Hospital for Sick Children
Hostess Food Products Ltd.
Hotel Dieu Hospital
Houghton Mifflin Canada Limited
Hovey & Associates Ltd.
Howden Applied Research Limited
HSA
HSC Research Development Corp.
Hudson Bay Mining & Smelting Co. Limited
Hudson's Bay Company
Human Computing Resources
Human Engineered Software
Humber College of Applied Arts & Technology
Huntect (70) Limited
Huronia Regional Centre
Huskv Injection Molding Systems Limited
Husky Oil Operations
John A. Huston Co. Ltd.
Hyde Houghton
Hydro Mississauga
Hymac Ltd.
Hypernetics Limited
IKOV Ltd.
IBI Group
IBM Canada Limited
Image Video Ltd.
Imperial Life Assurance Co. of Canada
Imperial Oil Limited
Imperial Tobacco Div. Imasco Ltd.
INCO Metals Company
The Independent Order of Foresters
The Individual Education Centre
Inducos Consultants of Canada
Industrial Adhesives Division of Chromasco Limited
Info Centre
Informart
Ingersoll PUC
Ingersoll Rand Canada Inc.
Inmont Canada Limited
Innisfilin Wines Ltd.
Inskip & Wilczynski
Insurance Bureau of Canada
Insurers Advisory Organization of Canada
International Communication Equipment Ltd.
International Import Customs Brokers Ltd.
Interwood Marketing Group
Inverleigh Construction
Iris Computer Planning
Co-ordination and Placement
Organizations Employing Co-operative Students

Iron Ore Company of Canada
J.D. Irving Limited
Irving Oil Limited
Irving Pulp & Paper Limited
IST Inc.
ISTEC Limited
ITT Canada Limited Business Communications
Jacmor Manufacturing Limited
Jag System Consultants Ltd.
Rolf Jensen & Associates Ltd.
Jargens Canada Inc.
JNC Limited Electronics
John Stark/William R. Hicks
B.F. Johnson Auto Electric
Barry Johns Architect Ltd.
Johnson & Higgins Willie Faber Ltd.
Johnson & Matthey Ltd.
Johnson Controls Ltd.
Johnson Macco Ltd.
Joint Venture Architects Korking Abdaluzia University
Jung/Brannen Associates Inc.
K Mert Canadas Ltd.
Kaptest Engineering Limited
A.R. Kaufman Family YMCA
William C. Karleff
Kaysea Consultant Limited
Keeprite Inc.
John W. Keith-King
Kellogg Salada Canada Inc.
Kelsey-Hayes Canada Ltd.
Kendall Canada
T.L. Kinnody Scoondary School
Kent County Board of Education
Kenting Earth Sciences Ltd.
Kentner Kelly & Wilson
Kerr Addison Mines Limited
Kerr Vayne Systems Ltd.
Kesmark Marine
Keysight International Ltd.
Kidd Creek Mines Limited
Peter Kiewit Sons Co. Ltd.
Kilborn Engineering Limited
Kimberly-Clark of Canada Limited
Kime Ditchfield Mills & Duniof
Kingston Psychiatric Hospital
J. Michael Kirkland
Kitchener-Waterloo Art Gallery
Kitchener-Waterloo Hospital
The Klassen Angus Group Ltd.
Klein & Taylor
L. Koffman
Koky Carpentry
KTS Business Systems Inc.
KWIP Technology Corp.
Kyles Kyles & Garratt
Labett Brewing Company Limited
Labatt's Ontario Breweries Ltd.
Labstat Inc.
LAC Minerals Ltd.
Lackie Bros. Ltd.
Lake Ontario Cement Ltd.
Lake Ontario Steel Company Ltd.
Lakefield Dist. Secondary School
Lakehead Board of Education
Lakehead University
F. Joseph Lamb Co.
Gail E. Lamb
Langhorne & Lynch
Landsdowne Children's Centre
Laurentian Hospital
Laurentian University
Laurier Life Insurance
Lavalin Inc.
H.R. Lawson Residence
Lear-Siegler Industries Ltd.
Lebensold Affleck Nichol Hughes
Lee Merrick & Associates Limited
Leeds-Grenville County Board of Education
Leigh Engineering & Aerospace Div.
Lambrouk Industries Ltd.
A.E. LePage Ltd.
Lever Detergents Limited
Levitsky Feldman Waxer
Ley Feldman & Truscott
Lilly Inglis
Lincoln County Board of Education
Linear Technology Inc.
Lingwood
Lippert Zvidris
Lipton Wiseman Greenspoon & Albaum
Liquid Paper Ltd.
Lithwick Johnston & Moy
Litton Systems (Canada) Ltd.
Loach Engineering Ltd.
Loblaws Limited
M. Loeb Limited
London Life Insurance Company
London Psychiatric Hospital
Long Manufacturing Division
Borg-Warner (Canada) Ltd.
Long Point Conservation Authority
Dan K. Loop
Loram International Ltd.
Lorne Park Secondary School
Lower Thames Valley Conservation Authority
Owen Luder Partnership
Ludmila Dejmek
Ludwig Gindl
Lummus Company Canada Limited
Lumonics Inc.
Lutheran Life Insurance Society of Canada
G. Edward Lutman
Lynx Canada Explorations Ltd.
MJ Data Consultants
MacDonald Demwaier & Associates
The W. Ross MacDonald School
MacGillivray & Co.
MacKillican & Associates
MacLaren Engineers
A.F. MacLaren & Company
MacLennan Associates
Madget Haar & Partners
Madsen Electronics Canada Ltd.
Magic Pantry Foods Inc.
Malcolm & Boyko
Malcolm Food Specialties
Management Board of Cabinet
Manalta Coal Ltd.
Mandelbaum Rosenberg
Manitoba Forestry Resources Ltd.
Manitoba Research Council
Manitoba Telephone Systems
Manufaurers Life Insurance Company
Maple Leaf Mills Ltd.
Maplehurst Correctional Centre
Markham Racquet Club
Marks & Spencer
Marshall Macklin Monaghan Ltd.
Martin Associates
Martin Feed Mills Ltd.
Manno S. Martin Contractor Ltd.
Mary Kay Cosmetics
Massey Ferguson Industries Limited
Mastic Industries Limited
Mathers & Heldenby
Matrox Electronic Systems Ltd.
Matsui Baer Vanstone Freeman
Matsushita Electric of Canada Ltd.
Maxima Computer Consulting Services Ltd.
Mcasphalt Engineering Services
McCay Duff & Co.
McColl Turner & Company
Peter McGray & Associates
McGraw Hill Ryerson Limited
Mcintosh Workun & Chernenko
McMaster University
McPherson Scott & Co.
McQuest Marine Research & Development Company Limited
MDS Health Group Limited
Meadowvale Secondary School
Meanwell Goodwin & Co.
Mecon Industries Ltd.
Mekinda Snyder & Weis
Gunter Mele
Memorex Canada
Mental Health Care
Mercantile & General Reinsurance Group
William Mercer Limited
Merrill Lynch Royal Securities Ltd.
Metal Flo Corp. Canada Ltd.
Meteorological & Environmental Planning Limited
Metrex Instruments Ltd.
Metro Canada Limited
Metropolitan Life Insurance Co.
Metropolitan Toronto Assn. for the Mentally Retarded
Metropolitan Toronto District Health Council
MIA Chemical Ltd.
Co-ordination and Placement
Organizations Employing Co-operative Students

National Hydrology Research Institute
Michelin Tires (Canada) Ltd.
Micom Co.
Micro-Software Sales
Micronet Limited
Microplace Inc.
Microsoft Incorporated
Midland Ross (Canada) Limited
Midwestern Regional Centre
Mill & Ross
Millard Rouse & Rosebrugh
Millbrook Correctional Centre
Miller Communications Systems Ltd.
Mineral Recovery Company
Mines Accident Prevention Association of Ontario
Mini-Peripherals Inc.
Ministry of Industry & Small Business Development
Mintz & Partners
Mira Electronics
Mitchell Partnership
Mitel Corporation
Mobil Chemical Canada Ltd.
Mohawk College of Applied Arts & Technology
Mold Masters Limited
Molson's Breweries of Canada Ltd.
Molson's Brewery (Ontario) Limited
The Molson Companies Limited
Monteith Ingram Engineering Ltd.
Ontario Ministry of the Environment
Office of the Legislative Assembly
Ontario Ministry of Education
Ontario Ministry of Correctional Services
Ontario Ministry of Colleges
Ontario Ministry of Agriculture & Food
Office of the Premier
Ontario Ministry of Energy
Ontario Ministry of Northern Affairs
Ontario Ministry of Transportation & Comm.
Ontario Association for the Mentally Retarded
Ontario Cancer Foundation
Ontario Cancer Institute
Ontario Cancer Treatment & Research Foundation
Ontario Correctional Institute
Ontario Crippled Children's Centre
Ontario Geological Survey
Ontario Hydro
Ontario Lottery Corporation
Ontario Ministry of Health
Ontario Ministry of Industry & Trade
Ontario Ministry of Municipal Affairs & Housing
Ontario Ministry of Natural Resources
Ontario Ministry of Revenue
Ontario Ministry of Tourism & Recreation
Ontario Ministry of Transportation & Comm.
Ontario Ministry of the Environment
Ontario Research Foundation
Ontario Robots Center
Ontario Science Centre
Ontario Public Service Commission
Ontario Science Centre
Optikon Corp. Ltd.
Oracle Telecomputing Inc.
Orenstein & Partners
Omsby & Campbell
Ortho Pharmaceutical (Canada) Limited
Otaco Foundry
Ottawa Board of Education
Ovaco & International Inc.
Overburden Drilling Management
Oxford Regional Centre
Page & Steele
Pamour Porcupine Mines Limited
Pan Canadian Petroleum Limited
Papeterie Reed Ltd. Mills Division
Parham Architects Engineers & Planners
Partac Lavalin Inc.
Participation House Hamilton & District
Partridge Skene & Company
Paterson Phipps International Inc.
PCL Construction Ltd.
PCL Packaging Ltd.
Pearson & Stephen
Pesta Marvin & Partners
Pesta Marvin Mitchell & Co.
Pension Finance Associates
People Care Centre Inc.
R.J. Percival Associates Limited
Perle Systems Limited

North American Life Assurance Company
North York Board of Education
North York Hydro
Northern & Central Gas Corporation Limited
Northern College of Applied Arts & Technology
Northern Digital Inc.
Northern Dynamics Ltd.
Northern Life Assurance Company of Canada
Northern Telecom Canada Limited
Northern Telecom Ltd.
Northgate Exploration Limited
Northstaton
Northway Industries of Balfour Ltd.
Northway-Gestalt Corporation
Northwest Survey Corp. (Yukon) Ltd.
Norwest Soil Research Ltd.
Norwich Union Life Insurance
NOVA An Alberta Corporation Limited
NTI Systems Inc.
Nuclospore Corporation
Numetrix Limited
Occidental Life Insurance Company of Canada
Office of the Leader of the Opposition
Office of the Premier
Office of the Premier
Office of the Premier
Office of the Premier
Officesmiths Inc.
Oliver Mangione McCalla & Associates Ltd.
Ont. Min. of Agriculture & Food
Ont. Min. of Colleges & Universities
Ont. Min. of Community & Social Services
Ont. Min. of Consumer & Commercial Relations
Ont. Min. of Correctional Services
Ont. Min. of Education
Ont. Min. of Energy
Ont. Min. of Northern Affairs
Ont. Min. of Natural Resources
Ont. Min. of Revenue
Ont. Min. of Tourism & Recreation
Ont. Min. of Transportation & Comm.
Ontario Ministry of the Environment
Ontario Research Foundation
Ontario Robots Center
Ontario Science Centre
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PCL Packaging Ltd.
Pearson & Stephen
Pesta Marvin & Partners
Pesta Marvin Mitchell & Co.
Pension Finance Associates
People Care Centre Inc.
R.J. Percival Associates Limited
Perle Systems Limited

Northern Dynamics Ltd.
Northern Life Assurance Company of Canada
Northern Telecom Canada Limited
Northern Telecom Ltd.
Northgate Exploration Limited
Northstaton
Northway Industries of Balfour Ltd.
Northway-Gestalt Corporation
Northwest Survey Corp. (Yukon) Ltd.
Norwest Soil Research Ltd.
Norwich Union Life Insurance
NOVA An Alberta Corporation Limited
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Nuclospore Corporation
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Ont. Min. of Consumer & Commercial Relations
Ont. Min. of Correctional Services
Ont. Min. of Education
Ont. Min. of Energy
Ont. Min. of the Environment
Ont. Min. of Government Services
Peterborough County Board of Education
Peterborough PUC
Petro Canada
Petro Canada Products Inc.
Petrosar Limited
Philips Management Information Systems
Philips Cables Limited
Photoquip System Ltd.
Picture Data Incorporated
Pigott Construction Co. Ltd.
Pine Ridge
Pinelands Lodge
Pitney-Bowes of Canada Limited
Planned Computer System
Planning Systems Research
Playtax Limited
R.L. Polk & Co. Ltd.
Polygram Inc.
Polyrim Manufacturing Limited
Polysar Limited
Port Weller Dry Dock
Pow Wow Point Lodge Co. Ltd.
Precision Electronic Components (1971) Ltd.
Price Waterhouse
Prince Edward Heights Centre
Prior Data Sciences Ltd.
Prochem Limited
Procter & Gamble Inc.
Procter & Gamble Specialties Ltd.
Procter & Redfern Ltd.
Project CANOE
Promac Controls Inc.
Propak Systems Ltd.
Protective Plastics
Prudential Assurance Co. Ltd.
Prudential Insurance Co. of America
Public Service Commission Alta. & Northwest Territories Reg.
Public Service Commission Canada
Public Service Commission Ontario Region
Public Works Canada
Pulp & Paper Research Institute of Canada
Pye & Richards
QRL Analysis Corporation
Quaker Oats Company of Canada Ltd.
Quasar Systems Ltd.
Queen Elizabeth Hospital
Queen Street Mental Health Centre
Queensway General Hospital
Queensway Medical Centre
RF Communications
RCA
Real Time Datapro Ltd.
Rector Foods Ltd.
RED-D-Mix Concrete Company
J.S. Redpath
Redpath Sugars Limited
Ref. Computer Corporation
Regal Stationery Co. Ltd.
Regional Industrial Development
Economic Analysis Group
Regional Municipality of Durham
Regional Municipality of Halton
Regional Municipality of Hamilton Wentworth
Regional Municipality of Metro Toronto
Regional Municipality of Niagara
Regional Municipality of Peel
Regional Municipality of Sudbury
Reinhold Limited
John Rennie Limited
Research Foods Ltd.
Reuter Stokes Canada Ltd.
Tim Richardson Consultant
Richardson-Vicks (Canada) Ltd.
Richvale Telecommunications
Rideau Correctional Centre
Ridgetown College of Agriculture and Technology
Riedel Distiller Ltd.
Rio Algom Limited
Wm. Roberts Electrical Mechanical Limited
Robertson Moore McDermott
Robin Hood Multifoods Limited
Robinson & Heinrichs
Robinson Lott & Bronham
Robson Sovran & Jones
Rockwell International of Canada Ltd.
Rogers Cablesystems Inc.
S.M. Roscoe Architect
Rosenberg Fine Goodfield
Rosenberg Silverberg & Hershoran
S.L. Ross Environmental Research Limited
Ross Pope & Company
Rothmans of Pall Mall Canada Ltd.
Royal Bank of Canada
Royal Canadian Mint
Royal Canadian Mounted Police
Royal Insurance of Canada
Royal Military College of Canada
Royal Ottawa Hospital
Royal Ottawa Regional Rehabilitation Centre
Royal Trust
Ryan & Lee
Ryback Smith & Ginsler Ltd.
Ryaner Polytechnical Institute
Rygel Home
SACDO University of Western Ontario
Sacks Pollock Houp & Company
W.M. Satter
Samson Belair
Sanyo Canada Inc.
Sarco Canada Limited
Saskatchewan Power Corporation
Sault College of Applied Arts & Technology
Save Our Streams
Scada Consultants Limited
Scandex Ltd.
Scarborough Board of Education
Scarborough Centenary Hospital
Scarborough General Hospital
Scarborough PUC
Schlumberger International
Schlumberger of Canada
Scott Batanchuck & Company
Seaconsult Marine Research Ltd.
Joseph E. Seagram & Sons Ltd.
Sealed Air of Canada Ltd.
G.D. Searle & Co. of Canada Ltd.
Laura Secord Candy Shops Ltd.
Secretariat for Social Development
Selwyn House School
Sanac College of Applied Arts & Technology
Sentrel Systems Limited
G.M. Sernas & Associates Ltd.
I.P. Sharp Associates Ltd.
Shaw Industries Ltd.
Shaw Laboratories
Sheldon Centre for Outdoor Education
Shell Canada Limited
Shell Canada Resources Ltd.
Sheller-Globe of Canada Limited
Sheppard Cartridge Hammond & Co.
The Sheppard Club
Sheridan College of Applied Arts & Technology
Sherritt Gordon Mines Limited
Sick Children’s Hospital of Toronto
J.E. Slevinpiper
Silicon Inc.
Siltronics Ltd.
Silverwood Industries Ltd.
Simcoe County Health Unit
Simpsons-Sears Limited
The Robert Simpson Company Limited
Sinclair Radio Laboratories Ltd.
Sir James Whitney School
Sir Sanford Fleming College
George H. Smith
Lloyd Smith
Smith Niles Selby
Smith Nixon & Company
Soberman Lenbaum & Colomby
Social Data Research Limited
Software Concepts
Solar Computers (Cambridge) Limited
Solaray
Soltarce Limited
Source Communications
South Central Postal Facility
South Lake Simcoe Conservation Authority
Southam Communications
Southwestern Regional Centre
Spar Aerospace Limited
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<th>Organization Name</th>
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<td>Specialty Chemicals Ltd.</td>
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<td>Sperry Univac Computer Systems</td>
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<td>Sperry-Univac Development &amp; Manufacturing</td>
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<td>SR Telecom Inc.</td>
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<td>St. Catharines General Hospital</td>
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<td>St. Clair College of Applied Arts &amp; Technology</td>
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<td>St. Joe Canada Inc.</td>
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<td>St. John Ambulance</td>
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<td>St. Joseph's Hospital</td>
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<td>St. Lawrence Cement Company</td>
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<td>The St. Lawrence Seaway Authority</td>
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<td>St. Martin's High School</td>
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<td>St. Michael's Hospital</td>
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<td>Standard Life Assurance Company</td>
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<td>Toronto Hydro Electric System</td>
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<td>Toronto Mutual Life Insurance Co.</td>
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<td>Refining Division</td>
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<td>Valley Blades Ltd.</td>
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<td>Vanier Centre for Women</td>
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<td>C.A. Ventin</td>
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<td>Village of Paisley</td>
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<td>Vins Plastics Limited</td>
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Co-ordination and Placement
Organizations Employing Co-operative Students

Wabco Equipment of Canada
Wabush Mines
Wage Engineering
Keith Wagland
Wainman & Kydd
B.P. Walker Associates Ltd.
Walker Brothers Quarries
Walker Exhaust
Wallace & Watson Associates
Waltex Industries Limited
Paul B. Walters & Associates Ltd.
Wampole Limited
Ward Mallette
Ward-Beck Systems Ltd.
Waterloo Computing Systems Limited
Waterloo County Board of Education
Waterloo County Roman Catholic Separate School Board
Waters Corfield & Meredith
Watsun User Service Facility
Wawel Villa Senior Citizens Centre
West & Cullen Nurseries
Jervis B. Webb Co. of Canada Ltd.
Webb Zerafa Menkes Housden
Weber & Howard
Gea. A. Welch & Co.
Welch Cybernetics Corporation
Welding Institute of Canada
Wellesley Hospital
Wellington County Board of Education
Welmet Industries Ltd.
Welsh & Galloway

Wescam Western Controls Inc.
West Cane Sugar Limited
West Park Hospital
Westeel-Rosco Limited
Western Geophysical Co. of Canada
Westhead Associates
Westinghouse Canada Inc.
Weston Bakeries Limited
Westwood Pharmaceutical Co.
Wheatley Hall Farms
Whitby Psychiatric Hospital
White Farm Equipment Canada Limited
Wilfrid Laurier University School of Business & Economics
Wilkinson & Company
Williams Woodruff Elmes
Willson Office Specialty Ltd.
Wilson & McLaren
Wilson Laboratories Inc.
Windsor Western Hospital Ctr. Inc.
Wood Gundy Limited
W.G. Wood Company Ltd.
Woodbridge Foam Corp.
Woodingford Lodge
Woodes Gordon
Woodstock PUC
Workmen's Compensation Board
World Translation Co. of Canada Ltd.
F.W. Woolworth Co. Ltd.
Worthington Canada Inc.
Wright & Barker Co. Ltd.
Wright Green & Dingfield

The Wyatt Company
Glen J. Wylie & Associates
Wylie & Ultn Limited
Xana Photo Products Inc.
Xerox Canada Inc.
Xerox Research Centre of Can. Ltd.
Yamnuska Centre
YMCA Brockville
YMCA Central Region
YMCA Chatham
YMCA Fort Erie
YMCA Kitchener-Waterloo
YMCA North York Branch
YMCA Orillia
York Borough Board of Education
York Ryerson Computing Centre
York University
Yorke Rosenberg Mardall
York University Children's Centre
Yorkville Sound Ltd.
Young & Wright
YWCA Kitchener
Zacks Investment Research
R.S. Zacks
ABK Telecomputers
Zymaize Inc.
3M Canada Inc.
445 Recreation Centre
The University Library
The University Library

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

Associate Librarian, Planning & Systems
C. Presser, AB (Hun’er), MLS (Pratt)

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

Business Administrator
J. Jorgensen, BA (Toronto)

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

Collections Division

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

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

Cataloguers
H. Calogeridis, BA, MLS (McGill)
Y. Gordon, BA (Manitoba), BLS (Toronto)
R. Lamb, BA (Guelph), MLS (Western Ontario)
L. Teather, BA, MLS (British Columbia)
M. Wan, BSc (Hong Kong), BMath (Waterloo), MA, MLS (Western Ontario)
L. Helfand, BSc (York), MLS (Western Ontario)

Head, Materials Acquisition Department
B. Bruder, BA (Waterloo Lutheran)

Cataloguer
J. Kuhn, BA, MA (Creighton), MLS (Western Ontario)

Co-ordinator, Collections Management
S. MacKinnon, BA (Mount Allison), BLS (McGill)

Collections Research Librarian
E. Waterman, BA (McMaster), BLS (Toronto)

Public Services

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

Co-ordinator, User Services
C. McDonald, BA (California)

University Map Librarian
R. Pinnell, BSc (Toronto), MSc, MLS (Western Ontario)

Cataloguer
A. Chan, BA (Hong Kong), MLS (Western Ontario)

Co-ordinator, Information Services
L. Claxton, BA (Waterloo), BLS, MLS (Toronto)

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

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

Head, EMS Reference & Collections Development Department
F. Abrams, BA (Sir George Williams), MLS (McGill)

Reference & Collections Development Librarians
N. Bastedo, BA (Rollins), MA (Toronto), MLS (Western Ontario)
J. MacDonald, BSc, BEd (Dalhousie), MLS (Western Ontario)
W. Macpherson, BSc, MLS (Dalhousie)
J. Parrott, BSc (Queen’s), MSc, BLS (Toronto)
D. Harding, BSc (Guelph), MLS (Western Ontario)

Co-ordinator, Machine-Assisted Reference Service
D. Morton, BSc, MLS (Western Ontario)
The University Library

The Library is central to the academic programs of the University. Its function is to provide books, journals and other library materials to support these programs. The library staff, aided by the university community, works to make the library a base for teaching, study and research. The University Library is composed of 2 divisional libraries, the Dana Porter Arts 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 on-line circulation control system uses light-pen technology (barcode readers) 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 borrower is informed, for example, that a book is on loan but due back in 2 days, or that a book requested previously is now available.

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 indexes and abstracts by computer. There is a charge for the service based on the data base being searched, the amount of time required to conduct the search and the number of references obtained.

Special services including a Kurtzweil reader (a machine capable of translating printed material into synthetic speech), a brailer and a 4-track cassette recorder and playback unit are available for the visually handicapped. The Library can also provide access to talking book material from the Audio Library Program. All libraries are accessible by wheelchair.

The Dana Porter Arts 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 Reading Room with seating for 160 readers, a Rare Book Room, a Listening Room with facilities for both phonodiscs and audio cassettes, 8 typing cubicles and a microcomputer room. The second or main floor contains the public catalogue, the circulation counter and the Information Desk. Also on the main floor is the Current Periodical Reading Room, the Interlibrary Loan Office and the Reference Collection. The periodical and newspaper collections and microforms are located on the third floor.

Government publications are located on the fifth floor. The upper floors 6 through 10 house the circulating book collection and contain seating accommodation for more than 700 library users.

The Arts Library collection numbers over 180 000 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 services - the catalogue, the circulation counter and the Information Desk are visible from the entrance to the Library. Seating is provided for 570 readers.

The E.M.S. Library collection numbers over 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 93 000 items including maps, air photographs, books, theses, and periodicals. Like the Arts 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 optometry field.

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 17 000 items, which includes a special collection on Peace Studies. It is also the home of a Mennonite Archive which consists of church records and documents of the Mennonites of Ontario. St. Jerome's College Library has a collection of about 28 000 volumes. St. Paul's College Library has about 5 000 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 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.

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.

- 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, lists of reference materials and guides to using the reference materials.

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

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

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

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

The Department of Computing Services, 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 microcomputers, 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, special 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. 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

Acting Director
V. G. Neglia, BSc (Waterloo)

Located on the first floor of the PAS building, the ACO operates a remote input-output facility for working with the Department of Computing Services’ large machines, plus a ‘stand-alone’ minicomputer. Equipment includes a PDP 11/34 running the UNIX operating system, with disk and tape drives, 2 printers (one a public-access MULTIWRITER), and numerous terminals.

The office attempts to address 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 problems they may encounter with their projects.

MATHEMATICS FACULTY COMPUTING FACILITY

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

Manager - Operations
G. P. Embro

Manager - Software
I. Telford, BSc

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 5000 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 graduate students and faculty. It is primarily used in the teaching of computer science courses. Since 1980 two more VAX 11/780s have been put under MFCF support. These computers provide the popular UNIX operating system in a relatively controlled environment. The VAX 11/780s under MFCF management, 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 1 of 2 laser printers or a Versatec. These devices are also used for graphics output because of their good resolution and are being utilized by the computer graphics courses.

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 which is under installation.

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

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

Degrees

The degree of Bachelor of Arts (BA) is awarded by the University upon successful completion of any of the undergraduate 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 Grade 13 and for those not currently registered in Ontario Grade 13. See Chapter 2 for details. Admission requirements for part-time students are the same as for full-time students.

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

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

2. Transfer Credit

Generally transfer credit is given for pertinent courses in which a grade of 60% or better was obtained. Students transferring from other institutions may have their transferred courses count toward the University of Waterloo degree; however, marks obtained in these courses will not be included in the calculation of the students' University of Waterloo averages.

Students transferring from Faculties within the University may elect to transfer all passed Arts Faculty courses and all pertinent courses taken from other Faculties in which they earned marks of at least 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.

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 councillor.

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

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

Classical Civilization
History
Economics
Philosophy
English
Political Science
Fine Arts
Psychology (ECEC)
French
Religious Studies
Geography
Russian-German
German-Russian
Scientific Translation
Scientific Translation
Spanish

There are no minors or double majors in General Programs.

2. Non-Major

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

Note 1

It is recommended that students register in no more than 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
- Anthropology
- Classical Studies
- Drama and Theatre Arts
- Economics
- English
- Fine Arts
- French
- Geography
- German
- History
- Latin
- Medieval Studies
- Music
- Philosophy
- Political Science
- Religious Studies
- Russian
- Slavic Studies
- Social Development
- Studies
- Sociology
- 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 his academic program. (For a detailed description of the Co-operative plan, see Chapter 5). Beginning at the end of Year 1 the Co-op student alternates 4-month terms on campus for academic studies with 4 months off campus for practical training in business, industry, or government.

The following Co-operative 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 (Economics Option)
- Co-op Honours English
- Co-op Honours Management
- Accountancy Studies (Economics Option)
- Co-op Honours Political Science
- Co-op Honours Political Science (Administrative Studies Option)
- Co-op Honours Psychology
- Co-op Honours Sociology

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

Notes:

1. The Applied Studies Co-operative Program combines an Honours Program 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 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 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)
- Peace and Conflict Studies (Option or Minor, see Chapter 15)
- Personnel and Administrative Studies (Minor, 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 (or a combination of year and term courses equivalent to 5 term courses per term). Students usually select 2 courses from disciplines in Group A and 2 from disciplines in Group B (see Degree Requirements), with 1 or 2 more courses as electives. As well, students are encouraged to select courses in any discipline in which they may hope to major. (Students are advised that a 6-course work load may be quite heavy.) The Faculty of Arts recommends that its students take at least 1 course in mathematics or science.

Notes:

1. From time to time, due to space limitations, students admitted to the University or otherwise 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 times, courses may be added or dropped only with the permission of the Examinations and Standings Committee acting on the recommendation of the instructor of the course and the Undergraduate Officer of the student's major Department, and only if the student can support his case with reasons showing that such a change in his program will serve his academic interests.

4. Courses offered during the Summer Session may be added or dropped during the first week in which the course begins only with the signature of the 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.

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

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

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

Students in the General 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 15 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 for non-majors (see below).

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

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.

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 year course is one which extends for 1 full academic year (September through April) and carries a minimum of 1 credit (1.0). A year course is equivalent to 2 term courses. 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 carrying a 0.25 credit weight may be taken in addition to the minimum term courses required for the degree.

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 reached the halfway point toward the General BA degree - that is, when they have finished 15 of their 30 term courses - 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 the subjects listed above will satisfy the Group requirements.

In order to complete the Group A and B requirements an Arts student in either a Major or an Honours Program 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. 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).

An Arts student in a Non-Major program must complete with passing marks a minimum of 4 term courses from Group A and a minimum of 4 term courses from Group B. Of the 4 term courses used to meet the Group A requirements, no more than 2 may be in the same discipline and similarly no more than 2 of the 4 term courses used to meet the Group B requirement may be in the same discipline. A student may take more than 2 term courses in a specific discipline but only 2 will be applied, where appropriate, to a Group A or B requirement.

Notes:

1. To meet the Group B requirement and the Group A requirement for Non-Majors, a student may take 1 term course from each of 4 disciplines included in the Group or 2 term courses in each of 2 disciplines or 2 term courses in 1 discipline and 1 term course in each of 2 other disciplines. The combination of 3 term courses in 1 discipline and only 1 term course in 1 other discipline is not acceptable.

2. R S 105: Elementary Biblical Hebrew and R S 106: New Testament Greek may be used to meet the Group A (ii) requirement.

Examinations and Standings

The following regulations govern final examinations and standings in the Faculty of Arts. These regulations also apply to part-time students and special programs. Further details concerning University Examination Regulations can be found in Chapter 1, page 1.6.

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 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 failed to write for medical reasons, a Doctor’s certificate, covering the precise period of absence must be filed in the Registrar's office.
4. No instructor shall be permitted to administer - and no student shall be required to sit - final examinations in the formal lecture period.

Grading System

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

<table>
<thead>
<tr>
<th>Grade</th>
<th>Weight</th>
</tr>
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<tbody>
<tr>
<td>A+</td>
<td>95</td>
</tr>
<tr>
<td>A</td>
<td>89</td>
</tr>
<tr>
<td>A-</td>
<td>83</td>
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<tr>
<td>B+</td>
<td>78</td>
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<td>B</td>
<td>75</td>
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<td>B-</td>
<td>72</td>
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<tr>
<td>C+</td>
<td>68</td>
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<td>65</td>
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<td>62</td>
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<td>D+</td>
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<td>55</td>
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<td>D-</td>
<td>52</td>
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<tr>
<td>F+</td>
<td>46</td>
</tr>
<tr>
<td>F</td>
<td>38</td>
</tr>
<tr>
<td>F-</td>
<td>32</td>
</tr>
</tbody>
</table>

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

Note
When a course is repeated, the 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 for a half-course and 7 months for a full course.

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

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

Course Load

Regular full-time students in both General and Honours Arts programs normally register for 5 or 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 regularly scheduled day courses as well as evening or Saturday courses. 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 56 and 60%, or the major or non-major average below 65% (unless the department specifies a higher average), the student may be
A student on the Dean's List receives a congratulatory letter from the Dean and the award is noted on the student's transcript.

Dean's List
To recognize outstanding academic achievement the Arts Faculty has established a Dean's List. Each student's academic record 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 designate 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 degree in accounting through 2 kinds of Honours programs: Honours Accounting or Honours Chartered Accountancy Studies (Economics Option) and Honours Management Accountancy Studies (Economics Option).

The Honours Accounting degree program is designed to provide a complete academic preparation for students intending to pursue a broad range of careers as professional accountants. This degree program consists of a 3-year Accounting Program following the pre-admission university-level work needed as preparation. The Accounting Program includes a required 1-year work internship. It is designed to prepare students to proceed directly to write final professional certification examinations of the Institute of Chartered Accountants (CA) and the Society of Management Accountants (RIA).

The Honours Chartered Accountancy Studies (Economics Option) or Honours Management Accountancy Studies (Economics Option) programs [hereinafter referred to as Honours Accountancy Studies (Economics Option)], by contrast, permit students to meet the minimum course requirements for the CA and RIA certificates in a 4-year program, but do not include either the breadth or depth of the Honours Accounting degree program. The programs are available in a regular or a co-operative format.

All students are advised to complete the Honours Accounting program. To do so, students should pursue the program of studies recommended below for the Honours Accountancy Studies (Economics Option) programs and apply for admission to the Accounting Program when they have completed the pre-admission studies set out below.

**The Honours Accounting Degree Program**

In order to qualify for the degree of Bachelor of Arts (Honours Accounting) students must fulfill the following requirements:

1. Successful completion of a minimum of 43 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 all courses labelled accounting (ACC).

2. The degree program consists of the Accounting Program set out below (32 term courses) plus, as a minimum, the pre-admission requirements set out in point 3 below (11 term courses). The 32 term courses in the Accounting Program must be completed regardless of study done before entry; students who have completed courses that are included in the Accounting Program will be required to substitute other courses with the approval of the Department.

3. The pre-admission requirements are:
   a) 1 term course in each of financial accounting and managerial accounting (total 2)
   b) 1 term course in each of statistics, computer science, calculus and linear algebra (total 4)
   c) 2 term courses in economics (total 2)
   d) 1 term course in a behavioural science other than economics (total 1)
   e) 1 term course in English (total 1)
   f) 1 term course from the Faculty of Arts Group A elective requirements (total 1)

Students intending to prepare themselves for admission to the Accounting Program should consult the Undergraduate Officer in the Accounting Group. Application for admission should be made to the Director, Accounting Program, Hagey Hall, University of Waterloo.

4. The Accounting Program consists of 3 calendar years, including both academic studies and work-term experiences. The first year (AP1) consists of 3 consecutive terms of academic study starting in the fall term. The second year (AP2) is a 12-month required work internship. Candidates for the Accounting Program must be Canadian citizens or 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. The third year (AP3) is a further 3 consecutive terms of academic study beginning with the fall term.

5. The Program includes a group of required core courses and the completion of an option. The core courses include:
   a) ACC 231, 251, 291, 292, 341, 371, 372, 381, 382, 401, 431, 441, 461, 462, 463, 491
   b) ECON 201, 202
   c) ENGL 210
   d) PHIL 215
   e) PSYCH 333 or approved equivalent
   f) STAT 311

6. All students must also complete one of the following 3 Options:
   a) Public Accounting: ACC 402, 443, 451, 452, 453, 494
b) Managerial Accounting & Information Systems: ACC 402, 443, 453, 454, 481, 483

c) Taxation: ACC 402; 2 out of ACC 464, 465, 466, 467; 1 out of ACC 468, 469; ECON 341; and an approved course in Tax Policy.

Graduates with the Public Accounting Option are able to write the Chartered Accountants’ Uniform Final Examination on graduation.

Graduates with the Managerial Accounting Option will receive the maximum credit available toward the RIA designation of the Society of Management Accountants of Ontario.

HONOURS ACCOUNTING DEGREE PROGRAM

Pre-admission

<table>
<thead>
<tr>
<th>Minimum Pre-admission Requirements</th>
<th>Recommended Courses</th>
<th>Additionally Recommended</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounting</td>
<td>2</td>
<td>ACC 101, 281</td>
</tr>
<tr>
<td>Economics</td>
<td>2</td>
<td>ACC 101, 102</td>
</tr>
<tr>
<td>Calculus (Note 4)</td>
<td>1</td>
<td>ENGL 109</td>
</tr>
<tr>
<td>Statistics (Note 3)</td>
<td>1</td>
<td>PSYCH 101</td>
</tr>
<tr>
<td>Calculus (Note 1)</td>
<td>1</td>
<td>ECON 221</td>
</tr>
<tr>
<td>Algebra (Note 4)</td>
<td>1</td>
<td>MATH 113a</td>
</tr>
<tr>
<td>Group A elective</td>
<td>1</td>
<td>MATH 111b</td>
</tr>
</tbody>
</table>

Further studies in the humanities, social sciences or mathematics will broaden the range of upper year electives open to students in the Accounting Program.

Accounting Program

Accounting Program One

<table>
<thead>
<tr>
<th>FALL</th>
<th>WINTER</th>
<th>SPRING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term AP1A</td>
<td>Term AP1B</td>
<td>Term AP1C</td>
</tr>
<tr>
<td>ACC 291</td>
<td>ACC 292</td>
<td>ACC 371</td>
</tr>
<tr>
<td>341</td>
<td>381</td>
<td>463</td>
</tr>
<tr>
<td>371</td>
<td>381</td>
<td>463</td>
</tr>
<tr>
<td>STAT 311</td>
<td>ECON 201</td>
<td>ECON 202</td>
</tr>
<tr>
<td>ENGL 210</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Accounting Program Two

Required: 12-month internship

Accounting Program Three

<table>
<thead>
<tr>
<th>Term AP3A</th>
<th>Term AP3B</th>
<th>Term AP3C</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACC 401</td>
<td>ACC 431</td>
<td></td>
</tr>
<tr>
<td>463</td>
<td></td>
<td></td>
</tr>
<tr>
<td>491</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

and in the 3 terms, PHIL 215, PSYCH 333, the requirements of 1 of the options and electives to total 16 courses.

Notes:

1. Students are encouraged, in Year 2, to take ECON 201 and 202 and eventually substitute elective courses early in the Accounting Program. This may be helpful later in structuring a sequence of elective courses.

2. Students with a strong background in mathematics should consider taking CS 118 instead of CS 116.

3. Students may substitute STAT 230 and 231 for ECON 221; STAT 230 and 231 are prerequisite to a number of mathematics-area electives. (Note that the completion of MATH 113b is a prerequisite for STAT 230.) Students who intend to take elective courses in the mathematical sciences, e.g., statistics, computer science, combinatorics and optimization or management science, should take MATH 130a & b (instead of MATH 113 a/b) and MATH 134a & b (instead of MATH 111b).

4. 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.

Pre-admission Studies at the University of Waterloo

Generally, students who wish to prepare themselves at the University of Waterloo to apply for admission to the Accounting Program should seek admission to the Faculty of Arts. Those students whose background and future interest are strongly based in mathematics should consider entry to the Honours Mathematics/Accountancy programs in the Faculty of Mathematics and eventual transfer to the Accounting Program.

The normal program for a student at the University of Waterloo involves registration in the Faculty of Arts and completion of pre-admission studies set out in the example above. To do so, students, in Year 1, should pursue the program of studies recommended below for the Honours Accountancy Studies (Economics Option) programs. All students should refer to the brochure entitled The Accounting Program, Pre-admission Requirements.

Honours Accountancy Studies (Economics Option)

(Honours Chartered Accountancy Studies (Economics Option) and Honours Management Accountancy Studies (Economics Option))

Recommended Program

<table>
<thead>
<tr>
<th>Year 1</th>
<th>ACC 101, 102, 131, 132</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECON 101, 102</td>
<td></td>
</tr>
<tr>
<td>ENGL 109</td>
<td></td>
</tr>
<tr>
<td>Group A elective</td>
<td></td>
</tr>
<tr>
<td>CS 115, 116</td>
<td></td>
</tr>
</tbody>
</table>

(students with a strong background in mathematics should consider taking CS 118 instead of CS 116) MATH 111b, 113a

(students who have not completed Grade 13 algebra may be required to complete MATH 103 before taking MATH 111b; students who have not completed Grade 13 calculus will be required to complete MATH 104 before taking MATH 113a).
### Honours Accountancy Studies (Economics Option)

#### Programs - Regular Program

(Honours Chartered Accountancy Studies (Economics Option) and Honours Management Accountancy Studies (Economics Option))

Eligibility for the degree of Bachelor of Arts in the Honours Accountancy Studies (Economics Option) programs require:

1. Successful completion of a minimum of 44 term courses including the Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative average of at least 75% in all courses designated as required. In addition, students must have a minimum average of 70% in all courses labelled accounting (ACC).

2. The following courses are required:
   a) ACC 101, 102, 231, 251, 281, 291, 292, 371, 372, 381, 382, 401, 461, 462, 491;
   b) ECON 101, 102, 201, 202, 211, 221, 231, 301 or 302;
   c) 1 term course in ACC or ECON numbered 300 or above and
d) either
   - Specialization A - (Honours Chartered Accountancy Studies (Economics Option))
     ACC 131, 132 and ECON 341;
   - or

Specialization B - (Honours Management Accountancy Studies (Economics Option))
M SCI 44 and
1 additional term course in ACC or ECON numbered 300 or above.

3. Those interested in qualifying as a Chartered Accountant should complete Honours Chartered Accountancy Studies (Economics Option) 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 should complete Honours Management Accountancy Studies (Economics Option) by electing Specialization B above.

### Honours Accountancy Studies (Economics Option) Programs - Co-operative Program

(Honours Chartered Accountancy Studies (Economics Option) and Honours Management Accountancy Studies (Economics Option))

Students may apply for direct admission to Year 1 Co-op Honours Accountancy Studies (Economics Option). 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 the Co-operative program 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 6 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. Work-term placements are in accounting settings in the public and private sectors.

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

(Anthropology includes Archaeology, Socio-Cultural Anthropology, Physical Anthropology, and Linguistics.)

General Anthropology
Eligibility for graduation in the 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. 8 of these 10 courses must be 200-level courses or above. ANTH courses must include:
   a) 101, 201, 202, 260, 330;
   b) 102A or 102B;
   c) 103 or 283 or 290.

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. 18 of these 20 courses must be 200-level courses or above. ANTH courses must include:
   a) 101, 201, 202, 260, 300, 330, 499;
   b) 102A or 102B;
   c) 103 or 283 or 290;
   d) one 400-level term course.

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

- Biology
- Classical Studies
- 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. 12 of these 14 courses must be 200-level courses or above. 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) 499 (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 8.13.

Minor in Anthropology
An Honours student may minor in Anthropology. The requirements for an Anthropology minor are identical to the requirements for a General BA in Anthropology.
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 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 112 or 115 or 116 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).

Notes:
1. Students must have an overall average of 75% 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. A list of approved Applied Studies courses is available from the Director of the program in ML 119.
4. 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

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRK 100A/100B, or LAT 100A/100B or LAT 203/204</td>
<td>LAT 203/204, or 2 term courses in Latin at the 200 level, or 2 term courses in Greek at the 200 level</td>
<td>2 term courses in Greek or Latin at senior level</td>
<td>4 term courses in Classical Civilization</td>
</tr>
<tr>
<td>CIV 101/102</td>
<td>CIV 251/252, 265/266</td>
<td>CIV 301/302, 351/352</td>
<td>CIV 101/102</td>
</tr>
<tr>
<td>6 additional term courses.</td>
<td>4 additional term courses.</td>
<td>4 additional term courses.</td>
<td>6 additional term courses.</td>
</tr>
</tbody>
</table>

Honours Latin
Recommended Program

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAT 100A/100B or 203/204</td>
<td>4 term courses in Latin</td>
<td>4 term courses in Latin</td>
<td>4 term courses in Latin</td>
</tr>
<tr>
<td>8 additional term courses.</td>
<td>2 term courses in Classical Civilization</td>
<td>2 term courses in Classical Civilization</td>
<td>2 term courses in Classical Civilization</td>
</tr>
<tr>
<td></td>
<td>4 additional term courses.</td>
<td>4 additional term courses.</td>
<td>4 additional term courses.</td>
</tr>
</tbody>
</table>

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 Honours requirements listed above. The Applied Studies requirements are listed on page 8.13.

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 80% 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

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRK 100A/100B, or LAT 100A/100B, or LAT 203/204</td>
<td>4 term courses in Classical Civilization</td>
<td>4 term courses in Classical Civilization</td>
<td>4 term courses in Classical Civilization</td>
</tr>
<tr>
<td>CIV 101/102</td>
<td>6 additional term courses.</td>
<td>6 additional term courses.</td>
<td>6 additional term courses.</td>
</tr>
</tbody>
</table>
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, 352, 353, 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 could work through a particular sequence of courses in one field (acting, academic, technical) which would in effect become an area of specialization. The DRAMA 499 project in the fourth year would then presumably be centred on this specialization.

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) 2 of DRAMA 221, 222, 243, 244, 261, 262, 306, 307, 321, 322, 326, 327, 331, 332, 343, 344, 361, 362;
   c) 6 of DRAMA 251, 252, 253, 254, 255, 258, 259, 301, 302, 351, 352, 353, 355, 356, 357, ENGL 362, 363;

Honours Drama and Theatre Arts (Applied Studies Co-op)
A student may combine an Honours Drama and Theatre Arts program with Applied Studies Co-op. The requirements in Drama and Theatre Arts are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 8.13.

Drama and Theatre Arts Joint Honours Program
Eligibility for graduation in the Joint Honours Drama and Theatre Arts program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 15 term courses must be in Drama and Theatre Arts including:
   a) DRAMA 101A must be taken in the first term, and DRAMA 101B and 102 must be taken in the second term;
   b) any 3 of DRAMA 251, 252, 253, 254, 255, 258, 259, 301, 302, 351, 352, 353, 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.
**Economics**

**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 and 2 term courses must be at the 400 level. ECON courses must include:
   a) 101, 102, 201, 202, 231;
   b) 241 or 263;
   c) an additional term course at the 300 level or above. (ECON 303 is recommended but not mandatory.)

**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, 401, 402;
   b) 241 or 263;
   c) an additional term course at the 300 level or above.

**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
4 additional term courses in Economics
4 additional term courses.

**Year 4**
ECON 401, 402
2 additional term courses in Economics
6 additional term courses.

**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 8.13.

**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 112; 115 or 180.
Recommended Program

Year 1
ECON 101, 102
ACC 121, 122
CS 112, 115 or 180
ENGL 109 or 150
MATH 111b
2 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
STAT 300
2 additional term courses.

Year 3B
ECON 301, 303, 421
3 additional term courses.

Year 4A
ECON 401, 422
3 additional term courses.

Year 4B
ECON 402, 403
3 additional term courses.

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 of at least 75%.

2. At least 14 term courses must be in Economics including ECON 101, 102, 201, 202, 211, 221, 231, 301, 302, 401, 402.

Notes Regarding Joint Honours Programs:

1. Economics and Geography
   The degree requirements of the Faculty of Arts must be met for the BA Degree and those of the Faculty of Environmental Studies for the BES Degree. Students must take ECON 221 or ENV S 271 and the above core courses.

2. Economics and Mathematics
   Substitute ECON 311, 321, for ECON 211, 221.
   ECON 421, 422 to be included in the above core courses. Students in Years 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 221 or SOC 280.

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.

English

Three-Year General English
Eligibility for graduation in the General English program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least 12 term courses must be in English, including:
   a) 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);
   e) 1 term course from 313, 314, 315, 316, 343, 344, 345, 346, 347, 415 (North American Literature);
   f) 3 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
The English major course requirements for the Four-Year General program are the same as for the Joint Honours program listed below. Students must maintain a minimum average of 70% in their English major courses.

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, 373A, 373B, 375A, 375B (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 (see Note 4).

Honours English (Co-operative Program)
The program leading to the Degree of Bachelor of Arts in Honours English (Co-operative Program) is designed for students who intend to enter careers in business, industry, government, or the communications media. Qualified students will ordinarily be admitted to the program after completion of their first 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.

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. The Applied Studies requirements are listed on page 8.13.

English Joint Honours Program
Eligibility for graduation in the Joint Honours English 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 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 305A, 305B, 373A, 373B, 375A, 375B (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 (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 from courses at the 100 level to fulfill the minimum English requirements. Some English courses do not fulfill the English Major requirements for a degree in English (see English Undergraduate Course Descriptions).

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 373A, 373B, 375A, 375B;
   d) 2 term courses from 211, 212, 232, 233, 343, 344;
   e) 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, 221, 222, 223, 224, 225;
   b) 2 additional Art History courses.
   Art History Option:
   a) FINE 110, 111, 120, 121, 210, 211, 212, 213, 219, 316;
   b) 2 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, 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, 221, 222, 223, 224, 225;
   b) 2 additional Art History courses;
   c) 4 term courses in Fine Arts at the 3rd or 4th year level, 1 of which must be 490A.
Art History Option:
- FINE 110, 111, 120, 121, 210, 211, 212, 213, 219, 316;
- 2 additional term studio courses;
- 4 term courses in Fine Arts at the 3rd or 4th year level, 2 of which must be 390A and 490A.

Film Studies Option: (A & B Requirements)
- FINE 110, 111, 250, 251, 350, 351 (or 360, 361), 470, 471, 490A, 270W (WLU);
- at least 6 term courses in Film Studies to be selected in consultation with the Fine Arts Film advisor. They may include FINE 252, 255R, 271W, 258W, 350, 351 (or 350, 351).

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:
   - FINE 110, 111, 120, 121, 220, 221, 222, 223, 224, 225;
   - 4 additional term courses in Art History;
   - 4 term studio courses on the 3rd year level chosen from: FINE 324, 325, 320, 321, 322, 323;
   - FINE 490, 491.

   Art History Option:
   - FINE 110, 111, 120, 121, 210, 211, 212, 213, 219, 316;
   - 2 additional term studio courses;
   - 6 term Art History courses on the 2nd or 3rd year level, 1 of which must be 390A;
   - FINE 490, 491.

   Film Studies Option:
   - FINE 110, 111, 120, 121, 250, 251, 270W, 350, 351, 360, 470, 471;
   - 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.
   - 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 9.13.

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:

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. One term course must be taken in at least 3 of the subject areas defined by the Department.

Four-Year General French
Eligibility for graduation in the Four-Year General French program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least 16 term courses must be in French of which at least 6 must be at the 200 level and 8 at the 300 and 400 level. Of the 8 courses at the 300 and 400 level, 2 must be FR 401, 402.

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 (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. One term course must be taken in at least 5 of the subject areas defined by the Department.

Recommended Program

Year 1
FR 192 or FR 195/196
8 additional term courses.

Year 2
A minimum of FR 251 plus 1 of FR 207, 208, 252 or 255, 231, 253, 276 plus 1 of FR 203, 232, 254, 273.
4 additional term 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 8.13.

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

- Anthropology
- Classical Studies
- Economics
- English
- Fine Arts
- Geography
- German
- History
- Latin
- Man-Environment Studies
- Mathematics
- Philosophy
- Political Science
- Psychology
- Russian
- Sociology
- Spanish
- Sociology
- 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. One term course must be taken in at least 5 of the subject areas defined by the Department.

Recommended Program

Year 1
FR 192 or FR 195/196
8 additional term courses.

Year 2
A minimum of FR 251 plus 1 of FR 207, 208, 252 or 255, 231, 253, 276 plus 1 of FR 203, 232, 254, 273.
Year 3
A minimum of FR 301/302 or its equivalent, plus 2 of FR 303, 342, or 363.

Year 4
A minimum of FR 401/402 or their equivalent plus 2 additional term courses in French at the 300 or 400 level.

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.

Minor Program in Business French
A minor program in Business French will consist of a minimum of 10 term courses in French. Students must demonstrate written and oral ability in French equal to that expected in FR 301/302.

Recommended Program

<table>
<thead>
<tr>
<th>Year</th>
<th>Courses</th>
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<tbody>
<tr>
<td>Year 1</td>
<td>FR 192</td>
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<tr>
<td>Year 2</td>
<td>FR 210</td>
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<td>FR 255</td>
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<tr>
<td>A minimum of 2 term courses from FR 203, 205, 206, 207, 208, 251, 252.</td>
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<tr>
<td>Year 3</td>
<td>FR 300</td>
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<tr>
<td>FR 310</td>
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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 192 and FR 195/196.
3. With the permission of the Department, the student may spend the third year enrolled in the Nantes program in France or in the Laval program in Quebec.

Study in France or Quebec
The Department offers students 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.
Four-Year General Geography
Eligibility for graduation in the Four-Year General Geography program includes fulfillment of the following requirements:

1. Successful completion of the equivalent of 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 65%.

2. At least 23 term courses must be in Geography; 4 of these 23 courses may be designated as Environmental Studies, and 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 201B Climatology
GEOG 202 Topics of Economic and Urban Geography
GEOG 275 Introductory Air Photo Analysis and Remote Sensing
ENV S 271 Introduction to Quantitative Research Methods

1 of:
GEOG 203 Topics of Cultural and Regional Geography
GEOG 204 Soviet Union
GEOG 205 Africa
GEOG 220 World Regional Geography
GEOG 221 The United States

and additional courses so that a student should have completed by the end of second year 22 term course equivalents.

Year 3
GEOG 381 The Nature of Geography
GEOG 391 Field Research
ENV S 272 Computer Programming in Environmental Studies

one 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

Honours Geography
Eligibility for graduation in the Honours Geography program includes fulfillment of the following requirements:

1. Successful completion of the equivalent of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 70% and a cumulative major average of at least 75%.

2. At least 23 term courses must be in Geography; 4 of these 23 courses may be designated as Environmental Studies, and 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

and additional courses.

Year 2
ENV S 200 Field Ecology
GEOG 201A Geomorphology and Soils
GEOG 201B Climatology
GEOG 202 Topics of Economic and Urban Geography
GEOG 275 Introductory Air Photo Analysis and Remote Sensing
ENV S 271 Introduction to Quantitative Research Methods

1 of:
GEOG 203 Topics of Cultural and Regional Geography
GEOG 204 Soviet Union
GEOG 205 Africa
GEOG 220 World Regional Geography
GEOG 221 The United States

and additional courses so that a student should have completed by the end of second year 22 term course equivalents.

Year 3
GEOG 381 The Nature of Geography
GEOG 391 Field Research
ENV S 272 Computer Programming in Environmental Studies

one of:
GEOG 307 Social Survey Techniques
GEOG 203  Topics of Cultural and Regional Geography
GEOG 204  Soviet Union
GEOG 205  Africa
GEOG 220  World Regional Geography
GEOG 221  The United States
and additional courses.

Year 3
GEOG 381  The Nature of Geography
GEOG 390  Senior Honours Research Essay Proposal
GEOG 391  Field Research
ENV S 272  Computer Programming in Environmental Studies

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

Year 4
GEOG 490A and B Senior Honours Research Essay

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 (pp. 00.00-00.00). 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, MATH 105 is strongly recommended in Year 1 for students without a Grade 13 Math.

2. For some courses, participating students may be expected to make a financial contribution to defray heavy equipment/travel costs, e.g. GEOG 391 (Field Research), which is mandatory for all 4-year students. Statements on fees, where required, will be found with the course description.

3. Students intending to teach in Secondary Schools are advised to take at least 4 term courses of Regional Geography.

4. Since many departments offering graduate work in Geography demand proficiency in a foreign language, students intent on graduate work should consider taking at least 2 term courses in a foreign language.

5. No more than 3 term course equivalents may be taken as reading courses in Geography.

Arts
Geography
German

German

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

Three-Year General Program in German
Four-Year German and Russian Scientific Translation Program
Honours Program in German
Honours German (Applied Studies Co-op)
Joint Honours Program with German Minor Program in German

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

Stream A
Students with little or no knowledge of German
First Year
GER 101/121
GER 151/251
Second Year
GER 201/202
GER 291/292

Stream B
Students with at least 2 years of High School German
First Year
GER 121/122 and/or GER 151/152
Second Year
GER 251/252
GER 291/292

Three-Year General German
Eligibility for graduation in the General German program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least 12 term courses must be in German.

Four-Year German and Russian Scientific Translation Program
German and Russian Scientific Translation is a four-year general program designed for students who wish to specialize in the field of translation of scholarly texts in the arts and sciences. Eligibility for graduation in this 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% in the primary and secondary languages.
2. The 40 term courses must include:
   a) 14 approved term courses in German;
   b) 8 approved term courses in Russian;
   c) 12 approved term courses in the sciences and/or mathematics.

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 8.13.

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
   - 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. GERM 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.
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

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-R
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 Honours requirements listed above. The Applied Studies requirements are listed on page 8.13.

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
Spanish
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. *C CIV 251 and C CIV 252 will be accepted for credit as term courses in History provided that the student does not have credit for HIST 237 or HIST 238. Either C CIV 485 or C CIV 486 (but not both) will be accepted for credit as a year course in History, but will not be accepted as a Senior Seminar in History.*

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**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:


**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.

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**Latin**

See Classical Studies.

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**Medieval Studies**

Students interested in an interdisciplinary approach to university education and to an examination of the Middle Ages may take either a General or an Honours BA in Medieval Studies. Such a degree is designed to provide a general awareness of our cultural heritage. In addition, the program is flexible enough to prepare students for careers in teaching, or for the pursuance of a graduate degree.

The Medieval Studies program is administered jointly by the English Department at St. Jerome’s College (Dr. D. Letson) and by the Department of Classical Studies (Dr. P. Forsyth). Interested students may call or write either of these advisors for further information.

**Three-Year General Medieval Studies**

Eligibility for graduation in the General Medieval Studies program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least 14 term courses must be from an approved list of Medieval Studies or related courses, including at least 2 term courses from each of 4 of the 8 subject fields specified below.

**Honours Medieval Studies**

Eligibility for graduation in the Honours Medieval Studies program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 16 term courses must be from an approved list of Medieval Studies or related courses, including at least 2 term courses from each of 5 of the 8 subject fields specified below.

**Subject fields:** Latin, English, Fine Arts, History, Philosophy, Religious Studies, Classical (Medieval) Civilization, Modern European Language.

**Honours Medieval Studies (Applied Studies Co-op)**

A student may combine an Honours Medieval Studies program with Applied Studies Co-op. The requirements in Medieval Studies are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 8.13.
Music

Three-Year General Music
Eligibility for graduation in the General Music program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 32 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 Music, including MUSIC:
   a) 101, 102, 150, 151, 201, 202, 250, 251;
   b) at least 3 of 253, 254, 353, 354.

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.

Honours Music
Eligibility for graduation in the Honours Music program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 43 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 23 term courses must be in Music, including MUSIC:
   a) 101, 102, 150, 151, 201, 202, 250, 251, 253, 254, 301, 302, 353, 354, 370, 371, 490, 491;
   b) 466, 467 or 2 other 300 level courses.

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 47 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 Music, including MUSIC:
   a) 101, 102, 201, 202, 301, 302, 150, 151;
   b) at least 3 of 253, 254; 353, 354;
   c) at least 3 of 250, 251, 370, 371;
   d) 8 additional term courses of which at least 6 must be above the 100 level;
   e) an honours seminar in music or a senior honours essay in the other discipline.

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
Eleven term course equivalents in Music, including MUSIC 101/102, 150/151, and any 8 term courses, selected in consultation with the Music Department, including the option of Music Studio.

Note For All Programs
Students electing to take Music Studio must audition before the Music Faculty. Normally a level of performance equal to the Royal Conservatory of Music Studio. Students must arrange for an audition with the Music Faculty.

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 - 386.

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 - 386.

Four-Year General Philosophy
Eligibility for graduation in the Four-year General Philosophy program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of
at least 60% and a cumulative major average of at least 68%.

2. At least 14 term courses must be in Philosophy, and must include the courses required in the Three-Year General program.

Honours Philosophy
Eligibility for graduation in the Honours Philosophy program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group Requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 20 term courses must be in Philosophy, including PHIL:
   a) one of 241, 242, 243, or 440A/B;
   b) 221, 322, 499;
   c) any 4 of 380 - 386.

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) 218 J or 221;
   c) 322;
   d) any 4 of 380 - 386;
   e) 499J or 499.

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. The Applied Studies requirements are listed on page 8.13.

Philosophy Joint Honours Program
A Joint Honours program with Philosophy may be taken in combination with any other discipline in which an Honours program is offered, subject to approval by the Departments concerned. Joint Honours programs have been approved with:

- Economics
- English
- French
- German
- History
- Latin
- Mathematics
- Political Science
- Psychology
- Religious Studies
- Russian
- Social Development
- Studies
- Sociology

Eligibility for graduation in the Joint Honours Philosophy program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group Requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 14 term courses must be in Philosophy, including PHIL:
   a) one or 2 of 140, 241, 242, 243, or 440A/B (depending on program);
   b) 221, 322;
   c) any 4 of 380 - 386;
   d) a Philosophy course which is relevant to the other subject (e.g. Aesthetics for Philosophy and English);
   e) a Senior Honours essay in either PHIL 499 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. 8.31).
Three-Year General Political Science
Eligibility for graduation in the General Political Science program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least 12 term courses must be in Political Science. Ten of these 12 courses must be above the 100 level, of which at least 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 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 70%.

2. At least 18 term courses must be in Political Science. Sixteen of these 18 courses must be above the 100 level, of which at least 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 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, 260B, 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 beyond the 100 level not in Political Science, selected from courses which have been designated as Administrative Studies courses by the Department of Political Science.

Recommended Program

| Year 1 | 6 term courses in Political Science (see note) | 4 other term courses. |
| Year 2 | 6 term courses in Political Science (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, 260B, 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 beyond the 100 level 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 2 academic terms with a minimum average of 75% 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 in Political Science are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 8.13. 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

<table>
<thead>
<tr>
<th>Year 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>P SCI 101/102</td>
</tr>
<tr>
<td>2 introductory term courses in the other discipline.</td>
</tr>
<tr>
<td>6 other term courses.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 term courses in P SCI (see note)</td>
</tr>
<tr>
<td>4 term courses in the other discipline.</td>
</tr>
<tr>
<td>4 other term courses.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 term courses in P SCI (see note)</td>
</tr>
<tr>
<td>4 term courses in the other discipline.</td>
</tr>
<tr>
<td>4 other term courses.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 term courses in P SCI, at least 2 of which must be at the 400 level (see note)</td>
</tr>
<tr>
<td>4 term courses in the other discipline.</td>
</tr>
<tr>
<td>4 other term courses.</td>
</tr>
</tbody>
</table>

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) 498 or 499.

PSYCH 291, 292, 391, and 2 of the following courses: PSYCH 392, 393, 394, 395, 396, 397, 398 must be completed prior to the beginning of the fourth year of the program.

It is also recommended that honours students include at least 2 third or fourth year special topics courses in their program.

Recommended Program

Year 1
PSYCH 101/102
The equivalent of 8 additional term courses.

Year 2
PSYCH 291/292
The equivalent of 2 additional term courses in Psychology.
The equivalent of 6 additional term courses.

Year 3
PSYCH 391
2 of PSYCH 392, 393, 394, 395, 396, 397, 398
The equivalent of 3 additional term courses in Psychology.
The equivalent of 4 additional term courses.

Year 4
PSYCH 498 or 499
2 fourth-year seminars in Psychology.
The equivalent of 2 additional term courses in Psychology.
The equivalent of 4 additional term courses.

Honours Psychology (Applied Studies Co-op)
A student may combine an Honours Psychology program with Applied Studies Co-op. The requirements in Psychology are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 8.13.

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 admission interviews taking place before the end of the fall term. However, interested students are advised to consult with the Co-op Faculty Advisor when planning their second-year programs.

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

Anthropology
Classical Studies
Drama
Economics
English
Fine Arts
French
Mathematics
Music
Philosophy
Political Science
Recreation
Religious Studies
Russian
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%.

2. At least 14 term courses must be in Psychology, including PSYCH:
   a) 101;
   b) 291, 292, 391;
   c) at least 2 of 203, 200, 207, 201, 271;
   d) at least 2 of 211, 253, 355, 357;
   e) at least 2 of 392, 393, 394, 395, 396, 397, 398;
   f) 496 or 499.

PSYCH 291, 292, 391, and 2 of the following courses, PSYCH 392, 393, 394, 395, 396, 397, 398 must 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 322, 341, 422).

2. At least 20 term courses must be in Psychology for letter grades, including PSYCH: 101, 200, 203, 207, 211, 212, 213, 253, 311, 312, 322, 341, 422. Students are also required to take PSYCH 325 and 425 for credit. DANCE 364 is also required.

It is further 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 Four-Year General Psychology program with Early Childhood Education and Care Option is a 65% 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 322, 341, 422).

2. At least 20 term courses must be in Psychology for letter grades, including PSYCH:
   a) 101, 211, 212, 213, 291, 292, 311, 312, 322, 341, 391, 392, 393, 422, 453;
   b) 203 or 207;
   c) 498 or 499.

Students are also required to take PSYCH 323 and 423 for credit. DANCE 364 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 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 traditions 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 65% 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, 490B;
   - 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 and 490B.

### 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. The Applied Studies requirements are listed on page 8.13.
Religious Studies Joint Honours Program
The Religious Studies Department offers Joint Honours programs with the following Departments:

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

The requirements in Joint Honours programs are the same as the Honours program, except the overall number of Religious Studies courses is 14 instead of 20. The RS 490 requirement may be waived for students who choose to do their senior honours essay in the other Department. There will be consultation between the Undergraduate Officers of the 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

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
- Four-Year Russian and German Scientific Translation Program
- Honours Program in Russian
- Honours Program in Slavic Studies
- Honours Slavic Studies (Applied Studies Co-op)
- Joint Honours Program with Russian
- Minor Program in Russian

Three-Year General Russian
Eligibility for graduation in the General Russian program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least 12 term courses must be in Russian.

Four-Year Russian and German Scientific Translation Program
Russian and German Scientific Translation is a Four-Year General program designed for students who wish to specialize in the field of translation of scholarly texts in the arts and sciences. Eligibility for graduation in this 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% in the primary and secondary languages.
2. The 40 term courses must include:
   a) 14 approved term courses in Russian;
   b) 8 approved term courses in German;
   c) 12 approved term courses in the sciences and/or mathematics.

Honours Russian
Eligibility for graduation in the Honours Russian program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 20 term courses must be in Russian.
Honours Slavic Studies
Eligibility for graduation in the Honours Slavic Studies program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 20 term courses must be in Slavic Studies. Of these 20 term courses, 12 will normally be in Russian and 8 in Ukrainian and Polish.

Honours Slavic Studies (Applied Studies Co-op)
A student may combine an Honours Russian program with Applied Studies Co-op. This program includes the following requirements:

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 16 term courses must be in Slavic Studies, of which 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:

<table>
<thead>
<tr>
<th>Drama</th>
<th>Man-Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economics</td>
<td>Mathematics</td>
</tr>
<tr>
<td>English</td>
<td>Philosophy</td>
</tr>
<tr>
<td>French</td>
<td>Political Science</td>
</tr>
<tr>
<td>Geography</td>
<td>Psychology</td>
</tr>
<tr>
<td>German</td>
<td>Sociology</td>
</tr>
<tr>
<td>History</td>
<td>Spanish</td>
</tr>
</tbody>
</table>

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 00.00.

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.

This program stands as a sound liberal and general education. However, it also provides an excellent background for further study in fields such as 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>
</tr>
</thead>
<tbody>
<tr>
<td>ISS 131R</td>
<td>SOCWK 120R</td>
<td>SOC 120R</td>
<td>PSYCH 120R</td>
</tr>
<tr>
<td>150R</td>
<td>121R</td>
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<td>250R</td>
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</tbody>
</table>
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 a full credit in social research (i.e., ISS 250R, 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 Major average of at least 75%.

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

3. At least 8 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 the theme area in depth, looking at the historical, institutional, and cross-cultural aspects, and examining value systems and patterns of change.

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

- Philosophy
- Religious Studies
- Psychology
- Sociology

Eligibility for graduation in the Social Development Studies Joint Honours program includes fulfillment of the following requirements:

1. Successful completion of from 42 to 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 75%.

2. At least 14 term courses must be in Social Development Studies including:
   a) 4 introductory 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 from the Major;
   d) ISS 469R (Senior Seminar), or ISS 499R (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:

- ISS 131R, ISS 150R, SOC WK 120R;
- 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.

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**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); 281 (sociological methods course);
   b) one of 271, 405, 406 (sociological theory);
   Students are strongly encouraged to elect SOC 280, although this is not required.

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**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 65% and a cumulative major average of at least 75%.

2. At least 19 term courses must be in Sociology, including SOC:
   a) 101, 280, 281, 282, 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 281/282
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.

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**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. The Applied Studies requirements are listed on page 8.13.
**Sociology Joint Honours Programs**

Sociology has Joint Honours programs with the following:

- Anthropology
- Economics
- English
- French
- Geography
- History
- Mathematics
- Philosophy
- Political Science
- Psychology
- Recreation
- Spanish

Eligibility for graduation in the Joint 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 65% 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 (281/282);
   d) 2 term courses in sociological theory to be chosen from 271, 405, 406;
   e) The equivalent of 7 term courses of electives in Sociology;
   f) An Honours Thesis course (499A/B) or the equivalent in the related department.

**Notes For Joint Honours Program**

1. For requirements in Joint Honours with History, Philosophy, Psychology and Mathematics, see the Department Undergraduate Officer.

2. 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.

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**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) 1 term course in Golden Age;
   d) 1 term course in Spanish American Literature.

**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/201B. (Students with little or no Spanish will take SPAN 101/102 in the first year and SPAN 201A/201B in the second year.)

8 additional term courses.
Year 2
A minimum of 6 term courses in Spanish, including SPAN 251A/251B, (or 201A/201B), and 205/206.
4 additional term courses.

Year 3
A minimum of 6 term courses in Spanish, including SPAN 351A/351B, (or 251A/251B), and 326 or 327.
4 additional term courses.

Year 4
A minimum of 6 term courses in Spanish, including 1 term course in Spanish American Literature.
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 Honours requirements listed above. The Applied Studies requirements are listed on page 8.13.

Joint Honours Spanish
The Department of Spanish recognizes combined Honours programs in Spanish and the following:
- Classical Studies
- English
- French
- German
- History
- Latin
- Sociology
- Psychology

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/201B (Students with little or no Spanish will take SPAN 101/102 in the first year and SPAN 201A/201B in the second year.)
8 additional term courses.

Year 2
A minimum of 4 term courses in Spanish, including SPAN 251A/251B, (or 201A/201B), and 205/206.
6 additional term courses.

Year 3
A minimum of 6 term courses in Spanish, including SPAN 351A/351B, (or 251A/251B), and 326 or 327.
6 additional term courses.

Year 4
A minimum of 4 term courses in Spanish, including 1 term course in Spanish American Literature.
6 additional term courses.

Minor 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. Please check with the Undergraduate Officer in Spanish and note cross-registration procedures on page 1.2 of the Calendar.

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 6 principal divisions of engineering starting with the first year. The curriculum for each of the 6 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
- 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 program in Systems Design Engineering is not divided into 2 groups. All students in this program start with 4 months of school before going out on the first work term in the Winter.

The program in Geological Engineering has only 1 group. Students in Geological Engineering start with 8 months of school before their first work term.

The admission 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 Grade 13
Applicants must present 6 credits, 5 of those must be: Relations and Functions, Calculus, Algebra, as well as Chemistry and Physics in their overall Grade 13 program. Applicants with high overall standing who are missing one of the 5 specific Grade 13 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 our specific requirements.

Admission as an Adult Student
Applicants must obtain standing in Ontario Grade 13 Mathematics and Science courses or their equivalent. The University has developed special pre-university mathematics and science courses which can be taken by correspondence and which are recommended for Adult Students. To discuss admissibility and appropriate qualifying work applicants are advised to contact the Admissions Officer for the Faculty of Engineering.

Admission to Advanced Standing
Because of the co-operative nature of the Engineering 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 a minimum of 3 satisfactory work terms. The level of advanced admission is determined by an examination of the applicant’s academic and work experience.

Credit for previous work experience can be applied only to those work terms preceding the level of admission and cannot exceed 3 work terms.
Examinations and Promotions

The Faculty constitutes the examining body for all examinations and is responsible for all decisions on grades, promotions, failures, deferred examinations, appeals and recommendations for the granting of degrees. Students are examined and grades are set for individual courses on the completion of the work for that course. Upon examination of the student’s performance at the end of each term, the Examinations and Promotions Committee assigns an academic decision. The possible decisions and their effects on the student’s progress in the program as follows:

Promoted - proceed to next term.
Promoted (Aegrotat) - proceed to next term.
Required to Repeat Term - No Penalty - may repeat in next available term.
**Required to Repeat Term - must stay out 2 terms before repeating.
Voluntary Withdrawal - readmission possible only through letter of application to Admissions Committee at any time after the term in which the student withdraws.
**Must Withdraw from Engineering - readmission possible only through application to Admissions Committee after at least 3 terms out and with new evidence of ability to succeed in program.
Decision Deferred - may not proceed until status cleared.
Recommended for BASc Degree at (Spring/Fall) Convocation - (First/Second/Third) Class Honours - program successfully completed.

*Not used in final term
**Not used in 1A

The rules which are applied when the student’s performance is assessed are as follows:

1. To continue in the degree program, a student must have a term average of 50% or better. Except in 1A, a student receiving an average below 50% who has never before in the program 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.

2. Excluding terms when a student is allowed to repeat without penalty, the program must be completed in no more than 10 academic terms (i.e. no more than 2 repeated terms) and no term may be repeated more than once.

3. To be unconditionally promoted in the program a student must have a term average of 60% or better and fewer than 2 grades below 50.

4. A student with a term average of over 60% and 2 or more course grades below 50 will normally be allowed to proceed on probation. Probationary status will be cleared by achieving an unconditional promotion at the end of the probationary term. A student on probation who receives an average over 60% and 2 or more course grades below 50 will be required to repeat the term.

5. A student with a term average of 50-59% who is required to repeat the term except in 1A when the student will be allowed to proceed on probation. A student on a repeat term who does not achieve an unconditional promotion will be required to withdraw from the program.

6. A student may withdraw voluntarily from the program at any time prior to 4 weeks before the commencement of the final exam period in the term by giving written notification of the withdrawal. Students in 1A may withdraw at any time prior to the commencement of the final exam period.

7. A student may be required to withdraw from the program 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.

8. Students who have successfully met all the requirements of the program and have been recommended for a BASc degree will have First, Second or Third Class Honours standing designated according to the cumulative 3A-4B average.
10. Grades for courses that are in addition to the degree requirements will not be included in the term average but will be reported on the student’s transcript.

11. Courses taken by students during work terms will not be included in the average for any term. The grades for courses taken at the University of Waterloo or on Letter of Permission, however, will be reported on a student’s transcript. Normally such courses are considered as enrichment of 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/her Department. Courses taken during work terms may not be used to reduce the number of courses taken in any subsequent term. Normally students will be expected to register for the minimum number of courses specified by the Calendar in each term of the program.

12. There are no supplemental examinations except in the last term of the program. A minimum grade is not normally required in any one subject, although individual departments may designate minimum grade requirements in certain courses. Also, there are individual department rules regarding the grading and averaging of General Studies elective courses.

13. Students who are required to repeat a term will normally be required to repeat all of the work of the failed term. Where timetables permit, repeating students may be excused from repeating individual courses in which good marks have been obtained and permitted to register in other appropriate courses, at the discretion of the student’s department.

14. All courses in the Faculty are assigned a numerical grade (between 0 and 100) by the examiners. The following exceptions are permitted:

- AEG - Aegeotat - 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 6 months have elapsed since the end of the term, a grade must be submitted.
- DNW - Did Not Write - The student did not withdraw from the course and was not eligible for an Incomplete grade. The student did not complete a sufficient proportion of the assignments, tests and examinations for an evaluation to be made.

In cases where students take courses in a Faculty where letter grades are assigned, the letter grades will be converted for purposes of reporting and averaging according to the following table:

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<thead>
<tr>
<th>Grade</th>
<th>Letter</th>
<th>Percentage</th>
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<tbody>
<tr>
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</tr>
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<tr>
<td>C</td>
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<td>65</td>
</tr>
<tr>
<td>D</td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td>F</td>
<td>38</td>
<td>38</td>
</tr>
</tbody>
</table>

15. Students who have reason to believe that a grade, term average or academic decision is incorrect or unjust may launch an appeal. Reasons in support of the appeal, including doctor’s certificates and similar supporting documents, must be submitted with the appeal. All appeals should be addressed to the Chairman of the Engineering Examinations and Promotions Committee, Registrar’s Office, University of Waterloo within 3 weeks of receipt of the mark report. Appeals being launched later than 6 months after the end of the term being appealed will not be considered.

16. Changes to a student’s original registration form may be permitted at the discretion of a student’s department. All such arrangements must be indicated and approved before the end of the normal “Drop/Add” Period, which is a period of 3 weeks at the beginning of each term. After the end of the 3 week period, only exceptional cases for change will be considered.

17. Students must demonstrate consistent satisfactory performance during their work-term employment. They must also submit the required number of acceptable work-term reports. (See booklet titled Regulations and Procedures for Co-operative Programs).

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 Regulation & Procedures for Co-operative Programs.)

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**

- Courses offered within the Faculty of Engineering
  - Management Sciences non-technical courses
- Courses offered in the Faculty of Arts
  - Economics
  - Political Science
  - Psychology
  - Sociology

**Group B: HUMANITIES**

- Courses offered within the Faculty of Engineering
  - General Engineering non-technical courses
- 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.

Any choices other than those from the published lists require the approval of the student’s departmental advisor.

Combined Bachelor's - Master's Program in Engineering

**I. INTRODUCTION**

The Faculty of Engineering program 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
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.
3. the Co-operative work-term requirements of the BASc program must be met.
B) There must be complete freedom of transferability from the combined programs to the regular programs.
C) Admission to the combined program is on the basis of merit, as is continuance in the program. Students who fail to maintain sufficiently high standing will be required to revert to the regular program, or even if circumstances so warrant, to withdraw from the University.
D) The culmination of the combined program is the Master's degree; this may be attained either through the completion of a Master's degree project or research thesis.
E) A combined program normally functions on the Co-operative basis.
F) Recruitment into a combined Bachelor's - Master's degree program must have the flexibility to satisfy the requirements of individual students; at the same time it must have coherence — each student's program must be addressed toward a well-defined area of specialization.

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

A) Application and Admission
Admission to the combined Bachelor's - Master's degree program is normally restricted to students with a consistently good academic record at the end of the 3A term who would be granted "conditional admission to the MASc program". The condition to be fulfilled is "satisfactory completion of the requirements of the BASc degree with at least a B average".

Students who are granted this admission would be notified at the start of the academic term preceding their 6th work term. As in any program culminating in a Master's degree, a Faculty Supervisor is appointed on admission.

1. Academic and Administrative Responsibility
Although the Supervisor advises students, all course selections and other academic administrative matters concerning each student are subject to the approval of the Department Associate Chairman 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 terms. 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 6 major divisions of engineering provide the foundation for professional activity in any field of engineering interest. In addition a wide variety of elective courses are available from which optional programs may be developed under the guidance of Faculty Advisors.

For further enlargement of the programs, refer to the Faculty chapter in this Calendar.

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) Electrical Engineering
d) Geological Engineering
e) Mechanical Engineering
f) 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).
Term 1A
MATH 110A
MATH 114
CH E 102
PHYS 115
GEN E 115

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

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

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

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

Chemical Engineering

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

This Option also deals with the further development of a core area of chemical engineering. It involves studies in optimal control, economic and process optimization, and simulation.

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**Guide to Undergraduate Chemical Engineering Course Numbers**

The code for the course numbers is consistent with the graduate course numbers and is as follows:

- **First digit (1-5):** year
  - 1-4: Year of study, core courses
  - 5: Fourth Year, elective courses

- **Second digit (0-8):** Subject matter
  - 0: General Engineering
  - 1: Transport Processes
  - 2: Mathematics, Control, Economics
  - 3: Chemistry, Kinetics, Catalysis
  - 4: Polymer Science and Engineering
  - 5: Extractive and Process Metallurgy
  - 6: Biochemical and Food Engineering
  - 7: Ecology, Environmental Engineering
  - 8: Projects, Seminars

- **Third digit (0-9):** Term
  - Even numbers: A Term
  - Odd numbers: B Term

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**A) Core Courses (Beyond Year 1)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH E 210</td>
<td>Transport Processes 1 (Equilibrium Stage Operations)</td>
</tr>
<tr>
<td>CH E 213</td>
<td>Transport Processes 2 (Fluid Mechanics)</td>
</tr>
<tr>
<td>CH E 220</td>
<td>Applied Mathematics 1</td>
</tr>
<tr>
<td>CH E 230</td>
<td>Physical Chemistry 1</td>
</tr>
<tr>
<td>CH E 231</td>
<td>Physical Chemistry 2</td>
</tr>
<tr>
<td>CH E 232</td>
<td>Inorganic Chemistry 1</td>
</tr>
<tr>
<td>CH E 233</td>
<td>Physical Chemistry Laboratory</td>
</tr>
<tr>
<td>CHEM 026</td>
<td>Organic Chemistry 1</td>
</tr>
<tr>
<td>CHEM 036</td>
<td>Organic Chemistry 2</td>
</tr>
<tr>
<td>MATH 210</td>
<td>Calculus 2</td>
</tr>
<tr>
<td>MATH 215</td>
<td>Differential Equations</td>
</tr>
<tr>
<td>CH E 314</td>
<td>Transport Processes 3 (Heat Transfer)</td>
</tr>
<tr>
<td>CH E 317</td>
<td>Transport Processes 4 (Mass Transfer)</td>
</tr>
<tr>
<td>CH E 320</td>
<td>Applied Mathematics 2</td>
</tr>
<tr>
<td>CH E 321</td>
<td>Process Dynamics and Control 1</td>
</tr>
<tr>
<td>CH E 330</td>
<td>Chemical Engineering Thermodynamics</td>
</tr>
<tr>
<td>CH E 331</td>
<td>Chemical Reaction Engineering</td>
</tr>
<tr>
<td>CH E 332</td>
<td>Inorganic Chemistry 2</td>
</tr>
<tr>
<td>CH E 333</td>
<td>Instrumentation Methods of Chemical Analysis</td>
</tr>
<tr>
<td>CH E 382</td>
<td>Engineering Economics and Process Design 1</td>
</tr>
<tr>
<td>CH E 410</td>
<td>Chemical Engineering Laboratory</td>
</tr>
</tbody>
</table>

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**CH E 484**  Engineering Economics and Process Design 2

**CH E 486**  Technical Seminar

**CH E 007**  General Awareness Seminar

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**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>1</td>
</tr>
<tr>
<td>3A</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>3B</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>4A</td>
<td>0</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>4B</td>
<td>0</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

*must include one of CH E 581 (counts as two courses), CH E 583, CH E 585.

Five electives must be chosen to, together with the 1B elective, satisfy the General Studies program requirements described on page 9.5. 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 group 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 Process**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH E 510</td>
<td>Prediction of Physico-Chemical Properties</td>
</tr>
<tr>
<td>CH E 515</td>
<td>Two-Phase Flow Operations</td>
</tr>
<tr>
<td>CH E 517</td>
<td>Performance of Separation Processes</td>
</tr>
</tbody>
</table>

2) **Mathematical Analysis and Control**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH E 520</td>
<td>Chemical Engineering Analysis</td>
</tr>
<tr>
<td>CH E 521</td>
<td>Process Dynamics and Control 2</td>
</tr>
<tr>
<td>CH E 523</td>
<td>Process Control Laboratory</td>
</tr>
</tbody>
</table>
3) Polymer Science and Engineering
CH E 540 Introduction to Polymer Science
CH E 541 Physical Chemistry of Polymers
CH E 543 Polymer Laboratory

4) Extractive and Process Metallurgy
CH E 550 Introduction to Extractive Metallurgy
CH E 551 Metallurgical Chemistry
CH E 553 Principles of High Temperature Extractive Metallurgy

5) Biochemical and Food Engineering
CH E 560 Introduction to Biochemical Engineering
CH E 561 Fermentation Operations
CH E 563 Food Processing

6) Pollution Control Engineering
CH E 560 Introduction to Biochemical Engineering
CH E 570 Air Pollution
CH E 571 Water Pollution

7) Research/Design Option
CH E 580 Research-Design Project 1
CH E 581 Research-Design Project 2
(worth 2 courses)

Other Research and/or Design Projects
CH E 583 Process Systems Design
CH E 585 Technical Elective Project

Courses not in any Option Group
CH E 501 The Chemical Engineer as an Entrepreneur
CH E 502 Fundamentals of Petroleum Production

A student may acquire a BASc in Chemical Engineering with an Option in Management Sciences by taking 8 specific M SCI courses as electives. Two of these are part of the CH E core. (M SCI chart is on p. 9.18.)

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 satisfactorily completing the Option.

Academic Program for Each Term

<table>
<thead>
<tr>
<th>Term 2A, Fall and Winter</th>
<th>MATH 210, CHEM 026, CH E 210, CH E 220, CH E 230, CH E 232, CH E 007.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term 2B, Spring and Fall</td>
<td>MATH 216, CHEM 036, CH E 213, CH E 231, CH E 233, CH E 007, General Studies Elective.</td>
</tr>
<tr>
<td>Term 3A, Winter and Spring</td>
<td>CH E 314, CH E 320, CH E 330, CH E 332, CH E 382, CH E 007, General Studies Elective.</td>
</tr>
<tr>
<td>Term 3B, Fall and Winter</td>
<td>CH E 317, CH E 321, CH E 331, CH E 333, CH E 007, Technical Elective, (CH E 550 or CH E 570). General Studies Elective.</td>
</tr>
<tr>
<td>Term 4A, Spring and Fall</td>
<td>CH E 410, CH E 484, CH E 486, CH E 007, 2 Technical Electives, Free Elective.</td>
</tr>
<tr>
<td>Term 4B, Winter</td>
<td>Either: CH E 581, CH E 007, 2 Technical Electives, Free Elective. or: CH E 583, CH E 007, 3 Technical Electives, Free Elective. or: CH E 585, CH E 007, 3 Technical Electives, Free Elective.</td>
</tr>
</tbody>
</table>

Note:
The 4A and 4B Free Electives must be General Studies electives, unless the General Studies requirements have been otherwise satisfied. Consult the Associate Chairman - Undergraduate Studies for alternate arrangements.

All courses indicated above for which numeric grades are received are included in determining the term average and rank in class. Grades for courses in excess of those indicated above are recorded but not included in determining the term average.
Civil Engineering

The complex problems and needs of current and future societies have created challenges for Engineering unparalleled in our history. In attempting to interpret and satisfy these needs, Civil Engineers currently direct the spending of more than one-tenth of Canada's gross national product - more than any other professional group. Certainly within the profession, there has been a growing awareness of the fact that a civil engineer must deal with the human impact of engineering - the social and moral issues - to a far greater degree than ever before.

Historically, Civil Engineering is the oldest branch of engineering and goes back at least 5,000 years to the profession of "master builder" which involved pyramids, temples and irrigation projects. Today, Civil Engineering has become an incredibly diverse field of engineering with opportunities for graduates in many fields of application. Furthermore, the introduction of new electronic data collection methods and inexpensive minicomputers have revolutionized many Civil Engineering fields. Consequently, our curriculum is being constantly monitored and revised in order to graduate engineers who can use these advanced aids to solve complex problems. As is true of all engineering programs, the curriculum not only continues to utilize the fundamentals of mathematics and natural sciences, but also draws upon the works of the social scientist, humanist and social-economist. The emphasis is on "problem-solving".

The Department of Civil Engineering at Waterloo is the largest in Canada, and therefore we can offer highly specialized program in each of the following Options:

a) Structural Engineering - intended for students primarily interested in design and construction of structures; emphasis is placed on a broad foundation in mechanics and behaviour of materials.

b) Environmental Health Engineering - the major attention in this Option is given to studies of water and air resources supply, treatment and disposal, industrial hygiene, radiation protection, control of communicable diseases and environmental sanitation and design of municipal facilities.

c) Transportation Engineering - intended for the student interested in the planning, design, construction, traffic operation and evaluation of street, highways, airports, and transit. Emphasis is placed on planning, design, operation and evaluation, particularly as related to demands.

d) Geotechnical Engineering - designed to provide the student with an understanding of the engineering properties of soils, the fundamentals of soil mechanics, and the application of geotechnical data and fundamentals to the design of foundation elements, earth-retaining structures, excavations, earth embankments and highway pavements.

e) Engineering Mechanics - for students with a strong interest in a rigorous study of Mechanics, applied mathematics and related fields, leading to an understanding of advanced analysis and serving as a preparation for graduate study in structural engineering, hydraulics, mechanics of solids and fluids, or properties of materials.

f) Hydrology and Hydraulic Engineering - intended for the student interested in the planning, management, design and operation of water supply and distribution systems, in flood control and flood hazard mapping, and in the hydrologic and hydraulic aspects of environmental issues.

g) Experimental Mechanics - for students with an interest in the experimental investigations of static and dynamic response of structures and machines, in theory and technique of experimental methods and in the rheology of materials used in experimental mechanics.

h) Materials - intended to provide the student interested in structural engineering, mechanics or properties of materials with a background in materials science.

or the student can choose a more general pattern of study involving some of the above.

It is difficult to give a simple definition of what a Civil Engineer is and does. Essentially the profession is principally involved with the creation, operation and maintenance of structures associated with water resources, transportation, power generation, and a wide range of industrial, commercial and institutional buildings and complexes including whole urban structures. The activities include investigation, planning, design, construction and evaluation.

Vocationally a Civil Engineer may specialize in any of the foregoing. He or she may also specialize in biomechanics, solid mechanics, fracture mechanics, elasticity, building structures, bridges, hydrology, hydraulics, sanitation (public health), industrial wastes, water resource structures, irrigation and drainage, inland waterways, harbours, aerospace, highways (roads and streets), railroads, pipelines, geology, meteorology, soil mechanics, foundations, tunneling (rock mechanics), surveying and cartography, urban and regional planning and overall project planning. The list is by no means complete. For example, some of our graduates are involved in aquaculture. Civil Engineering may also be combined with another discipline or profession. Examples include engineer-cost analyst, engineer-economist, engineer-sociologist, engineer-lawyer, engineer-biologist, engineer-psychologist, engineer-medical doctor. 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 Programs**

*a) Credit Courses*

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIV E 126</td>
<td>Civil Engineering Concepts</td>
</tr>
<tr>
<td>CIV E 203</td>
<td>Statics</td>
</tr>
<tr>
<td>CIV E 204</td>
<td>Mechanics of Solids 1</td>
</tr>
<tr>
<td>CIV E 205</td>
<td>Mechanics of Solids 2</td>
</tr>
<tr>
<td>CIV E 221</td>
<td>Calculus 2</td>
</tr>
<tr>
<td>CIV E 222</td>
<td>Differential Equations</td>
</tr>
<tr>
<td>CIV E 223</td>
<td>Computer Workship</td>
</tr>
<tr>
<td>CIV E 224</td>
<td>Probability and Statistics</td>
</tr>
<tr>
<td>CIV E 253</td>
<td>Geology for Engineers</td>
</tr>
<tr>
<td>CIV E 265</td>
<td>Structure and Properties of Materials</td>
</tr>
<tr>
<td>CIV E 280</td>
<td>Fluid Mechanics</td>
</tr>
<tr>
<td>CIV E 291</td>
<td>Survey Camp</td>
</tr>
<tr>
<td>CIV E 292</td>
<td>Engineering Economics</td>
</tr>
<tr>
<td>CIV E 294</td>
<td>Thermal Sciences</td>
</tr>
<tr>
<td>CIV E 300</td>
<td>Civil Engineering Project 1</td>
</tr>
<tr>
<td>CIV E 303</td>
<td>Structural Analysis 1</td>
</tr>
<tr>
<td>CIV E 313</td>
<td>Structural Concrete Design 1</td>
</tr>
<tr>
<td>CIV E 342</td>
<td>Transport Principles and Applications</td>
</tr>
<tr>
<td>CIV E 343</td>
<td>Transport Engineering Design</td>
</tr>
<tr>
<td>CIV E 353</td>
<td>Geotechnical Engineering 1</td>
</tr>
<tr>
<td>CIV E 354</td>
<td>Geotechnical Engineering 2</td>
</tr>
<tr>
<td>CIV E 375</td>
<td>Water Quality Engineering</td>
</tr>
<tr>
<td>CIV E 381</td>
<td>Hydrology/Hydraulics 1</td>
</tr>
<tr>
<td>CIV E 400</td>
<td>Civil Engineering Project 2</td>
</tr>
<tr>
<td>CIV E 413</td>
<td>Structural Steel Design</td>
</tr>
<tr>
<td>CIV E 491</td>
<td>Engineering Law</td>
</tr>
</tbody>
</table>

*b) Non Credit Courses*

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIV E 298</td>
<td>Civil Engineering Seminars</td>
</tr>
<tr>
<td>CIV E 299</td>
<td>Civil Engineering Seminars</td>
</tr>
<tr>
<td>CIV E 398</td>
<td>Civil Engineering Seminars</td>
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<tr>
<td>CIV E 399</td>
<td>Civil Engineering Seminars</td>
</tr>
<tr>
<td>CIV E 490</td>
<td>Civil Engineering Seminars</td>
</tr>
<tr>
<td>CIV E 499</td>
<td>Civil Engineering Seminars</td>
</tr>
</tbody>
</table>

**Seminar**

The engineer in society. Principles, methods and practice of Civil Engineering. Informal lectures.

**B) Electives**

*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 Civil Engineering Faculty advisor.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIV E 401</td>
<td>Civil Engineering Project 3</td>
</tr>
<tr>
<td>CIV E 403</td>
<td>Structural Analysis 2</td>
</tr>
<tr>
<td>CIV E 404</td>
<td>Structural Analysis 3</td>
</tr>
<tr>
<td>CIV E 405</td>
<td>Structural Dynamics</td>
</tr>
<tr>
<td>CIV E 406</td>
<td>Mechanics of Solids 3</td>
</tr>
<tr>
<td>CIV E 407</td>
<td>Building Science</td>
</tr>
<tr>
<td>CIV E 414</td>
<td>Structural Concrete Design 2</td>
</tr>
<tr>
<td>CIV E 415</td>
<td>Structural Systems</td>
</tr>
<tr>
<td>CIV E 421</td>
<td>Advanced Mathematics for Engineers</td>
</tr>
<tr>
<td>CIV E 422</td>
<td>Finite Element Analysis</td>
</tr>
<tr>
<td>CIV E 430</td>
<td>Experimental Mechanics</td>
</tr>
<tr>
<td>CIV E 440</td>
<td>Transport Systems</td>
</tr>
<tr>
<td>CIV E 442</td>
<td>Pavement Structural Design</td>
</tr>
<tr>
<td>CIV E 454</td>
<td>Geotechnical Engineering 3</td>
</tr>
<tr>
<td>CIV E 472</td>
<td>Wastewater Treatment</td>
</tr>
<tr>
<td>CIV E 473</td>
<td>Contaminant Transport</td>
</tr>
<tr>
<td>CIV E 480</td>
<td>Water Resources Management</td>
</tr>
<tr>
<td>CIV E 486</td>
<td>Hydrology/Hydraulics 2</td>
</tr>
<tr>
<td>CIV E 493</td>
<td>Engineering in the Canadian North</td>
</tr>
<tr>
<td>CIV E 496</td>
<td>Construction Engineering</td>
</tr>
</tbody>
</table>

A number of elective courses may be taken from the offerings of other departments. Each student is responsible for selecting his or her own program of electives, in keeping with his ultimate career objective after graduation.

*b) Social Sciences and Humanities Electives*

Four courses, together with the general studies course in the 1B term must satisfy the General Studies Program requirements described on p. 9.5.

†The offering of these courses is contingent upon sufficient demand and/or available teaching resources.

**C) Other Courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIV E 344†</td>
<td>Urban and Regional Engineering</td>
</tr>
</tbody>
</table>

†CIV E 344 is not intended for Civil Engineering students at any level. The offering of this course is contingent upon sufficient demand and/or teaching resources.

**Academic Program for Each Term**

**Year 1B (Winter and Spring Terms)**

CIV E 126, plus other Year 1 courses.

**Year 2A (Fall and Winter Terms)**

CIV E 203, CIV E 204, CIV E 221, CIV E 224, CIV E 265, CIV E 292, CIV E 298, CIV E 291†.
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

Four courses, together with the general studies course in the 1B term must satisfy the General Studies Program requirements described on p. 9.5.

Options in Electrical Engineering

As an alternative to the normal program shown, students may elect to take one of the two Options available which are described below.

Computer Engineering Option

The sequence of courses is designed to give Electrical Engineering students a greater training in software to augment their digital hardware capabilities. The courses and the terms in which they are taken are:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 240</td>
<td>Principles of Programming Languages and Data Structures</td>
<td>2B</td>
</tr>
<tr>
<td>CS 340</td>
<td>Data Structures</td>
<td>3A</td>
</tr>
<tr>
<td>CS 354</td>
<td>Principles of Operating Systems</td>
<td>3B</td>
</tr>
<tr>
<td>EE 427</td>
<td>Digital Systems Engineering</td>
<td>4B</td>
</tr>
</tbody>
</table>
In addition to these courses, 2 other computer science courses, chosen from a list, will be taken in the fourth year in either the A or B term. 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 9.17) designed for those students with an interest in the management of technology.

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

Further details are made available at the beginning of the 2A term.

Academic Program 1984/85

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

Note 2
The laboratory hours shown are approximate indications of the average time the student will spend in the laboratory.

Term 1B, Winter and Spring

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<tr>
<th>Course</th>
<th>Name</th>
<th>C</th>
<th>T</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 110B</td>
<td>Calculus 1B</td>
<td>3</td>
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<tr>
<td>PHYS 125</td>
<td>Physics for Engineering</td>
<td>3</td>
<td>2</td>
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<tr>
<td>GEN E 121</td>
<td>Digital Computation</td>
<td>3</td>
<td>2</td>
<td></td>
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<tr>
<td>EL E 123</td>
<td>Electrical Engineering Circuits</td>
<td>3</td>
<td>1</td>
<td>3*</td>
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<tr>
<td>EL E 126</td>
<td>Electricity &amp; Magnetism</td>
<td>3</td>
<td>1</td>
<td>3*</td>
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General Studies Elective. 3 — —

Term 2A, Fall and Winter

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<th>Name</th>
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<tr>
<td>EL E 201</td>
<td>Seminar</td>
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<tr>
<td>MATH 211</td>
<td>Advanced Calculus for (EL E 205)</td>
<td>3</td>
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<tr>
<td>EL E 208</td>
<td>Electronic Circuit Analysis</td>
<td>3</td>
<td>1</td>
<td>3*</td>
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<tr>
<td>EL E 222</td>
<td>Digital Computers</td>
<td>3</td>
<td>1</td>
<td>3*</td>
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<tr>
<td>EL E 261</td>
<td>Energy Systems &amp; Components 1</td>
<td>3</td>
<td>1</td>
<td>3*</td>
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<tr>
<td>M SCI 23</td>
<td>Engineering Economics</td>
<td>3</td>
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Term 2B, Fall and Spring

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<tr>
<td>EL E 202</td>
<td>Seminar</td>
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<tr>
<td>MATH 212</td>
<td>Advanced Calculus for (EL E 206)</td>
<td>3</td>
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<tr>
<td>EL E 224</td>
<td>Numerical Methods</td>
<td>3</td>
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<tr>
<td>EL E 231</td>
<td>Electronic Devices</td>
<td>3</td>
<td>1</td>
<td>3*</td>
</tr>
<tr>
<td>EL E 262</td>
<td>Energy Systems &amp; Components 2</td>
<td>3</td>
<td>1</td>
<td>3*</td>
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General Studies Elective 3 — —

Term 3A, Winter and Spring

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<tr>
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<td>Seminar</td>
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<tr>
<td>EL E 316</td>
<td>Probability &amp; Statistics</td>
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<tr>
<td>EL E 322</td>
<td>Electrical Engineering Circuits</td>
<td>3</td>
<td>1</td>
<td>3*</td>
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<tr>
<td>EL E 342</td>
<td>Electrical Networks 1</td>
<td>3</td>
<td>1</td>
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</tr>
<tr>
<td>EL E 371</td>
<td>Transmission Lines &amp; Basic Field Theory</td>
<td>3</td>
<td>1</td>
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General Studies Elective 3 — —

Term 3B, Fall and Winter

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<td>ME 250</td>
<td>Thermodynamics</td>
<td>3</td>
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<tr>
<td>EL E 318</td>
<td>Communications Systems</td>
<td>3</td>
<td>1</td>
<td>3*</td>
</tr>
<tr>
<td>EL E 323</td>
<td>Digital Circuits &amp; Systems</td>
<td>3</td>
<td>1</td>
<td>3*</td>
</tr>
<tr>
<td>EL E 380</td>
<td>Systems &amp; Control</td>
<td>3</td>
<td>1</td>
<td>3*</td>
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General Studies Elective 3 — —

Term 4A, Fall and Spring

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<th>Course</th>
<th>Name</th>
<th>C</th>
<th>T</th>
<th>L</th>
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</thead>
<tbody>
<tr>
<td>EL E 401</td>
<td>Seminar</td>
<td>1</td>
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</tbody>
</table>

General Studies Elective†

Four Technical Electives from the following:

- EL E 411 | Digital Communications | 3 | 1 |   |
- EL E 426 | Software Engineering     | 3 | 1 | 3*|
- EL E 428 | Computer Communications Networks | 3 | 1 |   |
- EL E 435 | Semiconductor Devices     | 3 | 1 |   |
- EL E 438 | Switching and Digital Circuits | 2 | 1 | 3*|
- EL E 446 | Linear Systems            | 3 | 1 |   |
- EL E 463 | Power Electronics         | 2 | 1 | 3*|
- EL E 474 | Antenna Engineering       | 2 | 1 | 3*|
- EL E 481 | Design of Analog and Digital Control Systems | 2 | 1 | 3*|
- EL E 499A | Project                  | 9 |   |   |
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, both conventional and unconventional such as tar sands development and in situ heavy-oil extraction.

The demand for expertise offered by geotechnically trained engineers is thus expanding into many of the resource-development areas that will probably continue to play a major role in the Canadian economy for many decades.

ACADEMIC PROGRAM

Term 2B, Winter
Course

<table>
<thead>
<tr>
<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>Seminar</td>
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</tbody>
</table>

Four Technical Electives from the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL E 412</td>
<td>Data Communication</td>
<td>3</td>
</tr>
<tr>
<td>EL E 413</td>
<td>Digital Signal Processing</td>
<td>3</td>
</tr>
<tr>
<td>EL E 427</td>
<td>Digital Systems Engineering</td>
<td>2</td>
</tr>
<tr>
<td>EL E 436</td>
<td>Design of Integrated Circuits &amp; Devices</td>
<td>2</td>
</tr>
<tr>
<td>EL E 437</td>
<td>Integrated Electronic Systems</td>
<td>2</td>
</tr>
<tr>
<td>EL E 439</td>
<td>Analogue Electronic Circuits</td>
<td>2</td>
</tr>
<tr>
<td>EL E 443</td>
<td>Electrical Networks 2</td>
<td>2</td>
</tr>
<tr>
<td>EL E 459</td>
<td>Sound, Noise and Electroacoustics</td>
<td>2</td>
</tr>
<tr>
<td>EL E 464</td>
<td>High Voltage and Insulation Engineering</td>
<td>3</td>
</tr>
<tr>
<td>EL E 465</td>
<td>Power Systems</td>
<td>3</td>
</tr>
<tr>
<td>EL E 473</td>
<td>Microwave Engineering</td>
<td>2</td>
</tr>
<tr>
<td>EL E 475</td>
<td>Guided Wave Engineering</td>
<td>3</td>
</tr>
<tr>
<td>EL E 482</td>
<td>Multivariable Control Systems</td>
<td>2</td>
</tr>
<tr>
<td>EL E 485</td>
<td>Computer Control Applications</td>
<td>2</td>
</tr>
<tr>
<td>EL E 499B</td>
<td>Project</td>
<td>-</td>
</tr>
</tbody>
</table>

Any 600-level courses taken by students in 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

ME 2B   EL E 269 Electrical Engineering 2

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

†If General Studies electives are 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.
Term 2B, Spring
CIV E 222 Differential Equations
CIV E 280 Fluid Mechanics
EARTH 221 Geochemistry 1
EARTH 232 Petrography
EARTH 238 Intro. Structural Geology
Social Sciences & Humanities Elective.

Term 3A, Winter
CIV E 300 Civil Engineering Project 1
CIV E 353 Geotechnical Engineering 1
CIV E 292 Engineering Economics
EARTH 333 Sedimentology
EARTH 370 Economic Geology
EARTH 390 Field Methods
EARTH 438 Engineering Geology

Term 3B, Fall
EARTH 437 Rock Mechanics
EARTH 260 Applied Geophysics 1
CIV E 354 Geotechnical Engineering 2
CIV E 224 Probability and Statistics
CIV E 291 Survey Camp
Social Sciences & Humanities Elective.
1 Earth Elective from:
EARTH 342 Geomorphology
EARTH 331 Igneous Petrology

Term 4A, Fall
EARTH 439 Groundwater Geology
EARTH 440 Quaternary Geology
EARTH 409 Field Trip
EARTH 456 Numerical Meth. in Geoscience
GEO E 400 Geological Engineering Project 1
Social Sciences & Humanities Elective.
1 Earth Science Elective from:
EARTH 421 Geochemistry 2
EARTH 470 Metallic Mineral Deposits

Term 4B, Winter
GEO E 401 Geological Engineering Project 2
EARTH 435 Advanced Structural Geology
Social Sciences & Humanities Elective.
3 Electives from:
EARTH 332 Metamorphic Petrology
EARTH 432 Precambrian Geology
EARTH 427 Crustal Evolution
EARTH 433 Applied Sedimentology
CIV E 430 Experimental Mechanics
CIV E 493 Engineering in the Canadian North
CIV E 473 Contaminant Transport
CIV E 491 Engineering Law
CIV E 454 Geotechnical Engineering 3
CH E 502 Fundamentals to Petroleum Production
CH E 550 Introduction to Extractive Metallurgy

1) This program satisfies the Social Sciences & Humanities elective program of the Engineering Faculty. Students will not be able to take the Management Sciences Option.

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:

- Chemical Engineering
- Civil Engineering
- Electrical Engineering
- Mechanical Engineering
- Systems Design
The Option in Management Sciences is structured to provide an understanding of the issues, concepts and techniques related to managerial problems, particularly those concerned with the management of technology. It aims to impart a training that will be useful for problem-solving capability in the long run; also, it lets students acquire certain skills which should help widen the scope of their immediate employment. Students taking the Option may advance to the MASc in Management Sciences within 3 academic terms following the completion of the BASc. The Option consists of 8 courses (see course descriptions in Chapter 16).

a) Probability and Decision Analysis
   M SCI 21 Probability and Statistics
   M SCI 32 Behavioural Decision Analysis

b) Economics
   M SCI 23 Managerial and Engineering Economics 1
   M SCI 43 Managerial and Engineering Economics 2

c) Operations Research
   M SCI 46 Operations Research 1
   M SCI 47 Operations Research 2

d) Organization Behaviour
   M SCI 44 Organizational Behaviour 1
   M SCI 53 Organizational Behaviour 2

The designation of an Option in Management Sciences will be shown on the student’s transcript when he or she achieves a grade of at least 50% in each of all 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 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.

In addition to the Option courses, there is one other course offered by the Department, namely M SCI 48 Introduction to Production Management, that is available as an elective to undergraduate Engineering students.
## Option in Management Sciences

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<tr>
<th></th>
<th>2A</th>
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<th>2B</th>
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<td>CHE 220'</td>
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*Equivalent with MSCI 21
†Equivalent with MSCI 23
‡This course may be taken as a substitute for MSCI 32
§SYDE 131 (equivalent with MSCI 23) is taken in 1A

**Note:**

MSCI 44 will also be offered every Winter to accommodate the increasing demand from other Faculties.
Mechanical Engineering

The scope of mechanical engineering is so wide and its services so universally needed as a basic part of all kinds of engineering work that the mechanical engineer is in demand in industries throughout Canada. Mechanical engineers are required in the field of power generation, where they deal with steam, diesel or other internal combustion engines, and with hydraulic or gas turbines, in the field of heating, ventilation and refrigeration; in the design, analysis, and production of machines and equipment, for example safety equipment, material handling equipment, automobiles, locomotives, marine vessels, furnaces, boilers, pressure vessels, heat exchangers, motors, generators and machine tools. They are employed in industries whose function is concerned with manufacturing, steel production, mining, transportation, communications, oil refining, chemical manufacture, paper, sugar, textiles, aerospace, nuclear energy, natural gas production and transmission and construction. In the last few years, because of the need to develop alternative energy sources, mechanical engineers have taken a major role in the development of new methods of energy conversion. The undergraduate program in Mechanical Engineering is designed to provide the student with a firm grasp of the fundamentals of mathematics and physics and engineering; and also to provide some opportunity for specialization in the later years. The degree of BASc in Mechanical Engineering is accredited and permits registration as a Professional Engineer in the Association of Professional Engineers in almost any Canadian Province upon satisfaction of the work experience requirement.

The Mechanical Engineering undergraduate program contains a core of basic subjects that must be taken by all students. The first year is virtually common with Civil and Electrical Engineering. The second and third years provide courses in Mechanical Engineering and Electrical Engineering with further development in mathematics and physics. Opportunities for specialization exist during the fourth year, where a choice of elective courses arranged into different option areas is available. Non-technical (general studies) courses are included in each of the 4 years.

Each student is responsible for selecting his own program of electives, in keeping with his ultimate career objective after graduation. Each term, certain faculty members are designated to give advice to students and to approve their selection. It is anticipated, and indeed encouraged, that individual students should take a majority of their technical electives from one of the option areas. The Options are:

a) Fluid Mechanics and Thermodynamics Option
The courses in this Option deal with a broad range of applications of the principles of thermodynamics and fluid mechanics, with emphasis on topics of industrial significance, for example, combustion, energy conversion, internal flows with heat and mass transfer, turbomachinery, and external flows such as plumes in air and effluents in water.

b) Environmental (Geophysical) Fluid Dynamics Option
This Option is closely linked with Option (a), and involves application of the principles of fluid mechanics and thermodynamics to problems in the natural environment. It is intended for students interested in careers in air and water pollution control, oceanography, and related fields.

c) Machine Design and Solid Mechanics Option
The courses offered in this Option range from those which provide the mathematical and physical basis of the subject matter through to those which are largely applied in nature. Subjects treated are: mechanics (including vibrations); theories of elasticity, plasticity and fracture; machine design and design optimization.

d) Engineering Materials Option
This Option consists of a comprehensive series of courses in metallurgy, including heat treatment, casting, welding, cold and hot forming. Nonmetallic materials, including plastics and ceramics. Composites, such as fiberglass and sandwich structures are also considered.

e) Production Option
The courses in this Option are designed to provide the student with an understanding of the principles and control of production processes, the application of computers to the manufacturing activity and the organization of production. Topics treated are: automation, metal forming, numerical control of machine tools, applications of fluid power and industrial noise control.

f) Mechanical Engineering Core with an Option in Management Sciences
A student may acquire a BASc in Mechanical Engineering with an Option in Management Sciences by taking 8 specific Management Science courses as electives (see elective course listing under Department of Management Sciences).
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 230 Control of Properties of Materials
M E 250 Thermodynamics
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 340 Manufacturing Processes
M E 351 Fluid Mechanics 1
M E 353 Heat Transfer 1
M E 354 Thermodynamics 2
M E 360 Introduction to Control Systems
M E 362 Fluid Mechanics 2
M E 462 Introduction to Automation
M E 482 Mechanical Engineering Projects
M SCI 21 Probability and Statistics (Equivalent to M E 202)
M SCI 23 Managerial and Engineering Economics 1
EL E 269 Electrical Engineering 2

h) 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 5 General Studies electives in non-technical subjects. The marks obtained in these courses will be included in the calculation of term averages. These courses are organized on a Faculty basis and detailed in this Calendar under the section General Studies in the Faculty of Engineering.

b) Technical Electives
Seven technical elective courses are required in addition to the core courses listed above to fulfill the requirements of the Mechanical Engineering program. Each student will, in addition, select and complete a two-term project (M E 482) under the direct supervision of a Professor. The project requires the student to demonstrate initiative and assume responsibility. Each student is responsible for selecting his own 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 else 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 563 Turbomachines
M E 565 Gas Dynamics
M E 566 Fluid Mechanics 3
M E 568 Noise Analysis and Control
M E 569 Fluid Mechanics-Design Topics

b) Environmental Fluid Mechanics:
M E 469 Introduction to the Environmental Sciences
M E 566 Fluid Mechanics 3
M E 568 Noise Analysis and Control
M E 571 Air Pollution 1

c) Machine Design and Solid Mechanics Option
M E 423 Mechanical Design 2
M E 435 Industrial Metallurgy
M E 463 Tribology 1
M E 524 Advanced Dynamics and Stress Analysis in Design
M E 525 Mechanical Vibrations in Machines
M E 527 Mechanics of Deformable Solids 3
M E 544 Welding
M E 568 Noise Analysis and Control
M E 626 Fatigue and Brittle Fracture
(See Graduate Calendar)

d) Engineering Materials Option
M E 432 Physical Metallurgy of Deformation and Fracture
M E 435 Industrial Metallurgy
M E 443 Metal Casting Processes
M E 527 Mechanics of Deformable Solids 3
M E 531  Physical Metallurgy of Structures and Transformations
M E 534  Non-metallic Materials
M E 541  Deformation Processes
M E 544  Welding

e) Production Option
M E 435  Industrial Metallurgy
M E 443  Metal Casting Processes
M E 448  Production Engineering: Design of Manufacturing Systems
M E 463  Tribology 1
M E 541  Deformation Processes
M E 542  Metal Cutting
M E 544  Welding
M E 548  Numerical Control of Machine Tools 1
M E 561  Fluid Power Control Systems
M E 568  Noise Analysis and Control

f) Mechanical Engineering Core with Option in Management Sciences
(See Department of Management Sciences)
The Mechanical Engineering curriculum structure is summarized in the following table:

<table>
<thead>
<tr>
<th>Table A - The Mechanical Engineering Undergraduate Program</th>
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<tbody>
<tr>
<td>Term</td>
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<td><strong>2B</strong> (S, F)</td>
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<td><strong>4A</strong> (S, F)</td>
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* A technical elective may be substituted for the non-technical elective in 3B with the combination of an extra non-technical elective and one less technical elective in either 4A or 4B.
Systems Design Engineering

Introduction
Effective solutions to problems involving both society and technology must be based on a broad systems point-of-view. Not only must the overall technical factors of these problems be carefully considered, but the economics, social, human and political parameters must be given equally careful attention. When large scale engineering problems are under study, few people can be knowledgeable of the complete span of factors and parameters which must be considered. For these cases, solutions must be arrived at by interdisciplinary teams where each member contributes his or her own special expertise. In order to work effectively on this team, each member needs to be aware of the fundamental systems and design aspects of the problem. The rapid growth and complexity of industry have, indeed, created unusual problems; however, underlying the complexities of modern civilization and technology are similarities which make it possible to approach problems in many diverse fields with essentially the same concepts, theories and techniques. Systems science has emerged as a scientific discipline for quantitative analysis, design and control of large classes of problems in engineering and social sciences.

The undergraduate program in Systems Design Engineering at Waterloo is a study of those basic skills required for system analysis, simulation, optimization and design. Numerous examples may be cited where these systems design fundamentals may be applied: transportation, engineering design, computer applications, water resources engineering, production, planning and scheduling, environmental pollution, education. Of course the importance of specialized expertise in these areas should not be minimized, but these skills usually work most effectively toward problem solutions when operating within an overall systems context.

The Engineering Profession
Systems Design Engineering is a unique engineering discipline which is formally accredited by the Association of Professional Engineers of the Province of Ontario (APEO). With two years of work experience beyond graduation (BASc), the Systems Design Engineer may apply for registration as a Professional Engineer. If a Masters degree (MASc) in Systems Design is also obtained only one year of work experience is required before application.

Each province within Canada has its own professional Engineering Association. The Canadian Accreditation Board (CAB) is a national organization that has representation from all of the Provincial Professional Engineering Associations. The CAB determines what types of courses must be contained in a university engineering program in order for the program to meet the standards of Canadian engineering. The Systems Design Engineering Program satisfies the strict standards of the CAB and is therefore acknowledged as a fully qualified Engineering Program. In fact, the Department of Systems Design at the University of Waterloo is the only department of its kind in all of Canada.

The Systems Design 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 also offers programs leading to MASc and PhD degrees, and in the past many Systems Design students have gone on to successfully complete graduate degrees. The faculty members of the Department are involved in a wide spectrum of research activities such as conflict analysis, pattern recognition, ergonomics, computer engineering, and solar energy. Students who also wish to do research in one of these areas may start at the undergraduate level by entering the combined Bachelor-Masters program at the end of their 3B academic term. In this way they will be able to complete a Master's degree within one year after receiving their Bachelor's degree.

The Systems Design 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 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
University of Waterloo
Waterloo, Ontario, N2L 3G1
(519) 885-1211 Ext. 2697

High School Liaison Officer
Department of Systems Design
University of Waterloo
Waterloo, Ontario, N2L 3G1
(519) 885-1211 Ext. 3113

Footnotes
1BASc Bachelor of Applied Science
2MASc Master of Applied Science
3PhD Doctor of Philosophy

Engineering
Systems Design Engineering
Employment Opportunities

Graduates of Systems Design Engineering will find employment opportunities in a number of diverse fields. To some extent, the technical option area chosen by the student in the third and fourth year determines more specifically what he or she does upon graduation. Some particular types of jobs which Systems Design engineers may be involved with include:

- analysis and optimization of engineering systems
- simulation and advanced computer applications
- process control and instrumentation
- operations research
- development of alternative energy sources
- design of man-machine interface
- control systems design
- socio-economic systems design
- data analysis and pattern recognition
- occupational health and safety
- product design, planning and management
- ergonomics
- resources management
- research and development

These types of professional activities may fall within the domain of one or more engineering disciplines such as chemical, civil (e.g. structural, water resource and transportation systems), electrical (e.g., circuit design and microprocessor applications), mechanical (e.g., energy conversion and design of machines), environmental (e.g., environmental impact assessment and planning), industrial and human engineering.

Undergraduate Curriculum in Systems Design

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).

System Design Undergraduate Core Curriculum

Listing by Terms

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<th>1A (Fall Term)</th>
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<tr>
<td>SY DE 101 Tutorial</td>
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<td>SY DE 111 Calculus 1</td>
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<td>SY DE 113 Linear Algebra</td>
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<td>SY DE 121 Digital Computation</td>
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<td>SY DE 131 Engineering Economics</td>
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<td>SY DE 161 Introduction to Systems Design Engineering</td>
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<td>SY DE 181 Statics</td>
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<td>SY DE 102 Tutorial</td>
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<td>SY DE 112 Calculus 2</td>
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<td>SY DE 122 Introduction to Computer Systems</td>
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<td>SY DE 142 Introduction to Ergonomics</td>
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<td>SY DE 182 Dynamics</td>
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<td>SY DE 184 Introduction to Chemical Systems</td>
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2A (Winter Term)
SY DE 201 Tutorial
SY DE 211 Differential Equations
SY DE 213 Theory and Applications of Statistics
SY DE 261 Systems Design Workshop 1
SY DE 281 Mechanics of Deformable Solids
SY DE 283 Electricity, Magnetism and Networks
1 General Studies Program elective.

2B (Fall Term)
SY DE 202 Tutorial
SY DE 212 Applicable Mathematics for Systems Design 2
SY DE 214 Theory & Applications of Statistics
SY DE 252 Physical Systems 1
SY DE 262 Systems Design Workshop 2
SY DE 292 Digital Circuits and Systems Laboratory
1 General Studies Program elective.

3A (Spring Term)
SY DE 301 Tutorial
SY DE 311 Introduction to Optimization
SY DE 353 Introduction to Linear Control Systems
SY DE 381 Thermodynamics
SY DE 391 Analogue Circuits and Systems Laboratory
1 Technical elective
1 General Studies Program elective.

3B (Winter Term)
SY DE 302 Tutorial
SY DE 322 Computer Simulation of Systems
SY DE 382 Systems Design Workshop 2
SY DE 382 Fluid Mechanics
SY DE 392 Control Systems Laboratory
2 Technical electives.

4A (Fall Term)
SY DE 401 Tutorial
SY DE 421 Computer-Aided Design
SY DE 461 Systems Design Workshop 4
2 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.

Technical Options in Systems Design
Each undergraduate student in Systems Design must choose a technical Option by the 3A term. At present the Department regularly offers Option programs in:
- Design & Human Systems
- Socio-Economic Systems
- Physical & Computer Systems

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, will constitute an individual technical Option for that student.

Each technical Option in Systems Design consists of a specified set of technical elective courses taken in the 3A, 3B, 4A and 4B terms. The third and fourth year curriculum is structured as shown:

3A
5 mandatory courses
1 technical elective course
1 General Studies Program elective

3B
5 mandatory courses
2 technical elective courses

4A
3 mandatory courses
2 technical elective courses
2 General Studies Program electives

4B
2 mandatory courses
3 technical elective courses
1 General Studies Program elective

SUMMARY OF THE SYSTEMS DESIGN 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 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 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, can obtain a background in Management Science in addition to the Engineering degree. The Management Sciences program for a Systems Design student consists of the following optional courses:

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SY DE 333 Applied Statistics
M SCI 43 Managerial & Engineering Economics
M SCI 44 Organizational Behaviour 1
M SCI 53 Organizational Behaviour 2

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
By augmenting the Systems Design curriculum with elective courses in Electrical Engineering and Computer Science, students can acquire a background in both hardware and software aspects of Computer Engineering. The sequence of courses which comprises this Option is shown in the following table.
### Special Individual Option

Some Systems Design 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 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.*
Environmental Studies
Faculty of Environmental Studies
Degrees

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 have been made. Students are not only free to, but are encouraged to choose courses from across the whole University.

Degrees
The Faculty of Environmental Studies offers 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 (3-2/3 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 (4-2/3 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).
- **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.

The Dean's Honours List will include no more than 5% of the students in any particular year based on the major average and no one included on the list shall have an overall average of less than 75%.

The Faculty has several awards granted to students for meritorious performance, e.g. Dean's Honours List, Alumni Gold Medal, monetary prizes. Further information on this can be obtained from the office of the Associate Dean, Undergraduate Studies.
Admission

The admission 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 Mathematics course or equivalent for admission to programs in Environmental Studies; Grade 13 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 level are required.

Interviews

Students being seriously considered for admission to the Schools of Architecture and Urban and Regional Planning are normally required to participate in an interview as part of the admissions process. For Architecture, a test will be conducted by the School on the day of the interview to establish ability to comprehend the various thematic areas. A portfolio of creative work must be submitted at the time of the interview. Contact the School of Architecture for further details.

Transfer Credit

Generally transfer credit is given for courses in which a grade of 60% or better was obtained. Students transferring from other institutions may have their transferred courses count toward the University of Waterloo degree as determined by the admissions officer of the particular program. Marks obtained in these courses will not be included in the calculation of the student’s average.

Students transferring from Faculties within the University, or former University of Waterloo students returning after an absence, generally have the option of either transferring previous UW courses with 60% (C-) or better without including these in cumulative average or transferring all relevant courses passed and including all courses passed and failed in the cumulative average. The specific transfer credit policies vary with each program or Faculty and students are advised to refer to the program or Faculty sections in the Calendar for detailed regulations.

English Language Proficiency Program

The Faculty of Environmental Studies expects that students enrolled in any of its programs should be able to demonstrate competence in writing. Accordingly, all students newly admitted to the Faculty are required to write the English Language Proficiency Examination during their first term of registration (normally scheduled during registration week in September). 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 Program is recorded on students’ academic record as Arts 000 Y.

Examinations and Standings

The following regulations govern the practice of the Faculty of Environmental Studies in regard to final examinations, standing, and make-up examinations. These regulations also apply to part-time students and special programs. Further details concerning University Examination Regulations can be found in Chapter 1.

A maximum of 6 first year credits 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 “course credit system” in which student progress is measured by course credits successfully completed rather than by years. Students who have passed fewer than 5 courses will be considered Year 1 students; those who have passed at least 5 courses but fewer than 10 will be considered Year 2 students; those with at least 10 but fewer than 16, Year 3; and those with 16 or more, Year 4.

1. Final Examinations

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

b) Failure to write an examination is ordinarily considered a failure to pass. A student who defaults a final examination, except for a properly
Examinations and Standings

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) Overall standing is determined by the cumulative average of grades assigned for all courses taken at the University except where a course is retaken, in which case the second grade will be included in the cumulative average regardless of whether it is higher or lower than the first. The first grade will, however, remain on the student's record. Students (except those in the School of Architecture) should note that their major average is determined by the cumulative average of grades assigned for all courses taken in the student's major 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.

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 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 overall average falls below 60.0% or the average in the major subjects below 65.0%, the individual may be granted conditional status for one year, during which period he/she must make reasonable progress toward obtaining good standing or he/she will be asked to withdraw. A student whose cumulative overall average falls below 55.0% may continue only with the permission of the Department.

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 each academic year enrol in at least 5 courses, but in not more than 6. A regular student in the Honours programs must each year enrol in at least 6 courses (unless otherwise specified in a departmental Honours program), but in not more than 7. Students may be enrolled for reduced programs after obtaining the approval of the appropriate Undergraduate Officer.

g) Even while otherwise in good standing, a student who fails more than 2 course credits or the
equivalent over the academic year or who, in the opinion of the School or Departmental Promotions Committee, is deemed not to be profiting from University studies may be required to withdraw regardless of his/her cumulative average.

h) If a student receives a “Required to Withdraw” 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 should be placed in the student’s file.

Academic Programs

Students who have not determined the field or subject in which they wish to concentrate should study the Calendar carefully. After examining the suggested departmental program, the student should read the descriptions of individual courses in order to have a more comprehensive idea of what the content of any program would include. Students should consult their High School Guidance Officer, Chairperson or Undergraduate Officer of any University department, or the Registrar, by letter or in person for additional clarification and information.

The Calendar is designed to enable students to make a wise choice of the programs and courses while at the University of Waterloo. Students are encouraged to consult the Undergraduate Officer of the appropriate School or Department. The Secondary School Liaison Officer and the Assistant Registrar for Environmental Studies will also respond to written or personal inquiries.

Caution - Environmental Studies students wishing to take courses where full enrolment might be expected, such as ENV S 200, should study their scheduling carefully to ensure that the courses can be fitted, at some time, into their undergraduate program.

Course and Program Changes

a) Students may add and drop term and year 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 or drop courses only with the written permission of the course instructor and the appropriate undergraduate officer and after demonstrating that such a change is in the student’s academic interest.

c) All schedule changes at any time must be submitted to the designated department office.

d) Students are encouraged not to register for more courses than their programs require unless exceptional circumstances can be demonstrated.

e) Students may reduce their programs below the specified minimum only upon the recommendation of the undergraduate officer of the major department.

f) Courses not dropped by the deadlines specified in b) will be graded and included in the calculation of the student’s average.

Correspondence Courses

Only in exceptional cases would correspondence courses be taken by a student during a term in which he or she was a full-time student 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
   - 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
   a) Techniques/Methods (Minimum of 2)
      - ENV S 271 Introduction to Quantitative Research Methods
      - ENV S 272 Computer Programming in Environmental Studies
      - PLAN 255 Planning Surveys and Analysis
      - PLAN 307 Social Survey Techniques
      - 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 250A/250B Environmental Methods & Techniques
      - M ENV 338 Social Impact Assessment
b) Content Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENV S 401</td>
<td>Environmental Law</td>
</tr>
<tr>
<td>ENV S 417</td>
<td>Land Use History and Landscape</td>
</tr>
<tr>
<td>ENV S 418</td>
<td>Land Use History and Landscape</td>
</tr>
<tr>
<td>ENV S 433</td>
<td>People in Natural Areas</td>
</tr>
<tr>
<td>ENV S 434</td>
<td>Advanced Park Planning and Management</td>
</tr>
<tr>
<td>GEOG 102</td>
<td>Introduction to Physical Geography</td>
</tr>
<tr>
<td>GEOG 201A</td>
<td>Geomorphology and Soils</td>
</tr>
<tr>
<td>GEOG 201B</td>
<td>Climatology</td>
</tr>
<tr>
<td>GEOG 300</td>
<td>Geomorphology and the Southern Ontario Environment</td>
</tr>
<tr>
<td>GEOG 315</td>
<td>Agricultural Geography</td>
</tr>
<tr>
<td>GEOG 408</td>
<td>Atmospheric Resource Management</td>
</tr>
<tr>
<td>GEOG 410</td>
<td>Recreation Geography</td>
</tr>
<tr>
<td>GEOG 411</td>
<td>Energy Resources Management</td>
</tr>
<tr>
<td>GEOG 414</td>
<td>Resources Management Workshop</td>
</tr>
<tr>
<td>GEOG 461</td>
<td>Land Dereliction &amp; Rehabilitation 1</td>
</tr>
<tr>
<td>PLAN 156</td>
<td>Introduction to Urban and Regional Planning Concepts</td>
</tr>
<tr>
<td>PLAN 256</td>
<td>Principles of Environmental Design</td>
</tr>
<tr>
<td>PLAN 370</td>
<td>Land Development Planning</td>
</tr>
<tr>
<td>M ENV 218</td>
<td>Canadian Energy Issues</td>
</tr>
<tr>
<td>M ENV 318</td>
<td>Soft Energy Paths in Canada</td>
</tr>
<tr>
<td>M ENV 337</td>
<td>Environmental Impact Assessment</td>
</tr>
<tr>
<td>M ENV 351</td>
<td>Organizations and Environmental Management</td>
</tr>
<tr>
<td>M ENV 418</td>
<td>Energy Research Seminar</td>
</tr>
<tr>
<td>ARCH 223</td>
<td>Human Ecology</td>
</tr>
<tr>
<td>ARCH 244</td>
<td>History of Gardens of Europe and Western Asia</td>
</tr>
<tr>
<td>ARCH 245</td>
<td>Survey of Contemporary Architecture</td>
</tr>
<tr>
<td>PLAN 222</td>
<td>Canadian Regional Issues</td>
</tr>
<tr>
<td>GEOG 203</td>
<td>Some Basic Topics of Cultural and Regional Geography</td>
</tr>
<tr>
<td>GEOG 315</td>
<td>Agricultural Geography</td>
</tr>
<tr>
<td>GEOG 349</td>
<td>The City as a System 1</td>
</tr>
<tr>
<td>GEOG 352</td>
<td>The Rural-Urban Fringe of Canadian Cities</td>
</tr>
<tr>
<td>GEOG 412</td>
<td>Geography of Manufacturing Firms and Industries</td>
</tr>
<tr>
<td>GEOG 450</td>
<td>Regional Urban Systems 2</td>
</tr>
<tr>
<td>GEOG 452</td>
<td>Problems of Rural Land Use</td>
</tr>
<tr>
<td>M ENV 220</td>
<td>Introduction to Environmental Economics</td>
</tr>
<tr>
<td>M ENV 320</td>
<td>Environmental Economics</td>
</tr>
<tr>
<td>M ENV 247</td>
<td>Urban Anthropology</td>
</tr>
<tr>
<td>M ENV 338</td>
<td>Social Impact Assessment</td>
</tr>
<tr>
<td>HIST 201X</td>
<td>Canadian Urban History</td>
</tr>
<tr>
<td>PLAN 232</td>
<td>Rural Planning and Development</td>
</tr>
<tr>
<td>PLAN 333</td>
<td>Inter-regional Economics</td>
</tr>
<tr>
<td>PLAN 360</td>
<td>Technology in Urban and Regional Planning</td>
</tr>
<tr>
<td>PLAN 430</td>
<td>Social Policy Planning</td>
</tr>
<tr>
<td>PLAN 456*</td>
<td>Political and Administrative Processes in Urban and Regional Planning</td>
</tr>
<tr>
<td>SOC 242</td>
<td>Industrial Sociology</td>
</tr>
<tr>
<td>ECON 333</td>
<td>Inter-regional Economics</td>
</tr>
<tr>
<td>ECON 335</td>
<td>Economic Development</td>
</tr>
<tr>
<td>ECON 343</td>
<td>Urban Economics</td>
</tr>
</tbody>
</table>

ELECTIVE Couses (3 half-course credits minimum)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 412</td>
<td>Geography of Manufacturing Firms and Industries</td>
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<td>Social Policy Planning</td>
</tr>
<tr>
<td>PLAN 456*</td>
<td>Political and Administrative Processes in Urban and Regional Planning</td>
</tr>
</tbody>
</table>

Regional Development Option

**Required Courses** (7 half-course credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLAN 156</td>
<td>Introduction to Urban and Regional Planning Concepts</td>
</tr>
<tr>
<td>GEOG 101</td>
<td>Introduction to Human Geography</td>
</tr>
<tr>
<td>GEOG 202</td>
<td>Some Basic Topics of Economic and Urban Geography</td>
</tr>
<tr>
<td>GEOG 311</td>
<td>Regional Industrial Development</td>
</tr>
<tr>
<td>GEOG 350</td>
<td>Regional Urban Systems 1</td>
</tr>
<tr>
<td>PLAN 319</td>
<td>Economic and Social Techniques for Regional Planning</td>
</tr>
</tbody>
</table>

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**

<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 201</td>
<td>Introduction to Environmental and Planning Law</td>
</tr>
<tr>
<td>GEOG/</td>
<td>PLAN 357 Conservation and Resource Management</td>
</tr>
<tr>
<td>BIOL 111</td>
<td>Introductory Biology 1</td>
</tr>
<tr>
<td>BIOL 112</td>
<td>Introductory Biology 2</td>
</tr>
<tr>
<td>BIOL 250</td>
<td>Ecology</td>
</tr>
<tr>
<td>ENV S 401</td>
<td>Environmental Law</td>
</tr>
<tr>
<td>ENV S 417</td>
<td>Land Use History and Landscape</td>
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<tr>
<td>ENV S 418</td>
<td>Land Use History and Landscape</td>
</tr>
</tbody>
</table>
Physical
GEOG 102  Physical Geography
GEOG 201A  Geomorphology and Soils
GEOG 201B  Climatology
GEOG 300  Geomorphology and the Southern Ontario Environment
GEOG 301  Climatology
GEOG 302  Geomorphology
GEOG 303  Physical Basis and Geography of Water
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

Applied Environmental Methods
The Environmental Studies Methods Committee coordinates and develops courses, programs and facilities applicable to environmental research and teaching including: general research and study methodologies, computer applications, regional information systems, computer cartography, ecosystem simulations, and modelling.

A new methods area has been established where printed output and CRT terminals, a graphics terminal, map digitizer, plotter, and thermal copier are located in a research room, graphics lab, tutorial/lecture room and student work room. In addition, new facilities for remote sensing, as well as a VAX 11780, for computer cartography, are located in the methods area. Computer access and associated consulting support is available to students.

Numerous formal and reading courses are available in the Faculty for students interested in pursuing a methods emphasis in their degree program. An important developing area is computer aided (building) design. A co-operative project by Architecture and Planning with Public Works Canada is central to this advance.

Interested persons should contact any of the following committee members: R. Newkirk (Chairman), D. Dudycha, L. Martin, D. McIntyre, L. Russwurm, and R. Schuster for further information.

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 in Architecture and Geography 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.

Environmental Studies and Science
Environmental Studies students with an interest in environmental science or the scientific aspects of resource management should supplement their courses with a selection of courses from the physical and biological sciences. Degree programs in Geography and Man-Environment Studies have joint honours and the equivalent of options with some programs in the Faculty of Science. Careful attention should be paid to the program descriptions in this Calendar. Students with an interest in ecology and the
ecological aspects of resource management and planning should consider a selection of elective courses in Biology. Interests in geomorphology, hydrology, groundwater and soils should develop elective courses in Earth Sciences. Interests in climatology, remote sensing and some aspects of hydrology should be supplemented by basic courses in Physics. Students with interests in water quality might consider courses in Chemistry and Biology. Students with any of these interests should develop and maintain basic skills in Mathematics, particularly calculus. Careful curriculum planning in consultation with faculty advisors should permit students with environmental science interests to develop the necessary background in the sciences. Students with these interests should consult with their Undergraduate Officer or the Associate Dean, Undergraduate 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 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 S. 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.

Environmental Studies
Academic Programs
Architecture

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 many forms of creative expression; and to an understanding of the present as part of an historical process. The program aims to build knowledge and expertise in various aspects of building and architectural design through:
1. The design studio, theories and methods, and practice of architectural design.
2. Studies of systems and measures including computer, physical and material sciences.
3. Environmental studies, including natural and human ecology.

THEME AREA DESCRIPTIONS
Systems and Measures
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 behaviour materials, structures and mechanical systems, behaviour of man, and communications; (3) to provide the student with an opportunity to develop skill in using different "techniques" for analyzing and synthesizing problems in the physical environment; (4) to establish a relationship between faculty and students; (5) to provide a vehicle for persons from faculties of different disciplines and from outside of the university to discuss with students their problems and projects from different points of view.

Bachelor of Architecture Program
The Bachelor of Architecture program increases the emphasis on architectural design and professional aspects of architecture. There are opportunities for students to develop their own areas of interest, and the final 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.
# Program for the Degree of Bachelor of Environmental Studies (Pre-Professional Architecture)

<table>
<thead>
<tr>
<th>Year/Term</th>
<th>Systems and Measures Theme Area</th>
<th>Ecology Theme Area</th>
<th>Culture Theme Area</th>
<th>Design Theme Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-A</td>
<td>ARCH 112 Mathematics</td>
<td>ENV S 195</td>
<td>ARCH 142 Iconography 1</td>
<td>ARCH 192 Design Fundamentals</td>
</tr>
<tr>
<td>Fall</td>
<td>ARCH 172 Building Science</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sept-Dec</td>
<td></td>
<td>Introduction to Environmental Studies</td>
<td>(1 credit)</td>
<td>(1½ credits)</td>
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<tr>
<td></td>
<td>TOTAL 4 cr.</td>
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<td></td>
</tr>
<tr>
<td>1B</td>
<td>CS 116 Introduction to Computing</td>
<td>FE or TE</td>
<td>ARCH 143 Iconography 2</td>
<td>ARCH 193 Design Fundamentals</td>
</tr>
<tr>
<td>Winter</td>
<td>ARCH 163 Statics</td>
<td></td>
<td></td>
<td>and Studio</td>
</tr>
<tr>
<td>Jan-Apr</td>
<td></td>
<td></td>
<td></td>
<td>(1½ credits)</td>
</tr>
<tr>
<td></td>
<td>TOTAL 4 cr.</td>
<td></td>
<td></td>
<td>ARCH 194 or FE</td>
</tr>
<tr>
<td>Off-Term</td>
<td>A student is free to use the off-term as he wishes. The Department of Co-ordination does not provide their normal services to arrange employment for students in this term. (See Chapter 5).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>May-Aug</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-A</td>
<td>ARCH 272 Surveying and Soils</td>
<td>FE or TE</td>
<td>ARCH 246</td>
<td>ARCH 292 Design Concepts</td>
</tr>
<tr>
<td>Fall</td>
<td>ARCH 262 Strength of Materials</td>
<td></td>
<td></td>
<td>and Studio</td>
</tr>
<tr>
<td>Sept-Dec</td>
<td></td>
<td></td>
<td></td>
<td>(1½ credits)</td>
</tr>
<tr>
<td></td>
<td>TOTAL 4 cr.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Co-op Work Term 1</td>
<td>For all Co-op terms, job interviews are arranged on campus during the preceding study term by the Department of Co-ordination, who maintain liaison with prospective employers. The experience a student may get during the work term may include: introduction to office procedures; assisting in design presentation and model building; minor drafting assignments.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jan-Apr</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2-B</td>
<td>ARCH 263 Theory of Structures 1</td>
<td>ARCH 224 An Introduction to Landscape Design</td>
<td>ARCH 247 Renaissance to Revolution</td>
<td>ARCH 293 Design Concepts and Studio</td>
</tr>
<tr>
<td>Spring</td>
<td>ARCH 247 FE or TE</td>
<td></td>
<td></td>
<td>(1½ credits)</td>
</tr>
<tr>
<td>May-Aug</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>TOTAL 4 cr.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Co-op Work Term 2</td>
<td>The type of experience a student may obtain in this term includes assisting in design presentation and model buildings; assisting in preparation and corrections to site plans, floor plans, and elevations, and on-site measurements.</td>
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<td></td>
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</tr>
<tr>
<td>Fall</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sept-Dec</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3A</td>
<td>ARCH 372 FE or TE</td>
<td></td>
<td>ARCH 392</td>
<td>Design Concepts</td>
</tr>
<tr>
<td>Winter</td>
<td>Mechanical Systems 1</td>
<td></td>
<td></td>
<td>and Studio</td>
</tr>
<tr>
<td>Jan-Apr</td>
<td>ARCH 362</td>
<td></td>
<td></td>
<td>(2 credits)</td>
</tr>
<tr>
<td>TOTAL 3½ cr.</td>
<td>Structural Synthesis 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Co-op Work Term 3</td>
<td>The type of experience a student may obtain in this term includes design research; detailed design developments; design presentation; assisting in preparation of site plans, floor plans, elevations, building cross-sections.</td>
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<tr>
<td>Spring</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>May-Aug</td>
<td></td>
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</tr>
</tbody>
</table>
Program for the Degree of Bachelor of Environmental Studies

<table>
<thead>
<tr>
<th>Term</th>
<th>Courses</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>3-B</td>
<td>ARCH 373 Mech. Systems 2</td>
<td>4</td>
</tr>
<tr>
<td>Fall</td>
<td>ARCH 363 Structural Synthesis 2</td>
<td>4</td>
</tr>
<tr>
<td>Sept-Dec</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>TOTAL 3½ cr.</td>
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<td>8</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>Co-op</td>
<td>Theme Area</td>
<td>Theme Area</td>
<td>Theme Area</td>
</tr>
<tr>
<td>Work Terms</td>
<td></td>
<td></td>
<td>design research; assisting in the development of conceptual designs and schematics, preparation of site plans and details, floor plans, elevations, cross-sections and standard details; assisting the site architect or construction superintendent.</td>
</tr>
<tr>
<td>4 &amp; 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter</td>
<td>Specifications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jan-Aug</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL 3½ cr.</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Electives
Students are permitted to study courses given by the University at large which are in the area of the student’s individual interest, with the aim of providing better orientation and more interdisciplinary communications.

Electives are divided into the following 2 categories:

(TE) Theme Elective (BES Degree) courses within the Faculty of Environmental Studies which deal with ecological issues.

(FF) Free Elective Courses selected by the student without restrictions as long as the course is approved by Senate.

Note Department approval is mandatory for both TE and FF.
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 elective course or equivalent in any single term (but who pass studio and maintain the minimum cumulative overall average) will receive the academic decision "Proceed on Probation": Failed elective courses or their equivalents must be repeated and passed by the end of the next term of study (which includes the higher level studio and core course(s)). Should the student fail more than one half course or equivalent in the next term, the student will receive the academic decision "Required to Withdraw".

4. Core Courses
Students who fail 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 (Pre-professional) 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 8 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) 4-year programs in Geography (Honours and General) provide students with considerable freedom to choose supporting electives from across the whole University. Thus, in consultation with professors, students will be able to have a tailor-made program to suit their particular needs, whether they are primarily interested in physical or human geography, regional or systematic topics, or a combination of these. Certain approved options as well as Joint Honours programs with a number of other departments are listed on page 10.16.

The 4-year Geography programs provide a sound, well-rounded foundation in the discipline, and prepare the student for specialization at the graduate level in almost any aspect of Geography. The programs include a group of mandatory core courses that provides a balance of content and analytic approaches. The content courses include a series of integrated courses in both physical and human geography. The courses in research analysis include field methods, remote sensing, cartography, statistical analysis, and computer use. In the Honours program, the fourth year includes a research project known as the Senior Honours Essay.

Although the 4-year programs are broad in scope, students may concentrate their courses in 1 or more of the 6 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 10.5). Students are also free to design a broadly based program without specialization.

For the Honours Co-operative program, students are admitted only after first year. Since competition occurs for places in the Co-op program, admittance is based on academic standing and interviews. The Co-op program provides for alternate terms of practical work experience and academic study. Co-op Geography students will enter their first work term in the winter of the second year.
Co-op Geography students must normally follow the work and study-term sequence outlined below; a work-term report is required upon completion of work-terms and 4 of these must be evaluated as successful for the Co-op degree. Inquiries for additional information regarding Co-operative studies should be directed to the Co-op Undergraduate Officer. The Co-op Geography program is not available in the Faculty of Arts. Co-op students may transfer to the regular Honours Geography program provided they are in good standing in the Co-op program at the time of application.

The 3-year General Geography program provides a liberal education in environmental studies, with less specialization in Geography than in the 4-year programs. A program of correspondence courses has been developed to allow a student to complete the 3-year General BES or BA in Geography through 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 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.

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, and Europe.

---

**Environmental Studies**

**Geography**

**Bachelor of Environmental Studies**

**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  
FNVS 195 Introduction to Environmental Studies  
Electives other than Geography (see notes below).

**Year 2**

ENV S 200 Field Ecology  
GEOG 201A Geomorphology and Soils  
GEOG 201B Climatology  
GEOG 202 Topics of Economic and Urban Geography  
one of:  
GEOG 203 Topics of Cultural and Regional Geography  
GEOG 204 Soviet Union  
GEOG 205 Africa  
GEOG 220 World Regional Geography  
GEOG 221 The United States  
and additional credits so that a student should have completed by the end of the second year 11 credits.

**Year 3**

GEOG 381 The Nature of Geography  
Additional credits so that a student will have completed at least 16 credits.

**Notes on Three Year Program**

1. **Minimum Required Credits**
   
   Total: 16 credits. Geography: 6.5 credits. Outside of Faculty of Environmental Studies: 4 credits. One credit in Environmental Studies may be counted as a Geography credit.

2. **Electives**
   
   No more than 5 courses should be taken in 1 term.  
   By the end of the second year, 1 course is required from English Group 1 (p. 16.45).  
   ENGL 109, 129R, 140R or 150 may be taken in Year 1; ENGL 209 or 210 may be taken in Year 2.
3. Grade Requirements
Students must maintain an overall average of 60% and a major average of 65%. Courses designated as "Environmental Studies" are included in the calculation of the major average.

4. Other Comments
See notes 4, 5, 6, and 7 on Four Year programs.

B) FOUR YEAR PROGRAMS (HONOURS REGULAR AND CO-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 195 Introduction to Environmental Studies
Electives other than Geography (see notes below).

Year 2
ENV S 200 Field Ecology
GEOG 201A Geomorphology and Soils
GEOG 201B Climatology
GEOG 202 Topics of Economic and Urban Geography
GEOG 275 Introductory Air Photo Analysis and Remote Sensing
ENV S 271 Introduction to Quantitative Research Methods
one of:
GEOG 203 Topics of Cultural and Regional Geography
GEOG 204 Soviet Union
GEOG 205 Africa
GEOG 220 World Regional Geography
GEOG 221 The United States

Year 3
GEOG 381 The Nature of Geography
GEOG 391 Field Research
ENV S 272 Computer Programming in Environmental Studies
one 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

Year 4
Honours students take:
GEOG 490A GEOG 490B Senior Honours Research Essay Proposal
Electives: see notes below.

Notes on Four-Year Programs

1. Minimum Required Credits
Total: 22 credits. Geography: 11.5 credits. Outside of Faculty of Environmental Studies: 5 credits. Two credits in Environmental Studies may be counted as Geography credits.

2. Electives
Normally 5 courses should be taken each term. In Year 1, MATH 105 is strongly recommended for students without a Grade 13 Math. By the end of the second year, 1 course is required from English Group One (p. 16.45). ENGL 109, 129R, 140R or 150 may be taken in Year 1; ENGL 209 or 210 may be taken in Year 2. In choosing electives, students may concentrate on one of the Department's areas of specialization (p. 10.18), or may elect to take one of the Faculty's Options (p. 10.5). Students interested in obtaining jobs in urban and regional planning, should take PLAN 156 in Year 1.

3. Grade Requirements
Students in the General program must maintain an overall average of 60.0, major average of 65.0. Students in the Honours program must maintain an overall average of 65.0 and a major average of 70.0. Courses designated as "Environmental Studies" are included in the calculation of the major averages.

4. Foreign Language Requirement
Since many departments doing graduate work in Geography demand proficiency in a foreign language, students intent on graduate work should consider taking at least 1 credit in a foreign language.

5. Secondary School Teaching
Students intending to teach in Secondary Schools are advised to take at least 2 credits of Regional Geography.
6. Equipment and Travel Costs
For some courses, participating students may be expected to make a financial contribution to defray heavy equipment/travel costs, e.g. GEOG 391 (Field Research), which is mandatory for all 4-year students. Statements on fees, where required, will be found with the course description.

7. Reading Courses
No more than one and one-half credits may be taken as reading courses in Geography.

8. Honours Co-operative Program
Students are admitted to the Co-op program only after the first year. They 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

<table>
<thead>
<tr>
<th>Year 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 101, 102, 110, 160, 175</td>
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</table>

<table>
<thead>
<tr>
<th>Year 2</th>
</tr>
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<tbody>
<tr>
<td>Fall Term 2A</td>
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<tr>
<td>ENV S 200 and 271</td>
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<tr>
<td>GEOG 201A</td>
</tr>
<tr>
<td>Electives</td>
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<table>
<thead>
<tr>
<th>Winter Work Term 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring Term 2B</td>
</tr>
<tr>
<td>GEOG 201B, 202, and one of 203, 204, 205, 221</td>
</tr>
<tr>
<td>One of GEOG 307, 316, 317, 318, 319, 360, 375, 376, ENGL 210</td>
</tr>
<tr>
<td>Electives</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fall Work Term 2</th>
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<tbody>
<tr>
<td>Year 3</td>
</tr>
<tr>
<td>Winter Term 3A</td>
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<tr>
<td>GEOG 381</td>
</tr>
<tr>
<td>ENV S 272 (may be taken in the Spring 2B if available).</td>
</tr>
<tr>
<td>Electives</td>
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<table>
<thead>
<tr>
<th>Fall Term 3B</th>
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<tbody>
<tr>
<td>GEOG 390, 391</td>
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<tr>
<td>Electives</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 4</th>
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</thead>
<tbody>
<tr>
<td>Winter Work Term 4</td>
</tr>
<tr>
<td>GEOG 490A</td>
</tr>
<tr>
<td>Electives</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fall Work Term 5</th>
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</thead>
<tbody>
<tr>
<td>Winter Term 4B</td>
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<tr>
<td>GEOG 490B</td>
</tr>
</tbody>
</table>

Joint Honours Programs
Joint Honours programs have been arranged between Geography and several 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 are considered as Options. These programs lead to degrees in the Faculty in which the student is registered, providing always that in addition to the requirements of the specific programs the general requirements of the Faculty have been met. For the programs already approved, the following degrees may be awarded:

<table>
<thead>
<tr>
<th>BES or BA Joint Geography with:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthropology</td>
</tr>
<tr>
<td>Canadian Studies</td>
</tr>
<tr>
<td>Economics, English, French</td>
</tr>
<tr>
<td>German, History</td>
</tr>
<tr>
<td>Man-Environment Studies</td>
</tr>
<tr>
<td>Music</td>
</tr>
<tr>
<td>Political Science</td>
</tr>
<tr>
<td>Recreation</td>
</tr>
<tr>
<td>Russian</td>
</tr>
<tr>
<td>Sociology</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>BES or BA or BMath Mathematics</th>
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<table>
<thead>
<tr>
<th>BES or BSc Earth Sciences Biology</th>
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</thead>
</table>

The Department of Geography is prepared to work out other programs for keenly interested students who meet Honours standards.

Geography core requirements in Joint programs are identical with those of the Geography Honours Regular program above. Further information may be obtained from the office of the Associate Chairman (Undergraduate Studies) in the Department.

Geography Course Requirements for Joint Honours Students Registered in Other Departments

<table>
<thead>
<tr>
<th>GEOG 101 Introduction to Human Geography</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 102 Introduction to Physical Geography</td>
</tr>
<tr>
<td>GEOG 160 Introduction to Cartography and Map Analysis</td>
</tr>
</tbody>
</table>

and one of:

<table>
<thead>
<tr>
<th>GEOG 125R Introduction to the Third World</th>
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<tbody>
<tr>
<td>GEOG 126R Development in the Third World</td>
</tr>
<tr>
<td>GEOG 127 Regional Problems of Europe</td>
</tr>
<tr>
<td>FNV S 195 Introduction to Environmental Studies</td>
</tr>
</tbody>
</table>

Environmental Studies
Geography
Environmental Studies
Geography

At least 3 of:
GEOG 251 Cities in Canada
GEOG 322 Geographical Study of Canada
GEOG 341 Historical Geography of Canada 1
GEOG 342 Historical Geography of Canada 2
GEOG 411 Resource Studies
GEOG 422 Canada

At least 3 of:
ANTH 203 Prehistoric Man in North America
ECON 363 Contemporary Canadian Problems 1
HIST 102E Canadian History
HIST 201X Canadian Urban History
HIST 203X Modern Quebec
HIST 205X Canadian Business History
HIST 206X History of Canadian Minorities
PLAN 222 Canadian Regional Issues
PSCI 260A Canadian Government and Politics 1
SOC 103 Canadian Society

Areas of Specialization

Listed below are Geography and other relevant courses in the Department's 6 major areas of specialization. This is not a definitive list; students are encouraged to seek out other courses that meet their needs.

Applied Physical Geography
GEOG 102 Introduction to Physical Geography
GEOG 201A Geomorphology and Soils
GEOG 201B Climatology
GEOG 300 Geomorphology and the Southern Ontario Environment
GEOG 303 Physical Basis and Geography of Water
GEOG 400 Climatic and Periglacial Morphology
GEOG 401 Glacial Geomorphology and Contemporary Applications
GEOG 406 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 Aquatic Biology
CIV E 353 Soil Mechanics
CIV E 493 Engineering in the Canadian North
EARTH 260 Structural Geology

Notes on Joint Honours Programs

1. Number of Credits
The minimum number of credits in Geography for students registered in Joint Honours programs is 7.5.

2. Grade 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 minimum 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 the following:

- GEOG 251 Cities in Canada
- GEOG 322 Geographical Study of Canada
- GEOG 341 Historical Geography of Canada 1
- GEOG 342 Historical Geography of Canada 2
- GEOG 411 Resource Studies
- GEOG 422 Canada

At least 3 of:
ANTH 203 Prehistoric Man in North America
ECON 363 Contemporary Canadian Problems 1
HIST 102E Canadian History
HIST 201X Canadian Urban History
HIST 203X Modern Quebec
HIST 205X Canadian Business History
HIST 206X History of Canadian Minorities
PLAN 222 Canadian Regional Issues
PSCI 260A Canadian Government and Politics 1
SOC 103 Canadian Society

Areas of Specialization

Listed below are Geography and other relevant courses in the Department's 6 major areas of specialization. This is not a definitive list; students are encouraged to seek out other courses that meet their needs.

Applied Physical Geography
GEOG 102 Introduction to Physical Geography
GEOG 201A Geomorphology and Soils
GEOG 201B Climatology
GEOG 300 Geomorphology and the Southern Ontario Environment
GEOG 303 Physical Basis and Geography of Water
GEOG 400 Climatic and Periglacial Morphology
GEOG 401 Glacial Geomorphology and Contemporary Applications
GEOG 406 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 Aquatic Biology
CIV E 353 Soil Mechanics
CIV E 493 Engineering in the Canadian North
EARTH 260 Structural Geology
EARTH 342  Geomorphology
EARTH 370  Economic Geology
EARTH 438  Engineering Geology
EARTH 439  Hydrogeology
EARTH 440  Quaternary Geology
ENV S 200  Field Ecology
SCI 220  Chemistry of Pollution
SCI 249  Continents Adrift
SCI 250  Environmental Geology
SCI 349  Introductory Pedology
SCI 453  The Seas and Man's Effect Upon Them
SCI 454  The Inland Waters and Man's Effect Upon Them

Environmental and Resources Management
GEOG 303  Physical Basis and Geography of Water
GEOG 315  Agricultural Geography
GEOG 352  The Rural-Urban Fringe of Canadian Cities
GEOG 356  Resources Management
GEOG 357  Conservation and Resource Management
GEOG 358  Water Planning and Management
GEOG 359  Geography of Energy
GEOG 408  Atmospheric Resource Management
GEOG 410  Recreation Geography
GEOG 414  Energy Resources Management
GEOG 452  Problems of Rural Land Use
GEOG 461  Land Dereliction and Rehabilitation 1
GEOG 462  Land Dereliction and Rehabilitation 2
ANTH 330  Cultural Ecology
CIV E 344  Urban and Regional Engineering
CIV E 480  Basic Principles of Water Resources
EARTH 370  Economic Geology
ECON 241  Cost Benefit Analysis and Project Evaluation
ECON 355  Economics of Energy and Natural Resources
ECON 357  Environmental Economics
ECON 451  Advanced Topics in Resource Economics
ENV S 195  Introduction to Environmental Problems
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 205  Ecosystem Perspectives and Analyses
M ENV 218  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
REC 331  Outdoor Education in Recreation
REC 334  Park Management
REC 432  Interpretation
REC 434  Advanced Park Planning and Management
REC 435  Recreation Resource Policy
SCI 250  Environmental Geology
SCI 453  The Seas and Man's Effects Upon Them
SCI 454  The Inland Waters and Man's Effects Upon Them
SOC 286  Sociology of Ecology
SOC 347  Sociology of Leisure

Regional Development
GEOG 311  Regional Industrial Development
GEOG 315  Agricultural Geography
GEOG 350  Regional Urban Systems
GEOG 319  Economic and Social Techniques for Regional Planning
ECON 333  Interregional Economics
ECON 335  Economic Development
ECON 365  Economic Development of Modern Europe
ECON 241  Cost-Benefit Analysis and Project Evaluation
MSCI 23  Managerial and Engineering Economics 1
MSCI 43  Managerial and Engineering Economics 2
PLAN 156  Introduction to Urban and Regional Planning
PLAN 232  Rural Planning and Development
PLAN 259  Regional Planning and Development
PLAN 333  The Sociology of Regional Planning
PLAN 360  Technology in Urban and Regional Planning
PLAN 370  Land Development Planning
P SCI 343  Canadian Municipal Government
P SCI 344  The Politics of Local Government
REC 302  Travel and Tourism
SOC 256  Ethnic and Racial Relations

Regional Geography
GEOG 127  Regional Problems of Europe
GEOG 125R Introduction to the Third World
GEOG 126R Development in the Third World
GEOG 225R Urbanization in the Third World
GEOG 226R Food and Agriculture, and Integrated Rural Development in the Third World
GEOG 204  Soviet Union
GEOG 205  Africa
GEOG 220  World Regional Geography
GEOG 221  The United States
GEOG 322  Geographical Study of Canada
GEOG 323  Comparative Regional Problems
GEOG 325R Topics in Development of the Third World
GEOG 332  Topics in Population Geography: Health and Disease
GEOG 341  Historical Geography of Canada 1
GEOG 342  Historical Geography of Canada 2
GEOG 421  Europe and the Mediterranean
GEOG 422  Canada
GEOG 423  Central and Eastern Europe
GEOG 424  Soviet Union
GEOG 425  Africa
GEOG 450  Field Research in Regional Geography

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 10.18).

Methods and Techniques
GEOG 160  Introduction to Cartography and Map Analysis
GEOG 275  Introductory Air Photo Analysis and Remote Sensing
GEOG 307  Social Survey Techniques
GEOG 316  Multivariate Statistics
GEOG 317  Nonparametric Statistics
GEOG 318  Spatial Analysis
GEOG 319  Economical and Social Techniques for Regional Planning
GEOG 360  Preparation of Maps and Illustrations
GEOG 375  Air Photo Interpretation and Remote Sensing 1
GEOG 391  Field Research
GEOG 403  Advanced Cartography 1
GEOG 404  Advanced Cartography 2
GEOG 407  Lab Techniques in Geomorphology
GEOG 470  Applied Air Photo Interpretation
GEOG 471  Advanced Remote Sensing

ARCH 212  Computer Science Simulation
ECON 321  Introduction to Econometrics
ENV S 271  Introduction to Quantitative Research Methods
ENV S 252  Media Tools for Environmental Studies
ENV S 253  Media Tools for Environmental Studies — Advanced Level
ENV S 272  Computer Programming in Environmental Studies
GEN E 115  Engineering Concepts 1
M ENV 241  Introduction to Environmental and Social Impact Assessment
PLAN 159  Graphics for Planning
PLAN 255  Planning Surveys and Analysis
SOC 281  Methods 1
SOC 282  Methods 2

Urban-Economic Geography
GEOG 101  Introduction to Human Geography
GEOG 202  Topics of Economic and Urban Geography
GEOG 251  Urban Areas in North America
GEOG 311  Advanced Economic Geography — Manufacturing and Transportation
GEOG 315  Agricultural Geography
GEOG 349  The City as a System I
GEOG 350  Regional Urban Systems I
GEOG 352  The Rural-Urban Fringe of Canadian Cities
GEOG 359  Geography of Energy
GEOG 412  Geography of Manufacturing Firms and Industries
GEOG 448  Urban Historical Geography
GEOG 450  City and Regional Systems
GEOG 452  Problems of Rural Land Use
CIV E 110  Urban Transport Problems and Prospects
CIV E 342  Transport Engineering 1
CIV E 343  Transport Engineering 2
CIV E 344  Urban and Regional Engineering
CIV E 444  Urban Transport Planning
CIV E 543  Land Use Models
ECON 231  Introduction to International Economics
ECON 333  Interregional Economics
ECON 343  Urban Economics
ECON 345  Industrial Organization
ENV S 201  Introduction to Environmental and Planning Law
ENV S 402  Planning Law
M ENV 247  Urban Anthropology
PHIL 425  Philosophy of the City

Environmental Studies
Geography
The Man-Environment Studies programs do not in themselves concentrate on one technical or pre-professional field to meet specifications for particular jobs. However, 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 experience 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 necessary. 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.

**Department of Man-Environment Studies**

**Nature of the Program**

The Department of Man-Environment Studies offers both an Honours Regular program and an Honours Co-operative program.

These 2 honours degree programs are oriented towards study of the many dimensions of human inter-relationships with various environments, including natural and managed landscapes, buildings and cities, small groups, communities, and whole societies. Through problem- and issue-oriented inquiry into such complex relationships, along with related study in contributing academic disciplines, ample scope is provided for acquiring a broad-based education, as well as technical knowledge and skills.

The current emphases in research and scholarship among the faculty fall into 3 major thematic areas:

1. Energy Management and Policy Analysis
2. Environmental and Social Impact Analysis
3. Natural Area Management

Many of the positions held by graduates of the Department can be described by one of these headings.

An even more important goal of the programs offered by the Department is the development of abilities to think and to analyze which are not artificially constrained by conventional boundaries of academic disciplines. The importance of the ability to think and to analyze 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.

**GEOGRAPHY MINOR FOR HONOURS STUDENTS IN OTHER DEPARTMENTS**

The requirements are the same as those noted for the 3 year General Geography program, i.e. core requirements plus electives to make 6.5 credits in Geography except that another Geography half-credit should be substituted for GEOG 110.
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 honours assignment respectively. Arrangements to receive extra credit for project work have been provided for those who learn most effectively through undertaking self-directed work under the guidance of faculty and other advisors. The fourth year also requires participation in a senior honours seminar course which provides the occasion for students to draw together what they have learned and direct it to one of the broad sub-areas within Man-Environment Studies.

The stress given to project-oriented learning within the 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 3 themes within the Department by taking the required core program and the identified electives for 1 of the 3 themes.

a) Energy Management and Policy Analysis
b) Environmental and Social Impact Analysis
c) Natural Area Management

3. A Joint Honours Degree

Students can elect to take a Joint Honours degree with another department, which will require fulfilling the core program of a second department as well as Man-Environment Studies.

4. A Minor

Students can elect to take a Minor with another department, which requires completion of 5 courses in another department.

5. 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 or 6 credits per term. Each student must have completed 22 full credits or the equivalent before graduation with a cumulative overall average of 65.0; an average of 70.0 must be maintained in M ENV/ENV S courses. There are several evaluation techniques used to determine grades.

The Honours Regular Program

Year 1
ENV S 195 Introduction to Environmental Studies
M ENV 100(F) Issue Analysis and Problem-Solving 1
M ENV 101(W) Issue Analysis and Problem-Solving 2
M ENV 150(F) Environmental Methods & Techniques 1
M ENV 161(W) Environmental Methods & Techniques 2
plus electives for a total of 3 credits for the Fall term and 3 credits for the Winter term.

Year 2
ENV S 200 Field Ecology
M ENV 241 Introduction to Environmental and Social Impact Assessment, or other half-credit 200 level or above course in 1 of the social sciences
ENV S 271 Introduction to Quantitative Research Methods
M ENV 290/291 Seminar-Workshop
M ENV 295 Development of Environmental Thought
plus electives for a total of 3 credits for the Fall term and 3 credits for the Winter term. Note that 200, 241, 271 and/or 295 may be taken in years other than Year 2.

Year 3
M ENV 390A/391A Seminar-Workshop (with consent of Faculty, 390B, 391B, may be taken in place of 390A, 391A.)
plus electives for a total of 2.5 credits for the Fall term and 2.5 credits for the Winter term.

Note: Students who would like additional flexibility in fourth year, such as being off campus for part of the year, MUST take M ENV 400 in third year.

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
ENV S 271 Introduction to Quantitative Research Methods
M ENV 290 Seminar-Workshop
M ENV 295 Development of Environmental Thought
plus electives for a total of 3 credits. With consent of Undergraduate Officer, 200 or 271 may be taken in Term 3A or Term 3B.

Term 2B
M ENV 291 Seminar-Workshop
plus electives for a total of 3 credits.

Term 3A
M ENV 241 Introduction to Environmental and Social Impact Assessment, or other half-credit 200 level or above course in 1 of the social sciences
M ENV 390A Seminar-Workshop
plus electives for a total of 2.5 credits.

Term 3B
M ENV 391A Seminar-Workshop
plus electives for a total of 2.5 credits.

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:
# Environmental Studies
## Man-Environment Studies

| 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 and S. Lerner

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 Programs |
| Theme Core: | M ENV 241 Introduction to Environmental and Social Impact Assessment |
| 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 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: | M ENV 202 Social Science Approaches to Environmental Problems |
| ENV S 334 Park Management (cross-listed as REC 334) |
| REC 302 Travel and Tourism |

| Year 3 | Required: Regular Program |
| Theme Core: | ENV S 433 People in Natural Areas (cross-listed as REC 433) |
| ENV S 417 Land Use History & Landscape Change |

| Year 4 | Required: Regular Program |
| Theme Core: | ENV S 434 Advanced Park Planning and Management |
| REC 410 Planning of Recreational Facilities |
| GEOG 461/462 Land Dereliction and Rehabilitation |

A student may want to develop his own particular specialty within protected area management. Specialization with this stream could be accommodated by concentrating on Options from the Earth and Life Sciences, History and Anthropology, Management Studies, or Public Administration. Consult the theme director in this regard.

### 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 5 credits: 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.
The integration of practical experience into the program is considered an important part of the education process. Students are expected to gain planning experience during the summer period and the School endeavours to help them find suitable work through an internship program. Most 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. Students will be asked to give permission for the release of their marks to employers.

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 4 year Honours program is 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 6 credits in each of the 4 years of the program. However, students interested in taking extra courses are free to take a 7 credit load in any given year without approval from the School; preregistration for more than 7 credits may only be done with the Undergraduate Officer’s approval. Students who have accumulated more than the required minimum number of credits for proceeding into the next year of the program may elect to reduce the load and will be permitted to take a minimum of 5 credits in any given academic year through Year 4.

All required courses should be taken in the year indicated.

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 overall average of 65.0 and a 70.0 in Planning and Environmental Studies courses and must obtain credit standing in 6 full courses. In subsequent years, a student must maintain a cumulative, overall average of 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.

4. First-year Credits
No more than 8 first year level credits will be allowed toward the 24% required to graduate.

5. Readings and Research Course
A student wishing to register for a readings and research course (Planning 275, 475 and 476) 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 ENY 271 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. Costs
For some courses, participating students may be expected to make a small financial contribution to defray materials/travel costs, e.g. PLAN 159 (Graphics for Planning), PLAN 300 (Seminar/Workshop Project in Urban and Regional Planning), PLAN 357 (Conservation and Resource Management), PLAN 300 (Seminar/Workshop Project in Urban and Regional Planning).

9. 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.

10. 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 as one of the theme elective planning courses required in Year 3.

11. 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, 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.
Honours Urban and Regional Planning Recommended Program

<table>
<thead>
<tr>
<th>YEAR 1</th>
<th>Required Planning Courses</th>
<th>Theme Elective Courses</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PLAN 100A Introduction to Urban Planning Concepts and Techniques 1</td>
<td>One-half credit 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 Year 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 6 full credits - all courses to be at the first year level.</td>
</tr>
<tr>
<td></td>
<td>PLAN 100B Introduction to Urban Planning Concepts and Techniques 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PLAN 159 Graphics for Planning</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>ARTS 000 Y English Language Proficiency Exam</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Year 1 Theme Elective Courses**

**Theme Areas**

The following courses are examples of Theme Electives:

1. **BIOPHYSICAL**
   - BIOL 111 Introductory Biology 1
   - EARTH 121 Introductory Geology 1
   - GEOG 102 Introduction of Physical Geography

2. **PSYCHO-SOCIAL**
   - SOC 101 Introduction to Sociology

3. **ECONOMIC**
   - ACC 121 Understanding and Using Financial Accounting Information
   - ECON 101 Introduction to Microeconomics
   - ECON 102 Introduction to Macroeconomics

4. **POLITICS**
   - P SCI 101 Introduction to Politics 1
   - P SCI 102H Citizen Participation in Canada
   - P SCI 102M Contemporary Issues in Canadian Public Policy

5. **PHILOSOPHY**
   - HIST 105 The Meaning of Civilization
   - PHIL 130J Philosophy of Discontent
   - PHIL 145 Critical Thought
   - P SCI 102F Political Rights and Obligations

6. **METHODS**
   - CS 116 Introduction to Computing
   - ENGL 109 Introduction to Essay Writing
   - MATH 105 Mathematics

7. **THE ARTS**
   - ANTH 102B Anthropology Through Science Fiction
   - ARCH 194 Visual Interdisciplinary Language
   - ENGL 106 Themes of Literature (any one)

8. **OTHER THEMES**
   - ENV S 111 Introduction to the Study of the Future
   - ENV S 195 Introduction to Environmental Studies
   - GEOG 101 Introduction to Human Geography

*For a complete listing of Theme Electives, see Department Undergraduate Manual.*
### Year 2 Required Planning Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENV S 200</td>
<td>Field Ecology</td>
<td>1 full credit from list of Second Year Theme Elective Courses (see below).</td>
</tr>
<tr>
<td>ENV S 271</td>
<td>Introduction to Quantitative Research Methods</td>
<td>Required and Elective Courses together to total 6% full credits.</td>
</tr>
<tr>
<td>PLAN 231</td>
<td>Citizen Involvement Planning and Social Change</td>
<td></td>
</tr>
<tr>
<td>PLAN 255</td>
<td>Planning Surveys and Analyses, PLAN 256A Principles of Environmental Design 1, PLAN 256B Principles of Environmental Design 2, and at least 2 of: PLAN 259 Regional Planning and Development, PLAN 270 Concepts and Ideas in Contemporary Urban Planning, PLAN 232 Rural Planning and Development.</td>
<td></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**
   - BIOL 250 Ecology
   - M ENV 218 Canadian Energy Issues
   - SCI 250 Environmental Geology

4. **ALL THEMES**
   - ENV S 201 Introduction to Environmental and Planning Law
   - ENV S 272 Computer Programming in Environmental Studies
   - M ENV 241 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>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLAN 300A</td>
<td>Seminar/Workshop Project in Urban and Regional Planning 1, PLAN 300B Seminar/Workshop Project in Urban and Regional Planning 2, PLAN 307 Social Survey Techniques and at least 2 of: PLAN 301 Urban Design, PLAN 357 Conservation and Resource Management, PLAN 330 Urban Social Planning.</td>
<td>2 full credits from list of Third Year Theme Elective Courses (see below).</td>
</tr>
</tbody>
</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**
   - GEOG 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 Adminis-</td>
<td>1 full credit from list</td>
<td>Required and Elective Courses</td>
</tr>
<tr>
<td>strative Processes in Urban</td>
<td>of Fourth Year Theme</td>
<td>together to total 6 full credits.</td>
</tr>
<tr>
<td>and Regional Planning 1, PLAN</td>
<td>Elective Courses (see</td>
<td></td>
</tr>
<tr>
<td>456B Political and Adminis-</td>
<td>below).</td>
<td></td>
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<tr>
<td>strative Processes in Urban</td>
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<td></td>
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<tr>
<td>and Regional Planning 2, PLAN</td>
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<tr>
<td>480A The Philosophy and Meth-</td>
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<td>ody of Urban and Regional</td>
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<tr>
<td>Planning 1, PLAN 480B The Phi-</td>
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<td>losophy and Methodology of Urban</td>
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<td>and Regional Planning 1,</td>
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<tr>
<td>PLAN 480B The Philosophy and</td>
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<tr>
<td>Methodology of Urban and</td>
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<tr>
<td>Regional Planning 2, PLAN 490</td>
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<td></td>
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<tr>
<td>Senior Honours Essay (2 full</td>
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<tr>
<td>course credits).</td>
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</tbody>
</table>

Year 4 Theme Elective Courses
The following courses are examples of Theme Electives:

1. URBAN THEME
   PLAN 414 Housing Policies
   PLAN 420 Health, Environment and Planning
   REC 410 Planning of Recreation Facilities

2. REGIONAL THEME
   GEOG 412 Alternative Future Environments 2
   PLAN 434 Planning with Native Peoples
   PLAN 449 Canadian Urban and Regional Planning: Part 1

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

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 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 Cooperative 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 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, the social sciences, and the biological sciences, as well as that of the performing arts. This orientation represents a marked departure from the strictly performance oriented approach which is taken in most 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, naturopathic medicine, 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 Program

The academic program in Recreation has been designed to give each graduate the body of knowledge necessary to prepare for a professional position in the field of Recreation. Students completing the Honours Degree Program can, in addition, complete course sequences resulting in a specialization in Recreation Administration, Therapeutic Recreation Services, Outdoor Recreation, or Leisure Studies. Joint Honours Programs are available with Kinesiology, Geography, Man-Environment Studies, Management Studies and Sociology. A Recreation-Business Option with Wilfrid Laurier University is also offered. Graduates of the Recreation 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 program graduates are awarded an Honours Bachelor of Arts degree. Those students who graduate from a Dance program receive an Honours Bachelor of Science degree in Dance, an Honours Bachelor of Arts Degree or a General Bachelor of Arts Degree.

Graduates who have pursued their studies in a Co-operative 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
The Co-operative system is one whereby after the first 8-month academic year the student alternates 4-month terms in academic study and related work experiences.

Arrangements for work assignments are made through the Department of Co-ordination and Placement of the University which provides the liaison between the campus and the field situation. Students should refer to Chapter 5 of the Calendar for further details concerning the Co-operative 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 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 Grade 13
Applicants to the Health Studies program are required to select a Grade 13 program which includes Chemistry and Biology.

Applicants to the Kinesiology programs are required to include 1 of Grade 13 Algebra, Calculus and Relations and Functions and 2 of Grade 13 Biology, Chemistry and Physics.

Applicants to the Recreation program are required to include 1 of Grade 13 Algebra, Calculus and Functions and Relations in their program.

Advanced Standing
Normally, students transferring to HKLS programs are granted credit for courses taken elsewhere in which they have received a grade of C- or better. All transfer students will be required to complete at least the equivalent of 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.

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.
3. Achieving a passing grade in 1 of ENGL 109, 140R, 150, 209, 210, 240R, 335.

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.
Examinations and Standings

**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 21 will be considered Year 2; those who have successfully completed at least 21 courses but fewer than 32, Year 3; and those with 32 or more, Year 4.

d) It should be noted that Recreation is on the term course system whereas Kinesiology, Health Studies and Dance operate under the credit weight system. See page 1.6 of this calendar for a description of these systems. This means that courses with credit weight of .75 offered by other departments will only count as 1 term course towards the degree for students in Recreation programs.

The following cumulative averages are required to proceed in the programs of the Faculty:

<table>
<thead>
<tr>
<th>Program</th>
<th>Overall</th>
<th>Major Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kinesiology Honours</td>
<td>63</td>
<td>67</td>
</tr>
<tr>
<td>Health Studies Honours</td>
<td>63</td>
<td>67</td>
</tr>
<tr>
<td>Kinesiology General</td>
<td>53</td>
<td>60</td>
</tr>
<tr>
<td>Recreation Honours</td>
<td>65</td>
<td>70</td>
</tr>
<tr>
<td>Dance Honours</td>
<td>60</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 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 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 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 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 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 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 5.0 credits can be obtained this way. The Associate Chairman may approve up to 2.5 credits. Requests for additional approval must go to the HKLS Undergraduate Affairs Committee. To obtain any approval the student must obtain a Letter of Permission Request form from the Associate Chairman and provide the details of the course(s) to be taken, appropriate course descriptions and the reasons for the request. When approved, the Associate Chairman will forward the approval to the Assistant Registrar for Human Kinetics and Leisure Studies who will prepare the appropriate Letter of Permission and forward it to the student, the host university and the major department concerned.

It will be the student's responsibility to ensure that an official transcript is sent to the Assistant Registrar, Faculty of Human Kinetics and Leisure Studies, Needles Hall, University of Waterloo, Waterloo, Ontario within two months of the completion of the course(s).

Note
The granting of any Letter of Permission request by the University of Waterloo does not necessarily ensure that the student will be able to enrol in the approved course at the other university. There may be restrictions on class enrolments, etc. at that institution. Students should contact that institution's Registrar's Office for procedural details.

Correspondence Courses
Correspondence courses are normally restricted to part-time students who are not able to attend classes on campus. Correspondence courses may, under some circumstances, be taken while on a work term. The Associate Chairman for Undergraduate Affairs is the only individual who can grant permission to enrol in a correspondence course. Permission must be granted before the student 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 falls on a holiday or weekend, the final drop day will be the last school day prior to the listed date.
c) Students may withdraw from a program without academic penalty up to November 1 in the Fall term, March 1 in the Winter term, and July 1 in the Spring Term. In order to withdraw from a program (i.e., the university) a student must complete a standard Student Withdrawal form which is available in the Registrar's Office.
d) Students should note the financial implications of dropping courses or withdrawing from programs (see page 2.4).
Appeals

Students who wish to appeal a grade received for a course should:

i) Contact the professor associated with the course and attempt to resolve it.

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 2 major perspectives of Dance offered through the Bachelor of Arts Degree and the Bachelor of Science Degree Program are Dance as a Theatre Art (encompassing Western and non-Western cultures and practices) and Dance as a Movement Science.

To provide the necessary knowledge for varying career interests, 3 different degree programs are offered: the Honours Bachelor of Science, the Honours Bachelor of Arts and the General Bachelor of Arts. The Honours degree programs comprise 4 years of study with the opportunity to specialize in a particular area of Dance in the fourth year through a major research project, special seminars and workshops.

The General degree program comprises 3 years of study and is designed for students who are interested in acquiring an overall knowledge of the subject of Dance.

Course Requirements

To be eligible for the Honours BSc degree or the Honours BA degree in Dance, students must successfully complete 22.0 course credits, and maintain an overall cumulative average of 60% and a cumulative average of 67% in their dance courses. To be eligible for the General BA degree, students must successfully complete 15.0 course credits and maintain a minimum overall cumulative average of 60% and a minimum cumulative average of 63% in their dance courses.

Honours Bachelor of Science Degree Program

A) Required Dance Courses
   DANCE 110, 111, 346, 347, 364, 410, 411, 412
   2 of DANCE 220, 221, 225
   2 of DANCE 230, 231, 233
   2 of DANCE 241, 242, 341, 342

B) Required Outside Courses
   BIOL 230, 233; CS 118; MATH 106; PHYS 103; MUSIC 150G, 151G; PSYCH 101, ANTH 102A

C) Required Kinesiology Courses
   KIN 102, 200, 222, 255, 300, 321, 330; plus 3 additional courses in the bio-physical area of Kinesiology.

D) DANCE Electives
   4 term-courses in DANCE.

E) Other Electives
   At least 3 of the 7 term course electives must be selected from the offerings of the Faculty of Science.

Honours Bachelor of Arts Degree Program

A) Required Dance Courses
   DANCE 110, 111, 336, 410, 411, 412
   2 of DANCE 220, 221, 225
   2 of DANCE 230, 231, 233

Suggested Course Sequences

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>DANCE 110</td>
<td>BIOL 230</td>
<td>KIN 300</td>
<td>DANCE 410</td>
</tr>
<tr>
<td>MUSIC 150G</td>
<td>KIN 200</td>
<td>DANCE 230</td>
<td>DANCE 411</td>
</tr>
<tr>
<td>MATH 106</td>
<td>KIN 222</td>
<td>DANCE 230 or 242</td>
<td>ELECTIVE</td>
</tr>
<tr>
<td>KIN 102</td>
<td>DANCE 241 or 242</td>
<td>DANCE 364</td>
<td>ELECTIVE</td>
</tr>
<tr>
<td>PSYCH 101</td>
<td>ELECTIVE</td>
<td>DANCE 346</td>
<td>ELECTIVE</td>
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Human Kinetics and Leisure Studies

Program Selection

Dance

<table>
<thead>
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<th>Year 1</th>
<th>Year 2</th>
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<th>Year 4</th>
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<tbody>
<tr>
<td>DANCE 110</td>
<td>BIOL 230</td>
<td>KIN 300</td>
<td>DANCE 410</td>
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<tr>
<td>MUSIC 150G</td>
<td>KIN 200</td>
<td>DANCE 230</td>
<td>DANCE 411</td>
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<tr>
<td>MATH 106</td>
<td>KIN 222</td>
<td>DANCE 230 or 242</td>
<td>ELECTIVE</td>
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<td>DANCE 241 or 242</td>
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<td>ELECTIVE</td>
</tr>
<tr>
<td>PSYCH 101</td>
<td>ELECTIVE</td>
<td>DANCE 346</td>
<td>ELECTIVE</td>
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<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
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<tbody>
<tr>
<td>DANCE 110</td>
<td>BIOL 230</td>
<td>KIN 300</td>
<td>DANCE 410</td>
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<tr>
<td>MUSIC 150G</td>
<td>KIN 200</td>
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<td>DANCE 346</td>
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<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
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</thead>
<tbody>
<tr>
<td>DANCE 110</td>
<td>BIOL 230</td>
<td>KIN 300</td>
<td>DANCE 410</td>
</tr>
<tr>
<td>MUSIC 150G</td>
<td>KIN 200</td>
<td>DANCE 230</td>
<td>DANCE 411</td>
</tr>
<tr>
<td>MATH 106</td>
<td>KIN 222</td>
<td>DANCE 230 or 242</td>
<td>ELECTIVE</td>
</tr>
<tr>
<td>KIN 102</td>
<td>DANCE 241 or 242</td>
<td>DANCE 364</td>
<td>ELECTIVE</td>
</tr>
<tr>
<td>PSYCH 101</td>
<td>ELECTIVE</td>
<td>DANCE 346</td>
<td>ELECTIVE</td>
</tr>
<tr>
<td>ELECTIVE</td>
<td>ELECTIVE</td>
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</tbody>
</table>
## B) Required Outside Courses
- MUSIC 150G, 151G; PSYCH 101; ANTH 102A; KIN 200; two term courses from Drama and/or Fine Arts and the equivalent of 1 full language course or 2 of DANCE 241, 242, 341, 342.

## C) Dance Electives
Eight term courses in Dance.

## D) Other Electives
At least 8 of the 17 term course electives must be taken within the Faculty of Arts.

### Suggested Course Sequences

#### Year 1
- **DANCE 110**
- **DANCE 111**
- **MUSIC 150G**
- **MUSIC 151G**
- **PSYCH 101**
- ANTH 102A
- **DRA 101 or Fine Arts**
- **DANCE Elective**
- **Elective**

#### Year 2
- **DANCE 230**
- **DANCE 231 or 233**
- **KIN 200**
- one of DANCE 221, 225
- **DANCE 241 or 242**
- **DANCE 341 or 342**
- **Elective**
- **DANCE Elective**
- **Elective**

#### Year 3
- **DANCE 336**
- one of DANCE 221, 225
- **DANCE 220 or Elective**
- **DANCE Elective**
- **DANCE 220 or Elective**
- **DANCE Elective**
- **Elective**
- **Elective**

#### Year 4
- **DANCE 410**
- **DANCE 411**
- **Elective**
- **DANCE Elective**
- **Elective**
- **Elective**

### Technique Courses
Technique is a highly valuable tool for students in all areas of dance. Ballet, Modern, Folk and Jazz Techniques are offered from beginning to advanced levels. Students may pursue these classes to the technical level of their interest and need. All technique courses 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 in other HKLS programs.

### Note
Students should plan their program with a faculty advisor so that courses are selected in the appropriate sequence.
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 22.0 course credits 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 407, 410
   One of: ENGL 109 or 210 (recommended for Year 1 or 2)
   One of: PHIL 226, 250 (recommended for Year 4)
   Two of: BIOL 211, 240, 241, 330, 441, HLTH 302, 303

e) Free electives:
   12 term courses selected in consultation with the student’s advisor.

Course Sequence

| Year 1 (Co-op and Regular) |  |  |
|----------------------------|  |  |
| **Fall**                   | **Winter**                |
| HLTH 140                   | HLTH 141                  |
| PSYCH 101                  | SOC 101                   |
| BIOL 230                   | BIOL 233                  |
| CHEM 123                   | CHEM 124                  |
| CHEM 123L                  | CHEM 124L                 |
| 1 Elective                 | 1 Elective                |

| Year 2                     |  |  |
|----------------------------|  |  |
| **Fall**                   | **Winter**                |
| HLTH 220                   | HLTH 241                  |
| HLTH 245                   | HLTH 346                  |
| KIN 317                    | BIOL 239                  |
| 2 Electives                | 3 Electives               |

| Year 3                     |  |  |
|----------------------------|  |  |
| 4 Electives                |  |  |

| Year 4                     |  |  |
|----------------------------|  |  |
| 4 Electives                |  |  |

Regular Program

| Year 2                     |  |  |
|----------------------------|  |  |
| **Fall**                   | **Winter**                |
| HLTH 340                   | HLTH 344                  |
| HLTH 349                   | HLTH 348                  |
| KIN 222                    | KIN 330                   |
| 4 Electives                | CS 316                    |
| 2 Electives                |  |  |

Year 4

| 4 Electives                |  |  |

Co-operative Programs

| Year 2                     |  |  |
|----------------------------|  |  |
| 2A (Fall)                  | 2B (Spring)               |
| HLTH 220                   | HLTH 346                  |
| HLTH 245                   | HLTH 348                  |
| KIN 222, 317               | HLTH 349                  |
| 1 Elective                 | KIN 330                   |
| BIOL 239                   |  |  |

| Year 3                     |  |  |
|----------------------------|  |  |
| 3A (Winter)                | 3B (Fall)                 |
| HLTH 241                   | HLTH 340                  |
| HLTH 344                   | HLTH 442                  |
| CS 316                     | 5 Electives               |
| 3 Electives                | 2 Electives               |

| Year 4                     |  |  |
|----------------------------|  |  |
| 4B (Winter)                |  |  |
| HLTH 431                   | HLTH 432                  |
| 5 Electives                | HLTH 443                  |
| 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. 22.0 course credits including -
   Kinesiology required courses:
   Health Studies required courses:
   HLTH 140, 141, 241, 245, 348, 349, 442, 445
   Outside Required:
   BIOL 230, 233, CHEM 123, 124 (plus 123L, 124L), CS 118 or 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 340, 344, 346, 410, 443, 1 of PHIL 226, 258.
   c) Free - 2 term courses chosen from any department within the University.
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 22.0 course credits 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 116 or 118 or 316, PSYCH 101, and SOC 101.

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.

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 20.0 course credits including the following requirements:
   a) Required Kinesiology Courses:
      KIN 102, 103, 200, 222, 252, 255, 300, 317, 321, 335, 354.
   b) Required Courses from other departments:
      PHYS 103, PHYS 105, BIOL 230, BIOL 233, MATH 106, CS 116 or 118 or 316, PSYCH 101, SOC 101.
   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

Year 1
(Common to Regular and Co-operative programs)

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>KIN 102</td>
<td>KIN 116 (if necessary)</td>
</tr>
<tr>
<td>KIN 103</td>
<td>KIN 255</td>
</tr>
<tr>
<td>BIOL 230</td>
<td>BIOL 233</td>
</tr>
<tr>
<td>MATH 106</td>
<td>PHYS 103</td>
</tr>
<tr>
<td>PSYCH 101</td>
<td>Elective*</td>
</tr>
</tbody>
</table>

*Students may choose a computer science course in place of an Elective in Year 1. If a computer science course is not chosen in Year 1 it must be completed by the end of 3A or 3N.
Regular Program

Year 2
Fall
KIN 200  KIN 222  SOC 101  PHYS 105  Elective
Winter
KIN 252  KIN 321  KIN 335  KIN 354  Elective

Year 3
Fall
KIN 300  KIN 317  Elective
Winter
KIN 330†  5 Electives

Year 4
Fall
KIN 431† or 433†  KIN 470†  5 Electives
Winter

Co-operative Programs

2A Fall
KIN 200  KIN 222  SOC 101  PHYS 105  Elective
2B Spring
KIN 252  KIN 321  KIN 335  KIN 354

3A Winter  3B Fall
6 Electives
KIN 300  KIN 317  4 Electives

4A Spring  4B Winter
KIN 431 or KIN 433  KIN 470†  5 Electives

*Note
All students in Year 1 are Honours' students. †for Honours students only.

Joint Honours Degrees
Joint Honours degrees with Recreation, 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

Forty-four term courses of at least 0.5 credits each are required for the Honours degree in Recreation in both the Co-operative and Regular programs. The student begins study in one of the 4 areas of concentration available in the second year of the program. Joint Honours programs are available. Minors are available in most subject areas. Students should consult with the Undergraduate Officer in the Department concerned for specific academic requirements. A Business Option with Wilfrid Laurier is also offered.

Degree Requirements

A) Recreation courses (22):

1. Required:

a) REC 100, 101, 201, 210, 230, 250, 270, 371, 399, 470, 471.

b) Each student normally must include in his program the 5 courses listed in 1 of the following areas of concentration:

- Therapeutic Recreation: REC 200, 252, 253, 254, 361.
- Recreation Administration: REC 312, 316, 320, 334, 410.
- Outdoor Recreation: REC 316, 332, 334, 432, 434.

2. Recreation Electives:
Each student must complete additional Recreation electives to meet the required total of 22 Recreation courses.

B) Courses outside the Department of Recreation:

1. Required: (8)

- PSYCH 101 and SOC 101
- Two English Courses
- Select 1 course from 4 of the following 6 categories:
  a) BUS 121W
  b) ECON 101
  c) A Fine Arts or Performing Arts course
  d) GEOG 101 or ENV S 195B
  e) A Natural or Physical Science course
  f) PLAN 156

2. Non Recreation Electives: (14)
**Course Sequence**

**Year 1 (Co-op and Regular)**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>REC 100, 250</td>
<td>REC 230, 101</td>
</tr>
<tr>
<td>one of ENGL 109, 140, 150 or 209</td>
<td>one of ENGL 110, 141, 151 or 210</td>
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<tr>
<td>PSYCH 101</td>
<td></td>
</tr>
<tr>
<td>2 Restricted Electives</td>
<td>2 Restricted Electives</td>
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**Year 2**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>REC 201, 210, 270</td>
<td>3 Recreation Electives</td>
</tr>
<tr>
<td>3 University Electives</td>
<td>3 University Electives</td>
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**Year 3**

<table>
<thead>
<tr>
<th>REC 371</th>
<th>REC 399</th>
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<tbody>
<tr>
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<tr>
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**Year 4**

<table>
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<th>REC 470</th>
<th>REC 471</th>
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<tr>
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<td>2 Recreation Electives</td>
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<tr>
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**Co-operative Program**

**Year 2**

<table>
<thead>
<tr>
<th>2A (Fall)</th>
<th>2B (Spring)</th>
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<tbody>
<tr>
<td>REC 201, 210, 270</td>
<td>3 Recreation Electives</td>
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<tr>
<td>3 University Electives</td>
<td>3 University Electives</td>
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</table>

**Year 3**

<table>
<thead>
<tr>
<th>3A (Winter)</th>
<th>3B (Fall)</th>
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</thead>
<tbody>
<tr>
<td>REC 371</td>
<td>REC 399</td>
</tr>
<tr>
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<td>2 Recreation Electives</td>
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<tr>
<td>2 University Electives</td>
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**Year 4**

<table>
<thead>
<tr>
<th>4A (Spring)</th>
<th>4B (Winter)</th>
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<tbody>
<tr>
<td>REC 470</td>
<td>REC 471</td>
</tr>
<tr>
<td>2 Recreation Electives</td>
<td>2 Recreation Electives</td>
</tr>
<tr>
<td>2 University Electives</td>
<td>2 University Electives</td>
</tr>
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**Options**

An Option is a specified combination or grouping of courses which provides the student with another emphasis in a particular program.

**Honours Recreation and Business Option**

In this program, students take Business courses at Wilfrid Laurier University. The 44 term courses must include:

- a) The 22 term courses required of all Recreation students.
- b) The 8 outside courses required of all Recreation students.
- c) 8 Business or Economics courses including BUS 121W, 352R, 383R, 388, and 398.
- d) 6 electives.

**Minors**

A Minor is a group of approved courses taken by an Honours student in a subject area outside of Recreation. Minors are available in most Departments at Waterloo. Students interested in pursuing a Minor should consult with the Department offering the Minor.

**Joint Honours Degrees**

Joint Honours degrees with Geography, Man-Environment Studies, Psychology, Sociology, and Kinesiology are available. 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 are available with Business, Legal Studies, Canadian Studies, and Public Administration.
Integrated Studies Program
Integrated Studies

An Opportunity for the Individual to Develop an Independent Program of Study

Integrated Studies, a small undergraduate program, was established within the University of Waterloo in 1969 for students who desire to create their own programs of study. While students may apply their studies toward a baccalaureate degree (it is an option, not a requirement), the Program's emphasis is to provide individuals with the opportunity to explore their learning interests.

Integrated Studies is distinctive in that the students are encouraged to engage in independent study and to develop a perspective beyond that of a single discipline. At the same time, the daily life of the Program reflects the broad diversity of the people within it. This community promotes a degree of interaction and sharing seldom found in a university setting, including much spontaneous learning, debates, discussions and plain fun. Finally, the students play the primary role in the operation of the overall Program.

Self Government
The students, in conjunction with the Resource Persons and staff, are responsible for the government of Integrated Studies through their participation in Operations Council. Council normally meets every second week to receive reports and recommendations from its committees, composed of members of the Program, and to decide on all matters affecting the Program's operation, with the exception of the BIS degree. Standing committees are concerned with such items as admission of students, budget development, hiring of personnel, student project assistance, and year end reviews.

Through Council, Integrated Studies attempts to foster the students' development by making a wide variety of resources accessible to them. This includes providing financial assistance for individual travel, conference and research expenses, allocating computer time, sponsoring seminars and conferences, and hiring Resource Persons.

Resource Persons
The Program's Resource Persons serve as tutors and advisors in the students' formulation and pursuit of their studies. As the Resource Persons are normally broadly experienced in interdisciplinary study, they are able to identify connections among areas of knowledge. From their experience in the University and the community they direct students to specialized areas of expertise or particular facilities to further their study and expand their interests.

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 Resource Persons. 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.

Year-End Reviews
Students are encouraged to document the structure and pursuit of their studies as their programs develop. They are required to report yearly on this development. It is suggested that they indicate the nature of their studies, resources used (personnel, facilities and materials) provide a critical evaluation of their education year indicating particular achievements and difficulties, and perhaps include examples of their work and evaluation by others.

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 Operations Council in consultation with the Vice-President, Academic.

The current Resource Persons are: Scott Arnold, Donna Lee Rerg, Maurice Constant, Anne Dagg, Maclean Jamieson, Samuel Randor, Rachel Vigier.
Disasters. During a term as a visiting student at the University of Alberta, where she had earlier completed examiners of preventative mental health community on the theme of her studies, she undertook training in psychodrama. Following the health services for victims of natural and technological psychopathology, its clinical treatment and social bases, engaged in tutorials and independent studies in psychotherapy, and a graduate psychology course in crisis intervention. In addition to completing practicums at Cambridge and at a transition house for battered women in Kitchener, she observed group counseling 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 3 senior undergraduate courses in 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 counseling, 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 counseling 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 3 senior undergraduate courses in 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 counseling, 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 counseling 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

Integrative Studies

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 counseling, 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 counseling 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 Integrative 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 Integrative 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 Integrative 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 Integrative 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 Integrated 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 Integrated 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 Integrated 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 Integrated 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 Integrated Studies “because the structured courses do not entirely match my interests”. His principle 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 the University of Cambridge. 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 Integrated Studies, and
3. an indication of the type of exploration proposed.

Candidates are also encouraged to submit letters of reference assessing their ability to pursue their proposed programs.

All applicants residing within a reasonable distance of the University are then interviewed by the Admissions Committee consisting of students and Program staff. Decisions on the remaining applicants are made solely on the submitted material.

Applicants with limited formal education are favourably received 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 Integrated 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 Gloria Smith, Coordinator of the Integrated Studies Program, at Extension 2368 in Room 1054, the Psychology, Anthropology and Sociology (PAS) Building.
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 may also register in Mathematics programs through St. Jerome's College.

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

General admission requirements and procedures are outlined in detail in Chapter 2. The following policies relate specifically to the Faculty of Mathematics.

Admission as an Adult Student

Any student who has been away from formal education for more than 2 years and who does not possess the minimum requirements for admission may apply as an adult student. However, as a minimum, applicants should have covered the material in the 3 required Ontario Grade 13 mathematics courses (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.)

Advanced Standing

1. 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 mark of 50-59% in a mathematics course equivalent to a course required for a BMath degree could give the student exemption from that requirement but not a credit toward the degree.

   A 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 elective (non-math) half-credits, with a possibility of exemptions in certain math courses.

Note

Students transferring from other post-secondary institutions or other University of Waterloo faculties 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.

2. Cumulative Averages

   Grades in courses taken at the University of Waterloo prior to a student's admission to the Faculty of Mathematics will normally be included in overall and mathematics cumulative averages if the courses are ones that a student registered in the Math Faculty might take for credit toward a BMath degree. Otherwise, the grades are 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.

3. 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 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 considered automatically for the Regular program.

Part-time Studies
Students wishing to work toward a BMath degree on a part-time basis must meet the 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 elective courses is available in the evenings, particularly during the Fall/Winter sessions.

The BMath Pass degree may be obtained entirely by part-time studies, either on campus or by correspondence; the BMath General degree requires at least 2 complete terms on campus; the BMath Honours degree requires at least 4 complete terms on campus.

Applicants who do not meet the 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 Specific Programs in Mathematics
There are 3 admission categories for the Faculty of Mathematics: Co-op Mathematics (Chartered Accountancy Option), Co-op Mathematics (except C.A.), and Regular Mathematics. Clearly, students admitted in the first of these categories are associated with a particular Honours program beginning in Year 1. Students admitted in the other 2 categories, however, identify with a specific program in the Faculty commencing at different year levels, depending upon admission category and program of interest.

The only students to be admitted to specialized Honours Mathematics programs in Year 1 are Co-op students who wish to register in one of the following:

- Actuarial Science
- Applied Math with Engineering Electives
- Math/Chartered Accountancy Option
- Math/Management Accountancy Option

All other Math students register in the non-specialist Faculty Honours program in Year 1 (labelled Honours Co-op Math or Honours Regular Math). In subsequent years, beginning with Year 2, students may elect to enter a specialized program or choose to remain registered in the non-specialist Faculty 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.

At present, the only restricted enrolment programs in the Faculty of Mathematics are:

- Co-op Math/Chartered Accountancy Option
- Co-op Math/Teaching Option
- All Computer Science Major programs

However, because of limited resources and varying demands, there may be occasions when other specific programs within the Faculty of Mathematics are not able to accommodate all qualified applicants. Every effort will be made to avoid such situations and to provide acceptable alternatives, but the Faculty cannot guarantee in advance that any specific program will be free of enrolment restrictions.
Academic Programs/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 for 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 wish more latitude in the depth and breadth of their course selection. The Pass program is a relatively non-specialized course of study intended primarily for students who wish to pursue a more general education and include a larger proportion of non-math electives in their programs. It could also be chosen by those wishing to take a substantial number of mathematics courses but who, for one reason or another, wish to complete their degrees in 3 years. 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.

The common mathematics curriculum in the first 2 years of study permits considerable flexibility for students to change from one academic program to another within the Faculty of Mathematics. In fact, if non-mathematics electives are judiciously chosen, this flexibility extends to many programs in other faculties as well.

The following tables and accompanying descriptions outline in detail the degree requirements and typical course load for each 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 entitled Regulations and Procedures for Co-operative Programs, available from the Department of Co-ordination 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.

### 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 half-credits&lt;sup&gt;1&lt;/sup&gt;</td>
<td>44 or 48 (See Note 1)</td>
<td>42</td>
<td>32</td>
</tr>
<tr>
<td>Minimum Math half-credits&lt;sup&gt;2&lt;/sup&gt;</td>
<td>24 to 30 (See Note 2)</td>
<td>24</td>
<td>12</td>
</tr>
<tr>
<td>Minimum elective half-credits&lt;sup&gt;3&lt;/sup&gt;</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Minimum Graduating Math Average&lt;sup&gt;4&lt;/sup&gt;</td>
<td>65%</td>
<td>60%</td>
<td>60%</td>
</tr>
<tr>
<td>Minimum Graduating Overall Average&lt;sup&gt;4&lt;/sup&gt;</td>
<td>65%</td>
<td>60%</td>
<td>60%</td>
</tr>
<tr>
<td>Maximum Course Attempts&lt;sup&gt;5&lt;/sup&gt; (or equivalent)</td>
<td>60 half-credits</td>
<td>54 half-credits</td>
<td>44 half-credits</td>
</tr>
<tr>
<td>Maximum Failures&lt;sup&gt;6&lt;/sup&gt; (or equivalent)</td>
<td>6 half-credits</td>
<td>8 half-credits</td>
<td>8 half-credits</td>
</tr>
<tr>
<td>Minimum Complete Terms Required&lt;sup&gt;7&lt;/sup&gt;</td>
<td>4 or 8 (See Note 7)</td>
<td>2</td>
<td>none</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 and Joint Honours Pure Math with Statistics. These programs require a minimum total of 44 half-credits, providing that the student has at least 8 complete terms. (See Footnote 7.)

2. The term 'math half-credit' includes courses with abbreviations ACTSC (Actuarial Science), AM (Applied Mathematics), C&O (Combinatorics and Optimization), CS (Computer Science), MATH (non-departmental faculty courses), PMATH (Pure Mathematics), and STAT (Statistics).

   All Honours Math 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 Accountancy Options require 24, Honours Pure Math and Joint Honours Pure Math with Statistics require 26; the Computer Science-Information Systems Option requires 27 math half-credits. See detailed program descriptions on the following pages.

   Note that 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.

3. The term 'elective half-credit' refers to courses offered by other faculties as well as those with the abbreviation MTHEL. A two-term (i.e. 8 month) course is equivalent to 2 one-term (i.e. 4 month) courses.

4. i) The Graduating Math Average is based on the specified minimum number of successfully completed math half-credits (12 for Pass; 24 for General; 24 to 30 for Honours, depending on the particular program). All Faculty and Departmental courses required for a particular program are included in this average.

   ii) The Graduating Overall Average is based on the specified minimum number of successfully completed half-credits (44 or 48 for Honours, depending on the particular program; 42 for General; 32 for Pass) submitted for the particular degree. It includes all the math courses on which the Graduating Math Average is based and all required electives.

5. 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 carrying 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 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 Standards and Promotions Committee.

   A course attempt refers to a course registration not formally cancelled with the Registrar's Office before the drop deadline in the term in which the course is taken. Further, if a 2-term course registration is cancelled after the drop deadline in the first term of the course but before the drop deadline in the second term of the course, the course will be recorded as a half-credit course attempt.

6. A course attempt not successfully completed constitutes a course failure. Further, a 2-term course registration cancelled between drop deadlines (see 5. above) constitutes an unsuccessfully completed half-credit course attempt, hence a half-credit failure.

7. A complete term (i.e. 4 months) is normally one in which a student successfully completes at least 5 half-credits on campus. For purposes of satisfying the requirements for a complete term, each term of a 2-term course will be regarded as a successfully completed half-credit, providing that the student successfully completes the 2-term course. Students in Honours Pure Math or Joint Honours Pure Math with Statistics require at least 8 complete terms if they wish to graduate with 44 half-credits instead of 48.
Mathematics
Required Faculty Core Courses
Typical Course Loads

English Writing Skills
B.Math 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 108K, 109, 129R, 150 and 210).

B.Math 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.

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; 2 of CS 140, 180, 234, 235, 250; 6 elective half-credits.</td>
<td>MATH 130a/b; MATH 134a/b; 2 of CS 140, 180, 234, 235; 6 elective half-credits.</td>
<td>MATH 130a/b; MATH 134a/b (See Note 4); 2 of CS 140, 180, 234, 235; 6 elective half-credits.</td>
</tr>
<tr>
<td>Year 2'</td>
<td>MATH 230a/b; MATH 234a/b; STAT 230, 231; 2 math half-credits; 2 elective half-credits; 2 elective or math half-credits.</td>
<td>MATH 220a/b; MATH 224a/b; STAT 220/221; 2 elective half-credits; 2 elective or math half-credits.</td>
<td>4 math half-credits; 3 elective half-credits; 3 elective or math half-credits.</td>
</tr>
<tr>
<td>Year 3</td>
<td>6 or 8 math half-credits (depending on the particular program); 2 elective half-credits; 2 elective or math half-credits.</td>
<td>6 math half-credits; 2 elective half-credits; 2 elective or math half-credits.</td>
<td>4 math half-credits; 3 elective half-credits; 3 elective or math half-credits.</td>
</tr>
<tr>
<td>Year 4</td>
<td>6 or 8 math half-credits (depending on the particular program); 2 elective half-credits; 2 elective or math half-credits.</td>
<td>6 math half-credits; 2 elective half-credits; 2 elective or math half-credits.</td>
<td>not applicable.</td>
</tr>
</tbody>
</table>

Footnotes to Table 1 (b)

1. Table 1 (b) describes the general framework and 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 abbreviations ACTSC (Actuarial Science), AM (Applied Mathematics), C&O (Combinatorics and Optimization), CS (Computer Science), MATH (non departmental faculty courses), PMATH (Pure Mathematics); and STAT (Statistics). The term ‘elective half-credit’ refers to courses offered by other faculties as well as those with the abbreviation MTHEL. A two-term (i.e., 8-month) course is equivalent to 2 one-term (i.e., 4-month) courses.

3. On-campus students in the Pass program normally take MATH 130a/b, 134a/b, and 2 of CS 140, 180, 234, 235. However, in exceptional circumstances (for example, in the Correspondence program) Pass students may take MATH 113a/b (or 115a/b) in place of 130a/b, Math 111a/b in place of 134a/b, and CS 116/117.

4. Some flexibility exists to permit the scheduling of courses in a different manner than that shown in Table 1 (b), provided that course pre-requisites have been met. In certain cases, substitutions among corresponding Advanced Honours, Honours, and General level courses may be made in the Faculty core. See Section 4.1 in Mathematics Faculty Policies.
Departmental Honours Programs: Requirements and Recommendations

Except where noted Honours programs may be taken on either the Regular or Co-operative system of study.

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 and Employee Benefit Programs. The courses offered provide theoretical preparation for the first five examinations of the Society of Actuaries, and include studies of such subject areas as Mathematics of Finance, Life Contingencies, Theory of Risks, and Demography.

By carefully selecting their electives, students can also gain valuable background knowledge in economics, finance, administration, and law.

Honours Actuarial Science

Faculty core requirements as outlined in Table 1(b) on page 13.6 (with CS 140, 180 recommended in Year 1) and:

ACTSC 231, 232, 331, 332, 431, 432;
MTHEL 305a;
STAT 333;
4 of AM 381, C&O 370, CS 337, MATH 332b (or PMATH 352a), PMATH 331 (or 351a), 334 (or 344), STAT 330, 331;
4 additional 400-level math half-credits including at least 2 of ACTSC 451, 452, 453, 454, 455, 456, 458, 463.

MTHEL 305a/b is recommended for Co-op students in Year 1 and for Regular students in Year 1 or 2.
Honours students in another department in the Faculty of Mathematics wishing a "double Major" or a "Minor" in Actuarial Science should consult the section "Combination Honours Programs within the Faculty of Mathematics" which begins on page 13.12.

Applied Mathematics

Traditionally, Applied Mathematics has been almost synonymous with Mathematical Physics but times change and today Applied Mathematics, while retaining its interest in the physical sciences, is broadening its scope and is becoming concerned with the applications of mathematics to the social and biological sciences. To handle the types of problems that arise in these areas, the Applied Mathematician requires 2 things: a firm background in mathematics with a mastery of techniques and an ability to understand a problem when that problem is stated in the language of biology, economics, engineering, chemistry, physics or business.

With these considerations in mind, the Honours Applied Mathematics program has been developed as follows. In the first 2 years the student takes essentially the same program as every other Mathematics student and acquires a basic mathematical background. In Year 3, he/she studies the mathematics needed by an applied mathematician. In the fourth year, in addition to broadening his/her mathematical background, the student can apply his/her acquired mathematical skills to problems in various fields such as: Fluid Mechanics, Differential Equations, Quantum Mechanics and General Relativity.

It is our belief that a graduate from this program will be able to turn his/her hand to many things such as meteorology, oceanography, seismic exploration, supersonic flow, the problems of navigation in space, control problems, ecological population studies and the study of epidemics.


For those students who wish a strong emphasis on Physics, the Department offers the program "Honours Applied Mathematics with Physics Electives".

Honours Applied Mathematics

Faculty core requirements as outlined in Table 1(b) on page 13.6 (with CS 140 required in Year 1) and:

MATH 332b or PMATH 352a; 1 of PMATH 331, 351a, CS 337;
A minimum of 8 Applied Math half-credits at the 300 or 400-level, at least 2 of which must be at the 400-level.
AM 260, 270 recommended.
PMATH 334 or 344 recommended.
PHYS 121/122 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
Faculty core requirements as outlined in Table 1 (b) on page 13.6 (with CS 140 required in Year 1) and:

- AM 371, 381, 391;
- 1 of CS 235, 250;
- CS 240, 340, 375;
- C&O 230;
- MATH 332b or PMATH 352a;
- 4 additional AM half-credits at the 300- or 400-level, at least 2 of which must be at the 400-level;
- 4 additional CS half-credits at the 300- or 400-level, at least 2 of which must be at the 400-level;
- 1 additional AM or CS half-credit at the 300- or 400-level;
- PHYS 121/122 recommended in Year 1.
- AM 260 and 270 recommended.
- PMATH 334 or 344 recommended.

Honours Applied Mathematics with Electives in Engineering (Co-operative only)
Faculty core requirements as outlined in Table 1 (b) on page 13.6 (with CS 140, 235 required in Year 1) and:

- AM 260, 270, 371, 381, 391, MATH 332b (or PMATH 352a)
- 4 of AM 340, 362, 365, 380A, 380B, CS 334, 337, C&O 350, 370, 371, PMATH 331 (or 351a), 334 (or 344), STAT 333, 433;
- A minimum of 6 AM half-credits at the 300- or 400-level with at least 2 at the 400-level.

Electives 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 109/101.

Electives required in Years 2, 3 and 4:
1 course per term from the chosen Engineering Group.

Group A
- ME 219, 220;
- 4 from ME 351, 354, CIV E 303, 304, 403, 404, 405, 413, 414, 415.

Group B
- SY DE 282, 555; 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;
- 5 of EL E 208, 231, 261, 262, 318, 332, 342, 371, 380, 419, 434, 435, 436, 453, 454, 463, 484, 481, 482.

Group E
- EL E 123, 126, 261, 262, 371, 380;
- 1 of EL E 342, 463, 464, 481, 482.

Honours Combinatorics and Optimization
Faculty core requirements as outlined in Table 1 (b) on page 13.6 and:

- 1 of CS 337, PMATH 331, 351a;
- 1 of MATH 332b, PMATH 352a;
- PMATH 334 (or 344);
- C&O 230, 350;
- 1 of C&O 330, 342;
- 1 of C&O 351, 367;
- 3 additional courses chosen from C&O 330, 331, 342, 343, 351, 367, 430 through 466;
- At least 3 additional 300 or 400-level math half-credits, which must include at least 2 half-credits with a prefix other than C&O.

Combinatorics and Optimization

Combinatorics is the mathematics of discretely structured problems. Although its boundaries are not easily defined, Combinatorics includes the theories of graphs, enumeration, designs, and polyhedra. It is a very old subject which in the past was studied principally for its aesthetic appeal. Today's modern technology, with its vital concern for the discrete, has given Combinatorics new challenges and a new seriousness of purpose. In particular, since computers require discrete formulations of problems, Combinatorics has become indispensable to modern Computer Science.

Optimization, or mathematical programming, is the study of maximizing and minimizing functions subject to specified boundary conditions or constraints. The functions to be optimized arise in engineering, the physical and management sciences, and in various branches of mathematics. With the emergence of the computer age, Optimization experienced a dramatic growth as a mathematical theory, enhancing both Combinatorics and classical analysis. In its applications to the management and engineering sciences, Optimization forms an important part of the discipline Operations Research.

Both Combinatorics and Optimization have long been special interests of Canadian Mathematicians. Indeed, Waterloo was the first university in the world to have a Department of Combinatorics and Optimization, and it continues to be a leading centre for teaching and research in the theories and applications of these disciplines.

Honours Combinatorics and Optimization
Faculty core requirements as outlined in Table 1 (b) on page 13.6 and:

- 1 of CS 337, PMATH 331, 351a;
- 1 of MATH 332b, PMATH 352a;
- PMATH 334 (or 344);
- C&O 230, 350;
- 1 of C&O 330, 342;
- 1 of C&O 351, 367;
- 3 additional courses chosen from C&O 330, 331, 342, 343, 351, 367, 430 through 466;
- At least 3 additional 300 or 400-level math half-credits, which must include at least 2 half-credits with a prefix other than C&O.
Joint Honours Combinatorics and Optimization with Computer Science

Faculty core requirements as outlined in Table 1 (b) on page 13.6 (including CS 140 in Year 1) and:

1 of MATH 332B, PMATH 331, 351a, 352a;
PMATH 334 (or 344);
C&O 230, 342, 350;
CS 240, 250, 340;
1 of C&O 375, 466;
3 of C&O 330, 331, 343, 351, 367, 430 through 466;
4 additional CS half-credits at the 300- or 400-level with at least 2 at the 400-level. (If CS 466 is selected instead of C&O 375 above, only 1 additional 400-level CS course need be included in these 4 additional CS half-credits.)

Honours students in another Department in the Faculty of Mathematics wishing a "double Major" or a "Minor" in Combinatorics & Optimization should consult the section "Combination Honours programs within the Faculty of Mathematics" which begins on page 13.12.

Computer Science

Computer Science is centred around the study of information. It is concerned with the nature and properties of information, its structure and classification, its storage and retrieval, and the various types of processing to which it can be subjected. It is also concerned with the physical machines that perform these operations, with the elemental units of which these machines are composed, with the organization of these units into efficient information processing systems, and with the exploration of the limits of the abilities of these machines.

Computer Science is well recognized as an independent discipline with an inherently mathematical nature. Its activity ranges from theoretical areas such as the theory of automata, system organization and logic design, formal languages and computability theory to applied areas such as scientific computing, programming languages, software management and computer systems.

The advent of the computer has led to a systems approach to solving many problems in science, business and industry. There is currently a great demand for information analysts to define how systems will normally be admitted to these programs at the beginning of their second year, based upon their academic performance in 12 half-courses from Year 1. with particular emphasis on their performance in MATH 130a/b, 134a/b, and CS 140. In this context, Computer Science Major programs include Honours Computer Science, Honours Co-op Computer Science with Electrical Engineering Electives, Honours Co-op Computer Science-Information Systems Option, and all Joint and Double Honours BMath programs involving Computer Science as one of the majors. Once admitted to a specific Computer Science Major program, a student may subsequently select a different Computer Science Major program (except possibly Computer Science with Electrical Engineering Electives where enrolment is also limited by Engineering) or apply to transfer to another program in the Faculty of Mathematics.

Notes

1. Application Procedure

Students will apply for the Computer Science Major program of their choice when they preregister for their 2A term. Normally, only students whose all-inclusive math and overall averages from Year 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 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 imply required withdrawal from Honours nor does it disqualify a student from taking Computer Science courses in the non-specialist stream.)
4. Exclusions
Students who have 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
Faculty core requirements as outlined in Table 1 (b) on page 13.6 (with CS 140 required in Year 1) and:

CS 240, 250, 340, 350, 354, 360, 369, 375;
4 additional CS half-credits at the 400-level;
C&O 230; and
At least 4 half-credits chosen from the following:
AM 381, 391, C&O 330, 342, 350, MATH 332b (or PMATH 352a), PMATH 331 (or 351a), 334 (or 344), 430a (or 432a).

Honours Computer Science with Electrical Engineering Electives (Co-operative only)
Computer Science requirements with the following modifications:
exclude CS 250 and CS 369;
include at least 2 of CS 450, 452, 454, 456, 457;
include EL E 123, 208, 222, 323, 332, 427, 438.
EL E 222 and 323 will be treated as math half-credits, in place of CS 250 and 369 respectively, for credit counts and average calculations.

Honours Computer Science - Information Systems Option (Co-operative only)
This program is offered jointly with the Division of Mathematics for Industry and Commerce.
Faculty core requirements as outlined in Table 1 (b) on page 13.6 (with CS 140, 180 required in Year 1) and:

CS 240, 250, 340, 350, 360, 375, 448, 482;
2 additional CS half-credits at the 400-level;
C&O 230;
At least 4 half-credits chosen from the following:**

**Or any 300 or 400-level honours mathematics half-credit, with prefix other than CS, which requires 1 of this group as a prerequisite.

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.

Joint Honours Math Programs with Computer Science
Applied Math, Combinatorics and Optimization, Pure Math and Statistics all have joint Honours programs with Computer Science. Consult pages 13.8, 13.9, 13.11, 13.12 respectively for program requirements.
Pure Mathematics

Pure Mathematics is the study of mathematics both for its own sake and that of possible future applications. A mastery of fundamental areas of mathematics such as algebra, analysis and geometry is essential, not only to the further development of these subjects, but also to their application either to other basic sciences or to technology. Thus, in addition to those who are especially attracted to pure mathematics, the department's programs are designed also for students who wish ultimately to apply their knowledge, but who would prefer to obtain a thorough understanding of mathematics before committing themselves to some particular area of application. Many of those Pure Mathematics graduates who do not become direct appliers of their mathematics enter the field of education, anywhere from the primary level to the most advanced research institute. Our objectives are based on the conviction that the ability to think clearly and precisely, and to continue educating oneself, are valuable in any field of endeavour.

The special interests of the Department include:
Algebra (group theory, representation theory, ring theory, lattice theory, universal algebra, linear and multilinear algebra); Analysis (generalized integrals, real and complex analysis, functional analysis); Geometry (algebraic topology, homotopy theory, differential geometry); Number Theory; Functional Equations and their applications (e.g. to information theory, probability, engineering, science and social science); Logic and Foundations.

The Department offers 3 programs. Two of the 3 programs, namely Honours Pure Mathematics and Joint Honours Pure Mathematics with Statistics, require a total of 44 half-credits with at least 12 electives and at least 26 mathematics half-credits. The Joint Honours Pure Mathematics with Computer Science program requires a total of 48 half-credits with at least 12 electives and at least 30 mathematics half-credits. For all 3 programs, MATH 244b is strongly recommended.

Honours Pure Mathematics
44 half-credits (see Note below) including at least 12 elective and 26 mathematics half-credits. The mathematics half-credits must include:
Faculty core requirements for Years 1 and 2 as outlined in Table 1 (b) on page 13.6 and:
- C&O 230;
- PMATH 344, 351a/b, 352a/b, 367;
- 6 400-level mathematics half-credits, at least 4 of which must be PMATH.

Note
Students will not normally be allowed to graduate from this program in fewer than 8 complete terms if they have fewer than 48 half-credits. 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
48 half-credits including at least 12 elective and 30 mathematics half-credits. The mathematics half-credits must include:
Faculty core requirements as outlined in Table 1 (b) on page 13.6 (with CS 140 required in Year 1) and:
- C&O 230;
- CS 240, 250, 340, 360, 375;
- PMATH 344, 351a/b, 352a;
- 1 of PMATH 352b, 367, 380a, 380b, C&O 342;
- 3 CS half-credits at the 300- or 400-level with at least 2 at the 400-level;
- 4 half-credits from 400-level PMATH courses or from 300- or 400-level CS courses, with at least 2 in PMATH.

Joint Honours Pure Mathematics with Statistics
44 half-credits (see Note below) including at least 12 elective and at least 26 mathematics half-credits. The mathematics half-credits must include:
Faculty core requirements for Years 1 and 2 as outlined in Table 1 (b) on page 13.6 and:
- PMATH 344, 351a/b, 352a, 451a;
- STAT 330, 331, 333, 430, 454;
- 1 of STAT 433, 450;
- 3 additional PMATH half-credits, 2 of which must be at the 400-level.

Note
Students will not normally be allowed to graduate from this program in fewer than 8 complete terms if they have fewer than 48 half-credits. A standard course load in Years 3 and 4 for students in this program is 5 courses per term.
Statistics

Statistics is the branch of modern applied mathematics which deals with the collection and analysis of data. Statistical methods are extensively used in Biology, Medicine, Health Sciences, Agriculture, Business, Economics, Engineering, and many other fields. Claims based on statistical arguments appear daily in the press, and it is difficult to assess these intelligently without some knowledge of statistical methods.

The statistician's first job is to determine what numbers to collect, and how to collect them so that they will be without biases and distortion. These problems are dealt with in the Design of Experiments and Sample Surveys. Statistical Inference is concerned with inferring what the population is like on the basis of a small amount of data (the sample). The link between population and sample is provided by Probability Theory, which forms an important part of the Statistics curriculum. Often the purpose of collecting data is to assist in reaching a decision, so the field of Decision Theory is also a part of Statistics.

Many other areas of pure and applied mathematics find applications in Statistics. Calculus and linear algebra are used extensively in the undergraduate 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 Computer Science is highly desirable.

Honours Statistics

Faculty core requirements as outlined in Table 1 (b) on page 13.6 and:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 330, 331, 333, 430, 450, 454;</td>
<td>4 of AM 371, 381, C&amp;O 330, CS 337, MATH 332b (or PMATH 352a), PMATH 331 (or 351a), 334 (or 344), 351b, 352b;</td>
</tr>
<tr>
<td>At least 4 additional 300- or 400-level math half-credits.</td>
<td></td>
</tr>
</tbody>
</table>

Joint Honours Statistics with Computer Science

Faculty core requirements as outlined in Table 1 (b) on page 13.6 (with CS 140 required in Year 1) and:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 330, 331, 333, 430, 454;</td>
<td>C&amp;O 230;</td>
</tr>
<tr>
<td>CS 240, 250, 340, 375;</td>
<td>1 of AM 371, 381, C&amp;O 330, MATH 332b, PMATH 331, 334, 344, 351a, 352a;</td>
</tr>
<tr>
<td>2 additional STAT half-credits at the 300- or 400-level.</td>
<td></td>
</tr>
</tbody>
</table>

Joint Honours Pure Math with Statistics

This program is described with Pure Mathematics programs.

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.

Mathematics

Statistics

Combination Honours Programs

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" following "Statistics".

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' and '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, Operations Research, Pure Mathematics, and Statistics.

'Y' Minor Requirements

Actuarial Science:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTSC 231, 232, 331, 332, MTHEL 305a;</td>
<td>1 of ACTSC 431, 433;</td>
</tr>
<tr>
<td>1 additional ACTSC half-credit.</td>
<td></td>
</tr>
</tbody>
</table>

Applied Mathematics:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM 270, 365, 371, 381, 391;</td>
<td>2 additional 300- or 400-level AM half-credits.</td>
</tr>
</tbody>
</table>

Combinatorics & Optimization:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>C&amp;O 230, 350;</td>
<td>1 of C&amp;O 330, 342;</td>
</tr>
<tr>
<td>2 of C&amp;O 330, 331, 342, 343, 351, 367, 430 through 466.</td>
<td></td>
</tr>
</tbody>
</table>

Computer Science:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 140, 234, 235;</td>
<td>6 additional CS half-credits.</td>
</tr>
</tbody>
</table>
### Pure Mathematics:
PMATH 344, 351a/b, 352a; 3 additional 300- or 400-level PMATH half-credits, at least 2 of which are 400-level.

### Statistics:
STAT 331, 333; 1 of STAT 332, 454; 2 additional 300- or 400-level STAT half-credits.

### Combination Honours Programs with other Faculties leading to the BMath Degree

In the descriptions below, 'X' refers to any one of Actuarial Science, Applied Mathematics, Combinatorics & Optimization, Computer Science, 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 'X'. In addition to meeting Graduating Average requirements of 'X', students in these programs must also satisfy the Honours average requirements specified by 'Z'.

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthropology</td>
<td>14 half-credits in Anthropology, 12 of which must be at the 200-level or above; these must include ANTH 101, 102a (or 102b), 103 (or 283 or 290), 201, 202, 260, 300, 330, and 499 plus 1 additional 400-level half-credit.</td>
</tr>
<tr>
<td>Economics</td>
<td>101, 102, 201, 202, 231, 301, 302, 311, 321, 401, 402, 421, 422, 1 additional Economics half-credit.</td>
</tr>
<tr>
<td>English</td>
<td>16 English Major half-credits as outlined under &quot;Joint Honours Programs&quot; on page 8.18.</td>
</tr>
<tr>
<td>French</td>
<td>192 or 195/196; 14 additional half-credits in French as outlined under &quot;Joint Honours Programs&quot; on page 8.21.</td>
</tr>
<tr>
<td>Geography</td>
<td>A minimum of 15 half-credits (or equivalent) in Geography (up to 1.5 credits designated Environmental Studies may be counted for credit as Geography courses). Required courses are: GEOG 101, 102, 201a/b, 202, 260, 275, 381; ENV S 200; 1 of GEOG 203, 204, 205, 220, 221; 1 of GEOG 125R, 126R, 127, ENV S 195A or 195B.</td>
</tr>
<tr>
<td>German</td>
<td>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.</td>
</tr>
</tbody>
</table>

### Music
A minimum of 19 half-credits in music as follows: MUSIC 101/102, 201/202, 301/302, 150/151; at least 3 of 253/254, 353/354; at least 3 of 250/251, 370/371; plus 8 additional term courses of which at least 6 must be above the 100-level. These 8 term courses are selected in consultation with the chairman of the Music Department. An honours seminar in Music or a senior honours essay in the other discipline is required.

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, 266/367.

| Philosophy       | 221, 258, 359, 380, 381, 384, 385, 440; 4 additional half-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 courses selection is detailed under "Joint Honours Programs" on page 8.32. |
| Russian          | A minimum of 16 half-credits in Russian; RUSS 101/102 in Year 1 and 4 half-credits in Russian in each of Years 2, 3, 4. |
| Sociology        | 101, 280, 281, 282, 405, 406; 9 additional half-credits in Sociology. The Senior Honours Essay may be written in either 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 departmental area, not necessarily restricted to the disciplines mentioned above) in a faculty other than Mathematics which chooses to make a 'Minor' designation available to Math Faculty students, must be satisfied. The minimum average required in these 10 half-credits is determined by 'Z'.

### Note

BMath transcripts include no more than 2 areas of study.

### Combination Honours Programs leading to a degree in another faculty (i.e. not BMath) are described on page 13.17.
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. 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.

Faculty core requirements as outlined in Table 1 (b) on page 13.6 (with CS 140 required in Year 1) and:

AM 260*, 270*, 340*;
C&O 230, 270*, 350*;
CS 234*, 235*, 334*;
MATH 332b or PMATH 352a;
PMATH 331 or 351a;
STAT 331*;
1 of AM 444, C&O 330, PMATH 334, 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 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.
3. A total of 48 half-credits is required for the program (30 math half-credits, 12 non-math elective half-credits, and 6 non-math or math half-credits).

General Mathematics (Regular Only)
Students enrolled in the General Math/Business Administration, Chartered Accountancy, and Management Accountancy Options are not covered by the degree requirements described in this section. Requirements and recommendations for these Options follow this section.

The degree requirements outlined below apply only to students who enter 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 if they need clarification as to which degree requirements apply to them.

Faculty core requirements as outlined in Table 1 (b) on page 13.6 and:

MATH 322a/b, 324;
1 of CS 337, C&O 350, AM 444;
8 additional math half-credits to include at most 2 with the same prefix (ACTSC, AM, CS, C&O, MATH, PMATH, STAT).

Note
Students are advised to select these 8 half-credits from the following recommended list:

ACTSC 221, 222, 337;
AM 260, 270, 340, 380a/b, 444,
C&O 220, 270, 350, 370, 371, 380, 382;
CS 330, 334, 335, 337, 338, 430, 432, 435, 437;
PMATH 340, 360, 380a/b, 430a/b;
STAT 320, 321, 332, 430, 440, 442, 443.

Pass Mathematics (Regular Only)
Faculty core requirements as outlined in Table 1 (b) on page 13.6.
Mathematics/Business Administration, Chartered Accountancy and Management Accountancy 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 Accountancy. 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 Co-operative systems of study. General level Options are also available in all 3 areas, but only in the Regular system of study.

The Chartered Accountancy and Management Accountancy 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 Accountancy Option is structured so that successful completion of the program normally qualifies a student for 12 RIA 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 able to complete all Institute or Society requirements in as little as 1 year after graduation. Graduates of the Regular program are able to complete all such requirements in as little as 2 years after graduation.

Note
In the requirements and recommendations which follow, courses labelled 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 - Introduction to Marketing
- BUS 362W - Marketing Functions
- 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 Accountancy Options

Faculty core requirements as outlined in Table 1 (b) on page 13.6 (with CS 140, 180 required in Year 1). On entering Year 3, students must specify 1 of the packages a), b), c) listed below:

a) Information Systems Package
   - CS 234, 330, 338, STAT 331;
   - CS 432 or 434;
   - 2 of AM 380a (or PMATH 380a), C&O 350, 367, 370, 454;
   - 1 of STAT 332, 333, 442, 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, 338, STAT 331;
   - 2 of C&O 367, 450, 452, 456, 459, 464, 466;
   - 1 of STAT 332, 333, 442, 443;
   - 2 additional math half-credits.

c) Statistics Package
   - STAT 330, 331, 332, 443, CS 330, 338;
   - 2 of C&O 350, 367, 370, 371, 454;
   - 2 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, C&O 270, CS 434 are recommended for all 3 packages.

The non-math elective half-credits required (together with the term in which these courses are normally taken) are given in the table below.

<table>
<thead>
<tr>
<th>Year/Option</th>
<th>Math/Bus. Admin.</th>
<th>Math/Accountancy Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A ACC 121, ECON 101</td>
<td>ACC 101, ECON 101</td>
<td></td>
</tr>
<tr>
<td>1B ACC 122, ECON 102</td>
<td>ACC 102, ECON 102</td>
<td></td>
</tr>
<tr>
<td>2A BUS 352W, MTHEL 101</td>
<td>ACC 281, MTHEL 101</td>
<td></td>
</tr>
<tr>
<td>2B BUS 362W</td>
<td>ACC 291, M SCI 44</td>
<td></td>
</tr>
<tr>
<td>3A ACC 371, M SCI 44</td>
<td>ACC 251, 292</td>
<td></td>
</tr>
<tr>
<td>3B ACC 372, M SCI 53</td>
<td>ACC 381, 461</td>
<td></td>
</tr>
<tr>
<td>4A BUS 481W, 454W</td>
<td>ACC 371, 491</td>
<td></td>
</tr>
<tr>
<td>4B BUS 491W, M SCI 48</td>
<td>ACC 372, 462</td>
<td></td>
</tr>
</tbody>
</table>

Note
In the requirements and recommendations which follow, courses labelled BUS are offered by Wilfrid Laurier's School of Business and Economics. These courses are:
These programs require a minimum of 48 half-credits, at least 24 of which must be math half-credits. This is usually accomplished by including 3 math half-credits each term in Years 2, 3, 4 rather than 4 as implied by Table 1 (b) on page 13.6.

2. In addition to the 65% math and overall 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 required for their program.

3. The explicitly required non-math elective half-credits for the Math/Chartered Accountancy and Management Accountancy Options are identical except for M SCI 44 which is required only in the Management Accountancy Option.

General Mathematics/Business Administration, Chartered Accountancy and Management Accountancy Options
These programs are available only in the Regular system of study.
Faculty core requirements as outlined in Table 1 (b) on page 13.6 (with CS 140, 180 required in Year 1) and:
2 of CS 235, 330, 398;
2 of ACTSC 221, STAT 320, 321 (see Note 2), 332, 333;

The non-math elective half-credits required (together with the term in which these courses are normally taken) are stated in the table in the preceding section for Honours students.

Notes
1. These programs require a minimum of 42 half-credits, at least 24 of which must be math half-credits.

2. STAT 321 is required by the Society of Management Accountants but not for the BMath General degree.

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.

There are various recommended courses which are of special interest to persons interested in a career in teaching. A selection of these may be made in consultation with an Academic Advisor as the student progresses.

Work-term arrangements in this Option differ from other Co-operative programs because of the nature of the program. Details concerning this and the Faculty of Education component are outlined in a separate brochure available upon request.

Honours Mathematics Teaching Option
(Co-operative only)
Faculty core requirements as outlined in Table 1 (b) on page 13.6 and:
PMATH 334 (or 344);
MATH 332b or PMATH 352a;
1 of CS 337, PMATH 331, 351a;
At least 5 of ACTSC 221 (or 231), 222 (or 232),
C&O 230, 270, 380, 382, 480, 481, PMATH 360,
STAT 331, 332;
A total of at least 14 300- or 400-level math half-credits, at least 6 of which must be at the 400-level.
MTHEL 206a;
SOC 207G, PHIL 311.
Recommended electives include PSYCH 212, 213,
PHIL 312, and MTHEL 102.

Notes
1. 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.

2. 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.

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: Economics, French, Geography, German, Man-Environment Studies, Philosophy, Psychology, Russian, Sociology.

The mathematics requirements are: 14 half-credits in mathematics comprised of MATH 130a/b, 134a/b, 230a/b, 234a/b; STAT 230, 231; 2 of CS 115, 118, 234, 235; 2 additional math half-credits which would be valid for BMATH degree credit. A minimum average of 65% is required on the 14 math half-credits.

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' has been introduced for Honours students in another faculty, consisting of 10 half-credits in mathematics comprised of MATH 130a/b, 134a/b; STAT 220, 221; 2 of CS 115, 118, 234, 235; 2 additional math half-credits which would be valid for BMATH degree credit. A minimum average of 65% is required on the 10 math half-credits.

Mathematics
Combination Honours Programs
Mathematics for Industry and Commerce

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 Accountancy
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 Co-ordination 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, 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.
Faculty Policies

1. UNDERGRADUATE STANDINGS & PROMOTIONS COMMITTEE

Membership, Duties, Operating Procedures
The Committee consists of the Dean, Associate Deans for Undergraduate Studies, 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 & 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 a student to discuss his/her 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 6 half-credit failures.

ii) At the end of their first 2 full-time terms of registration, they have failed to complete successfully 8 half-credits, with an average on these 8 half-credits of at least 60%.

iii) 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).

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’. 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.

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 Promotion 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.

2.4 Exceeding Maximum Course Attempts/Failures
A student who, at the end of a specific term, has accumulated all the requirements for a particular degree, but has simultaneously exceeded the maximum number of failures or course attempts permitted for the degree in question will not normally be granted the degree. In some cases, depending upon the circumstances, the student might be eligible for a lesser degree. In other circumstances, however, it is quite possible that the student would be required to withdraw from the Faculty with no degree.
3. GRADING POLICIES

3.1 Grade Designations/Averages
In addition to marks from the numerical scale 0-100, the designations INC (Incomplete course work, no credit granted), AEG (Aegrotat, credit granted due to illness), CR (Credit granted), NMR (No mark reported) and DNW (Did not write examination, no credit granted) may be used from time to time. Courses recorded as AEG or CR will count as credits but have no numerical grade for average purposes. Those recorded as INC, NCR, NMR and DNW will count as failures for the purpose of course-attempt and failure counts (INC, NMR, DNW count as 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 student wishing to appeal a grade may do so by contacting the Assistant Registrar, Faculty of Mathematics, in Needles Hall. Such an appeal must (i) be made in writing, normally within one month of the official release of that term's grades, (ii) specify the course(s), instructor(s) and grade(s) involved together with reasons why the appeal is being made, (iii) include $5.00 per grade appealed (which is refunded if the grade is raised). Please note, however, that a grade may be lowered if a re-examination leads to the discovery of an earlier error 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, 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 switch from an Honours program to General or Pass. In this case, the student must enrol in General Courses.

4.2 Course Upgrading
A student who takes the General version of a course instead of the 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 take the Honours course.

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. Note that supplemental examinations are not available for students in the Math Faculty.

4.4 Repeated Courses
A student may not normally retake a passed course more than once in an attempt to improve the grade. Both attempts will be included in the student's quota of course attempts, but the course will be included only once in credit counts and may be counted at most once in the Graduating Averages required for the degree in question.

4.5 No Credit/Overlap Courses
Some courses offered within the University may not normally be taken for credit toward a BMath degree. The mathematical content 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% overall average in his/her most recent complete academic term may not normally take a Correspondence course on a part-time basis during the fall term if he/she will be registered full-time during the winter term. This policy is intended to limit this type of situation to students who should be able to cope with the overlap involved with studying for, and writing final examinations in, fall- term Correspondence courses while simultaneously carrying a full-time load of on-campus winter courses.

Correspondence courses may not normally be used to satisfy explicitly stated course requirements for an Honours program. It is the intent of this policy to require that all such degree requirements be satisfied entirely by on-campus courses. Any additional elective, whether mathematics or non-mathematics courses, may be taken on a part-time basis by Correspondence for Honours degree credit. It should also be noted that this policy applies only to Honours programs. No such restriction applies for General or Pass programs.

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 employers to take 2 half-credit courses.) Interested students are encouraged to discuss Correspondence course selections with their "on-campus" Faculty Advisor, but the actual paperwork to preregister for Correspondence courses involves a separate application form 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 overall average) are normally permitted to take elective courses that are not explicitly required for their particular program at other universities on a part-time basis during terms off campus. These elective 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 electives 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 Mathematics Undergraduate Office or the Registrar's Office. Please note that permission must be obtained before taking the course. The Committee will not normally approve a course taken elsewhere for Waterloo degree credit if prior approval was not obtained.

All courses taken on "letters of permission" at other institutions to be counted toward a BMath degree, 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. 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 employers 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.

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 carrying 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 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. Voluntary withdrawal from a Mathematics program is discussed later in Section 5.6.
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 normally cancelled with the Registrar's Office before the drop deadline in the term in which the course is taken. Further, if a two-term course registration is cancelled after the drop deadline in the first term of the course but before the drop deadline in the second term of the course, the course will be recorded as a half-credit course attempt.

A course attempt not successfully completed constitutes a course failure. Further, a two-term course registration cancelled between drop deadlines (see above) constitutes an unsuccessfully completed half-credit course attempt, hence a half-credit failure.

5. MISCELLANEOUS POLICIES

5.1 Special Co-op Regulations

i) Co-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 students admitted at the 1A level, this sequence will normally involve 5 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 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, 4 satisfactory work terms will 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

Students 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 the criteria 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 terms which might be involved in the request.
5. The student's employer supports the request in writing (if appropriate).
6. The request is properly documented.

iii) Course Load

While registered for an academic term, Co-op students are expected to maintain a full-time course load, unless they are within 1 or 2 term-courses of fulfilling the 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 employers to take 2 half-credit courses.

5.2 Course Load, Part/Full-Time

Beginning in Year 2 all Pass and General students are restricted to preregistering for a maximum of 5 courses per term. Honours students are restricted to preregistering for a maximum of 6 courses per term. With permission from a Faculty Advisor. Honours students may add extra courses during the ADD period.

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 be permitted to register in the same number of courses in the subsequent term.

The burden of proof is left to the student when seeking approval to take extra courses (i.e. the student should have his/her most recent mark report when seeking approval and not expect the Faculty Advisor to supply the necessary verification).

In all cases a student’s “year” will be determined by the number of half-credits (N) achieved to date according to the scheme below:

<table>
<thead>
<tr>
<th>Year</th>
<th>N</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>first Year</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>second Year</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>third Year</td>
<td>20</td>
<td>3</td>
</tr>
<tr>
<td>fourth Year</td>
<td>32</td>
<td>4</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 to particular courses in the Spring term will always be given to Co-op students.

Co-op students normally preregister for Spring courses at the beginning of the preceding November. Regular students may preregister in early February. By that time, the extent of the demand by Co-op students for Spring courses will be known and departments will be in a better position to determine which courses will be available to Regular students. A list of such courses will be available for February preregistration.

If subsequent preregistration requests from Regular students should exceed the space available in the non-restricted courses, it may not be possible to accommodate all Regular students in the courses in question.

5.4 Course Prerequisites

At any time prior to the completion of lecture, if it is discovered that a student is taking a course offered by the Faculty of Mathematics without having previously successfully completed all the course prerequisites stated in the University Undergraduate Calendar, the student is subject to having his/her preregistration/registration in that course purged from University records. Such purging may be done at the request of the course instructor, the department offering the course, and/or the Faculty of Mathematics, but not without the consent of the instructor.

5.5 Illness or Incapacity

Normally, failure to write a required final examination in any course in which a student is officially registered, or failure to complete such a course for some other reason, will result in a DNW, NMR or INC grade being recorded for the course. All of these grades are considered as failures for the purpose of course-attempt and failure counts and count as zeros in average calculations.

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

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

If a student completes an examination, even though he/she is ill, the subsequent grade obtained in the course must normally stand. Subsequent appeals on the grounds of illness may be considered if accompanied by proper medical documentation and 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 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 in the Mathematics Undergraduate Office or 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 on 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 readmission 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 résumé covering the 'inactive' period, including official transcripts from any post-secondary institutions attended, must accompany the letter requesting readmission. If the student is re-admitted, he/she will be subject to Faculty policies in effect at the time of re-admission. ('Inactive' is taken to mean that the student has not been registered at the University of Waterloo, or on an approved Letter of Permission, as a BMath degree candidate.)

6. DEAN'S HONOURS LIST/ ALUMNI GOLD MEDALLIST
To recognize outstanding academic 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. 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).

An Alumni Gold Medal is presented annually (usually at the Spring Convocation) to recognize the academic excellence of our top undergraduate.

7. 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 108K, 109, 129FL, 150 and 210.)"

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.

8. "AREAS OF STUDY" ON TRANSCRIPTS
BMath transcripts include no more than 2 areas of study.
Faculty of Science

Introduction
The first students were enrolled in the Faculty of Science in the autumn of 1959. There are now approximately 2,000 full-time students including approximately 200 graduate students, taking programs within the Faculty.

The Faculty of Science has 5 teaching departments: Biology, Chemistry, Earth Sciences, Physics, and the School of Optometry. Programs of studies through the Biology, Chemistry, Earth Sciences, and Physics departments lead to a Bachelor of Science (BSc) degree in either 3 or 4 years depending upon the program taken. The School of Optometry offers a 4 year professional program leading to a Doctor of Optometry (OD) degree.

Biology, Chemistry, Earth Sciences and Physics are also available on a Co-operative system of study where the students alternate four-month study terms on campus with 4-month work terms in industry, business or government in an area related to their studies.

A program leading to an Honours BSc in Psychology is also available.

The Associate Dean and Department Chairmen will be pleased to receive inquiries about the programs in this Faculty.

Degrees
The degree of Bachelor of Science (BSc) is awarded by the University on the successful completion of any of the undergraduate programs involving Biology, Chemistry, Earth Sciences, Physics and Psychology, which are discussed under Academic Programs. The ordinary or pass-level BSc will be awarded on completion of the 3 year General Science Program. The Honours degree, BSc (Honours), will be awarded on completion of any of the honours programs. MSc and PhD degrees are discussed in the Graduate Calendar.

Upgrading of BSc Degree
Normally a student may not upgrade a General BSc or its equivalent to a Waterloo Honours BSc. However, from time to time such conversion privileges may be allowed in exceptional cases on the recommendation of the Department(s) concerned and with the approval of the Examinations and Standings Committee. Rulings of the Committee in any particular case on the conditions to be met for such conversion may include time limits.

Admission

The admission requirements and procedures for all programs are outlined in Chapter 2 of this Calendar.

Co-operative Students
Students applying to Co-operative programs in the Faculty of Science will not normally be admitted above the Year 2 Term B level.

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 students will be required to complete 50% of the course content while registered in the Faculty of Science. Credits will be transferred without a cumulative average and only for relevant courses with a 60% or better mark.

Admission as an Adult Student
Applicants are normally required to obtain standing in at least 1 Ontario Grade 13 Mathematics and 1 Science course 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 as of September 1982 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 exception to this is Honours Earth Sciences (Geography Option). This program follows 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 term or year marks.
b) Final examinations in one-term courses are held in December, April, or August. Final examinations for all full year courses are held in April, and cover all the work taken in each course. The time normally allowed for each examination is 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 in a course, a student must obtain a minimum of 50% 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 his 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.

d) Failure to write an examination is considered a failure to pass. A student who defaults a final examination, except for a properly certified reason, shall have no make-up examination privileges and must repeat the work in class. If a student fails to write for health reasons, a Doctor's certificate, covering the precise period of absence, must be filed in the Registrar's Office within 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) In cases where more than 1 course or course-sequence contains the same or similar course content, credit will only be given in one.
h) All examinations which receive a failing grade are automatically re-read.

2. Make-up Examinations
Make-up examination privileges may be granted to students in good standing:
a) In a case where failure to pass is attributable to extraordinary circumstances, especially medical or health-related problems.
b) Only when such failed courses could not be repeated and when a student's progress could be unduly held up by lack of one prerequisite.

In all cases regarding make-up examinations the student must have satisfied all term-work requirements in the course and must have the permission of the Examinations and Standings Committee (who must be satisfied the student has a fair chance to pass the examination - the student's overall University record may be used in making this assessment.) Regardless of standing, no student will be allowed make-up privileges if he or she has failed more than 2 full credits or their equivalent in a given year (except on medical grounds as in a.).

3. 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. In order to proceed to term 2A students must have obtained a 60% overall average, 60% or better in their major field and passed all core courses. Those not meeting these requirements may be transferred to the General program (Regular system) in good standing, if possible.
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 related work-terms required is normally 4.

The minimum number of satisfactory work reports is normally 4.

4. Standing

Grades

Marks in individual courses will be reported as numerical marks on the scale 0 to 100. A mark of 50 or better is necessary to pass and receive credit for a course. For Science students, 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.

Science

Examinations and Standings

Readmission is not automatic. All such applicants will be assessed in competition with new applicants and on the probability of their future success.

Readmission when granted will be with conditional standing.

Terminology

INC (either term work, lab work, examination, etc., are incomplete), AEG (aegrotat - signifying the student's work or examination was incomplete for some acceptable reason (such as illness) and the instructor felt the student should receive credit for the course but a numerical mark could not be set). A course for which the grade designation INC has been given must be completed within 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. Then, if the required courses and accumulated average are met, the student will be allowed to graduate.

CR (Credit granted where performance was satisfactory but no specific mark is given and AEG is not acceptable).

NCR (Credit is not granted where performance was unsatisfactory but no specific mark is given).

DNW (Final examination not written in a course that has not been dropped officially whether the course has been attended or not).

AEG or CR will count as a course passed towards the total necessary but will not count in the overall average.

Unless there are medical or other extenuating circumstances, a DNW will be weighted for averaging purposes as 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.
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 for full-time Honours students who have completed second year studies or higher during the previous 12 months.

The list of nominations will not exceed 10% of the number of such students in each Department. To be eligible for consideration a student must have a cumulative average and an overall average for the completed year of at least 80%.

The award will be noted on the student'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.

Academic Programs

Introduction
Admission to all Co-operative programs is at Year 1 (see Chapter 2 for Admission Requirements). Regular Honours programs begin at the Year 2 level, admission to which requires at least a 60% overall average as well as 60% or better in the field of specialization. Honours Biology and Earth Sciences require a 65% cumulative average in the field of specialization.

Enrolment may be subject to limitations.

To be eligible for an Honours degree a student must have been enrolled full-time in 2 out of 3 of years 2, 3 and 4 of an Honours Program, 1 of which must be Year 4. Year 4 of the program must be taken at the University of Waterloo.

a) Honours Science Programs (see p. 14.27)
(4 programs, with specialization in Biology, Chemistry, Earth Sciences, or Physics; and a non-specialized program):

A 60% cumulative overall average must be maintained in all programs.

A 60% cumulative average must be maintained in all courses in the field of specialization for Chemistry and Physics and a 65% cumulative average for Biology and Earth Sciences.

A student who fails 1 of the credits in the field of specialization may be placed in conditional standing in order to clear that requirement. Failure of more than 1 such course could result in requirement to withdraw from that program.

Not more than 3 credits offered under the “Science” label may be applied to any Honours Program. No more than 5 failed credits will be allowed.

b) Honours Major Programs (see also p. 14.10)
Honours Biology - Regular and Co-operative
Honours Biology and Chemistry (Biochemistry) - Regular and Co-operative
Honours Biology and Man-Environment - Regular
Honours Chemistry - Regular and Co-operative applied
Honours Earth Sciences - Regular (Geology or Geography) and Co-operative applied (Geology or Geophysics)
Optometry - Regular
Honours Physics - Regular, Co-operative applied, and Co-operative applied (Geophysics)
Honours Psychology - Regular

In all programs an overall cumulative average of 60% must be maintained with a cumulative average of at least 60% in the major field.

A student who fails 1 of the courses in the field of specialization may be placed in conditional standing in order to clear that requirement. Failure of more than 1 such course will result in requirement to withdraw from that program. No more than 5 failed credits will be allowed.
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 may not continue in the program.

Honours students in a Chemistry program must achieve a 60% average in the non-elective lecture courses each term or the student will be placed in conditional standing. The condition must be removed by achieving a 60% average in the non-elective lecture courses in the next term of study, or the student will be required to withdraw from the Honours program.

A student required to transfer from an Honours program in Chemistry who enrolls in the General program will be permitted to take no more than 2 lecture courses in Chemistry during the first term of study as a General degree student.

In the Honours Earth Sciences (Geography) program a cumulative average of 75% must be maintained in the Geography courses, 65% cumulative average in the Earth Sciences courses, and a cumulative average of 60% in the other courses.

In the Honours Psychology program a cumulative average of 75% must be maintained in the Psychology courses and a cumulative average of 60% in the Faculty of Science courses.

In the Honours Biology program 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. In the Honours Biology and Man-Environment program students must maintain a 75% average in all courses taken in the Faculty of Environmental Studies. All Biology Honours programs require a 65% average in all Biology courses.

In the Co-operative Applied Physics program a 60% overall average and a 60% Physics average must be obtained in Year 1 and in each subsequent term, and in the Honours Physics program a 60% overall average and a 60% Physics average must be obtained each academic year. A student failing to meet these requirements will be permitted to continue in conditional standing. If the student fails to meet these requirements a second time he or she will not be permitted to continue in either program.

c) **Minors**
A Minor in each of the 4 disciplines, Biology, Chemistry, Earth Sciences and Physics is available to Honours students in another faculty.

**Biology** - To obtain a Minor in Biology, students must complete 10 Biology term courses, at least 5 of which must be at the third or fourth year level. A minimum average of 65% is required in the 10 term courses.

**Chemistry** - To obtain a Minor in Chemistry a student is required to take - CHEM 123-124 plus labs; 0.5 lab credits beyond Year 1 appropriate to the lecture credits chosen; a minimum of 1.0 lecture credit from Honours Chemistry courses at 300 or 400 level; lecture credits to complete a minimum of 3.5 credits from Honours Chemistry courses at 200 or higher level. A minimum cumulative average of 60% is required in these credits.

**Earth Sciences** - A Minor in Earth Sciences consists of 10 term courses in Earth Sciences (5.0 credits). A cumulative average of 65% must be maintained in Earth Courses.

Year 1 EARTH 121-122
Year 2 Four term courses from EARTH 221, 231, 232, 236, 238.
Year 3 Three or 2 term courses from EARTH 331, 332, 333, 336, 342, 345, 355, 368, 369, 370.
Year 4 One or 2 term courses from EARTH 421, 432, 433, 434, 435, 438, 439, 440, 447.

**Note:**
Prerequisite and antirequisite regulations in the Course Descriptions in the Calendar must be followed.

**Physics** - A Minor in Physics consists of at least 4.5 lecture credits and 1.0 lab credit. The lecture credits must include: PHYS 121-122; PHYS 243 (or 253); PHYS 226-246 (or 256), PHYS 324-325 (or 253-354). The lab credits must include PHYS 121L-122L and 0.5 credits of Year 2 labs. A minimum average of 60% must be obtained in all Physics credits attempted (whether passed or failed). First year Calculus is implied by above.

**Academic Program Selection**

Students entering first year in the Faculty of Science are essentially enrolled in a common year. Students in Year 1 Co-operative Biology, Biology and Chemistry (Biochemistry), Chemistry, Earth Sciences and Physics are labelled as such but all other students are officially in Year 1 General Science. Essentially the same courses are available to all first year students and students may enter Year 2 programs in Science provided they have taken the necessary courses in Year 1, have achieved the necessary passing average, and enrollment 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 5.0 lecture courses per term, exclusive of laboratory credits. 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). Only students whose secondary school Grade 13 average was 70% or better may select 6 lecture-courses if they wish (recommended for students intending to take an Honours Physics program). Prior to graduation all students in the Faculty of Science must complete at least 1.0 credit of approved Mathematics 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 various Year 2 Honours programs and Optometry can be found in the table on page 14.8.

2. Course and Program Changes
   a) Students may “add or drop” half courses during the first 2 weeks of the Fall, Winter and Spring terms upon having the appropriate change form completed.
   b) Students may “add or drop” full-year courses during the first 2 weeks of the Fall term upon having the appropriate change form completed.
   c) 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 one-term courses. The final drop day for full-year courses is March 1. The permission of the instructor and the appropriate undergraduate officer or the Associate Dean must be obtained. Courses which have not been dropped officially will receive a DNW grade.
   d) Students may not drop a laboratory course without written clearance from the lab supervisor (faculty member or senior demonstrator). Students not checking out of such courses remain liable for the full value of the locker kit issued to them.
   e) Students may withdraw from the University as late as the official course drop date without penalty on their record. If however, a student chooses to withdraw to avoid a number of failures, he or she will likely be disqualified for readmission.

3. Correspondence Courses
   Only in exceptional cases should correspondence courses be taken by 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.

4. 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 Science Undergraduate Office or 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.

5. Audit
   The Faculty of Science does not record nor recognize audits for students in Science or any other Faculty.

6. Enrolment In a Graduate Course
   A student may obtain credit toward a graduate degree in the Faculty of Science for normally not more than a one term graduate course taken during the fourth year of an undergraduate program provided this course is not used for credit toward his undergraduate degree. Prior approval of the Faculty Graduate Studies Committee must be obtained for students wishing to do so. Credit for the graduate course toward a graduate degree will not be given unless the student attains an “A” average in his/her major subjects in the fourth year.

7. 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). 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' experience teaching in an Ontario high school.

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.

Year 1 Science Program Selections Leading to Year 2 Honours Programs and Optometry

<table>
<thead>
<tr>
<th>Regular Programs</th>
<th>Required Courses in Year 1</th>
<th>Recommended Electives in Year 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Major Field of Study</strong></td>
<td><strong>Required Courses in Year 1</strong></td>
<td><strong>Recommended Electives in Year 1</strong></td>
</tr>
<tr>
<td><strong>Biology</strong> (see Notes 5 &amp; 6)</td>
<td>Two 200 level term courses in BIOL, CHEM 123-124 and 123L-124L.</td>
<td>PHYS 111-112, or MATH 113a-113b, EARTH 121-122, and a computer course.</td>
</tr>
<tr>
<td><strong>Biology and Chemistry</strong> (Biochemistry) (see Note 5)</td>
<td>Two 200 level term courses in BIOL, MATH 113a-113b, CHEM 123-124 and 123L-124L, a first year Physics credit with labs, CS 118.</td>
<td></td>
</tr>
<tr>
<td><strong>Biology and Man-Environment</strong> (see Note 5)</td>
<td>Two 200 level term courses in BIOL, 2 term courses in M ENV, CHEM 123-124 and 123L-124L, CS 118 or 118.</td>
<td></td>
</tr>
<tr>
<td><strong>Chemistry</strong> (see Note 2)</td>
<td>CHEM 123-124 and 123L-124L, MATH 113a-113b, PHYS 121-122 and 121L-122L, CS 118.</td>
<td></td>
</tr>
<tr>
<td><strong>Chemistry with Options</strong></td>
<td>CHEM 123-124 and 123L-124L, MATH 113a-113b, PHYS 121-122 and 121L-122L, CS 118.</td>
<td></td>
</tr>
<tr>
<td>a) Chemistry (Environmental Studies Option) (see Notes 2 &amp; 5)</td>
<td>CHEM 123-124 and 123L-124L, MATH 113a-113b, PHYS 121-122 and 121L-122L, CS 118.</td>
<td></td>
</tr>
<tr>
<td>b) Chemistry (Mathematics Option) (see Note 2)</td>
<td>CHEM 123-124 and 123L-124L, MATH 115a-115b, PHYS 121-122 and 121L-122L, MATH 111a-134b, CS 118.</td>
<td></td>
</tr>
<tr>
<td>c) Chemistry (Physics Option) (see Note 2)</td>
<td>CHEM 123-124 and 123L-124L, MATH 115a-115b, PHYS 121-122, and 121L-122L, CS 118, MATH 111a-134b.</td>
<td></td>
</tr>
<tr>
<td><strong>Earth Sciences</strong> (see Note 3)</td>
<td>EARTH 121-122, CHEM 123-124 and 123L-124L, PHYS 121-122 and 121L-122L, CS 118, MATH 113a-113b or MATH 115a-115b, 1 unrestricted term course.</td>
<td></td>
</tr>
<tr>
<td><strong>Earth Sciences (Geography Option)</strong> (see Note 3)</td>
<td>EARTH 121-122, CHEM 123-124 and 123L-124L, GEOG 101-102, CS 118, 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>Optometry (consult page 14.25 for full list of prerequisites for admission to Optometry.)</td>
<td>MATH 113a-113b, BIOL 230 and 211, CHEM 123-124 and 123L-124L, PHYS 121-122 and 121L-122L, PSYCH 101.</td>
<td>PSYCH 102(a-g) or SOC 101.</td>
</tr>
<tr>
<td>Physics (see Note 1)</td>
<td>MATH 115a-115b or MATH 113a-113b; MATH 134a-134b, PHYS 121-122 and 121L-122L.</td>
<td>A computer course, CHEM 123-124 and 123L-124L.</td>
</tr>
<tr>
<td>Psychology (see Note 5)</td>
<td>Two 200 level term courses in BIOL, CHEM 123-124 and 123L-124L, PHYS 111-112 or 121-122 and 121L-122L, MATH 113a-113b, PSYCH 101-102(a-g).</td>
<td></td>
</tr>
<tr>
<td>General Science &amp; Honours Science non-major</td>
<td>2.0 Science lecture-credits from the courses offered to Year 1 students in Biology, Chemistry, Earth Sciences &amp; Physics.</td>
<td>MATH 113a-113b; a computer course.</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>Applied Chemistry (see Note 2 and 4)</td>
<td>CHEM 123-124 and 123L-124L, MATH 115a-115b, PHYS 121-122 and 121L-122L, CS 118.</td>
<td></td>
</tr>
<tr>
<td>Applied Physics (see Note 1 and 4)</td>
<td>MATH 115a-115b, MATH 134a-134b, PHYS 121-122, PHYS 121L-122L.</td>
<td>A computer course, CHEM 123-124 and 123L-124L.</td>
</tr>
<tr>
<td>Applied Physics (Geophysics Option) (see Note 1 and 4)</td>
<td>MATH 114, 115a-115b, PHYS 121-122 and 121L-122L, CHEM 123-124 and 123L-124L, EARTH 121-122, CS 118.</td>
<td></td>
</tr>
<tr>
<td>Applied Earth Sciences (Geology Option) (see Note 3)</td>
<td>EARTH 121-122, CHEM 123-124 and 123L-124L, PHYS 121-122 and 121L-122L, CS 118, MATH 113a-113b.</td>
<td>1 elective.</td>
</tr>
<tr>
<td>Applied Earth Sciences (Geophysics Option) (see Note 3)</td>
<td>EARTH 121-122, MATH 113a-113b, or MATH 115a-115b, PHYS 121-122 and 121L-122L, CHEM 123-124 and 123L-124L, CS 118, MATH 114 or 111b.</td>
<td></td>
</tr>
<tr>
<td>Co-operative Biology (see Notes 4, 5 and 6)</td>
<td>3 or 4 200 level term courses in Biology, CHEM 123-124 and 123L-124L.</td>
<td>PHYS 111-112, EARTH 121-122 and a computer course.</td>
</tr>
<tr>
<td>Co-operative Biology and Chemistry (Biochemistry) (see Notes 4 and 5)</td>
<td>3 or 4 200 level term courses in BIOL, CHEM 123-124 and 123L-124L, MATH 115a-115b, a first year Physics credit with labs, CS 118.</td>
<td></td>
</tr>
</tbody>
</table>
Note 1
Co-op Physics students and those planning to enroll in Honours Physics in Year 2 are advised to select MATH 130a-130b instead of MATH 113a-113b or 115a-115b if they have more than an 80% average, and may select MATH 111 instead of MATH 134 if they have less than an 80% average in Grade 13 Mathematics and Physics.

Students wishing a Biophysics Option with the Honours Physics program are advised to include BIOL 111-112 in their program.

Students wishing a Geophysics Option with the Honours Physics program are advised to select ECON 101-102.

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 118 (Winter term).

Students wishing to proceed in a Theoretical Physics program are advised to take a computing course in Year 1.

Note 2
The Year 2 Honours Chemistry programs (including Co-op Applied Chemistry and Honours Biology and Chemistry (Biochemistry)) are normally limited to the 150 best qualified students. Those who have failed core courses should not expect to proceed in any Honours Chemistry program.

Note 3
Fundamental is limited to approximately 4% students in Year 2 of all Earth Sciences programs. Selection is made on the basis of academic standing in Year 1, including standing in EARTH 121 and 122.

Note 4
Students in the Co-operative Biology, Biology and Chemistry (Biochemistry), Chemistry, and Physics programs have 2 methods of taking Year 1: (a) 2 terms in a row "8-stream" (September-April) or (b) fall term on campus "4-stream" (September-December), winter term at work (January-April) and spring term on campus (April-August). Any students in Co-op programs taking CS 118 must do so in the Fall term.

Note 5
The Department of Biology offers 10 introductory courses which provide a thorough and broadly based foundation in biology. Areas of biology that are covered include Botany (230, 231), Cell Biology (230), Ecology (250), Genetics (239), Microbiology (240-241), Physiology (233) and Zoology (210-211). First year students must take any 2 of these courses (and may take 3), along with Year 1 Chemistry, as prerequisites for entering Year 2 of a Biology-Major program.

BIOL 230 is recommended for first Year. BIOL 240 should be taken before BIOL 241.

In Year 2, students pursing the Honours Biology program must take the remaining 8 (or 7) biology courses and complete the Calendar requirements in Chemistry and Statistics. Students who proceed into Years 3 and 4 of the Honours Biology program may then specialize in those areas of biology most closely related to their needs and interests.

For students who do not intend to major in Biology or enter the School of Optometry and wish to obtain a general introduction to biology, BIOL 111 and 112 are available. These courses will emphasize basic principles. See course descriptions in Chapter 16.

Note 6
By the end of Year 2, all Honours Biology majors must have completed an introductory course in computer programming equivalent to CS 116 or CS 118.

Academic Program Descriptions

1. Honours Majors Programs

Honours Biology

Year 1
(For complete discussion of Year 1, see page 14.9.) (Course weight is shown in parentheses.)

Students entering Year 2 must take the remaining 8 (or 7) Biology courses from the following list of 10.

Year 21
BIOL 210 Introductory Invertebrate Zoology (0.5)
BIOL 211 Introductory Vertebrate Zoology (0.5)
BIOL 220 Plant Biology 1 - The Living Plant (0.5)
BIOL 221 Plant Biology 2 - The Diversity of Plants (0.5)
BIOL 230 Introductory Cell Biology (0.5)
BIOL 233 Human Physiology (0.5)
BIOL 239 Genetics (0.5)
BIOL 240 Fundamentals of Microbiology (0.5)
BIOL 241 Introduction to the Microbial World (0.5)
BIOL 250 Ecology (0.5)

CHEM 266 Basic Organic Chemistry 2 (0.5)
CHEM 266L Organic Chemistry Laboratory (0.25)

Plus

CHEM 267 Basic Organic Chemistry 3 (0.5) or CHEM 237 Introductory Biochemistry (0.5)
CHEM 237L Introductory Biochemistry Laboratory (0.25)

STAT 202 Elementary Statistics for Biologists (0.5)

Elective (0.5)

Note:
By the end of Year 2, all Honours Biology majors must have completed an introductory course in computer programming equivalent to CS 116 or CS 118.

Year 3
At least 8 term courses from:

BIOL 311 Vertebrate Zoology (0.5)
BIOL 315 Invertebrate Zoology (0.5)
BIOL 316 Anthropod Zoology (0.5)
BIOL 323 Plant Anatomy & Morphogenesis (0.5)
BIOL 324 The Flowering Plants (0.5)
BIOL 327 Mycology 1 (0.5)
BIOL 330 Molecular Biology (0.5)
BIOL 331 Cell Physiology (0.5)
BIOL 332 Histology & Cytology (0.5)
BIOL 335 Plant Physiology (0.5)
BIOL 336 Embryology (0.5)
BIOL 337 Comparative Animal Physiology 1 (0.5)
BIOL 338 Comparative Animal Physiology 2 (0.5)
BIOL 342 Microbial Biotechnology (0.5)
BIOL 344 Microorganisms in Foods (0.5)
RIOL 350 Environmental Toxicology 1 (0.5)
RIOL 356 Population Ecology 1 (0.5)

Plus

Electives 4 term courses. (Chemistry courses and PHYS 301 (0.5) or PHYS 302 (0.5) are recommended.)

In order to graduate in the Honours Biology program a student must take at least 1 term of Biochemistry (CHEM 237 & 237L) and 1 term of Organic Chemistry beyond Year 1.
Students who plan to specialize in areas of Biology with a substantial biochemical component should plan to take Biochemistry in Years 3 and 4. They are advised to take Organic Chemistry, CHEM 267, in their second year and to select the Biochemistry courses, CHEM 237 & 237L and 333 & 333L in their third year, and other Biochemistry courses in their fourth year. (Alternatively, they may take CHEM 237 and 237L along with CHEM 267 in their second year, and then CHEM 332 and 332L and CHEM 333 & 333L in their third year, and other Biochemistry courses in their fourth year).

Year 4†
10 term courses of which at least 6 must be BIOL 400-level courses. This year is designed to be the specialist year. The course selection should reflect this and must form an integrated group around a particular area of interest. (CHEM 432-433 is recommended.)

Since some fourth-year courses are offered in alternate years only, Biology major students are advised to plan their third- and fourth-year courses simultaneously. Students are also advised that a number of botanically-related courses can be taken during either third of fourth year. Viz. (BIOL 323, 324, 327, 420, 424, 427, 457).

†All Honours Biology students who have completed their third year are required to participate in an off-campus field course (BIOL 497 or 498) before entering Year 4; the cost will range between $100 and $500 per student. All students must fulfill this field course requirement to obtain their BSc Honours degree in this program.

Note regarding Electives
A listing of Science and other electives is found on page 14.9. Although this list was prepared for the General Science program many of the courses would be suitable here. Other Honours level courses in Chemistry, Physics or Psychology should also be considered.

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.

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
By the end of Year 2B, students must have completed the 10 introductory Biology courses at the 200-level and a computer course. Selection of Biology courses in both the Winter and Spring Terms must be made in consultation with the Undergraduate Officers in Biology. Students should be aware that BIOL 233 and 239 must be taken during either the Winter or Spring Terms in even-numbered years and BIOL 211, 221 and 241 must be taken during either the Winter or Spring Terms in odd-numbered years.

Stream 8
(Students who take Year 1B during Winter Term)

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<td>Year 1A</td>
<td>Year 1B</td>
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<td>BIOL - 2 or 3 200-level term courses.</td>
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<td>STAT 202</td>
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<td>BIOL - 4 300-level term course.</td>
<td>Electives - 2 term courses. (Biochemistry courses recommended.)</td>
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<td>Electives - 2 term courses.</td>
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Stream 4
(Students who take Year 1B during Spring Term)

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<tr>
<td>Year 1A</td>
<td>Year 1B</td>
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<tr>
<td>BIOL - 1 200-level term course.</td>
<td>BIOL - 2 or 3 200-level term courses.</td>
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<td>CHEM 123, 123L</td>
<td>CHEM 124, 124L</td>
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<tr>
<td>Electives - 3 term courses.</td>
<td>Electives - 1 or 2 term courses.</td>
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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.
made in consultation with the Undergraduate Officer in Biology. 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.

Students with Grade 13 Physics are advised to take PHYS 121-122 and 121L-122L.

Stream 8
(Students who take Year 1B in Winter Term).

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<td>PHYS 122, 122L or PHYS 112, 112L</td>
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Honours Co-operative Biology and Chemistry
(Biochemistry)

Program Advisors: Dr. L.J. Brubacher, Chemistry and Dr. J.C. Carlson, Biology.

This program is the preferred route for the study of biochemistry at Waterloo. It 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 Biology and Chemistry (Biochemistry) fulfills the academic requirements for professional membership in the Chemical Institute of Canada.

Note:
By the end of Year 2B, students must have completed BIOL 230, 233, 239, 240 and 241. Selection of Biology courses in both the Winter and Spring Terms must be made in consultation with the Undergraduate Officer in Biology.
### Fall Year 2B
- CHEM 221, 221L
- CHEM 237, 237L
- CHEM 265, 265L
- CS 118
- STAT 202

### Winter Year 3A
- Work Term: BIOL 331, BIOL 1-330-level term course, CHEM 333, 333L, CHEM 357, CHEM 356L, 357L

### Stream 4 and 8

#### Fall Year 4A
- CHEM 312
- CHEM 464
- Plus: BIOL 433
- Any 3 of: BIOL 434
- BIOL 430
- BIOL 432
- BIOL 435
- BIOL 441
- BIOL 443
- BIOL 446
- BIOL 448
- BIOL 455
- BIOL 460
- BIOL 480
- CHEM 432
- CHEM 435
- CHEM 452
- CHEM 492
- BIOL 499

#### Winter Year 4B
- BIOL 431
- BIOL 438
- BIOL 442
- BIOL 444
- BIOL 447
- BIOL 449
- BIOL 461
- BIOL 481
- CHEM 419
- CHEM 433
- CHEM 434
- CHEM 492 (cont’d)
- CHEM 499 (cont’d)

#### Winter Year 3B
- BIOL 330
- BIOL 350
- CHEM 332, 332L
- CHEM 356
- CHEM 368, 368L

### Year 1
- Normal Year 1 Science (see page 14.7) in which CHEM 123-124, 123L-124L, 2 200-level term courses in Biology (see Note 6 on page 14.10), PHYS 121-122 and 121L-122L or 111-112 and 111L-112L, CS 118 and MATH 113a-113b are required.

### Year 2
- Fall
  - 1 Biology term
  - 2 Biology term course from:
  - BIOL 210 (0.5)
  - BIOL 220 (0.5)
  - BIOL 230 (0.5)
  - BIOL 240 (0.5)
  - BIOL 250 (0.5)
  - BIOL 211 (0.5)
  - BIOL 221 (0.5)
  - BIOL 233 (0.5)
  - BIOL 239 (0.5)
  - BIOL 241 (0.5)
  - plus
  - CHEM 212 (0.5)
  - CHEM 220 (0.5)
  - CHEM 221L (0.25)
  - CHEM 2220L (0.25)
  - CHEM 234 (0.5)
  - STAT 202 (0.5)
  - CHEM 265 (0.5)
- Winter
  - CHEM 221 (0.5)
  - CHEM 221L (0.25)
  - CHEM 237 (0.5)
  - CHEM 237L (0.25)
  - CHEM 265L (0.25)

### Year 3
- Fall
  - 2 Biology term courses from:
  - BIOL 316 (0.5)
  - BIOL 323 (0.5)
  - BIOL 324 (0.5)
  - BIOL 327 (0.5)
  - BIOL 330 (0.5)
  - BIOL 336 (0.5)
  - BIOL 337 (0.5)
  - BIOL 342 (0.5)
  - BIOL 350 (0.5)
  - CHEM 312 (0.5)
  - Elective (0.5)
  - CHEM 312 (0.5)
  - CHEM 332 (0.5)
  - CHEM 332L (0.25)
  - CHEM 335 (0.5)
  - CHEM 356 (0.5)
  - CHEM 368 (0.5)
  - CHEM 368L (0.25)
  - Elective (0.5)
  - CHEM 312 (0.5)
  - CHEM 464 (0.5)

### Year 4
- Fall
  - 4 courses from 400-level courses in Biology, CHEM 432, 435, 452 or 492
  - Elective (0.5)

### Honours Biology and Chemistry (Biochemistry) (Regular Program)
- Program Advisors: Dr. L.J. Brubacher, Chemistry and Dr. J.C. Carlson, Biology.
- This program is the preferred route for the study of biochemistry at Waterloo. It 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 Biology and Chemistry (Biochemistry) fulfills the academic requirements for professional membership in the Chemical Institute of Canada.
Honours Biology and Man-Environment Studies
Students must maintain a 75% average in all courses taken in the Faculty of Environmental Studies and a 65% average in all Biology courses.

(For a complete discussion of Year 1, see page 14.8.)
(Course weight is shown in parenthesis.)

In order to graduate in Honours Biology and Man-Environment, students must complete 15 term courses in Biology, 12 term courses in Man-Environment or equivalent, STAT 202, CHEM 266-266L, 237-237L beyond year one. Contact the Undergraduate Officers in both Departments for further details.

Honours Chemistry Program

General Information
As well as the Honours Biology and Chemistry program (Regular or Co-operative) previously described, students may take:

1) Co-operative Applied Chemistry (Honours)
   - p. 14.16
2) Honours Chemistry - p. 14.16
3) Honours Chemistry (with Options)
   a) Honours Chemistry (Environmental Studies Option) - p. 14.16
   b) Honours Chemistry (Mathematics Option) - p. 14.17
   c) Honours Chemistry (Physics Option) - p. 14.18

(There is also a 4-year Honours Science degree (Program 3) which offers less intensive specialization in chemistry, described later in this chapter of the Calendar).

General Program Courses
Honours Chemistry Students (all programs) may not elect to take General program courses for degree credit.

Professional Standing
All 5 programs listed here fulfill the academic requirements for professional membership in the Chemical Institute of Canada.

Elective Courses for Chemistry Programs
Elective courses are given subject to sufficient demand being recorded at the stated pre-registration period. Table (a) lists present expectations but is subject to change. Certain specialized electives may be withdrawn if the specialist lecturer should be unavailable.
### (a) Technical Electives with Chemistry Content

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### (b) Electives Relevant to Industrial Employment

The Waterloo Advisory Council suggests students contemplating careers in industry should seriously consider some of these elective subjects and courses:

- Statistics: STAT 204, 304, 'CH E 220
- Writing: Law
- Environment: M ENV 320
- Management Science: M SCI 44
- Economics: ECON 101, 102, 201, 202
- Computing: CS 235, 234, 337, GE 121
- Microprocessors: Business (WLU)
- Critical Thinking: Accounting
- EL E 222, 323, 427, PHYS 353
- ACC 121, 122
- BUS 352, 362, 382, 383
- SCI 209, ENGL 210
- P SCI 291, 292, ENV S 201, ACC 231

**Notes:**

- Asterisk (*) indicates strong recommendation for Applied Chemistry students.
- Dagger (†) indicates special permission required from the Associate Chairman for Undergraduate Studies in the Chemical Engineering Department.
Co-operative Applied Chemistry (Honours)

Program Advisor: Professor G.E. Toogood

This program, which offers the Honours Chemistry courses integrated with 6 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.

The same core courses are taken as in the Honours Chemistry program. There may be some variations in the sequence of certain courses between the 2 streams. The course sequences are set out below.

Co-operative Applied Chemistry

Year 1
(For a complete discussion of Year 1, see page 14.8).

Stream 8
(Students who took 1B term in the winter).

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<th>Fall Year 2A</th>
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Year 3B Work Term Work Term
CHEM 10, 312, 315L, 358, 358L, 3 Electives*.

Stream 4
(Students who took 1B term in the spring.)

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<tr>
<td>CHEM 10, 221, 221L, 255, 265, 265L, PHYS 243, 243L, 1 Elective.</td>
<td>CHEM 10, 312, 314L, 355, 355L, 368, 368L, 2 Electives*.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3B Work Term</th>
<th>Work Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 10, 313, 315L, 358, 358L, 3 Electives*.</td>
<td></td>
</tr>
</tbody>
</table>

Both Stream 4 and Stream 8

Year 4 (Fall and Winter)
CHEM 10
Eight electives*
CHEM 492

*In Years 3 and 4, at least 6 of the electives chosen must be lecture courses from the list of Technical Electives with Chemistry Content, of which at least 4 must be at the 400 level.

Honours Chemistry

Program Advisor: Professor G.E. Toogood

Year 1
(For a complete discussion of Year 1, see page 14.8).

Year 2

<table>
<thead>
<tr>
<th>Fall Term</th>
<th>Winter Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 10</td>
<td>CHEM 10</td>
</tr>
<tr>
<td>CHEM 212 (0.5)</td>
<td>CHEM 221 (0.5)</td>
</tr>
<tr>
<td>CHEM 220 (0.5)</td>
<td>CHEM 221L (0.5)</td>
</tr>
<tr>
<td>CHEM 220L (0.25)</td>
<td>CHEM 255 (0.5)</td>
</tr>
<tr>
<td>CHEM 254 (0.5)</td>
<td>CHEM 265 (0.5)</td>
</tr>
<tr>
<td>CHEM 264 (0.5)</td>
<td>CHEM 265L (0.25)</td>
</tr>
<tr>
<td>MATH 215 (0.5)</td>
<td>PHYS 243 (0.5)</td>
</tr>
<tr>
<td>PHYS 243L (0.25)</td>
<td>PHYS 243L (0.25)</td>
</tr>
</tbody>
</table>

| Elective (0.5) |

Year 3

<table>
<thead>
<tr>
<th>Fall Term</th>
<th>Winter Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 10</td>
<td>CHEM 10</td>
</tr>
<tr>
<td>CHEM 312 (0.5)</td>
<td>CHEM 313 (0.5)</td>
</tr>
<tr>
<td>CHEM 314L (0.25)</td>
<td>CHEM 315L (0.25)</td>
</tr>
<tr>
<td>CHEM 355 (0.5)</td>
<td>CHEM 358 (0.5)</td>
</tr>
<tr>
<td>CHEM 355L (0.25)</td>
<td>CHEM 358L (0.5)</td>
</tr>
<tr>
<td>CHEM 368 (0.5)</td>
<td>3 Electives† (1.5)</td>
</tr>
<tr>
<td>CHEM 368L (0.5)</td>
<td>2 Electives* (1.0)</td>
</tr>
</tbody>
</table>

Year 4

Fall and Winter Terms
CHEM 10
CHEM 492 (1.5)
8 Electives† (4.0)

†In Years 3 and 4, in addition to the required chemistry core courses, students must choose 4 400-level term courses and 2 term lecture courses at any level from the list of Technical Electives with Chemistry Content.

Honours Chemistry (with Options)

a) Honours Chemistry (Environmental Studies Option)
Program Advisor: Professor J.G. Smith

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.
Year 1
(For a complete discussion of Year 1, see page 14.8).

Year 2
Fall Term
CHEM 10
CHEM 212 (0.5)
CHEM 220 (0.5)
CHEM 220L (0.25)
CHEM 254 (0.5)
CHEM 264 (0.5)
MATH 215 (0.5)

Winter Term
CHEM 10
CHEM 221 (0.5)
CHEM 221L (0.5)
CHEM 255 (0.5)
CHEM 265 (0.5)
CHEM 265L (0.25)
PHYS 243 (0.5)
PHYS 243L (0.25)
Elective* (0.5)

Year 3
Fall Term
CHEM 10
CHEM 316 (0.5)
CHEM 316L (0.25)
CHEM 356L (0.25)
CHEM 368 (0.5)
CHEM 368L (0.5)
MATH 216 (0.5)

Winter Term
CHEM 10
CHEM 255 (0.5)
CHEM 313 (0.5)
CHEM 357 (0.5)
CHEM 357L (0.25)
MATH 322B (0.5)
PHYS 359 (0.5)
Elective (0.5)

Year 4
Fall and Winter Terms
CHEM 10
CHEM 419 (0.5)
CHEM 492 (1.5)
ENV S 201 (0.5)

Winter Term
CHEM 10
CHEM 492 (1.5)
CHEM 492L (0.5)
CHEM 492L (0.5)
MATH 220a (0.5)
MATH 224a (0.5)

*Completing the Environmental Studies Option requires 4.0 credits selected from the list below or approved by the Undergraduate Dean of Environmental Studies. Unless specified, all are 0.5 credits.

Students should select at least one basic course from each portion of the list below:

ENV S 195 Introduction to Environmental Studies
Legal, Economic and Social Aspects
ENV S 201 Introduction to Environmental and Planning Law
PLAN 156 Introduction to Urban and Regional Planning Concepts
ENV S 202 Social Science Approaches to Environmental Problems
M ENV 320 Environmental Economics
ENV S 401 Environmental Law
ENV S 411 Alternative Future Environments
PLAN 222 Canadian Regional Issues
PLAN 319 Economic and Social Techniques for Regional Planning

Resource Management
ENV S 200 Field Ecology (0.75)
SCI 350 Canadian Non-Renewable Resources
GEOG 301 Climatology
GEOG 303 Physical Basis and the Geography of Water
GEOG 356 Resources Management
GEOG 357 Conservation and Resource Management
GEOG 358 Water Planning and Management
GEOG 359 Geography of Energy
GEOG 414 Energy Resources Management

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.

Year 1
(For a complete discussion of Year 1, see page 14.8.)

Year 2
Fall Term
CHEM 10
CHEM 212 (0.5)
CHEM 220 (0.5)
CHEM 220L (0.25)
CHEM 254 (0.5)
CHEM 264 (0.5)
MATH 220a (0.5)

Winter Term
CHEM 10
CHEM 221 (0.5)
CHEM 221L (0.5)
CHEM 255 (0.5)
CHEM 265 (0.5)
CHEM 265L (0.25)
PHYS 243 (0.5)
PHYS 243L (0.25)
Elective (0.5)

Year 3
Fall Term
CHEM 10
CHEM 316 (0.5)
CHEM 316L (0.25)
CHEM 356L (0.25)
CHEM 368 (0.5)
CHEM 368L (0.5)
MATH 216 (0.5)

Winter Term
CHEM 10
CHEM 255 (0.5)
CHEM 313 (0.5)
CHEM 357 (0.5)
CHEM 357L (0.25)
MATH 322B (0.5)
PHYS 359 (0.5)
Elective (0.5)

Year 4
Fall and Winter Terms
CHEM 10
CHEM 419 (0.5)
CHEM 492 (1.5)
ENV S 201 (0.5)

Four CHEM courses† (2.0)
Four electives† (2.0)


Suggested electives include CS 474, AM 371, 381, 397, 465 and 481, PHYS 363, 434 and 454.
c) Honours Chemistry (Physics Option)
Program Advisor: Professor G. Stoles
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 2 disciplines.

Students wishing to follow this program on the Co-operative system of study should first speak to Professor Stoles and to Mr. R.A. Pullin of the Co-ordination Department.

Year 1
(For a complete discussion of Year 1, see page 14.8)

Year 2
Fall Term
CHEM 10
CHEM 212 (0.5)
CHEM 220 (0.5)
CHEM 220L (0.25)
CHEM 254 (0.5)
PHYS 256 (0.5)
PHYS 256L (0.25)
MATH 216 (0.5)

Year 3
Fall Term
CHEM 10
CHEM 264 (0.5)
CHEM 312 (0.5)
CHEM 355 (0.5)
CHEM 355L (0.25)
PHYS 352 (0.5)
PHYS 352L (0.25)
Elective (0.5)

Year 4
Fall and Winter Terms
CHEM 10
CHEM 492 (1.5)
PHYS 434 (0.5)
PHYS 454 (0.5)
3 chemistry electives (1.5)*
2 physics electives (1.0)*
1 other elective (0.5)

Suggested electives include PHYS 353, 353L, 363, 432, 441 and 445.

Honours Earth Sciences Programs

General Information
Within Earth Sciences, students may select from 5 Honours programs as follows:

- Co-op Applied Earth Sciences/Geology Option
- Co-op Applied Earth Sciences/Geophysics Option
- Honours Earth Sciences/Geology Option (Regular)
- Honours Earth Sciences/Geography Option (Regular)
- Honours Science - Program 4 (with specialization in Earth Sciences)

The first 4 programs provide academic preparation for students intending to pursue careers as professional geologists. Honours Science - Program 4 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. (This program is described later in this chapter under Honours Science Programs).

All programs require the satisfactory completion of 21 lecture-credits or equivalent, the total credit requirements vary from program to program and even within programs due to varying credit weightings for elective courses. There are limitations on the size of upper year classes. Meeting the minimum entrance requirements is not a guarantee that places will be available in the Year 2 program.

A breakdown of course-type groupings for each program is provided below. Course requirements are listed in the Year 1 Sciences Program Selection Table (p. 14.8).
1. Program Notes
   a) Years 1 and 2 Science courses taken to satisfy the Mathematics/Science requirements must be taken with the lab if an optional lab is available.
   b) Standards for the program will be 65% cumulative major average and 60% overall average.
   c) The program is defined in terms of lecture credits; 21.0 lecture credits are required. Additional credits will reflect required Year 1 and Year 2 labs.

2. Science/Mathematics Electives
   2.0 lecture credits from Mathematics/Sciences departmental courses (SCI-labelled courses not included) beyond those courses specified in the Core. Labs must be taken and passed if optional labs are available in Year 1 and 2 Level courses. Total Credits: 2.0 C, plus required labs.

3. Arts Electives
   1.0 elective credits from courses given through the Faculty of Arts. No outside courses to be considered as Arts-equivalents. Total Credits: 1.0 C

4. Unrestricted Electives
   1.5 lecture credits are totally unrestricted as to source. The good student wanting to take extra courses beyond the minimum program requirements will find it easy to do so in Years 2 and 4. Total Credits: 1.5 C

Honours Earth Sciences (Geology Option)

Year 1
(For a complete discussion of Year 1, see page 14.8).

Year 2
EARTH 221 Geochemistry 1 (0.5)
EARTH 231 Mineralogy (0.5)
EARTH 232 Petrography (0.5)
EARTH 235 Stratigraphy (0.5)
EARTH 236 Principles of Paleontology (0.5)
EARTH 238 Introductory Structural Geology (0.5)
EARTH 260 Applied Geophysics 1 (0.5)
ENGL 210 Report Writing (0.5)
Electives 2 term courses, normally from courses in Science and/or Mathematics.

Year 3
EARTH 331 Igneous Petrology (0.5)
EARTH 332 Metamorphic Petrology (0.5)
EARTH 333 Sedimentology (0.5)
EARTH 336 Paleontology (0.5)
EARTH 342 Geomorphology (0.5)
EARTH 345 Historical Geology (0.5)
EARTH 355 Statistical Methods in Geology (0.5)
EARTH 370 Economic Geology (0.5)
EARTH 390 Methods in Geological Mapping
Electives 2 credits, normally 1 from courses in Science and/or Mathematics, and 1 from Arts.

Year 4
EARTH 427 Crustal Evolution (0.5)
EARTH 490 Field Trip
7 half-credits from:†
EARTH 421 Geochemistry 2 (0.5)
EARTH 432 Precambrian Geology (0.5)
EARTH 433 Applied Sedimentology (0.5)
EARTH 434 Biostratigraphy (0.5)
EARTH 435 Advanced Structural Geology (0.5)
EARTH 436 Thesis (1.0)
EARTH 437 Rock Mechanics (0.5)
EARTH 438 Engineering Geology (0.5)
EARTH 439 Hydrogeology (0.5)
EARTH 440 Quaternary Geology (0.5)
EARTH 456 Numerical Methods in Geoscience (0.5)
EARTH 461 Applied Geophysics 2 (0.5)
EARTH 470 Metallic Mineral Deposits (0.5)
Electives 1 credit, not from Earth Sciences.

†Upon program approval by the Undergraduate Officer, a student may take 6.0 half-credits from the above list to allow freedom to take courses in the Faculties of Engineering, Mathematics or Science. Students who plan to go graduate work in hydrogeology are advised to take MATH 213a-213b or CIV E 221 during their fourth year.

Recommended electives: CHEM 218, Development of Chemical Bonding and Structure; CHEM 219, Chemistry of Non-Transition Metals; CHEM 356-357, General Physical Chemistry; BIOL 111-112, Introduction to Biology; 200-level term courses in Biology; PHYS 259-259L, Crystallography and X-Ray diffraction; PHYS 250, The Solar System; PHYS 251, The Stellar System; MATH 213a-213b, Calculus; MATH 226, Elementary Differential Equations; MATH 216, Differential Equations; MATH 230, Advanced Calculus; or courses relevant to Industrial Employment (see page 14.15, Table B). PHYS 368-369 are considered as unrestricted electives.

Note
The Department of Earth Sciences is prepared to work out Honours programs with students who wish to use their electives to specialize in a particular discipline; e.g., Mathematics, Biology, Chemistry, Physics.

On page 14.9, a list of recommended Science and Mathematics electives is given.

(See Undergraduate Course Descriptions, Chapter 16).
Honours Earth Sciences (Geography Option)
This program combines the basic courses of Honours Earth Sciences with Geography.
Minimum total credits for this program are 23.0, comprised of 42 term courses plus 2 field courses. The program breaks down as 21 EARTH courses, 2 EARTH Field courses, 10 Geography/Environmental Studies courses, 5 Science/Math core courses, 1 Arts core course, 2 Arts electives, 3 unrestricted electives.
In selecting 200-, 300-, and 400-level Geography options, students should select courses from one or more of the following sequences in Note 1.
Students must maintain a 75% average in all Geography courses, a 65D/0 average in Earth Sciences courses and a 60% average in all other courses.

Note 1
Electives:
5 term courses from 1 or more of the following sequence:
Cartography Sequence
GEOG 260 Introduction to Cartography and Map Analysis (0.75)
GEOG 360 Preparation of Maps and Illustrations (0.5)
GEOG 403 Advanced Cartography (0.5)
GEOG 404 Advanced Cartography 2 (0.5)
Air Photo/Remote Sensing Sequence
GEOG 275 Introduction to Air Photo Analysis and Remote Sensing (0.75)
GEOG 375 Air Photo Interpretation (0.75)
GEOG 376 Environmental Remote Sensing (0.75)
GEOG 470 Applied Air Photo Interpretation (0.75)
GEOG 471 Applied Remote Sensing (0.75)
Resource Management Sequence
GEOG 303 Physical Basis and the Geography of Water (0.75)
GEOG 356 Resources Management (0.5)
GEOG 357 Conservation and Resource Management (0.5)
GEOG 358 Water Planning and Management: Strategies and Experiences (0.75)
GEOG 359 Geography of Energy (0.5)
GEOG 414 Energy Resources Management (0.5)
GEOG 461 Land Dereliction and Rehabilitation 1 (0.5)

Year 1
(For a complete discussion of Year 1, see page 14.8).

Year 2
EARTH 221 Geochemistry 1 (0.5)
EARTH 231 Mineralogy (0.5)
EARTH 232 Petrography (0.5)
EARTH 235 Stratigraphy (0.5)
EARTH 236 Principles of Paleontology (0.5)
EARTH 238 Introductory Structural Geology (0.5)
ENV S 200 Field Ecology (0.75)
GEOG 201 Some Basic Topics of Physical Geography (0.75)
GEOG 202 Some Basic Topics of Economics and Urban Geography (0.5)
Elective 1 elective (0.5)

Year 3
EARTH 331 Igneous Petrology (0.5)
EARTH 332 Metamorphic Petrology (0.5)
EARTH 333 Sedimentology (0.5)
EARTH 336 Paleontology (0.5)
EARTH 342 Geomorphology (0.5)
EARTH 345 Historical Geology (0.5)
EARTH 370 Economic Geology (0.5)
EARTH 390 Field Camp
ENGL 210 Report Writing (0.5)
GEOG Electives 2 one-term equivalents (1.0)
(See Note 1)
Elective 1 credit (1.0)

Year 4
EARTH 427 Crustal Evolution (0.5)
EARTH 440 Quaternary Geology (0.5)
EARTH 490 Field Trip
and 4 term courses from 400-level EARTH.
GEOG 3 term courses from 300- or 400- level Geography (See Note 1).
Elective 1 elective (0.5)

Co-operative Applied Earth Sciences
Both Co-operative programs in Earth Sciences are Honours programs. In addition to good academic training, the graduating geologist will have gained considerable practical experience, thus satisfying the requirements of many potential employers. In the first year, students take the Year 1 Science program as described on page 14.8. 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. 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.
General features and conditions of the Co-operative plan at the University of Waterloo are given in Chapter 5.
The normal progress of a student entering Cooperative Earth Sciences in the Fall of 1984 is shown in the Co-op chart in Chapter 5. There are 2 programs available: Geology and Geophysics. Students contemplating careers in Engineering Geology should consult the program outlined in the Geological Engineering Section.

Geology Option

Students should refer to Notes 1-4 under Regular Honours Earth Sciences program (p. 14.18). A list of recommended Science and Mathematics electives is given on page 14.19.

Year 1
(For a complete discussion of Year 1, see page 14.8).

Year 2A
EARTH 231 Mineralogy (0.5)
EARTH 235 Stratigraphy (0.5)
EARTH 236 Principles of Paleontology (0.5)
EARTH 260 Applied Geophysics (0.5)
Electives 1 elective (0.5)

Year 2B
EARTH 221 Geochemistry 1 (0.5)
EARTH 232 Petrography (0.5)
EARTH 238 Introductory Structural Geology (0.5)
ENGL 210 Report Writing (0.5)
Electives 1 elective (0.5)

Year 3A
EARTH 332 Metamorphic Petrology (0.5)
EARTH 333 Sedimentology (0.5)
EARTH 345 Historical Geology (0.5)
EARTH 370 Economic Geology (0.5)
EARTH 390 Methods in Geological Mapping
Electives 2 half credits, normally 1 from Science or Mathematics and 1 from Arts. (1.0)

Year 3B
EARTH 331 Igneous Petrology (0.5)
EARTH 336 Paleontology (0.5)
EARTH 342 Geomorphology (0.5)
EARTH 355 Statistical Methods in Geology (0.5)
Electives 2 half credits, normally 1 from Science or Mathematics and 1 from Arts (1.0)

Year 4A, 4B
Identical to regular program in Honours Earth Sciences (See p. 14.18).

Geophysics Option

This is a Co-operative program which supplements the core geology courses with physics and mathematics and is intended for students planning careers in geophysical exploration. This Option differs from the Geophysics Option offered by the Physics Department in that its main emphasis is geological, but the 2 programs are supervised by a Geophysics Curriculum Committee comprised of Faculty from both departments.

Attendance is required at the field camp (EARTH 390) and on the fourth year field trip (EARTH 490).

Year 1
(For a complete discussion of Year 1, see page 14.8).

Year 2A
EARTH 231 Mineralogy (0.5)
EARTH 235 Stratigraphy (0.5)
EARTH 260 Applied Geophysics 1 (0.5)
MATH 213a Calculus 2 (0.5)
ENGL 210 Report Writing (0.5)
1 of PHYS 226-226L or PHYS 256-256L (0.5)

Year 2B
EARTH 221 Geochemistry 1 (0.5)
EARTH 232 Petrography (0.5)
EARTH 238 Introductory Structural Geology (0.5)
MATH 213b Calculus 2 (0.5)
1 of PHYS 243-243L or PHYS 253-253L (0.5)
Elective (0.5)

Year 3A
EARTH 332 Metamorphic Petrology (0.5)
EARTH 333 Introductory Sedimentology (0.5)
EARTH 370 Economic Geology (0.5)
EARTH 390 Methods in Geological Mapping
PHYS 369 Geophysics 2 (0.5)
Elective (0.5)

Year 3B
EARTH 236 Principles of Paleontology (0.5)
EARTH 331 Igneous Petrology (0.5)
EARTH 355 Statistical Methods in Geology (0.5)
PHYS 368 Geophysics 1 (0.5)
PHYS 254 Properties of Matter (0.5)
MATH 216 Differential Equations (0.5)

Year 4
EARTH 427 Crustal Evolution (0.5)
EARTH 460 Applied Geophysics 2 (0.5)
EARTH 461 Applied Geophysics 3 (0.5)
EARTH 490 Field Trip
PHYS 352 Electronics 1 (0.5)
PHYS 352L Electronics 1 Laboratory (0.25)
PHYS 353 Electronics 2 (0.5)
PHYS 353L Electronics 2 Laboratory (0.25)
Plus 2.5 Earth Sciences credits from 3rd and 4th year courses.

Geotechnical Option

This program is no longer available. Students interested in this Option should seek admission to the Geological Engineering degree program.
Students who are still in the Geotechnical Option follow the courses outlined below.

### Year 3A
- **CIV E 353** Geology and Soil Mechanics (0.5)
- **CIV E 232** Engineering Economics (0.5)
- **EARTH 437** Rock Mechanics (0.5)
- **EARTH 332** Metamorphic Petrology (0.5)
- **EARTH 333** Sedimentology (0.5)
- **EARTH 370** Economic Geology (0.5)
- **EARTH 390** Methods in Geological Mapping

### Year 3B
- **CIV E 200** Civil Engineering Project (0.5)
- **CIV E 354** Foundation Engineering (0.5)
- **EARTH 331** Igneous Petrology (0.5)
- **EARTH 260** Applied Geophysics (0.5)
- **EARTH 438** Engineering Geology (0.5)
- **EARTH 439** Hydrogeology (0.5)
- **CIV E 291** Survey Camp (0.5)

### Year 4
- **CIV E 204** Dynamics (0.5)
- **CIV E 224** Probability and Statistics (0.5)
- **CIV E 280** Fluid Mechanics (0.5)
- **EARTH 435** Advanced Structural Geology (0.5)
- **EARTH 440** Quaternary Geology (0.5)
- **EARTH 345** Historical Geology (0.5)
or
- **EARTH 427** Crustal Evolution (0.5)

**Earth Sciences Courses Totalling 1.5 Credits From:**
- **EARTH 421** Geochemistry 2 (0.5)
- **EARTH 432** Precambrian Geology (0.5)
- **EARTH 433** Applied Sedimentology (0.5)
- **EARTH 436** Thesis/Geotechnical Project (1.0)
- **EARTH 456** Numerical Methods in Geoscience (0.5)
- **EARTH 461** Applied Geophysics 2 (0.5)
- **EARTH 470** Metallic Mineral Deposits (0.5)
- **EARTH 490** Field Trip
  or
- An Approved Engineering course (0.5)

1.5 credits from Arts electives.

### Honours Physics

The Honours program is in the form of a core of required courses, plus appropriate electives. The elective courses may be chosen from a wide range of courses offered by the Physics Department and by other departments of the University. By careful selection of electives, students can deepen their knowledge of experimental or theoretical physics, or obtain a background in another subject (e.g., Astronomy, Geophysics, Chemistry, Mathematics, Computing, Business Administration). The choice of electives must be made to fit the student's timetable, and must be approved by the Undergraduate Officer of the Department of Physics. The required courses which constitute the core are listed below. Examples of possible elective programs are available in the office of the undergraduate advisors. Detailed descriptions of the courses start in Chapter 16.

### Year 1
*(For a complete discussion of Year 1, see page 14.8).*

### Year 2

#### Fall Term
- **PHYS 10** Physics Seminar (0.0)
- **PHYS 254** Thermal Physics and Properties of Matter (0.5)
- **PHYS 256** Wave Motion and Optics (0.5)
- **PHYS 256L** Physical Optics Lab (0.25)
- **MATH 213a** Calculus 2 (0.5)
- **MATH 216** Differential Equations (0.5)
- **Elective** (0.5)

#### Winter Term
- **PHYS 10** Physics Seminar (0.0)
- **PHYS 253** Electricity and Magnetism (0.5)
- **PHYS 253L** Electricity and Magnetism Lab (0.25)
- **PHYS 263** Classical Mechanics and Special Relativity (0.5)
- **MATH 213b** Calculus 2 (0.5)
- **Electives** (1.0)

### Year 3

#### Fall Term
- **PHYS 10** Physics Seminar (0.0)
- **PHYS 354** Atomic and Molecular Physics (0.5)
- **PHYS 358** Thermodynamics (0.5)
- **PHYS 360a** Intermediate Lab (0.25)
- **PHYS 364** Mathematical Physics 1 (0.5)
- **Elective** (0.5)
- **Elective Lab** (0.25)

#### Winter Term
- **PHYS 10** Physics Seminar (0.0)
- **PHYS 359** Statistical Mechanics (0.5)
- **PHYS 360b** Intermediate Lab (0.25)
- **PHYS 363** Classical Mechanics (0.5)
- **PHYS 365** Mathematical Physics 2 (0.5)
- **Elective** (0.5)
- **Elective Lab** (0.25)

### Year 4

#### Fall Term
- **PHYS 10** Physics Seminar (0.0)
- **PHYS 434** Introductory Quantum Mechanics (0.5)
- **PHYS 441** Electromagnetic Theory (1.0)
  *(Year Course)*
- **PHYS 455** Nuclear and Particle Physics (0.5)
- **PHYS 433** Experimental Research Project (1.0)
  *(Year Course)*
or
- **PHYS 437a** Theoretical Physics Project (0.5)

- **Electives to make up total of 5 credits in Year 4 of which (0.5) must be in Physics.**
Note
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.

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.

Co-operative Applied Physics (Honours)
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 coordinated to complement the student's course work and interest where possible. Many work-term experiences, especially in the upper years, provide the student with a deeper insight into the meaning and methods of research as well as an incentive to develop course work. Such experience provides a contribution to the development of a scientist who cannot be learned in lecture courses, and helps prepare an individual to apply a fundamental physics background to the solution of practical problems.

Further information about the Co-operative work terms and the Co-ordination Department can be found in Chapter 5.

Options
There are 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

Year 1
(For a complete discussion of Year 1, see page 14.8)

Year 2A (Fall)
MATH 213a Calculus 2 (0.5) or
MATH 230a Advanced Calculus (0.5)
MATH 216 Differential Equations (0.5) or
AM 260 Mathematical Modelling (0.5)
PHYS 100 Physics Seminar (0.0)
PHYS 254 Thermal Physics and Properties of Matter (0.5)
PHYS 256 Wave Motion and Optics (0.5)
PHYS 256L Physical Optics Lab (0.25)
Elective (0.5)

Year 2B (Spring)
MATH 213b Calculus 2 (0.5) or
MATH 230b Advanced Calculus (0.5)
PHYS 100 Physics Seminar (0.0)
PHYS 253 Electricity and Magnetism (0.5)
PHYS 253L Electricity and Magnetism (0.25)
PHYS 263 Classical Mechanics and Special Relativity (0.5)
Elective (1.0)

Year 3A (Spring)
PHYS 100 Physics Seminar (0.0)
PHYS 354 Atomic and Molecular Physics (0.5)
PHYS 358 Thermodynamics (0.5)
PHYS 360a Intermediate Lab (0.25)
PHYS 364 Mathematical Physics 1 (0.5)
Elective (0.5)
Elective Lab (0.25)

Year 3B (Winter)
PHYS 100 Physics Seminar (0.0)
PHYS 359 Statistical Mechanics (0.5)
PHYS 360b Intermediate Lab (0.25)
PHYS 363 Classical Mechanics (0.5)
PHYS 365 Mathematical Physics 2 (0.5)
Elective (0.5)
Elective Lab (0.25)

Year 4
Terms A and B (Fall and Winter)
PHYS 100 Physics Seminar (0.0)
PHYS 434 Introductory Quantum Mechanics (0.5)
PHYS 441 Electromagnetic Theory (1.0) (Year Course)
PHYS 455 Nuclear and Particle Physics (0.5)
Electives must make up a total of 5 credits in Year 4.
1 of PHYS 433 or PHYS 437A is recommended.
Note

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)
(Terms follow scheme of Co-op Earth Science)

Year 1A (Fall)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 121</td>
<td>Introductory Physics 1</td>
<td>0.5</td>
</tr>
<tr>
<td>PHYS 121L</td>
<td>Introductory Physics 1 Lab</td>
<td>0.25</td>
</tr>
<tr>
<td>CHEM 123</td>
<td>Chemical Reactions, Equilibria and Kinetics</td>
<td>0.5</td>
</tr>
<tr>
<td>CHEM 123L</td>
<td>Chemical Reaction Lab 1</td>
<td>0.25</td>
</tr>
<tr>
<td>EARTH 121</td>
<td>Introductory Geology 1</td>
<td>0.5</td>
</tr>
<tr>
<td>MATH 114</td>
<td>Algebra and Vector Geometry</td>
<td>0.625</td>
</tr>
<tr>
<td>MATH 115a</td>
<td>Calculus</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Year 1B (Winter)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 122</td>
<td>Introductory Physics 2</td>
<td>0.5</td>
</tr>
<tr>
<td>PHYS 122L</td>
<td>Introductory Physics 2 Lab</td>
<td>0.25</td>
</tr>
<tr>
<td>CHEM 124</td>
<td>Organic Chemistry 1</td>
<td>0.5</td>
</tr>
<tr>
<td>CHEM 124L</td>
<td>Chemical Reaction Lab 2</td>
<td>0.25</td>
</tr>
<tr>
<td>EARTH 122</td>
<td>Introductory Geology 2</td>
<td>0.5</td>
</tr>
<tr>
<td>CS 118</td>
<td>Introduction to Scientific Problem or Solving by Computer</td>
<td></td>
</tr>
<tr>
<td>CS 140</td>
<td>Introduction to Mathematical Problem Solving by Computer</td>
<td></td>
</tr>
<tr>
<td>MATH 115b</td>
<td>Calculus</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Year 2A (Fall)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 254</td>
<td>Thermal Physics and Properties of Matter</td>
<td>0.5</td>
</tr>
<tr>
<td>PHYS 256</td>
<td>Wave Motion and Optics</td>
<td>0.5</td>
</tr>
<tr>
<td>PHYS 256L</td>
<td>Physical Optics Lab</td>
<td>0.25</td>
</tr>
<tr>
<td>MATH 213a</td>
<td>Advanced Calculus</td>
<td>0.5</td>
</tr>
<tr>
<td>MATH 216</td>
<td>Differential Equations</td>
<td>0.5</td>
</tr>
<tr>
<td>EARTH 231</td>
<td>Mineralogy and Crystallography</td>
<td>0.5</td>
</tr>
<tr>
<td>EARTH 260</td>
<td>Applied Geophysics 1</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Year 2B (Spring)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 10</td>
<td>Physics Seminar</td>
<td>0.0</td>
</tr>
<tr>
<td>PHYS 253</td>
<td>Electricity and Magnetism</td>
<td>0.5</td>
</tr>
<tr>
<td>PHYS 253L</td>
<td>Electricity and Magnetism Lab</td>
<td>0.25</td>
</tr>
<tr>
<td>PHYS 263</td>
<td>Classical Mechanics and Special Relativity</td>
<td>0.5</td>
</tr>
<tr>
<td>MATH 213b</td>
<td>Advanced Calculus</td>
<td>0.5</td>
</tr>
<tr>
<td>EARTH 232</td>
<td>Petrography</td>
<td>0.5</td>
</tr>
<tr>
<td>EARTH 238</td>
<td>Introductory Structural Geology</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Year 3A (Winter)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 10</td>
<td>Physics Seminar</td>
<td>0.0</td>
</tr>
<tr>
<td>PHYS 259</td>
<td>Crystallography and X-Ray Diffraction</td>
<td>0.5</td>
</tr>
<tr>
<td>PHYS 259L</td>
<td>Crystallography and X-Ray Diffraction Lab</td>
<td>0.25</td>
</tr>
</tbody>
</table>

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.

A cumulative average of 75% must be maintained in the Psychology courses and a cumulative average of 60% in the Faculty of Science courses.

Year 1
(For a complete discussion of Year 1, see page 14.8).

Year 2

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSYCH 291</td>
<td>Basic Research Methods</td>
<td>0.5</td>
</tr>
<tr>
<td>PSYCH 292</td>
<td>Basic Data Analysis</td>
<td>0.5</td>
</tr>
<tr>
<td>One of</td>
<td>PSYCH 203, 206, 207, 261, 271</td>
<td>0.5</td>
</tr>
<tr>
<td>One of</td>
<td>PSYCH 211, 253, 355, 357</td>
<td>0.5</td>
</tr>
<tr>
<td>Electives</td>
<td>PSYCH (1.0)</td>
<td></td>
</tr>
<tr>
<td>Electives*</td>
<td>Science (2.0)</td>
<td></td>
</tr>
<tr>
<td>Elective</td>
<td>Unspecified (1.0)</td>
<td></td>
</tr>
</tbody>
</table>

Year 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSYCH 391</td>
<td>Advanced Data Analysis</td>
<td>0.5</td>
</tr>
<tr>
<td>Two of</td>
<td>PSYCH 392, 393, 394, 395, 396, 397, 398</td>
<td></td>
</tr>
</tbody>
</table>
One of PSYCH 203, 206, 207, 261, 271 (0.5)
One of PSYCH 211, 253, 355, 357 (0.5)
Elective PSYCH (0.5)
Electives* Science (2.0)
Elective Unspecified (1.0)

Year 4
PSYCH 499 Senior Honours Essay (1.0)
Electives PSYCH (1.0)
Electives* Science (1.0)
Elective Unspecified (2.0)

*No more than 2.0 credits offered under the “Science” label may be included in the total Science elective credits.

Also, of the 5.0 Science credits required in Year 2, 3, and 4, at least 2.0 of these must be at the 300- or 400-level, exclusive of the “Science” labelled courses.

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 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.

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; BIOL 201, Human Anatomy; BIOL 202, Histology, Embryology; BIOL 240, Fundamentals of Microbiology; CHEM 123-123L, Chemical Reaction, Equilibria and Kinetics; CHEM 124-124L and 266-266L, Organic Chemistry; CHEM 237-237L, Biochemistry; PHYS 121-122, 121L-122L, General Physics; PHYS 245-246L, Physical Optics; PSYCH 101, Introductory Psychology; PSYCH 200 or 292, or STAT 202, Statistics; MATH 113a,b, Calculus. Laboratory courses must be completed where given with the above course. To complete the pre-professional program, additional courses in the behavioural sciences, social sciences and the humanities are recommended.

The Admissions Committee will also consider applications from superior students who have completed other academic 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 1983 there were approximately 350 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. The agreement provides that no more than 7 from Alberta, 3 from Manitoba, 1 from New Brunswick, 1 every 3 years from P.E.I. and 3 from Saskatchewan may be admitted to the first professional year. 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. 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, 1984. 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 Officer of the School.

Admission to Advanced Standing
Applications are not ordinarily accepted to a year more advanced than the first professional year. However, graduates from certain Commonwealth Universities who are licensed to practise optometry in their country of origin may in certain instances be admitted to a more advanced level in a program leading to the O.D. degree. For more information write: The Admissions Officer, School of Optometry.

Note
Interviews with the Admissions Officer of the School are required in the case of applicants in certain categories before any application can be processed. Those categories include:
1. Applicants over age 30.
2. Applicants with undergraduate or graduate training who have not completed prerequisites for the pre-professional program and who are considering a “make-up” year.
3. Applicants considering a “make-up” year to repeat courses for the purpose of raising grades.
4. Applicants who are 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
Year 1: First Professional Year. First offered 1980-81.

Fall Term
OPTOM 100 History and Orientation (0.5)
OPTOM 104 Anatomy of the Eye and Associated Structures (0.5)
OPTOM 105 General Pathology (0.5)
OPTOM 106 Geometric Optics (0.5)
BIOL 301 Vertebrate Physiology (first term) (0.5)

Winter Term
OPTOM 111 Physiological Optics (0.5)
OPTOM 114 Anatomy of the Eye and Associated Structures (0.5)
OPTOM 115 General Pathology (0.5)
OPTOM 116 Ophthalmic Optics 1 (0.5)
BIOL 301 Vertebrate Physiology (second term) (0.5)

Year 2: Second Professional Year. First offered 1981-82.

Fall Term
OPTOM 241 Physiological Optics (0.5)
OPTOM 242 Clinical Optometry (0.5)
OPTOM 244 Neurophysiology of Vision (0.5)
OPTOM 245 Ocular Pathology (0.5)
OPTOM 246 Ophthalmic Optics 2 (0.5)
OPTOM 261 Physiological Optics (0.5)

Winter Term
OPTOM 251 Physiological Optics (0.5)
OPTOM 252 Clinical Optometry (0.5)
OPTOM 254 Physiology of The Eye and Ocular Adnexa (0.5)
OPTOM 255 Ocular Pathology (0.5)
OPTOM 274 Genetics (0.5)
The Honours Science program allows a student to study sciences in greater depth than permitted in the General Science program but without as intense a degree of specialization as required in the more specialized programs such as Honours Biology, Honours Chemistry, etc. Students desiring a somewhat broader background in the Sciences might find this program more suitable than the more traditional specialized programs. However, students contemplating graduate study in the traditional disciplines following their undergraduate studies are advised to pursue the more specialized Honours programs.

Course programs must be discussed with and approved by the appropriate Department Undergraduate Officer or his delegate.

A 60% cumulative overall average is required in all programs. A 60% cumulative overall average in all Faculty of Science courses is required in Program (1) outlined below; a 60% cumulative average in the field of specialization for Chemistry and Physics, and a 65% for Biology and Earth Sciences programs. This is the same as for all Honours programs in the Science Faculty.

All programs require the successful completion of 22 or more credits, the number depending on the respective program. Of the total credits, 20 must be lecture credits. At least 14 of the total credits must be Faculty of Science credits.

No more than 3 credits offered under the "Science" label may be applied to any program.

One of the 5 programs described below should be selected: Program (1) is non-specialized; Programs (2), (3), (4) and (5) have a field of specialization: Biology, Chemistry, Earth Sciences or Physics respectively. All programs lead to the degree of Bachelor of Science (Honours Science).

### SPECIFIC REQUIREMENTS

**Program (1)**

**Honours Science** (non-specialized)

Requires 22 credits exclusive of any Year 1 lab credits, 14 of which must be Science credits.

**Year 1**

Five lecture credits, exclusive of laboratory credits. At least 2 of these must be Science courses chosen from: BIOL 111-112 or 2 200-level term courses; CHEM 123-124 + labs; EARTH 121-122; PHYS 111-112 or PHYS 121-122 + labs.

**Years 2, 3 & 4**

Normally 4 Science credits should be taken in Years 2, 3 and 4 plus 2 other credits per year in Year 2 and 3; 1 other credit in Year 4. Of the total required 14 Faculty of Science credits, at least 10 must be at the 200-level.
or higher and at least 4 of them other than any Science labelled credits must be at the 300- or 400-level. At least 1.0 credit in Math must be included in the total credits required.

### Program (2)
**Honours Science** (with specialization in Biology)

<table>
<thead>
<tr>
<th>Year 1</th>
<th>(For a complete discussion of Year 1, see page 14.8)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3 credits from BIOL 210, 211, 220, 221, 230, 233, 239, 240, 241, 250. CHEM 266-266L and either 267 and 237-237L. 2 other credits (STAT 202 is recommended).</td>
</tr>
<tr>
<td>Year 3</td>
<td>3 credits from BIOL 311, 315, 316, 323, 324, 327, 330, 331, 333, 335, 336, 337, 338, 342, 344, 350, 356. 1 other Science credit† 2 other credits.</td>
</tr>
</tbody>
</table>

### Program (3)
**Honours Science** (with specialization in Chemistry)

Year 1

Five lecture credits plus related lab credits. CHEM 123-124 and 123L-124L, PHYS 111-112 or 121-122 and PHYS 111L-112L or 121L-122L, MATH 113a-113b must be included.

### Program (4)
**Honours Science** (with specialization in Earth Sciences)

The program consists of 21.0 lecture credits, i.e. 42 term courses of which 10 credits are from EARTH courses, at least 4 lecture credits are from other Science courses, at least 1.5 credits are from Mathematics, at least 1.5 credits are from Arts and 4.0 credits are unrestricted. SCI-labelled courses count as unrestricted electives and may not be used to satisfy the Science course requirements. A year-by-year breakdown of courses follows below. Standards for this program are 65% cumulative major average and 60% cumulative overall average.

| Year 1 | 3 Chemistry lecture credits, at least 2 of which must be chosen from CHEM 212, 220, 221, 254, 255, 264, 266. 1 lecture credit to be chosen from Physics, Biology or Earth Sciences. *(Not Science-labelled courses.)* 2 Elective credits. CHEM 10, Chemistry Seminar (0.0) is also required. |
| Year 2 | 3 Chemistry credits at the 300-level or higher. 1 lecture credit to be chosen from Physics, Biology or Earth Sciences *(Not Science-labelled courses.)* 2 Elective credits. CHEM 10, Chemistry Seminar (0.0) is also required. |
| Year 3 | †Before graduation a student must obtain lab credit for CHEM 123L and 124L, plus, at least 0.5 lab credit and one lecture credit in each of the following areas of Chemistry: Analytical, inorganic, Organic, Physical. Wherever possible, the laboratory chosen should accompany the appropriate lecture-course. |
| Year 4 | 6 or 8 term courses from EARTH 331, 332, 333, 336, 345, 355, 260, 370. 2 other Science term courses. ENGL 210 One other unrestricted term course. |

†In order to graduate in Honours Science Program 2 a student must take at least 1 term of Biochemistry (CHEM 237 and 237L) and 1 term of Organic Chemistry beyond Year 1 and a computer course. Students who plan to specialize in areas of Biology with a substantial biochemical component should plan to take Biochemistry in Years 3 and 4. They are advised to take Organic Chemistry, CHEM 267, in their second year and to select Biochemistry courses, CHEM 237 and 237L and, 333 and 333L in their third year, and other Biochemistry courses in fourth year. (Alternatively, they may take CHEM 237 and 237L along with CHEM 267 in their second year, and then CHEM 332 and 332L and CHEM 333 and 333L in their third year, and other Biochemistry courses in their fourth year). At least 1.0 credit in Math must be included in the total credits required.

Since some fourth-year courses are offered in alternate years only, Biology major students are advised to plan their third- and fourth-year courses simultaneously. Students are also advised that a number of botanically-related courses can be taken during either third or fourth year. Viz. (BIOL 323, 324, 327, 420, 424, 427, 457).

†/n order to graduate in Honours Science Program 2 a student must take at least 1 term of Biochemistry (CHEM 237 and 237L) and 1 term of Organic Chemistry beyond Year 1 and a computer course. Students who plan to specialize in areas of Biology with a substantial biochemical component should plan to take Biochemistry in Years 3 and 4. They are advised to take Organic Chemistry, CHEM 267, in their second year and to select Biochemistry courses, CHEM 237 and 237L and, 333 and 333L in their third year, and other Biochemistry courses in fourth year. (Alternatively, they may take CHEM 237 and 237L along with CHEM 267 in their second year, and then CHEM 332 and 332L and CHEM 333 and 333L in their third year, and other Biochemistry courses in their fourth year). At least 1.0 credit in Math must be included in the total credits required.

Since some fourth-year courses are offered in alternate years only, Biology major students are advised to plan their third- and fourth-year courses simultaneously. Students are also advised that a number of botanically-related courses can be taken during either third or fourth year. Viz. (BIOL 323, 324, 327, 420, 424, 427, 457).
Year 4
3 to 5 term courses from EARTH 300- or 400-level courses.
EARTH 427
6 to 4 other term courses to balance overall program requirements.

Program (5)
Honours Science (with specialization in Physics)
This program is designed to allow a student the broadest possible selection of courses consistent with specialization in Physics. A total of 22 credits are required, 14.0 of which must be Faculty of Science credits.

The following Honours courses from Physics and Mathematics should be included:

Year 1
(For a complete discussion of Year 1, see page 14.8).

Year 2
PHYS 253, 253L, 254, 256, 256L, 263, MATH 213a-213b, 216.

Years 3 and 4
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. PHYS 354 and 455 must be included.

In addition at least 1.5 credits of Physics lab courses must be completed during the 4 years of the program. PHYS 433 may be used in lieu of a Physics lecture credit, but not as a core lecture credit.

3. General Science Programs
As of September 1983, only the 3-Year General Science program will be available to new applicants. The 4-Year General program has been discontinued. Students currently in 4-Year General programs in good academic standing may continue to completion. Students may specialize in a particular subject area in the 3-year program or may elect to pursue a broad range of Science subjects. The 3-year program is titled "General Science" with no area of specialization designated. Students wishing to major should consider the 4-Year Honours programs.

Students who have completed Year 2 or 3 of the 3-year program and who have taken the required courses are qualified to apply for admission to medical school in Ontario. Students who have passed the first year of the program with appropriate choice of courses are qualified to apply for admission to a dental school.
must also have any necessary prerequisites listed before attempting upper year courses: these are listed in the Departmental descriptions.

Science courses recommended
(other than Year 1 courses)


General Science (non-Major) students may not take Honours Core Chemistry courses. Nor may they take 400-level courses, and certain 300-level courses, without the consent of the instructor.

A student required to transfer from an Honours program in Chemistry who enrolls in the General program is permitted to take no more than 2 lecture courses in Chemistry during the first term of study as a General degree student.


(No more than 3 credits may be selected from the courses under the “Science” label).


Mathematics courses recommended

MATH 113a, 113b, 111a, 111b, 215 or 216, CS 115, 118, 210; STAT 204, 304 but not MATH 103-106.

Arts courses recommended

It is impossible to list all the possible Options here. Many students select first or second year Options from the following subject areas: Accounting, Anthropology, Arts, Classical Studies, Economics, English, French, Geography, German, History, Philosophy, Political Science, Psychology, Russian, Sociology, Religious Studies. Subject to prerequisites and timetable, a wide range of Arts courses are available.

General Science - Four-year Major Programs

As of September 1983, no new applicants were admitted to any of the 4-Year General programs. Students currently in these programs in good academic standing may continue to completion.

The minimum standard for graduation from the 4-year majoring programs will be a cumulative (overall) average of 55% calculated from all courses taken (in any year - whether passed or failed) plus a 60% cumulative average for the major field courses. No more than 5.0 failed credits are permitted. Students who do not maintain their major field average in the 4-year program will be transferred to the 3-year ("Non-Major") program where a Major field average is unnecessary.

Recommended Program

The selection of courses in upper years will be restricted partly by limitations imposed by the timetable, and partly by the necessity in many courses of having completed prerequisites. Each student’s program must, therefore, be approved by the Undergraduate Officer of the Department of his major field.

The following programs are those recommended by the Department of Major study in their fields. The University will make every effort to ensure that the timetable accommodates these programs.

Biology Major

Year 4

5 credits at least 2† of which are 400-level Biology courses or from the previous list of 300-level Biology courses.

†In order to graduate in the Biology Major program a student must take at least 1 term of Biochemistry (CHEM 237 and 237L) and 1 term of Organic Chemistry beyond Year 1. Students who plan to specialize in areas of Biology with a substantial biochemical component should plan to take biochemistry in Years 3 and 4. They are advised to take CHEM 267 (Organic Chemistry) in their second year and to select, as electives, CHEM 332, 333, 332L, 333L (Biochemistry) in their third year and other Biochemistry courses in fourth year. Other students are advised to take CHEM 237-237L in their second year.

Note

Some possible electives are shown in the list under the 3-year program. These courses would be suitable choices here. (PHYS 301-302 are especially recommended.)

Chemistry Major

Year 4

5 elective credits to complete the requirements for the degree.†

†Electives can be freely chosen provided that before graduation at least 2 Chemistry credits are obtained at the 300- or 400-level, in addition to the required courses listed above. At least 15.0 lecture-credits must be obtained before graduation. General Science, Chemistry Major students may not take Honours Core courses but must take the General program equivalents, where they are available.
Earth Science Major

Year 4
2 or 3 credits from:
3 or 2 credits from non-Earth Sciences courses.

Physics Major (a minimum of 20.0 credits required)

Year 4
2 or 3 of:
2 or 1 non-Physics Science credits.
Arts or Mathematics Elective.

General Science and Business

As of September 1983, no new applicants were accepted into this program. Students in good standing in the program may continue to completion.

In the near future General Science and Business may be replaced by an Honours Science and Business program. Meanwhile, students interested in this area might consider a Management Studies Minor (see Chapter 15 of this Calendar).

The program is made up of at least 21 credits with 10 required in Science (including at least 4 at the 300-level or higher) and the remainder in Mathematics, Economics and Business Administration. The Business courses are given at Wilfrid Laurier University and may be taken by University of Waterloo students through co-operation between the two Universities; Economics and Accounting courses are offered by the Department of Economics and Accounting respectively, University of Waterloo.

Because courses for this option are given by several faculties at two universities, timetable changes may occur from time to time. It is the student’s responsibility to keep informed of these changes.

A 55% overall average must be maintained in this program. A 70% average is normally required in the Economics, Accounting and Business courses for transfer credit to Schools of Business Administration.

Science

General Science Programs

Year 2, 3, and 4
Students must take during Years 2 through 4, at least 5 lecture-credits from one of the Science Departments viz. Biology, Chemistry, Earth Sciences or Physics and at least 2 of these credits must be at the 300-level or higher. Enough Science credits must be taken to give a total of 10 lecture credits.

plus at Year 4
3 credits from:
- BUS 352-362 (WLU); BUS 454-464 (WLU);
- BUS 481-491 (WLU); M SCI 47, M SCI 53.

Note

Students interested in Science with Business may also wish to consider an Honours program in Science with a Management Studies Minor (Chapter 15).
Interdisciplinary Options
Interdisciplinary Options

Students in many General or Honours programs may select a specified group of courses from a number of disciplines to form an Interdisciplinary Option or Minor which will be designated on the diploma. Interdisciplinary Options or Minors are composed of courses selected from different disciplines which have a common focus on a particular theme or area of study.

For example, a student enrolled in Honours French might select courses in the Canadian Studies Option, or a student in Honours Biology might wish to take the Gerontology Minor.

Students should note that, in most cases, courses for an Option would be selected after Year 1. The 9 Interdisciplinary Options now available are described below:

- Canadian Studies
- Gerontology
- Iberoamerican Studies
- Legal Studies
- Management Studies
- Peace and Conflict Studies
- Personnel and Administrative Studies
- 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 three-year General degree can do the General Option in Canadian Studies. Those taking the Honours degree should declare an Honours Option in Canadian Studies. Both Options are identical except that Honours students do the fourth year.

Year 2
CDN ST 201/202 given at the Canadian Studies Program Centre at St. Paul's United College.
1 full or 2 half-courses in the home discipline chosen from courses dealing specifically with Canada.
1 full or 2 half-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.

Honours students may Minor in Canadian Studies regardless of their faculty or department. To do so, they must put together a package equivalent of 5 full courses. Students take the CDN ST core courses 201/202 and 301/302. They also take the equivalent of 3 full courses from the approved list of courses which follows.

Double Honours and Canadian Studies
It is possible to do a double Honours program and also take the Canadian Studies Option. In this case, students take 1 full course or 2 half-courses in each of the Honours areas and take the core Canadian Studies courses. They do not need to take the courses listed outside of their Honours areas in other departments.

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 5 full courses. Students take the CDN ST core courses 201/202 and 301/302. They also take the equivalent of 3 full courses from the approved list of courses which follows.

Canada and are to be selected from the list of approved courses which follows. The equivalent of 2 full courses chosen to meet the Honours requirement in the home discipline.

Year 3
CDN ST 301/302 given at the Canadian Studies Program Centre at St. Paul's College.
1 full or 2 half-courses in the home discipline chosen from courses dealing specifically with Canada.
1 full or 2 half-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 400 given at the Canadian Studies Program Centre at St. Paul's College.
1 full or 2 half-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 2 full courses chosen to meet the Honours requirement in the home discipline.

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 5 full courses. Students take the CDN ST core courses 201/202 and 301/302. They also take the equivalent of 3 full 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 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 363 Contemporary Canadian Problems
- 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 495 Senior Honours Essay Canadian Literature Option.

### Environmental Studies
- ENV S 195 Introduction to Environmental Studies
- 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
- ENV S 433 People in Natural Areas

### French
- FR 151 Basic French (For students who have no background in French)
- FR 152 Basic French (For students who have no background in French)
- FR 155 Intensive Review of French (For students with Grade 12 French)
- FR 192 French Language (For students with Grade 13 French)
- FR 195 French Literature 1
- FR 196 French Literature 2
- FR 205 Spoken French
- FR 206 Spoken French
- FR 207 Spoken French
- FR 208 Spoken French
- FR 251 Intensive Language Training
- FR 252 Francais Pratique
- FR 301 Introduction to Environmental Studies
- FR 302 French Language
- FR 371 French-Canadian Poetry
- FR 401 Advanced Language Study
- FR 402 Advanced Language Study
- FR 471 French-Canadian Poetry
- FR 501 Problems of French Language
- FR 502 Problems of French Language

### Geography
- GEOG 251 Cities in Canada
- GEOG 300 Geomorphology and the Southern Ontario Environment
- GEOG 322 Geographical Study of Canada
- GEOG 341 Historical Geography of Canada 1
- GEOG 342 Historical Geography of Canada 2
- GEOG 352 The Rural-Urban Fringe of Canadian Cities
- GEOG 422 Canada

### History
- HIST 102C Origins of War in the 20th Century
- HIST 102E Canadian History
- HIST 201X Canadian Urban History
- HIST 203X Modern Quebec
- HIST 205X Canadian Business History
- HIST 206X History of Canadian Minorities
- HIST 223 Canadian Culture and Society to 1900
- HIST 224 Canadian Culture and Society in the Twentieth Century
- HIST 245 Religious and Cultural Minorities in Canada
- HIST 253X Canadian History: 1760-1900
- HIST 254X Canadian History: 1900-1979
- HIST 319 French-Canadian History
- HIST 320 Modern Quebec History
- HIST 322 History of Canadian-American Relations Since 1914
HIST 325 History of Canadian Indians to 1870's
HIST 386 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 338 Social Impact Assessment
M ENV 385 Technology/Lifestyles for a Conserver 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/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 428 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

SOC 248 Health, Illness 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 316 Canadian Art
FINE 319 Canadian Art

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 220 Evangelical Christianity
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
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.

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 a list of optional courses.
3. An overall minimum average of 65% in the 10 academic courses.

Core Courses (5 to be completed)

- GERON 400 Multidisciplinary Seminar on Aging
- PSYCH 217 Aging and Basic Psychological Processes
- PSYCH 218 Aging, Death and Dying
- KIN 352/344 Sociology of Aging
- GERON 402/402A Epidemiology of Aging
- SOC 247 Sociology of Death and Dying
- SCI 255 The Biology of Aging

Optional Courses

- ECON 353 Population Economics
- PHIL 203 Philosophical Perspectives on Death
- PHIL 226 Ethics and the Life Sciences
- SOC 248 Health, Illness and Society
- SOC 343 Sociology of Health Care
- ISS 350U Adult Life Crisis and Events
- REC 361 Aging and Leisure
- BIOL 433 Stress Physiology and Aging in Plants
- OPTOM 509 Community Health Optometry
- OPTOM 512 Visual Gerontology
- PHYS 480 Radiation Biophysics
- R S 271 Personality and Religion
- ANTH 404 Human Development in a Cross-Cultural Perspective: Human Development, Aging and Death
- PLAN 420 Health, Environment and Planning
- HLTH 245 Community Health
- 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
MC Building: Room 6151
Ext. 3468

or any members of the Committee

Science: J.C. Carlson, Biology
B2-252A (ext. 2664)

Arts: N.H. Charness, Psychology
PAS 4055 (ext. 3313)

Env. Studies: M.E. Haight
ES1-105A (ext. 3027)

HKLS: B.D. McPherson, Kinesiology
BMH 1002B (ext. 3950)

Church Colleges: P. Naus
St. Jerome's College
884-8110

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

Professor
L.A. Costa-Pinto, BA, LIC, Doctor in Sociology (Federal University of Brazil)

Associate Professor
T.S. Abler, BA (Northwestern), MS (Wisconsin-Milwaukee), PhD (Toronto)

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

ANTH 203 Prehistoric Man in North America
ANTH 223 New World Civilizations
ANTH 377 Early Man in the New World
ANTH 388 Applied Anthropology
ANTH 420 Social and-Cultural Change

P SCI 102F Populist Politics in the Third World
P SCI 350A Politics of the Developing Areas 1
P SCI 350B Politics of the Developing Areas 2
P SCI 433 Public Policy and Underdevelopment in the Third World

P SCI 453 /651 Comparative Politics of Latin America
P SCI 454 /652 Comparative Politics II

SOC 225R Race and Culture in the Third World 1
SOC 226R Race and Culture in the Third World 2
SOC 252 Migration and Society
SOC 255 Third World Development
SOC 265 Political Sociology
SOC 325G Issues in Third-World Development
SOC 354 World Population Problems
SOC 364 Social Change
SOC 440S Directed Readings in Developing Nations

SPAN 217 Spanish American Civilization 1
SPAN 218 Spanish American Civilization 2
SPAN 227 Survey of Spanish American Literature 1
SPAN 226 Survey of Spanish American Literature 2

SPAN 101 Language
SPAN 102 Language
SPAN 201A Language
SPAN 201B Language
SPAN 251A Language
SPAN 251B Language
SPAN 351A Language
SPAN 351B Language
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, BA, LLB (Alberta)
F.G. Reynolds, BSc, MSc, (Manitoba), FSA, FClA
J.A. Wahl, CR, BA (Western Ontario), MA, PhD
(St. Louis)

Assistant Professors
R.C. Prus, BA (Manitoba), MA, PhD (Iowa)
R.P. Woolstencroft, BA, PhD (Alberta)

Lecturer
S.P. Gunz, BA, LLB (Sydney), MBA (Manchester)

Legal Studies is an Interdisciplinary Option that focuses on law primarily from a multidisciplinary perspective. Given the centrality of law to most human institutions and values, a great deal of attention has been paid to law by scholars working in a wide variety of disciplines including Accounting, Actuarial Sciences, History, Philosophy, Political Science, Sociology, Economics, and Environmental Studies. Students are invited to join in these scholarly investigations. The liberal arts orientation of this program emphasizes the student's development of broadly based critical and creative intellectual skills, clarity and facility in the communication of ideas, and humane values in this examination of law as a major feature of social life. In this regard it should be noted that Legal Studies is not intended as either a necessary or a sufficient preparation for law school.

Requirements
The courses in this option are divided into 3 sections. The first consists of broadly based courses that are concerned with the nature and character of legal systems, reasoning and concepts; these include courses in the history of law, philosophy of law, sociology of law, and Canadian law. Students are required to take all the courses (4 term courses) in this section. In the second section the courses are in general more advanced and concerned with particular aspects of the law. Students must select 4 term courses from this section. In the third section the courses are less central to the area of legal studies, but serve to bridge the gap between legal studies and particular disciplines. Students will choose 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 programs. Students must complete 5 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
- P SCI 292 Aspects of Canadian Law, 0.5
- SOC 370G Sociology of Law, 0.5

Total credits in Section 1: 2.0.

Section 2
Students are required to complete successfully 2 year-course equivalents from the following courses. 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
- ENV S 201 Introduction to Environmental & Planning Law, 0.75
- ENV S 401 Environmental Law, 0.75
- ENV S 402 Planning Law, 0.75
- 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 327A Philosophy of Law - Part 2, 0.5
- P SCI 291 The Canadian Legal Process, 0.5
- P SCI 333 Administrative Law (in 1980/81 offered as P SCI 392), 0.5
- P SCI 363 Canadian Constitutional Law (in 1980/81 offered as P SCI 392), 0.5
- SOC 224 Law and Order: Regulating Deviance, 0.5
- SOC 227 Crime and Society, 0.5

Total credits in Section 2: 2.0.

Section 3
Students are required to complete successfully 1 year-course equivalent from the following courses:

- ACC 461 Taxation 1, 0.5
- ACC 462 Taxation 2, 0.5
- HIST 211 British History to 1603, 0.5
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.

Students should be prepared to take a number of courses that presuppose a thorough understanding of basic mathematics.

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 some background in algebra, calculus, computer science and statistics.

Management Studies offers 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.

This course is not designed for individuals whose strongest interest is the management of people.

Although MATH 120A, MATH 124B, CS 115 and STAT 210 are recommended as a sufficient body of knowledge as corequisites and prerequisites, alternative sequences of courses in some Faculties may be substituted according to the following table.

### Prerequisites by Faculty

<table>
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<tr>
<th>ARTS</th>
<th>ENV S</th>
<th>HKLS</th>
<th>SCIENCE</th>
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<tr>
<td>MATH 110</td>
<td>MATH 104</td>
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<td>MATH 111</td>
<td>MATH 105</td>
<td>MATH 106</td>
<td>MATH 113</td>
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The program for a Minor in Management Studies is as follows:

- ACC 101/102 or 121/122;
- ACC 131 or BUS 111;
- ECON 101;
- M SCI 44, 53 or PSYCH 333;
- M SCI 46;
- CS 330; PHIL 216;
- ENGL 210 or SCI 209.

Students planning to enter the above program must consult with their Faculty Advisor and in addition should inform the Director of the Program, E.S. Lucy, at ext. 2992 or 2993.

Peace and Conflict Studies

(Participating Faculty members are listed in Chapter 16.)

Peace and Conflict Studies (PACS) is an interdisciplinary program of study which may be chosen by students in conjunction with a major in some other department. It provides a course of study for those who have a special interest in the causes and conditions of international, intergroup, or interpersonal conflict, and in approaches to conflict resolution or management. The PACS Option is especially appropriate for those considering careers in conflict resolution occupations (e.g. social work, community development, public administration, law and corrections, education, or politics). The program is administered by Conrad Grebel College in co-operation with participating departments in the University of Waterloo. The participating departments presently include History, Man-Environment Studies, Philosophy, Political Science, Psychology, Religious Studies, Social Development Studies, and Sociology.

### Program Options

There are 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 on p. 15.10) 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 following the suggestion of the departments concerned and approval by the PACS Faculty Group. 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 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 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 271 Introduction to Peace Research 1
PACS 272 Introduction to Peace Research 2
PACS 398/399 Directed Readings in Peace and Conflict Studies

Man-Environment Studies
M ENV 241 Social Change
M ENV 331 Environmental Issues in Global Perspective
M ENV 337 Environmental Impact Assessment
M ENV 338 Social Impact Assessment
M ENV 375Z Politics of the Environment
M ENV 400 Senior Honours Seminar in Environmental Management
ENV S 401 Environmental Law

Philosophy
PHIL 216 Rational Behaviour and Decision-Making
PHIL 225 Social and Political Philosophy: Canadian Problems
PHIL 243 Conflict, Contract and Choice
PHIL 327A Philosophy of Law 1
PHIL 327B Philosophy of Law 2
PHIL 328 The Philosophy of Karl Marx
PHIL 329 War, Peace, and Justice
PHIL 422 Political Philosophy 1
PHIL 423 Political Philosophy 2
Interdisciplinary Options
Peace and Conflict Studies
Personnel and Administrative Studies

Recommended PACS-Related Courses
The course below, offered by a non-participating department, does not count as credit for the PACS degree but is recommended as of special interest to PACS students.

SY DE 433 Conflict Analysis

Personnel and Administrative Studies

Personnel and Administrative Studies (PAS) is a Minor program that can be taken in conjunction with many existing Honours Majors. The program is designed to provide a broad interdisciplinary exposure to those academic disciplines which provide the theoretical background for current management practice. The program should be of interest to those students who wish to pursue further education in management, or to those who plan to begin a management or administrative career at the entry level immediately after university.

This Minor program assumes that students will develop, in depth, an interest in a major academic field or course of study and then focus this interest toward their personal career development through pursuing a Personnel and Administrative Studies course. The PAS Minor may be combined with a co-operative program in order to obtain work experience in this field.

The program of study consists of 12 half-course credits that may be completed at any point in the 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: One of CS 112, 115, 116.
- Statistics: MTHEL 102 or equivalent course within the student's Honours program.
- Accounting: ACC 121.

B. Human Resources
- Public Administration: PSC 331, 332.
- Personnel and Industrial Psychology: PSYCH 339, and PSYCH 333 or MSCI 44.
- Industrial Sociology: SOC 242 or MSCI 53.

C. Economic Factors
- Microeconomics: ECON 101
- Management: ACC 131, 132.

D. PAS Core Courses
- Personnel Administration: PAS 260
- Issues in Personnel Administration: PAS 300

More information on this program is available from the Course Director, E.S. Lucy, at ext. 2992.

Studies in Personality and Religion (SIPAR)

Chairman & Director of the Program
A.L. Evans, BA (Toronto), BD (Emmanuel), STM (McGill), DMin (Andover-Newton)

Members of the SIPAR Advisory Committee
Professor
H.J. Fallding, BA, BSc, MA (Sydney), PhD (Australian National), FRCS

Associate Professors
D. M. Amoroso, BA, MA (Toronto), PhD (Waterloo)
J.M. Cornell, BA, MS, PhD (Washington)
F.C. Gérard, MA (College St. Dominique, France), DD, STM (McGill), PhD (Hartford Seminary Foundation)
J.R. Horne, BA, MA (Western Ontario), BTh (Huron), PhD (Columbia)
R.D. Legge, BA (Transylvania), STB (Harvard), PhD (McMaster)

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 processes of religious growth and human development. The SIPAR Option is also appropriate for those considering careers in the ministry or other 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. The participating departments presently include Philosophy, Psychology, Religious Studies and Sociology.

The Core Course Curriculum
The core course curriculum provides an introduction to the field of Studies in Personality and Religion. The goals of the core course program are to 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. These courses are to include ARTS 202P, RS 270 and RS 271 plus 3 other SIPAR designated courses. 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.
Core Courses

ARTS 202P 0.5
Psychology of Religion in Historical Perspective

RS 270 0.5
Psychology of Religion

RS 271 0.5
Personality and Religion

ARTS 302P 0.5
Seminar on Selected Topics in Personality and Religion

Courses Selected from Participating Departments
A further understanding of this subject may be developed through the study of selected courses offered by participating departments, which will either broaden the student's comprehension of the field or permit a deeper understanding of some particular aspect of Studies in Personality and Religion.

The actual combination of courses selected by a student is subject to the approval of the SIPAR advisor.

Religious Studies
RS 274 Religious Approaches to Personal Crisis, 0.5
RS 275 Religion and Psychotherapy, 0.5
RS 370 Dream in the Religious Experience of Mankind, 0.5
RS 371 Religion and Self-Destructive Behaviour, 0.5

Psychology
PSYCH 101 Introductory Psychology, 0.5
PSYCH 211 Developmental Psychology, 0.5
PSYCH 214 Psychology of Adolescence, 0.5
PSYCH 231 Psychology of Religious Experience, 0.5
PSYCH 254 Interpersonal Relations, 0.5
PSYCH 258 Principles and Evolution of Psychoanalytic Thought, 0.5
PSYCH 334 Theories in Counselling Psychology, 0.5
PSYCH 355 Personality Theory, 0.5
PSYCH 357 Psychopathology, 0.5

Philosophy
PHIL 102C Philosophy of Life, 0.5
PHIL 102D Introduction to Philosophy of Religion, 0.5
PHIL 201 Love, 0.5
PHIL 203 Philosophical Perspectives on Death, 0.5
PHIL 236 Philosophy of Religion: The Occult, 0.5
PHIL 335 Philosophy of Religion, 0.5
PHIL 470 Phenomenology, 0.5

Interdisciplinary Options
Studies in Personality and Religion

Women's Studies

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. Before pre-registration each spring, students should consult with the Women's Studies Co-ordinator and with the Department involved to determine which courses will be available in the coming academic year.

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 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
Interdisciplinary Options
Women's Studies

to the Women's Studies program, it may be counted toward the Option. Students should consult the Co-ordinator 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 all courses in the Option.

Women's Studies Core Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>History 248 (WLU)</td>
<td>History of the Sexes</td>
</tr>
<tr>
<td>Philosophy 202 (UW)</td>
<td>Philosophy of Women</td>
</tr>
<tr>
<td>Psychology 235 (UW)</td>
<td>Scientific Perspectives on Gender &amp; Sex</td>
</tr>
<tr>
<td>Sociology 233 (WLU)</td>
<td>Sociology of Women</td>
</tr>
</tbody>
</table>

Women's Studies Approved Courses

University of Waterloo

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthropology 350</td>
<td>Sex Roles in Anthropology</td>
</tr>
<tr>
<td>Classical Civilization 292</td>
<td>Social Problems in Antiquity (equivalent to WLU Classics 217)</td>
</tr>
<tr>
<td>Economics 353</td>
<td>Population Economics</td>
</tr>
<tr>
<td>English 108E*</td>
<td>Women in Literature (equivalent to WLU English 225)</td>
</tr>
<tr>
<td>English 206E</td>
<td>Women Writers of the 20th Century</td>
</tr>
<tr>
<td>French 391</td>
<td>French Women Writers</td>
</tr>
<tr>
<td>History 202X</td>
<td>The Individual and the Family in History</td>
</tr>
<tr>
<td>Philosophy 201</td>
<td>Love</td>
</tr>
<tr>
<td>Philosophy 202</td>
<td>Philosophy of Women</td>
</tr>
<tr>
<td>Philosophy 220</td>
<td>Moral Issues</td>
</tr>
<tr>
<td>Philosophy 302</td>
<td>Modern Feminism</td>
</tr>
<tr>
<td>Political Science 476</td>
<td>Research Seminar in Political Behaviour</td>
</tr>
<tr>
<td>Psychology 236</td>
<td>A Psychological Analysis of Human Sexuality</td>
</tr>
<tr>
<td>Psychology 235</td>
<td>Scientific Perspectives on Gender &amp; Sex</td>
</tr>
<tr>
<td>Religious Studies 261</td>
<td>Women and the Great Religions</td>
</tr>
<tr>
<td>Religious Studies 236</td>
<td>Human Sexuality and Christian Morality</td>
</tr>
<tr>
<td>Sociology 206*</td>
<td>Sex Roles (equivalent to WLU Sociology 234)</td>
</tr>
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</table>

Wilfrid Laurier University

<table>
<thead>
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<th>Course Title</th>
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<tbody>
<tr>
<td>Anthropology 317</td>
<td>Psychological Anthropology</td>
</tr>
<tr>
<td>Classics 205</td>
<td>Greek and Roman Mythology</td>
</tr>
<tr>
<td>Classics 217*</td>
<td>Women in Greece and Rome (equivalent to UW C CIV 292)</td>
</tr>
<tr>
<td>English 225*</td>
<td>The Woman Writer: Theory and Practice (equivalent to UW English 108E)</td>
</tr>
<tr>
<td>English 226</td>
<td>Women in Fiction</td>
</tr>
<tr>
<td>History 248</td>
<td>History of the Sexes up to the Industrial Revolution</td>
</tr>
<tr>
<td>History 249</td>
<td>History of the Sexes from the Industrial Revolution to the Present</td>
</tr>
<tr>
<td>Philosophy 249</td>
<td>Philosophy of Consciousness: Feminine/Masculine</td>
</tr>
<tr>
<td>Religion and Culture 226</td>
<td>Love and Its Myths</td>
</tr>
<tr>
<td>Religion and Culture 227</td>
<td>Evil and Its Symbols</td>
</tr>
<tr>
<td>Religion and Culture 346</td>
<td>Religion and the Crisis of Daily Life</td>
</tr>
<tr>
<td>Religion and culture 348</td>
<td>Dynamic Psychology of Religion</td>
</tr>
<tr>
<td>Social Welfare 200</td>
<td>Canadian Social Welfare Programs</td>
</tr>
<tr>
<td>Sociology 201</td>
<td>Sociology of the Family</td>
</tr>
<tr>
<td>Sociology 233</td>
<td>Sociology of Women</td>
</tr>
<tr>
<td>Sociology 234*</td>
<td>Sociology of Sex Roles (equivalent to UW Sociology 206)</td>
</tr>
</tbody>
</table>

Special Topics

To be announced

(These courses are described fully in Chapter 16.)

Other Women's Studies Content Courses

To be announced

(These courses are not available for credit toward the Women's Studies Option.)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 447</td>
<td>History of Biology</td>
</tr>
<tr>
<td>C CIV 201</td>
<td>Ancient Greek Society</td>
</tr>
<tr>
<td>C CIV 202</td>
<td>Ancient Roman Society</td>
</tr>
<tr>
<td>CS 492</td>
<td>The Social Implications of Computing</td>
</tr>
<tr>
<td>DANCE 110</td>
<td>Introduction to the World of Dance</td>
</tr>
<tr>
<td>DANCE 231</td>
<td>History of Ballet in the 20th Century</td>
</tr>
<tr>
<td>ECON 351</td>
<td>Labour Economics</td>
</tr>
<tr>
<td>ENGL 211</td>
<td>The Novel 1</td>
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<tr>
<td>ENGL 212</td>
<td>The Novel 2</td>
</tr>
<tr>
<td>ENGL 316</td>
<td>Canadian Drama</td>
</tr>
<tr>
<td>ENGL 335</td>
<td>Creative Writing</td>
</tr>
<tr>
<td>ENGL 415</td>
<td>Major Canadian Writers</td>
</tr>
<tr>
<td>FINE 316</td>
<td>Canadian Native Art</td>
</tr>
<tr>
<td>FR 273</td>
<td>Aspects of Quebec</td>
</tr>
<tr>
<td>HIST 252X</td>
<td>Europe in the Nineteenth Century</td>
</tr>
<tr>
<td>HIST 254X</td>
<td>Canadian History: The National Period</td>
</tr>
</tbody>
</table>
**Interdisciplinary Options**

**Women's Studies**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>ITAL 396</td>
<td>Special Topics/Directed Readings</td>
</tr>
<tr>
<td>M ENV 241</td>
<td>Social Change</td>
</tr>
<tr>
<td>P SCI 272</td>
<td>Political Behaviour 2</td>
</tr>
<tr>
<td>P SCI 344</td>
<td>The Politics of Local Government</td>
</tr>
<tr>
<td>P SCI 475</td>
<td>Political Socialization</td>
</tr>
<tr>
<td>PSYCH 214</td>
<td>Psychology of Adolescence</td>
</tr>
<tr>
<td>PSYCH 253</td>
<td>Social Psychology</td>
</tr>
<tr>
<td>PSYCH 311</td>
<td>Behaviour and Development of Human Infants</td>
</tr>
<tr>
<td>PSYCH 316</td>
<td>Moral Development</td>
</tr>
<tr>
<td>PSYCH 331</td>
<td>Individual Differences</td>
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<tr>
<td>PSYCH 364F</td>
<td>Sex, Evolution and Social Behaviour</td>
</tr>
<tr>
<td>PSYCH 370</td>
<td>Cross-Cultural Psychology</td>
</tr>
<tr>
<td>R S 256</td>
<td>Current Ethical Issues</td>
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<tr>
<td>SCI 252</td>
<td>Biology and Society</td>
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<tr>
<td>SCI 400A</td>
<td>The History of Science 1</td>
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<tr>
<td>SCI 400B</td>
<td>The History of Science 2</td>
</tr>
<tr>
<td>SOC 243</td>
<td>Occupational Sociology</td>
</tr>
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</table>
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 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>
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<tr>
<th>Course Name</th>
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<tbody>
<tr>
<td>Course</td>
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<td>Term(s) Offered</td>
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<tr>
<td>Type of instruction and Number of hours/wk</td>
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<td>Credit weight</td>
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Course Name —- Applied Probability


Prereq: STAT 230 or STAT 220/221.

Terminology

<table>
<thead>
<tr>
<th>Terms Offered</th>
<th>Type of Instruction</th>
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<tr>
<td>F</td>
<td>Fall term</td>
</tr>
<tr>
<td>S</td>
<td>spring term</td>
</tr>
<tr>
<td>W</td>
<td>winter term</td>
</tr>
<tr>
<td>J</td>
<td>summer, first half, July</td>
</tr>
<tr>
<td>A</td>
<td>summer, second half, August</td>
</tr>
<tr>
<td>M</td>
<td>summer, both terms, July, August</td>
</tr>
<tr>
<td>Y</td>
<td>September - April—8 month session</td>
</tr>
<tr>
<td>C</td>
<td>Lecture</td>
</tr>
<tr>
<td>L</td>
<td>Laboratory</td>
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<tr>
<td>T</td>
<td>Tutorial</td>
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<tr>
<td>S</td>
<td>Seminar</td>
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<tr>
<td>D</td>
<td>discussion</td>
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<td>reading course</td>
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<tr>
<td>coreq</td>
<td>corequisite</td>
</tr>
<tr>
<td>P</td>
<td>Practicum</td>
</tr>
</tbody>
</table>

* For term courses with credit weights other than 0.5, students should consult their faculty advisor regarding how such courses are counted for degree credit in their particular program.
## Course Abbreviations

<table>
<thead>
<tr>
<th>Course Name</th>
<th>Course Abbreviation</th>
<th>Course Name</th>
<th>Course Abbreviation</th>
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</thead>
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<tr>
<td>Accounting</td>
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<tr>
<td>Actuarial Science</td>
<td>ACTSC</td>
<td>Interdisciplinary Social Science</td>
<td>ISS</td>
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<td>Anthropology</td>
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<td>Italian</td>
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<td>Applied Math</td>
<td>AM</td>
<td>Kinesiology</td>
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<td>Arts</td>
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<td>Man-Environment Studies</td>
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<td>Mathematics Elective</td>
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<td>Mechanical Engineering</td>
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<td>Music</td>
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<td>Classical Civilization</td>
<td>C CIV</td>
<td>Peace and Conflict Studies</td>
<td>PACS</td>
</tr>
<tr>
<td>Combinatorics &amp; Optimization</td>
<td>C&amp;O</td>
<td>Personnel and Administrative Studies</td>
<td>PAS</td>
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<tr>
<td>Computer Science</td>
<td>CS</td>
<td>Philosophy</td>
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Accounting Group

Professor, Chairman
J.R. Hanna, BComm (McMaster), MBA, PhD, (Michigan), CA, FCA

Associate Professor, Associate Chairman
W.M. Lemon, BA (Western Ontario), MBA (Toronto), PhD (Texas at Austin), CA, CPA

Associate Professor, Undergraduate Officer
A.R. Olsen, BComm (Sir George Williams), MBA (Western Ontario)

Professors
P.P. Boyle, BSc (Queens, Belfast), MSc, PhD (Trinity, Dublin), PIA (London), FCA
J.K. Courtis, BComm, MComm (Melbourne), MBA, PhD (Minnesota), FASA (Australia)
L.G. Eckel, BA, BComm, (Saskatchewan), MBA, PhD (Michigan), CA, FCA
W.R. Thirk, BA (British Columbia), MA, PhD (Yale)

Visiting Professors
W.R. Scott, BComm (Carleton), MBA, PhD (Chicago), CA
P.B.B. Turney, BA (Bristol), MS, PhD (Minnesota), CPA

Associate Professors
H.M. Armitage, BSc (McGill), MBA (Alberta), PhD (Michigan State), RIA
R.E. Beam, BA (Western Ontario), CA
D.T. Carter, BComm, MBA (Windsor), CA
D.J. Johnston, BComm, MBA (Queens'), CA, FCA
S.N. Laken, BA (Western Ontario), MBA (Pennsylvania), PhD (Western Ontario), MCABV

Assistant Professors
J.E. Boritz, BA, MBA (York), PhD (Minnesota), CA, OSA
B.G. Gaber, BA (Wilfrid Laurier), MS, PhD (Wisconsin), CA
E.F. Krzner, BA, MBA (Toronto)
K. Kumar, BSc (Kanpur), MBA (McMaster), CGA
G.W. Russell, BComm, MBA (McMaster), RIA

Lecturers
M. Dunlop, BComm, (Queen's), CA
S.P. Gunz, BA, LLB, MA (Sydney), MBA (Manchester)

D.B. Kennedy, B Math (Waterloo), MBA (McMaster), RIA
A.K.B. Wonesley, MA (Cambridge), MA (Surrey), MBA (McMaster)

Adjunct Faculty
A.H. Headlam, MBA (Wilfrid Laurier), FCA
W.D. Jenkins, BA, LLB (Western Ontario), MA (Waterloo)
K.A. Tambling, BSc (McGill), MBA (Western Ontario)

Faculty members holding cross appointments to Accounting from:
Economics

Course Descriptions

Introductory Notes
The minimum grade required to satisfy a prerequisite for courses labelled ACC is C-.

Students may only repeat courses labelled ACC in which they have a grade of D+ or less.

ACC 101 F 3C 1L 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, ACC 131, and CS 112 or 140.

ACC 102 W,S 3C 1L 0.5
Introductory Accounting 2
A continuation of Accounting 101.
Restricted to students who have obtained at least a "C" in ACC 101.

ACC 121 F 3C 1L 0.5
Understanding and Using Financial Accounting Information
This course is designed for non-accounting majors to help them understand and analyze financial statements.

ACC 122 W,S 3C 1L 0.5
Understanding and Using Managerial Accounting Information
This course is designed for non-accounting majors. The use of accounting information to assist in planning, control and managerial decision-making will be examined.

ACC 131/132 F,W 3C 0.5/0.5
Management 1/2
The functional areas of business, finance, personnel administration, production, marketing and accounting are examined within differing organizational structures. Coverage also includes study of the principles of effective management and the financial system in Canada as a source of corporate capital.
Prereq: ACC 131 is a prerequisite for ACC 132

ACC 231 F,W 3C 0.5
Business Law
Particular attention is given to the law relating to contracts and business organizations. Other areas of study include sources of law, the judicial process, real and personal property, torts, agency, credit, and negotiable instruments.

ACC 251 F,W,S 3C 0.5
Auditing 1
An examination of the standards developed by the accounting profession which guide professional accountants in performing the attest function. Elements of effective control structures and the concept of audit evidence are examined.
Prereq: ACC 291

ACC 281 F,W,S 3C 0.5
Introductory Managerial Accounting
An introduction to the principles and practices of managerial accounting.
Prereq: ACC 102

ACC 291 F,W,S 3C 1L 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 292 F,W,S 3C 1L 0.5
Financial Accounting 2
This course completes the coverage of intermediate financial accounting. It deals with problems related to the measurement of liabilities, accounting for income taxes and the reporting and measuring of corporate equities.
Prereq: ACC 291
The theoretical concepts examined in a conceptual framework. The development and use of accounting in the context of the Canadian economy. Accounting program ACC 291 or registration in the Honours distribution decisions. Developments in costing systems. Costs rather than procedural aspects of topics examined will include interest background for applying underlying applications of quantitative methods to decision-making will be considered. Emphasis is placed upon the long-term rate determination, capital markets, and risk/return characteristics of financing alternatives. 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 371 F.W.S 3C,1L 0.5 Managerial Finance 1 Analytic techniques for financial decision-making will be considered within a conceptual framework. Emphasis is placed upon the long-term investment, capital structure and distribution decisions. Developments in capital asset pricing, and efficient markets will be examined. Prereq: ECON 101 or 102, 221 and ACC 291 or registration in the Honours Accounting program.

ACC 372 F.W.S 3C,1L 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,1L 0.5 Managerial Accounting 1 The development and use of accounting information in performing the managerial functions of planning, controlling, decision making and performance evaluation. Emphasis is on analysis of costs rather than procedural aspects of costing systems. Prereq: ACC 291 and a course in Statistics.

ACC 382 F.W.S 3C,1L 0.5 Managerial Accounting 2 Consideration of more complex topics in management planning and control. Emphasis is on cost accumulation systems, cost-volume-profit 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 292 and 371.

ACC 402 3C 0.5 Research An introduction to research methodology and current research in accounting. Prereq: Registration in AP3 and ACC 401.

ACC 414-419 0.5 Special Topics Admission by consent of instructor.

ACC 431 3C 0.5 Management Decisions A case course that examines the accountant's participation in such functional areas as marketing and production. Students are involved in policy and strategy formulation, in evaluation of the impact of government regulation and policy. Prereq: Registration in AP3.

ACC 441 F.S 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 381.

ACC 443 F 3C,1L 0.5 Models for Decision Making This course deals with modeling 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. Prereq: Registration in AP3.

ACC 451 F 3C 0.5 Auditing 2 An examination of the elements involved in the determination of the extent of audit testing. Quantitative models will be employed in developing and evaluating examination samples. Prereq: Registration in AP3.

ACC 452 S 3C 0.5 Auditing 3 An examination of current topics affecting public accounting practice. Topics will also include legal, ethical and statutory guidelines. Prereq: Registration in AP3 and ACC 451.

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: Registration in AP3 and ACC 441.

ACC 454 W.S 3C 0.5 Operational Auditing An extension of the basic audit to include the appraisal and establishment of administrative and operational controls and the evaluation of the efficiency of individual business functions. Prereq: Registration in AP3.

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: Completion of 292 or registration in the Honours Accounting program.

ACC 462 W 3C 0.5 Taxation 2 A continuation of ACC 461. Prereq: ACC 461.

ACC 463 F 3C 0.5 Taxation: Business and Property Income An in-depth study of the computation of business and property income with an emphasis on the case law that has developed in this area. Prereq: Registration in AP3 and ACC 463.

ACC 464 3C 0.5 Taxation: Corporate Reorganizations An in-depth study of the provisions of the Income Tax Act relating to corporate reorganizations including share exchanges, amalgamations, and winding up a corporation. Prereq: Registration AP3 and ACC 463.
ACC 466 3C 0.5
**Taxation: Partnerships and Trusts**
An examination of tax legislation pertaining to the taxation of partnerships and their members, and trusts and their beneficiaries.
*Prereq:* Registration in AP3 and ACC 463

ACC 467 3C 0.5
**International Taxation**
An examination of topics including shareholders of non-resident corporations and tax on Canadian income of non-residents. The course will also examine the effects on Canadian residents of the United States' tax legislation.
*Prereq:* Registration in AP3 and ACC 463

ACC 468 3C 0.5
**Taxation: Estate Planning**
A comprehensive review of Canadian income tax legislation with a focus on techniques and consequences of estate planning.
*Prereq:* Registration in AP3 and ACC 463

ACC 469 3C 0.5
**Taxation: Purchase and Sale of a Business**
A comprehensive review of Canadian income tax legislation and related areas with a focus on a comparison of alternative methods and their consequences on purchase and sale of a business.
*Prereq:* Registration in AP3 and ACC 463

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 481 3C 0.5
**Controllership**
A comprehensive insight into the problems facing top management accounting executives. Course includes a number of cases designed to expose students to real world situations requiring qualitative and quantitative analysis.
*Prereq:* ACC 382

ACC 482 3C 0.5
**Advanced Topics in Managerial Accounting**
An extension of basic managerial accounting concepts. Course includes the assignment of a broad range of articles designed to expose the student to theoretical and practical applications of managerial and cost accounting.
*Prereq:* Registration in AP3 and ACC 382

ACC 483 W, 3C, 1L 0.5
**Decision Support Systems**
Decision Support Systems represent the marriage of computers and decision-making models, and are of particular interest to accountants. Emphasis is on the implications of DSS to managers and the building of prototype DSS.
*Prereq:* Registration in AP3

ACC 491 F,S 3C 0.5
**Financial Accounting 3**
An advanced accounting course considering specific problems of accounting for the corporate entity, such as business combinations, intercorporate investments, consolidated financial statements, accounting for foreign operations and foreign currency transactions, segment reporting.
*Prereq:* ACC 292

ACC 494 W 3C 0.5
**External Reporting**
A case course integrating accounting, taxation, corporate and securities law, and report formulation.
*Prereq:* Registration in AP3 and ACC 491

ACC 483 W, 3C, 1L 0.5
**Decision Support Systems**
Decision Support Systems represent the marriage of computers and decision-making models, and are of particular interest to accountants. Emphasis is on the implications of DSS to managers and the building of prototype DSS.
*Prereq:* Registration in AP3

ACC 491 F,S 3C 0.5
**Financial Accounting 3**
An advanced accounting course considering specific problems of accounting for the corporate entity, such as business combinations, intercorporate investments, consolidated financial statements, accounting for foreign operations and foreign currency transactions, segment reporting.
*Prereq:* ACC 292

ACC 494 W 3C 0.5
**External Reporting**
A case course integrating accounting, taxation, corporate and securities law, and report formulation.
*Prereq:* Registration in AP3 and ACC 491

ACC 498 3C 0.5
**Advanced Topics in Managerial Accounting**
An extension of basic managerial accounting concepts. Course includes the assignment of a broad range of articles designed to expose the student to theoretical and practical applications of managerial and cost accounting.
*Prereq:* Registration in AP3 and ACC 382

ACC 483 W, 3C, 1L 0.5
**Decision Support Systems**
Decision Support Systems represent the marriage of computers and decision-making models, and are of particular interest to accountants. Emphasis is on the implications of DSS to managers and the building of prototype DSS.
*Prereq:* Registration in AP3

ACC 491 F,S 3C 0.5
**Financial Accounting 3**
An advanced accounting course considering specific problems of accounting for the corporate entity, such as business combinations, intercorporate investments, consolidated financial statements, accounting for foreign operations and foreign currency transactions, segment reporting.
*Prereq:* ACC 292

ACC 494 W 3C 0.5
**External Reporting**
A case course integrating accounting, taxation, corporate and securities law, and report formulation.
*Prereq:* Registration in AP3 and ACC 491

Course Descriptions

**Accounting**

**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.E. Counts, BS (S.W. Texas State College), MA (Kentucky), PhD (Southern Illinois)

Wm. B. Roosa, BA (Texas Christian), MA (New Mexico), PhD (Michigan)

M. Shimpo, BA (International Christian, Japan), MA, PhD (British Columbia)

Assistant Professors
M.H. Hill, BA (Washington), MA (Washington State), PhD (Southern Illinois)

A.C. Zeller, BSc (Trent), MA, PhD (Toronto)

Faculty Members of Anthropology holding cross and/or joint appointments to:

1. Urban and Regional Planning

**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 102A W 3C 0.5**
**Introduction to Social and Cultural Anthropology**
The dynamic nature of socio-cultural systems is examined. Topics include language, technology, social organization, economics, politics, and religion. Data are drawn from a broad ethnographic base, including both "primitive" cultures and modern, developed societies.

A student may not take both ANTH 102A and ANTH 102B for credit.
ANTH 102B F 3C 0.5
Anthropology Through Science Fiction
Basic anthropological concepts, such as biological and cultural evolution, culture, human adaptability, and culture contact will be explored through examples from science fiction and related anthropological studies.

ANTH 103 3C 0.5
The Nature of Language
A general introduction to the scientific study of language. Lectures on the nature of human language as compared with animal communication, some of the basic methods of historical and descriptive linguistics, and the importance of language in culture and society.

ANTH 201 F 3C 0.5
Principles of Archaeology
An introduction to the working assumptions, analytic approaches, and integrative and descriptive methods of archaeological anthropology.

ANTH 202 W 3C 0.5
Principles of Social Organization
An introduction to basic concepts used by social anthropologists for the analysis of social, economic, political and ideational systems.
Prereq: ANTH 102A or ANTH 102B or permission of the instructor

ANTH 203 F 3C 0.5
Prehistoric Man in North America
This is a general introduction to North American Archaeology. The traditional cultural ecological approach is used.

ANTH 222 W 3C 0.5
Prehistoric Man in the Great Lakes Area - A Survey
A general survey of the archaeological evidence of prehistoric man in the Great Lakes area from his arrival ca. 11,000 years ago to the coming of the Europeans. Cultural ecology and cultural evolution will be stressed.
Honours Anthropology students should take ANTH 322.

ANTH 228 F 3C 0.5
Peoples of the Pacific
A comparative ethnological survey of selected indigenous societies in the Pacific Region.

ANTH 230 F 3C 0.5
Indians of Canada
The cultures of Canadian Indians are described as they existed when initially contacted by Europeans. Consideration is given to economic adaptation, social organization, political structure, material culture, ritual, and mythology.
Prereq: Second year standing

ANTH 241 F 3C 0.5
The Contemporary Canadian Indian Scene
An analysis of present-day Canadian Indian politics, economics, social organization and education. The emergence of pan-Indianism and large-scale Indian organizations will be examined as responses to the Federal Government's policy of withdrawing and decentralizing administrative services for native people.

ANTH 258 F 3C 0.5
Anthropology and the Future of Man
Anthropological theories pertaining to culture change and cultural evolution are examined in the context of the modern world. Long and short term trends in technology are examined using data from Archaeology, Ethnography, History, Technology and Science.
Prereq: ANTH 101 or 102 or permission of the instructor

ANTH 260 F 0.5
Human Evolution
Data, methods, and theory in the study of the origin and evolution of humans are surveyed. Topics will include osteology, growth and development, the fossil record, and genetics.
Prereq: ANTH 101 or permission of the instructor

ANTH 261 W 3C 0.5
Primate Behaviour
An introduction to the behaviour of non-human primates and its relevance to human development. Topics will include social organization, role of behaviour, and communication patterns, as well as the history of primate studies.

ANTH 300 W 3C 0.5
Design of Anthropological Inquiry
This course systematically examines research design and methodology in anthropology.
Prereq: ANTH 101, ANTH 102A or ANTH 102B

ANTH 311 W 3C 0.5
Magic, Witchcraft and Religion
An introduction to the way in which anthropologists study the system of behaviour and belief known as religion.
ANTH 404 F 0.5
Human Development in a Cross-Cultural Perspective: Human Development, Aging and Death
A seminar in the current issues in the anthropology of aging. Among the topics to be covered: life span and life expectancy; perceptions of the aging process; treatment of the aged; aging and gender; aging and death, as experience and process. Students will be responsible for class reports and a research project.
Prereq: ANTH 102A or 102B or permission of instructor

ANTH 492 Y 1.0
Reading in Anthropology
Guided reading in a selected portion of the anthropological literature.
Prereq: Anthropology Major or Honours student and permission of the instructor

ANTH 495/497 F,W,S 0.5
Reading in Anthropology
Guided reading in a selected portion of the anthropological literature.
Prereq: Anthropology Major or Honours student and permission of the instructor

ANTH 499 Y 1.0
Honours Essay
Directed reading and research in a selected area of anthropology inquiry.

COURSES NOT OFFERED 1984-85
ANTH 220 Prehistoric Archaeology: Old World I
ANTH 221 Prehistoric Archaeology: Old World II
ANTH 223 New World Civilizations
ANTH 250 Regional Studies in Archaeology
ANTH 270 Archaeological Method and Technique
ANTH 271 Archaeological Field Methods
ANTH 283 Phonology for Non-Linguists
ANTH 285 Descriptive Grammar 1 - Morphology
ANTH 320 Pleistocene Prehistory in the Old World
ANTH 321 Recent Prehistory in the Old World
ANTH 350 Sex Roles in Anthropology
ANTH 370 Ethnographic Field Methods
ANTH 372 Archaeological Research
ANTH 373 Archaeological Reporting
ANTH 377 Early Man in the New World
ANTH 390 Reading in Anthropology
ANTH 420 Social and Cultural Change
ANTH 449 Honours Seminar
ANTH 451 The Formative Years of Cultural Theory
ANTH 452 Contemporary Cultural Theory
ANTH 460 Human Adaptation and Evolution

School of Architecture

Associate Professor, Director
L.W. Richards, BArch (Miami), MArch (Yale), MRAIC

Associate Professor, Associate Director, Undergraduate Officer
J.C. Somfay, BArch (New South Wales), MArch (Toronto), OAA

Professors
L.A. Cummings, 1 AB (Washington), AM (Missouri), PhD (Washington), Recipient of the OCUFA (Ontario) Teaching Award
P.H. Nash, 2 BA, MA (UCLA), CE (Grenoble), MCP, MPA, PhD (Harvard), MCP, AICP
R.H. Sims, AA Hons.Dip. (London), RIBA, MRAIC
F.H. Watts, AA Dip (London), MLA (Harvard), RIBA, MRAIC

Associate Professors
A. Banerji, BArch (Calcutta), MArch (North Dakota State)
M. Elmit, 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
F. Thompson, BArch, MArch (Toronto), MRAIC
R. Wijer, BA (Waterloo), MA (Ottawa)

Assistant Professors
O. Dutt, BA (Punjab), BSc (London), MS (Wisconsin), PhD (Waterloo), PEng
E.R. Haldenby, BES, BArch (Waterloo), Recipient of the Distinguished Teacher Award
D. McKay, BArch (Toronto)
L. Pignatti, BArch (Rome), MArch (Toronto)

Adjunct Faculty
K.S. Andonian, MArch (Yerevan Polytechnic), MSc, PhD (Waterloo)
S. Arnold, BA (Southern Illinois)
M. Baraness, BArch (Paris), MArch (Toronto)
B. Boigun, BArch (Toronto)
W. Dendy, BA (Toronto), BA, MA (Cambridge), MA (Columbia)

E. Gustave, BArch, MArch (Toronto), MRAIC
R. Keenfr, BFAED (Pratt), RCA
W. Lamb, BArch (McGill), MRAIC
T.M. Meyer Boake, BES, BArch (Waterloo)
R. Schutz, BArch (Toronto)
F. Urban, AB (Merrimack), MA (Boston), BFA (Nova Scotia)
J. Zvilna, RCA

Lecturer
G. Consiglio, BArch (Toronto), MSc (Waterloo), MRAIC

Visiting Professional Critics
Internationally known practitioners and educators augment the program annually.
Faculty Members of Architecture holding cross and/or joint appointments to:
1 English
2 Civil Engineering
Faculty Members holding cross and/or joint appointments to Architecture from:
Environmental Studies

Course Descriptions

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
Application of trigonometry and analytical geometry in architecture; geometric constructions; differential and internal calculus, applications in physical situations; life cycle costing; introduction of probability and statistics.

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
Basic concepts, forces, moments, systems of forces, resolution of forces, transformation of couples; resultant of force systems; centre of gravity of a system of forces and of composite bodies; equilibrium, free body diagrams; shears, moments, bar forces in simple trusses; friction, moment of inertia.
Prereq: ARCH 112 or MATH 130

ARCH 172 F 2C,2L 0.5
Building Science
Building materials and the effect of environments on their performance; heat flow and air movement, quantitative considerations; visual and sonic environments; and their control for human comfort.

ARCH 174/175 0.5
Experimental Courses
These courses offer a vehicle for introducing additional electives to the program on a short-term basis, and for developing future permanent courses.
Prereq: Consent of instructor

ARCH 192 F 1T,1S,14Std. 1.5
Design Fundamentals and Workshop Design Studio
Development of the means to appreciate art and science of building; introduction to a history of architecture; introduction to the study of theories of architecture; development of skills in graphic communication; introduction to a study of building structure, construction, and materials; promotion and encouragement of the theory and practice of design. Field trip (1 week).
Prereq: Architecture students only

ARCH 193 W 1T,1S,14Std. 1.5
Design Fundamentals and Studio
Reinforcement and development of the ARCH 192 program, but with emphasis upon the application of design method and practice to specific architectural problems.
Prereq: ARCH 192

ARCH 194 W 2C 0.5
Visual Interdisciplinary Language
Theory and practice of visual form based on formative processes and hierarchial structures. Propositions: form follows process, rotation is a universal form-generating process, symmetric form is a result of an asymmetric process and freedom is the single organizing principle.
Prereq: Consent of instructor

ARCH 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 landforms.
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 analyze buildings and theories of representative architects and designers, documenting the development of architectural ideas in Europe and elsewhere.
Prereq: Consent of instructor

ARCH 246 F 4C,2L 1.0
Foundations of Europe: Sense of Periods and Styles
Recognition of patterns of life and concepts of order and conduct, models of the universe and other, moving metaphors and myths by means of study of the thoughts, acts, art, architecture, technology, literature, music and town design of the West from the break-up of the Roman Empire until the Renaissance. Field trips to museums, concerts in Toronto, Detroit or Buffalo.
Prereq: ARCH 143 or consent of instructor

ARCH 247 S 4C,2L 1.0
Renaissance to Revolution: Sense of Periods and Styles
Analysis of the various styles emerging out of provincial and international Gothic, especially Italian use of classical models, the spread of this "renaissance" mode, leading to consideration of the Mannerist, the Baroque, the Rococo, the Neoclassical; investigation of the course of men's attitudes from humanism, nationalism, and Reformation through the Enlightenment until the French Revolution and Hume's dethronement of Reason. Field trips to museums; concerts in Toronto, Quebec, Detroit or Buffalo; Stratford Festival.
Prereq: ARCH 246 or consent of instructor

ARCH 252 F,W,S 0.5
Creative Problem Solving
Development of creative skills through group behaviour in problem solving sessions by: developing a clear understanding of each participant's own creative thought processes; increasing his/her ability to consciously and deliberately make use of his/her own creative potential; engendering an awareness of the capacity to use himself/herself and the people he/she works with to produce better solutions to the problems identified by the group.
Prereq: Consent of instructor

ARCH 262 F 2C,2L 0.5
Strength of Materials
Concept of simple stress and strain; statically indeterminate axially loaded members; thermal stresses, torsion, shear and bending moments in simple beam; shear and moment diagrams; qualitative deflected shapes, flexural and shearing stresses, deflection calculations; combined stresses, beams of different materials, compression members, Euler's formula.
Prereq: ARCH 163
ARCH 263 S 2C,2L 0.5  
Theory of Structure 1  
Study of loading conditions as per building code; stability of structural systems; geometric instability; analysis of statically determinate structures, beams, arches, cables, trusses, frames; approximate analysis of rigid frames; influence lines; deformations by conjugate beams; introduction to indeterminate structures.  
Prereq: ARCH 262

ARCH 265 S 1C,2L 0.5  
Structural Morphogenesis  
Prereq: Consent of instructor

ARCH 272 F 2C,3L 0.5  
Survey and Soils  
Surveying types, instruments and measurements. Plotting of areas and contours; layout of buildings and underground systems. Types of soils, their identification and investigation; mechanics of strength, suitability of soils for various types of foundations.

ARCH 274/275 0.5  
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 284, 285 F,W 3C 0.5  
Architectural Research  
This offers a student an opportunity for independent research into architectural problems not offered in the regular curriculum, guided exploration of specific architectural problem areas, of appropriate complexity to the particular term.  
Prereq: Approval of (in house) UGAC

ARCH 292 F 3C,11std 1.5  
Design Concepts and Studio  
To develop in each student the ability to design on a small, personal scale and explore design as a thinking process. Small space design exercises where the student is required to define and analyze a problem and generate an architectural solution. Solutions are refined through a series of evaluations.  
Prereq: ARCH 192, 193

ARCH 293 S 3C,11std 1.5  
Design Concepts and Studio  
Design involving problems of human perception and dimension in complex or large spaces, and to develop in each student the ability to generate solutions to architectural problems on a scale which involves "privacy and community". Emphasis is placed on programming, analysis and solution evaluation. Problems of construction, servicing, and siting will be further explored. Field trip to a major Urban Area (1 week).  
Prereq: ARCH 292

ARCH 345 W 2C,1S 0.5  
Architectural Theory 1850-1940  
Beginning with the introduction of important theories of architecture in vogue prior to 1850, the course will examine texts, movements, buildings, projects, and urban proposals of the period in order to understand the structure of contemporary architectural theory.  
Prereq: Consent of instructor

ARCH 346 W 2C,2L 0.5  
Romanticism and 20th Century: Sense of Periods and Styles  
Depiction of "modern" culture as one in which the notion of environmental order as the fulfilling of natural law is replaced by a notion of order as the creation of autonomous human wills. Selected works in philosophy, literature, art and architecture will be studied  
Prereq: ARCH 247 or consent of instructor

ARCH 347 4C 0.5  
The Roots of Civilization  
The course attempts to establish a basis for the understanding of the functions of myth, ceremony and ritual, the structures of primitive and ancient built environments, man's attitude towards nature, and his use of the resource environment, the development of classical culture, and beginnings of science.  
Prereq: ARCH 346 or consent of instructor

ARCH 348 F (Rome) 2C,2S 0.5  
Italian Renaissance Architecture  
Architecture and urban design from the early 15th to the early 17th century in central and northern Italy. Special attention is paid to the development of theory and its relation to architectural practice. In addition to the works of the major figures of the period, typical relationships between buildings and their urban and natural contexts are considered.  
Prereq: Registration in ARCH 492 or consent of instructor

ARCH 349 S 4C,T 0.5  
Topics in Cultural History  
Research into various topics including architectural history, theory, practice, and pedagogy but exploring the means of study (the human mind, the preceptors, the tools of searching, ordering of findings, ways of presentation of the results of reflection). Guest lecturers, field trips, and private consultants will diversify the common studies. Because the topics will shift, it is possible to enroll in the course more than once.  
Prereq: Consent of instructor after an interview and inventory

ARCH 362 W 2C,2L 0.5  
Structural Synthesis 1: Steel and Concrete Design  
Design and behavior of structural steel systems, application of current building specifications, proportioning structural elements based on pertinent design considerations, bolted and welded; criteria for choosing steel systems; introduction to plastic design.  
Prereq: ARCH 263

ARCH 363 F 2C,2L 0.5  
Structural Synthesis 2: Concrete and Timber Designs  
Design and behavior of structural concrete systems, application of building specifications; analysis and design of concrete elements using ultimate strength principle; criteria for choosing structural concrete systems; introduction to prestressed concrete. Behaviour and design of modern wood structures fasteners, ring connectors and their significance in timber construction; proportioning and design of sawn and laminated timber members.  
Prereq: ARCH 362

ARCH 372 W 2C,2L 0.5  
Mechanical Systems 1  
Plumbing and drainage; heating, ventilating and air-conditioning systems; electrical distribution for power and light illumination; acoustics, geometries and materials; vertical transportation systems.  
Prereq: ARCH 293, or consent of instructor

ARCH 373 F 2C 0.5  
Mechanical Systems 2  
Advanced topics and integrative investigations in heating, ventilating and air-conditioning systems for buildings; plumbing and drainage; electrical distribution for power and light in buildings; illumination; acoustics, geometries and materials; and vertical transportation systems.  
Prereq: ARCH 372
ARCH 374/375
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 R 0.5
Architectural Research
This offers a student an opportunity for independent research into architectural problems not offered in the regular curriculum. It allows guided exploration of a specific architectural problem area, of appropriate complexity to the particular term.
Prereq: Approval of (in house) UGAC

ARCH 386 W 4C,17std 2.0
Design Concepts and Studio
Design of complex environments; the effect of legal and administrative controls on the design of process and form; the influence of mechanical, structural and industrial building components on design process and architectural form. Projects will involve co-ordination 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 392

ARCH 446 F (Rome) 2C,2S 0.5
Italian Urban History
The course provides a survey of the history of settlement and urban form on the Italian peninsula from antiquity to the present day. It in the influences upon the structure of public and private space are outlined for each historical period. These include the constants such as geography and climate, but more especially the factors that induce and manifest change: politics, warfare, economics, social structure, the arts and theory.
Prereq: Registration in ARCH 492 or consent of instructor

ARCH 448 F (Rome) 2C,2S 0.5
Rome and the Campagna
History of settlement and building in Rome and the surrounding area from antiquity to the present. Acts of design in architecture, urban form and landscape related to political, cultural and spiritual authority of Rome. Comparison drawn between the image of the city, represented in literature and art, and the material facts of the place. Field trips, lecture.
Prereq: Registration in ARCH 492 or consent of instructor

ARCH 452 W 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
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
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
These courses provide an opportunity during term 10. The thesis is to be developing the thesis for presentation vehicle for thinking and design at an innovative level. Thus considerable emphasis is placed on both theory and depth. A thesis topic is to be submitted and approved during term 8 (4b) and all research work completed by the end of the 8 month co-op work term 5. Terms 9 and 10 (5a and 5b) will be spent developing the thesis for presentation during term 10. The thesis is to be a vehicle for thinking and design at an innovative level. Thus considerable emphasis is placed on both theory and development of design solutions.

P.H. Smith, Jr., BA (Harvard), PhD (Pennsylvania)

Course Descriptions
Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes
1. Courses designated "Arts", those listed below, usually cover some topics and themes of general interest to several disciplines and their presentation is often made with this interdisciplinary perspective in view.

2. Arts courses are elective courses in General and Honours programs and do not satisfy either the Group A or Group B requirements.

Arts 122/123 F, W 2C, 1D 0.5

Quest for Meaning in the 20th Century 1 and 2
Against the background of rapidly shifting values in western culture, this course asks the student to examine his or her perspective and then face the resources of others in answering the question of Who am I? What is my obligation to society? What is my relationship to the natural world? Is there an ultimate meaning to life? Teaching methods include personal statements, thematic and biographical books and films.

Each term is unique. Arts 122 is not a prerequisite for Arts 123.
Offered by Conrad Grebel College.

Arts 198 F 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 211/212 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/I. ARTS 211 will concentrate on gaining skill in computer programming. ARTS 212 will stress file management, advanced text formatting and the use of system program utilities. Applications will include word indexes, text concordances, methods of computer-aided text comparison.

Prereq: ARTS 211 presupposes ARTS 198 or equivalent; 212 presupposes 211 or permission of the instructor.

ARTS 215 Y 3C 1.0

Man in Crisis (Literary Views)
A critical study of such themes as freedom vs. happiness, nihilism, collectivism vs. individualism, old tablets vs. utopias, alienation, earthbound fragmentation vs. the transcendental in the artistic writings of Kafka, Brecht, Hesse, Nietzsche, Solzhenitsyn, Dostoevsky, Zamiati, Camus, and others. Taught in English.

ARTS 215A F 3C 0.5

Man in Crisis 1 (Literary Views)
A critical study of Dostoevsky's The Grand Inquisitor, Nietzsche's Thus Spake Zarathustra, Tolstoy's What Men Live By, and works by Aldous Huxley, Zamiati, Turgenev, and Andres. The 2 major themes are Utopia, the yearning for and the shape of perfectibility, and Nihilism, the denial and/or destruction of "Old Tablets" or "God is Dead."

ARTS 215B W 3C 0.5

Man in Crisis 2 (Literary Views)
A critical study of Brecht's The Caucasian Chalk Circle, Kafka's The Metamorphosis, and works by Ibsen, Hesse, Dostoevsky, Tolstoy, and Solzhenitsyn. The 2 major themes are Nihilism (see above) and Alienation, the divided self in exile, or the inability to give and to accept love.
ARTS 225 W 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 240 J 1.0

Introductory Topics in Family Life Education: Sexuality and Sex Education
The course will examine human sexuality from a biological, psychological, and social perspective. The significant principles of sex education and some of the most relevant methods and programs will be discussed as well.
Offered at St. Jerome's College.

ARTS 250 J Y 1.0

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 0.5

Seminar on Selected Topics in Personality and Religion

ARTS 345 J A 1.0

Advanced Topics in Family Life Education: Sexuality and Sex Education
The course presents an in-depth analysis of select topics in human sexuality, gives special attention to the emotional aspects of sexuality, and also focuses on the evaluation of current family life and sex education programs.
Prereq: ARTS 240 J
Offered at St. Jerome's College.

COURSES NOT OFFERED 1984-85

ARTS 220 R Chinese Thought and Culture I
ARTS 221 R Chinese Thought and Culture II
ARTS 320 R/321 R Special Topics in Chinese Thought and Culture
ARTS 350 J Advanced Topics in Family Life Education: Marriage and the Family

Department of Biology

Professor, Chairman of Department
J.E. Thompson, BSc (Toronto), PhD (Alberta)

Associate Professor, Associate Chairman of the Department
S.M. Smith, BSc, MSc (McMaster), PhD (Manitoba) Recipient of the Distinguished Teacher Award

Professor, Graduate Officer
W.B. Kendrick, BSc, PhD, DSc (Liverpool) FRSC

Associate Professor, Graduate Officer
N.C. Bole, BSc (Simon Fraser), MSc (British Columbia), PhD (Toronto)

Associate Professors, Undergraduate Officers
J.C. Carlson, BSc, MSc, PhD (Massachusetts)
C.A. Peterson, BSc, MSc (Alberta), PhD (California, Davis)

Assistant Professors, Undergraduate Officers
D.G. Dixon, BSc (Sir George Williams), MSc (Concordia), PhD (Guelph)
W.R. Hawthorn, BSc, MSc (McMaster), PhD (Western Ontario)

Professor Emeritus
H.B.N. Hynes, BSc, PhD, DSc (London), ARCS, FRSC

Professors
R.G.H. Downer, BSc, MSc (Queen's, Belfast), PhD (Western Ontario)
Recipient of the Distinguished Teacher Award
E.B. Dumbroff, BSc, MForestry, PhD (Georgia)
C.H. Fernando, BSc (Ceylon), DPhil (Oxford)
A.D. Harrison, BSc, MSc, BEd, PhD (Cape Town)
W.E. Inness, BSc, MSc (Ottawa), PhD (Michigan State)
J.Kruv, BSc, MSc (Waterloo), PhD (Western Ontario)
C.J. Mayfield, BSc, PhD (Liverpool)
J.W. Morton, BSc, PhD (Dundurn), FLS
J.J. Pasternak, BSc, MSc (Ontario), PhD (Ontario)
G. Power, BSc (Durham), PhD (McGill)
J. Sitak, LScO (Montreal), MSc, PhD (Cornell), OD (Pennsylvania College of Optometry)

J.B. Theberge, BScA (Guelph), MSc (Toronto), PhD (British Columbia)
T. Vowoanatha, MSc, PhD (Mysore) Recipient of the Distinguished Teacher Award

Associate Professors
R.D. Beauchamp, BA (McMaster), MA, PhD (Brown)
J.C. Carter, BA (Toronto), MSc, PhD (McGill)
A.M. Charles, BSc, MSc, PhD (Manitoba)
H.C. Duthie, BSc, PhD (Wales)
H.R.N. Eydt, BSc, MSc, PhD (McMaster)
B.R. Glick, BSc (City College, New York), MSc, PhD (Waterloo)
M. Globus, BSc, MSc (McGill), PhD (Toronto)
A.G. Kempton, BSA, MSA (Toronto), PhD (Michigan State)
J.R. Lepole, BS, MS (West Virginia), PhD (Pennsylvania State)
P.E. Morrison, BSc, MSc (Western Ontario), PhD (McMaster)
J.C. Semple, BSc (Tuffs), MA (Washington U, St. Louis)
K. Zachariah, BSc (Madras), BA Honors (Oxford), MA, PhD (Princeton)

Assistant Professor
W.D. Taylor, BSc, PhD (Toronto)

Research Assistant Professors
N.W. Lunn, BSc, MSc, PhD (Toronto)

NSERC University Research Fellow
A. Morgan, BSc (Leicester), MSc (Saskatchewan), PhD (Birmingham), NSERC University Research Fellow

J.F. Sturk, BSc (Waterloo), MSc, PhD (Toronto) NSERC University Research Fellow

S. Vethamany-Globus, BSc, MA, MSc (Madras), PhD (Toronto)

Adjunct Faculty
G.G. Stewart, BSc (Wales), PhD (Bath)

The Labatt Brewing Company, London

Senior Demonstrators
J.F. Brookfield, BA, BEd, BSc, MSc (Dalhousie)
L. Pasternak, BSc, MSc (Toronto)
N.J. Scott, BSc, MBA (McMaster), MSc (Waterloo)
M.A. Thompson, DVM (Guelph)
K.E. Travors, BSc (Acadia), MSc (Waterloo)

Faculty members holding cross appointments to Biology from:

1. Physics
2. Urban and Regional Planning
3. Optometry
4. Chemistry
Faculty Members of Biology holding cross appointments to:  
Chemistry

Course Descriptions

Introductory Notes

1. All Honours Biology students who have completed their third year are required to participate in an off-campus field course (BIOL 497 or 498) before entering Year 4. These courses are held either in early Spring or the following September (after Labour Day). The cost of most trips will range from $100 to $500 per student.

2. The Huntsman Marine Laboratory, St. Andrews, New Brunswick offers a summer course "Introduction to Marine Biology". This course will be accepted as 0.50 transfer credit towards a BSc if taken by students of the University of Waterloo.

BIOL 10 F,W,3, 1C 0  
General Biology Seminar  
Required for all Biology students beyond Year 1 (including Co-op), this seminar brings together students from all years to receive information concerning the activities of the Biology Department and to hear invited speakers.

BIOL 111 F 2C 0.5  
Introductory Biology 1  
An introduction to basic concepts in biology, including aspects of genetics, evolution and plant biology.  
Open to students other than those intending to major in Biology or to enter the School of Optometry.

BIOL 112 W 2C 0.5  
Introductory Biology 2  
An introduction to the basic principles of zoology and ecology with reference to man as a biological organism.  
Open to students other than those intending to major in Biology or to enter the School of Optometry.

BIOL 201 F 2C,3L 0.5  
Human Anatomy  
Basic anatomical features of the skeletal, muscular, nervous and cardiovascular systems of the human.  
Open to students other than those intending to major in Biology.  
BIOL 201 cannot be counted for credit toward a BSc (Kinesiology) degree.

BIOL 202 W 2C,3L 0.5  
Embryology and Histology  
Fundamental developmental processes in vertebrates, including man; the development of the early embryo, morphogenesis of tissues and the major organ systems. Structure of human cells and tissues at the light-microscope level; epithelia, connective, muscular and nervous tissues and the major organ systems.  
Open to students other than those intending to major in Biology.

BIOL 210 F 2C,3L 0.5  
Introductory Invertebrate Zoology  
A study of the functional morphology of selected invertebrate types with special emphasis on the various grades of organization and development in the different phyla.

BIOL 211 W,S 2C,3L 0.5  
Introductory Vertebrate Zoology  
An introduction to the structure, evolution and development of vertebrate organ systems.  
Offered during the Spring term in odd-numbered years.

BIOL 220 F 2C,3L 0.5  
Plant Biology 1 - The Living Plant  
An introduction to the structure, function and physiology of plants with emphasis on flowering plants.

BIOL 221 W,S 2C,3L 0.5  
Plant Biology 2 - The Diversity of Plants  
A comparative survey of the morphology and life histories of the different kinds of plants and fungi important to man and an introduction to their evolution  
Offered during the Spring term in odd-numbered years.

BIOL 222 F T 0.5  
Non-Vascular Plants  
An introductory course which will survey the evolution, morphology, ecology and importance to man of the fungi, algae, and bryophytes.  
By correspondence only for 1984-85.

BIOL 230 F 2C,3L 0.5  
Introductory Cell Biology  
An introduction to the concepts of cell biology with emphasis on (1) the structural organization of the cell and its constituent organelles and (2) the function of critical molecular processes that are characteristic of living organisms.  
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,3L 0.5  
Embryology and Histology  
Fundamental developmental processes in vertebrates, including man; the development of the early embryo, morphogenesis of tissues and the major organ systems. Structure of human cells and tissues at the light-microscope level; epithelia, connective, muscular and nervous tissues and the major organ systems.  
Open to students other than those intending to major in Biology.

BIOL 234 W,S 2C,3L 0.5  
Human Physiology  
The physiology of the major organ systems including the nervous, muscular, circulatory, respiratory, urinary, digestive, endocrine and reproductive systems.  
Antireq: SCI 351-352  
When taking this course, the lab must be designated separately. The lab is compulsory, but does not have any credit weight.  
Offered during the Spring term in even-numbered years.

BIOL 235 W,S 2C,3L 0.5  
Genetics  
Offered during the Spring term in even-numbered years.

BIOL 240 F 2C,3L 0.5  
Fundamentals of Microbiology  
Introduction to fundamental theories, principles and methods of microbiology. Structure, methods of cultivation, growth, effects of physical factors, and inhibition and killing of microorganisms will be studied.

BIOL 241 W,S 2C,3L 0.5  
Introduction to the Microbial World  
Biological characterization of major bacterial groups, microorganisms as geochemical agents, utilization of microorganisms by man, and mechanisms of microbial pathogenicity  
Offered during the Spring term in odd-numbered years.

BIOL 245 F 2C,3L 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.

BIOL 246 W 2C,3L 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.
BIOL 250 F 3C/2l. 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. Field trips as required.

BIOL 301 Y 2C,3L 1.0

Human Physiology
The physiology of the major organ systems of the body. Topics discussed include circulation, respiration, digestion and nutrition, metabolism, muscle, nervous system, special senses, and the endocrine system.

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 211

BIOL 315 W 2C,3L 0.5

Invertebrate Zoology
A survey of the major invertebrate phyla other than the anthropods, with emphasis on their functional anatomy, classification and ways of life.

Prereq: BIOL 210

BIOL 316 F,S 2C,3L 0.5

Anthropod Zoology
A survey of the phylum Anthropoda, including the insects, with emphasis on their classification, interrelationships and ways of life.

Prereq: BIOL 210

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 1
The comparative physiology of animals with particular emphasis on homeostatic principles as demonstrated by water balance, excretion, nutrition, digestion and the endocrine system.

BIOL 338 W 2C,3L 0.5

Comparative Animal Physiology 2
A comparative study of the cardiovascular, nervous, muscular, respiratory and reproductive systems.

BIOL 342 F,S 2C,3L 0.5

Microbial Biotechnology
The role of microorganisms in biotechnology. Topics examined will include the isolation, selection, and development of microorganisms important in biotechnology, and specialized techniques for their cultivation and maintenance. Processes studied will include biomass conversions, fermentations, bioproduction of compounds, nitrogen fixation, treatment and utilization of wastes and mineral leaching.

Prereq: BIOL 240-241 or permission of instructor

BIOL 344 W 2C,3L 0.5

Microorganisms in Foods
Food preservation, spoilage, poisoning and modern concepts in quality assurance programs are studied. The aim is to understand factors governing microbial changes in foods. Problem solving in the food industry is emphasized. Laboratory work will reflect current practices in quality control and testing.

Prereq: BIOL 240-241 or permission of instructor

BIOL 350 F,S 2C,3L 0.5

Environmental Toxicology 1
An introduction to the basic theories, principles and techniques of environmental toxicology. A comparative study of the effects of specific groups of 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 415 F 2C,3L 0.5
Parasitology
Basic systematics of animal parasites and a brief review of other parasitic organisms. The life histories and population dynamics of parasites. Ecology of freshwater parasites, with emphasis on the parasites of fishes. Human parasites.
Prereq: Biol 315
Offered every other year. Alternates with Biol 416

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.
Offered every other year. Alternates with Biol 415.

Biol 420 F 2C,3L 0.5
The Flora of Canada
Offered every other year. Alternates with Biol 424.

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 Canada. 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 every other year. Alternates with Biol 420.

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 2.5,3L 0.5
Mycology
The growth of mycological knowledge will be traced and current developments analyzed. Extensive literature surveys, active class participation, and a lab project will be required.
Prereq: Biol 327

Biol 430 F 2C,3L 0.5
Comparative Animal Physiology
A comparative study of respiratory, circulatory and endocrinological systems of animals, emphasis will be placed on invertebrate groups.

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.

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 3C,5 S 0.5
Advanced Genetics
A detailed examination of the recent advances in molecular genetics with emphasis on the regulation of gene action in both prokaryotes and eukaryotes. Current research literature will be reviewed.
Offered every other year. Alternates with Biol 438.

Biol 435 F 2C,3L 0.5
Developmental Biology
Analysis of embryonic development of selected organisms with emphasis on growth and the processes of subcellular, cellular and organ differentiation stressing recent experimental methodology.

Biol 438 W 3C,5 S 0.5
Advanced Molecular Biology
An examination of the current major issues in molecular biology with emphasis on the technical and conceptual advances. Current research literature will be reviewed.
Prereq: Biol 330
Offered every other year. Alternates with Biol 434.

Biol 439 W 3C 0.5
Biochemistry of Natural Products
The chemistry, functions and distribution of natural products including alkaloids, isoprenoids, amines, phenolics, cyanogentic 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
Biocil Physiology 1
A study of the physiology of microorganisms including multiphasic and synchronous growth, cell permeation, nutrition, physical and chemical environmental factors and metabolic mechanisms as elucidated by radioactively labelled tracers.
Prereq: BIOL 240-241, or permission of instructor

Biocil Physiology 2
A study of the physiology of microorganisms with emphasis on the metabolic mechanisms of fermentative microbes, cellular and sub-cellular protein synthesis including turnover of ribosomes, inhibition by antibiotics and the quantitative techniques used to elucidate the mechanisms of protein biosynthesis.
Prereq: BIOL 240-241, 440 or permission of instructor

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

Limnology
A study of the geomorphology, physical and chemical processes, and biology of lakes and streams. Ecology of zooplankton, zoobenthos, and fishes is emphasized.
Prereq: BIOL 210, 250
Antireq: SCI 454

Fisheries Biology
The practices of fisheries biology; life history; age and growth, fecundity, production, harvest and management of fisheries resources.
Prereq: A 1 week field course

Environmental Toxicology 2
Cellular, developmental and physiological effects of toxicants on multicellular organisms.
Prereq: BIOL 350

Population Ecology 2
The analysis of the structure and dynamics of plant and animal populations. Theoretical, mathematical and experimental approaches to the study of population ecology.
Prereq: BIOL 366

Analysis of Communities
A study of the organization, structure and development of communities with emphasis on vegetation change. Topics include: sampling procedures; diversity; stability; succession; niche; multivariate analysis.
Prereq: BIOL 250 and STAT 202

Quaternary Ecology
A consideration of the Quaternary environment. Pollen, plant macrofossil and faunal remains as indicators of past environments. Relationship of fossil assemblages to modern ecosystems. Pollen analysis and the interpretation of fossil deposits.
Prereq: an introductory course in biology or geology, or permission of the instructor

Statistical Procedures for Biologists 1
An introduction to biometrical analysis. Measures of central tendency, dispersion and variability; the normal distribution; one-sample hypotheses; parametric and non-parametric two-sample and paired-sample hypotheses; correlation; goodness-of-fit tests; chi-square and G-tests for contingency tables; the Poisson and Binomial distributions. Throughout, the emphasis is on biological examples and problems from the student's own research area.

Biocil Physiology 3
The analysis of the structure and dynamics of plant and animal populations. Theoretical, mathematical and experimental approaches to the study of population ecology.
Prereq: BIOL 366

Analysis of Communities
A study of the organization, structure and development of communities with emphasis on vegetation change. Topics include: sampling procedures; diversity; stability; succession; niche; multivariate analysis.
Prereq: BIOL 250 and STAT 202

Field Course 1
This intensive field course of two weeks duration may be one of several arranged or approved by the Department and is usually taken after completion of third year.

Field Course 2
Required of all honors biologists except those who take BIOL 497. This general interest field course usually of one week duration may be one of several arranged or approved by the Department and is usually taken after completion of third year.

Senior Honours Project
A senior-year research project. Normally, only students attaining a 70% cumulative major average will be accepted into this course. Students are referred to the co-ordinator for BIOL 499 for further details.
## Canadian Studies

**Associate Professor, Chairman of The Canadian Studies Program Board**
K.M. Bennett, BA (Queens), PhD (McGill)

**Associate Professor, Director of the Program**
S.F. McMullin, BA, MA (Carleton), PhD (Dalhousie)

### Professors
- G.R. Francis, BA (Toronto), MA (British Columbia), PhD (Michigan)
- D.W. Hoffman, BSA, MSA (Toronto), PhD (Waterloo)
- T.S. Abler, BA (Northwestern), MS (Wisconsin-Milwaukee), PhD (Toronto)
- F.C. Gerard, MA (College St. Dominique, France) BD, STM (McGill), PhD (Harvard Conn) P
- A. Hunter, BA (British Columbia), MA, PhD (McMaster)
- R.D. Legge, BA (Transylvania), "STB (Harvard), PhD (McMaster)
- W.R. Macnaughton, BA (Toronto), MA, PhD (Wisconsin)
- E.H. Officer, BA (British Columbia), MA (Wisconsin)
- W.D. Wilson, MA, PhD (Trinity College, Dublin)

### Associate Professors
- S.D. Burt, BA, MA (Waterloo), PhD (York)
- D.J. Horton, BA (Waterloo Lutheran), MA (Waterloo), PhD (McGill)
- R.R. Krueger, BA, MA (Western Ontario), PhD (Indiana)
- D.W. Hoffman, BSA, MSA (Toronto), PhD (Waterloo)

### Participating Faculty
- T.S. Abler, BA (Northwestern), MS (Wisconsin-Milwaukee), PhD (Toronto)
- M.S. Bird, BA, MA, PhD (Iowa) R
- R.D. Lambert, BA, MA (McMaster), PhD (Michigan)
- R.C. MacGillivray, BA (Queen's), MA, PhD (Harvard)
- K.M. McLaughlin, BA (Waterloo), MA (Dalhousie), PhD (Toronto)
- S.E. McMurphy, BA, MA (Carleton), PhD (Dalhousie)
- W.R. Needham, BComm (Carleton), MA, PhD (Queen's)

### 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.

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<tr>
<th>Course Code</th>
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<tr>
<td>CDN ST 101 F</td>
<td>2C</td>
<td>Landforms and Mindscapes</td>
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**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 different scientific disciplines.
### Course Descriptions

#### Chemical Engineering

**Department of Chemical Engineering**

Professor, Chairman of Department  
E. Rhodes, BSc Tech, MSc Tech, PhD (Manchester), PEng

Professor, Associate Chairman  
G.L. Rempel, BSc, PhD (British Columbia)

Associate Professor, Associate Chairman (Graduate Studies)  
G.S. Muller, BASc (Waterloo), MSc, PhD (Manchester), PEng

Professor, Associate Dean, Graduate Studies  
D.S. Scott, BSc, MSc (Alberta), PhD (Illinois), PEng

Professors  
J.J. Byerley, BASc, MASC (Toronto), PhD (British Columbia)  
K.S. Chang, BS (I-Hayang Institute Technology, Seoul), MSc, PhD (Northwestern)  
F.A. Dullien, Dipl Ing (Budapest Technical University) MASC, PhD (British Columbia), PEng  
T.Z. Fahidy, BSc, MSc (Queen’s), PhD (Illinois), PEng  
R.Y.-M. Huang, BASc (National Taiwan University), MASC, PhD (Toronto), PEng  
R.R. Hudgins, UE, BASc, MASC (Toronto), MA, PhD (Princeton)  
M.M. Moo Young, BSc (London), MASC (Toronto), PhD (London), PEng  
K.F. O'Driscoll, BCHE (Pratt Institute), MA, PhD (Princeton)  
D.C.T. Pei, BEng (McGill), MSc (Queen’s), PhD (McGill)  
P.M. Reilly, UE, BASc (Toronto), DIC, PhD (London), PEng  
C.W. Robinson, BASc (British Columbia), PhD (California Berkeley)  
A. Rudin, BSc (Alberta), PhD (Northwestern), PEng  
P.L. Silveston, BS, MS (MIT), Dr Ing (Munich), PEng  
D.R. Spink, BS (Michigan), MS (Rochester), PhD (Iowa State), PEng  
G.A. Turner, BSc (London), PhD (Manchester)  
B.M.E. van der Hoff, Ing (Amsterdam), Ir (Delft)  
J.R. Wyrzycki, BEng (McGill), MASC, PhD (Toronto)  

Associate Professors  
L.E. Bodnar, BA, MA (Saskatchewan), PhD (McMaster)  
C.M. Burns, BASc, MASC (Toronto), PhD (Polytechnic Institute, Brooklyn), PEng  
K. Enns, BASc, LLB, MASC, PhD (Toronto)  
J.D. Ford, BEng (McGill), MASC, PhD (Toronto), PEng  
C.E. Gall, BASc (Toronto), MSc (Queen’s), PhD (Minnesota), PEng  
I.F. Macdonald, BEng (NSTC), PhD (Wisconsin)  

Assistant Professors  
I. Chatzis, BASc, MASC, PhD (Waterloo), (Dupont - NSERC Assistant Professor)  
J.M. Scharer, BSc, PhD (Pennsylvania)  
G.R. Sullivan, BASc (Waterloo), DIC, PhD (London), PEng (Dupont - NSERC Assistant Professor)  

Adjunct Faculty  
T.L. Batke, BASc, MASC, PhD (Toronto), LLB (Waterloo)  
B.A. Jacobson, BSc, MSc (Alberta), PEng  
P. Readhough, BSc (McMaster)

Faculty Members of Chemical Engineering holding cross appointments to:  
1. Chemistry  
2. Management Sciences  
3. Statistics

Faculty Members holding cross appointments to Chemical Engineering from:  
4. Chemistry

### Course Descriptions

#### Introductory Note

Prerequisite: For all courses in the Department of Chemical Engineering, registration in the Department or permission of the Associate Chairman (Undergraduate Studies) is a requirement.

**CH E 101** W,S 3C,1T,3L 0.5  
**Chemical Engineering Concepts 2**  
An extension of the topics covered in. CH E 100; energy balances; laboratory experiments illustrate the physical principles discussed.

**CH E 102** F 3C,2T 0.5  
**Chemistry for Engineers**  
Chemical principles with applications in engineering. Stoichiometric calculations, properties of gases, properties of liquids and solutions; gas phase chemical equilibrium, ionic equilibrium in aqueous solution, oxidation-reduction reactions, chemical kinetics.

**CH E 210** W,F 3C,1T 0.5  
**Transport Processes 1 (Equilibrium State Operations)**  
Equilibrium between phases; the equilibrium-stage concept. Cascades of stages with and without reflux; examples of their analysis when used to separate components by distillation, extraction, absorption and leaching. Introduction to computer methods for multicomponent mixtures.

**CH E 213** S,F 3C,2L 0.5  
**Transport Processes 2 (Fluid Mechanics)**  
Fundamentals of fluid flow; conservation laws for mass, momentum and mechanical energy; flow of fluid in conduits; flow past immersed bodies. Description, collection and separation of particulate systems.

**CH E 220** W,F 3C,1T 0.5  
**Applied Mathematics 1**  
Basic concepts of probability and their relevance to engineering decisions. Statistical frequency distributions, tests of significance, correlations, curve fitting, sampling theory, applications, errors, design of experiments.

**CH E 230** W,F 3C,1T 0.5  
**Physical Chemistry 1**  
Introduction to physical chemistry. Ideal and real gases, the kinetic theory of gases, first law of thermodynamics, thermochromy, heats of reaction, second law, chemical equilibria in simple systems, phase equilibria in simple systems, third law.

**CH E 231** S,F 3C,1T 0.5  
**Physical Chemistry 2**  
Prereq: CH E 220
Control theory. Stability criteria. Introduction to techniques, analytical and graphical controllers, frequency response proportional-integral-derivative Block and signal flow diagrams, analogies. Mass transfer models and mass transfer by molecular and solids drying; introduction to mass transfer with chemical reaction.

CH E 323 S,F 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 314 W,S 3C,1T 0.5 Transport Processes 3 (Heat Transfer) Introduction to heat transfer, momentum-heat transfer analogies and dimensional analysis, steady and transient heat conduction, convection and applications to engineering problems, radiant heat transfer and heat transfer with change of phase.

CH E 317 W,F 3C,1T 0.5 Transport Processes 4 (Mass Transfer) Mass transfer by molecular and turbulent motion, heat-mass transfer analogies, mass transfer models and application to separations such as distillation, absorption, adsorption, extraction, etc.; simultaneous heat and mass transfer in gas-liquid contacting and solids drying; introduction to mass transfer with chemical reaction.

CH E 320 W,S 3C 0.5 Applied Mathematics 2 Gamma-Beta and error-functions, sine-cosine, exponential and elliptic integrals, linear differential equations; Wronskian, Green function; initial and boundary value problems; Bessel functions; Fourier series, integrals and transforms; orthogonal functions; Laplace transforms; applications.

CH E 321 W,F 3C 0.5 Process Dynamics and Control 1 Block and signal flow diagrams, proportional-integral-derivative controllers, frequency response techniques, analytical and graphical stability criteria. Introduction to modern control theory.

CH E 330 W,S 3C 0.5 Chemical Engineering Thermodynamics Thermodynamics of flow processes, vapour power plants, internal combustion engines, liquefaction of gases, refrigeration and evaporation, chemical equilibria in chemical reactions, thermal pollution, the energy crisis, efficient energy utilization and thermodynamics.

CH E 331 W,F 3C 0.5 Chemical Reaction Engineering Homogeneous reactors; batch, CSTR, tubular flow systems, ideal models, residence time distributions in ideal reactors, temperature effects, steady states, semi-batch systems, nonideal behaviour. Heterogeneous catalysis, mass transfer effects; catalytic rate equations, fixed and fluidized bed reactors.

CH E 332 W,S 3C 0.5 Inorganic Chemistry 2 Introductory electrochemistry; electrolysis, electrolytic conductance and transport, reversible, electrode processes, irreversible electrode processes and electrode kinetics, electrochemical measurements and their analytical applications, chemistry of corrosion.

CH E 333 W,F 3L 0.5 Instrumental Methods of Chemical Analysis An introduction to modern analysis including optical, electrochemical, radiochemical, chromatographic and spectroscopic methods.

CH E 382 W,S 3C 0.5 Engineering Economics and Process Design 1 Mathematics of finance, time value of money, taxes and depreciation, profitablility, estimation of capital and production costs, linear programming. Study of piping, valves, pumps, compressors, and fans. Materials of construction.

CH E 410 S,F 8L 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).

CH E 484 S,F 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.
Performance of Separation Processes
Introduction, patterns of change and computational approaches, group methods, limited flows and stage requirements, capacity and efficiency of contacting devices, energy requirements, selection, optimal design and operation, mass transfer with chemical reaction.

Chemical Engineering Analysis
Application of advanced mathematical techniques to the analysis of chemical engineering processes.

Process Dynamics and Control 2
Computer control, state space methods, control of complex chemical systems. Prereq: CH E 321

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 251, CHEM 254 or equivalent Antireq: CHEM 353

Physical Chemistry of Polymers
Polymer solutions, molecular characterization of polymers, molecular weight distributions, morphology and crystallinity in polymers, reaction and kinetics and mechanism of addition and condensation polymerization. Prereq: CH E 540

Polymer Laboratory
Experimental studies of polymerization and physical properties of polymers; condensation and addition polymerization, copolymerization, molecular weight, extrusion rheology. Coreq: CH E 541

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 metallurgical processes.

Metallurgical Chemistry
Ionic equilibria, thermodynamics and kinetics of reactions in solution, bonding, stability and stereochemistry of coordination compounds and mechanisms of their reaction, introductory hydrometallurgy, corrosion and homogeneous catalysis.

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.

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 580 or permission of instructor

Food Processing
Applications of unsteady and steady heat and/or mass transfer operations to processing natural and texturized foods. Design and analysis of sterilization, low temperature preservation, concentration, separation and purification processes. Effects of formulation, additives, and processing on organoleptic and nutritional quality. Prereq: CH E 580 or permission of instructor

Air Pollution
Treatment of gaseous waste products from representative Canadian industries; characterization and toxcity of filtration, scrubbing, cycloning, electrostatic precipitation, and other chemical treatment, legal, socio-political, economic and engineering aspects.

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.

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.

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.

Process System 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.

Technical Elective Project
An individually supervised research or design project, based on 1 of the technical elective courses taken in the 4A term. A written report meeting minimum technical report standards, and a public oral presentation will be required.

General Awareness Seminar
Informal discussions on the Chemical Engineering program.
Course Descriptions

Some courses are regularly given every other year, and are listed in their regular places. Any other courses not offered in the current academic year are listed at the end of this section.

Introductory Note
In all cases, it is the student's responsibility to determine eligibility to enter a course. It is advisable to obtain special permissions 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 formulas, nomenclature, stoichiometry, an introduction to thermochemistry, solution chemistry, chemical equilibria, acids, bases, oxidation-reduction reactions, kinetics and bonding.

Successful completion of this course fulfills the University Admission requirements where high school chemistry is necessary. No University credit offered by correspondence only.

CHEM 10 F.W.S. 1C 0 General Chemistry Seminar

Required for all Chemistry students beyond Year 1, this seminar brings together students from all years to receive information concerning the activities of the Chemistry Department and the Chemical Institute of Canada, and to hear invited speakers.
YEAR 1 CHEMISTRY COURSES

**CHEM 123** F 3C,1T 0.5
**Chemical Reactions, Equilibria and Kinetics**
The stoichiometry of compounds and chemical reactions; principles of equilibria, solubility and acid-base equilibria; electrochemistry; chemical kinetics.
Prereq: Grade 13 Chemistry, Mathematics (Calculus)
Coreq: (for Science students) CHEM 123L

**CHEM 123L** F 3L 0.25
**Chemical Reaction Laboratory 1**
Selected experiments for students taking CHEM 123.

**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

**CHEM 124L** W,S 3L 0.25
**Chemical Reaction Laboratory 2**
Selected experiments for students taking CHEM 124.

UPPER YEAR CHEMISTRY COURSES

**CHEM 212** 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 218** F 2C,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 218
Antireq: CHEM 313
1994-95, by correspondence only

**CHEM 220** F,W 2C,1T 0.5
**Introductory Analytical Chemistry**
The principles underlying quantitative measurements.
Prereq: CHEM 123, 123L
Coreq: (for Science students) CHEM 223L
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 3L 0.5
**Analytical Chemistry Laboratory 2**
Selected experiments for students taking CHEM 221.
For Honours students only

**CHEM 228** W,S 2C,3L 0.5
**Analytical Chemistry for Life Sciences**
Selected topics of importance to biology students, with related experiments.
Prereq: CHEM 123, 124
Antireq: CHEM 220
For students in Honours Biology only

**CHEM 237** F,W,S 3C 0.5
**Introductory Biochemistry**
An introduction to the chemistry of amino acids, carbohydrates, lipids and nucleic acids. Structure and properties of proteins and enzymes.
Prereq: CHEM 264 or 266
Coreq: CHEM 237L

**CHEM 237L** F,W,S 3L 0.25
**Introductory Biochemistry Laboratory**
Selected experiments for students taking CHEM 237.

**CHEM 254** F,W, 2C,1T 0.5
**Physical Chemistry 1**
This course emphasizes the macroscopic approach. Areas to be studied include properties of gases; the first, second and third laws of thermodynamics applied to ideal systems; chemical equilibrium.
Prereq: CHEM 123, MATH 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.
Prereq: CHEM 124
Antireq: CHEM 36, 266
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 aromatics. Introduction to spectroscopy.
Prereq: CHEM 264
Antireq: CHEM 267
For Honours students only

CHEM 265L F,W,S 3L 0.25
**Organic Chemistry Laboratory 1**
Selected experiments for students taking CHEM 265.
For Honours students only

CHEM 266 F,W 3C 0.5
**Basic Organic Chemistry 2**
Continued 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
Antireq: CHEM 36, 264

CHEM 266L F,W 3L 0.25
**Organic Chemistry Laboratory**
Selected experiments for students taking CHEM 266.

CHEM 267 W 2C 0.6
**Basic Organic Chemistry 3**
A continuation of the concepts of CHEM 266. Introduction to carbohydrates, proteins, and lipids. Introduction to NMR and IR spectroscopies.
Prereq: CHEM 266
Antireq: CHEM 36, 265
For students needing a full year of Organic Chemistry as a prerequisite to medicine, either the sequence 266-267 and 266L, or the sequence 264-265 and 265L should be selected.

CHEM 311 W 2C 0.5
**Radiochemistry**
Prereq: Grade 13 Chemistry, completion of Year 1 in good standing or permission of instructor

CHEM 312 F,S 2C,1T 0.5
**Transition Metal Chemistry**
The transition elements and their compounds. Stereoechemistry of complexes: ligand field and molecular orbital theories of metal-ligand bonding, electronic spectra and magnetochemistry of complexes; reaction mechanisms (if time permits).
Prereq: CHEM 212
Antireq: CHEM 316
For Honours students only

CHEM 313 F,W 2C,1T 0.5
**Chemistry of Main Group Elements**
A systematic approach to the syntheses, properties, reactivity and structures of compounds of the main group elements. Trends in chemical behaviour, bonding and stereochemistry. Electron-deficient compounds, the rare gases, chemistry of phosphorus, nitrogen and sulfur will be dealt with in detail.
Prereq: CHEM 212
Antireq: CHEM 219
For Honours students only

CHEM 314L F,W,S 3L 0.25
**Inorganic Chemistry Laboratory 1**
An introduction to practical inorganic chemistry.
Coreq: CHEM 312 or 313
For Honours students only

CHEM 315L F,W 6L 0.5
**Inorganic Chemistry Laboratory 2**
Advanced experiments in inorganic chemistry.
Prereq: CHEM 314L
For Honours students only

CHEM 316 F 2C,1T 0.5
**Coordination Chemistry**
A basic coverage of first row transition elements for General and certain Honours students; preparation, nomenclature and general chemistry of transition metal complexes emphasizing structure, bonding, physical properties such as colour and magnetism, and chemical reactions.
Prereq: CHEM 216 or 212
Antireq: CHEM 312

CHEM 318L F 3L 0.25
**Inorganic Chemistry Laboratory**
Selected experiments for students taking CHEM 316

CHEM 320 W 2C 0.5
**Analytical Separations**
Basic principles, instrumentation and methods of liquid and gas chromatography.
Prereq: CHEM 221 or permission of instructor

CHEM 321L W 3L 0.25
**Advanced Analytical Laboratory**
Selected experiments for students of analytical chemistry.
Prereq: CHEM 221, 221L

CHEM 332 F,S 2C 0.5
**Structural Biochemistry**
Prereq: CHEM 237
Coreq: CHEM 265 or 267

CHEM 332L F,S 3L 0.25
**Structural Biochemistry Laboratory**
Selected experiments for students taking CHEM 332.

CHEM 333 F,W 2C 0.5
**Metabolism 1**
Metabolism of carbohydrates, lipids and amino acids.
Prereq: CHEM 237
Coreq: CHEM 265 or 267

CHEM 333L F,W 3L 0.25
**Metabolism Laboratory**
Selected experiments for students taking CHEM 333.

CHEM 350 W 2C 0.5
**Spectroscopy and Molecular Structure**
Introduction to concepts and applications of microwave, Raman, IR, electronic and resonance spectroscopy with respect to molecular parameters.
Prereq: CHEM 351

CHEM 351 F 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 polymerization, emulsion polymerization.
Prereq: CHEM 254, 264 or equivalents
Antireq: CH E 540

CHEM 355 F,W,S 2C,1T 0.5
**Physical Chemistry 3**
Introduction to the microscopic description of physical processes, laws governing electrons and atoms and the properties of atomic and molecular states, application to electromagnetic radiation interacting with atoms and molecules producing transitions between states.
Prereq: CHEM 255, MATH 215 or equivalent
Antireq: PHYS 354
For Honours students only
Physical Chemistry 4
CHEM 356L F,W 3L 0.25

Physical Chemistry Laboratory 1
Selected experiments for students taking CHEM 355.
For Honours students only

CHEM 356 F,S 2C,1T 0.5
General Physical Chemistry
An introductory survey of the thermodynamics of ideal systems; the application of thermodynamic principles to the study of solutions, phase equilibria, chemical equilibrium and the properties of electrolytes.
Prereq: CHEM 123, MATH 113a/b or equivalent
Antireq: CHEM 254

CHEM 357 W 2C,1T 0.5
Physical Chemistry for the Life Sciences
An introductory survey of kinetic molecular theory and transport phenomena with applications to biological systems. Chemical kinetics. Some spectroscopies important to life sciences.
Prereq: CHEM 123, MATH 113a/b or equivalent

CHEM 357L W 3L 0.25
General Physical Chemistry Laboratory 2
Selected experiments for students taking CHEM 357.
Prereq: CHEM 356L

CHEM 358 F,W 2C,1T 0.5
Physical Chemistry 4
The statistical nature of large assemblies of atoms and molecules, kinetic theory of gases, transport processes, the collision theory and transition state theory of chemical kinetics.
Prereq: CHEM 355
For Honours students only

CHEM 358L F,W 6L 0.5
Physical Chemistry Laboratory 2
Selected experiments for students taking CHEM 358.
Prereq: CHEM 356L
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 364 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 of organic molecules; synthesis of selected organic compounds examined in detail with emphasis on cyclo-addition reactions and condensation reactions.
Prereq: CHEM 265 or 267
Antireq: CHEM 368

CHEM 366L F 3L 0.25
Organic Chemistry Laboratory
Selected experiments for students taking CHEM 366.

CHEM 368 F,W,S 2C 0.5
Organic Chemistry 4
The design of organic syntheses, and especially the formation of enolate ions and their use in the formation of new carbon-carbon bonds. Acidity and basicity of organic molecules. Stereochemical concepts applied to organic molecules as well as conformational analysis.
Prereq: CHEM 265
Antireq: CHEM 368

CHEM 369 W (even years only) 3C 0.5
History of Chemistry
The development of chemistry will be traced from alchemy to the 20th century. The contributions of famous scientists to the concepts and models of modern chemistry will be emphasized.
Prereq: Completion of 2 years of a Chemistry Honours program

CHEM 409 W (odd years only) 2C 0.5
Solid State Chemistry
Packing in solids; metals, alloys and molecular crystals; ionic and covalent solids; chemical factors affecting crystal structures; properties of metals, semiconductors and molecular crystals.
Prereq: CHEM 312 or 313

CHEM 411 F 2C 0.5
Organometallic Chemistry
Prereq: CHEM 312

CHEM 416 W 2C 0.5
Applied Inorganic Chemistry
The chemistry of inorganic compounds and processes of industrial importance will be discussed. Inorganic polymers; catalysis by inorganic systems including nitrogen fixation, hydrogenation, hydroformylation. Extraction and purification of metals.
Prereq: CHEM 312

CHEM 417 W (even years only) 2C 0.5
Inorganic Cage Compounds
The synthesis, structure and reactions of selected groups of important cage compounds such as metal clusters, metalloboranes, boranes, and carboranes will be considered. The emphasis is on current literature. The course is available on a special self-study basis or by regular lectures.
Prereq: CHEM 312 or 313

CHEM 419 W 2C 0.5
Biological Aspects of Inorganic Chemistry
Metalloproteins and other metal-containing biological molecules in hydrolytic enzymes; redox reactions; nitrogen fixation and oxygen transport; the role of alkali and alkaline earth metal cations.
Prereq: CHEM 312 or 316

CHEM 420 W 2C 0.5
Analytical Chemistry
Selected topics in modern analysis of inorganic materials such as rocks, ores, ceramics, metals and alloys; atomic flame spectroscopic methods, analytical X-ray techniques, methods for ultrapure materials, trace and micro determinations.
Prereq: CHEM 221 or permission of instructor
The colloidal size range, the importance
Thermal and Electrokai Analytical
Techniques and fundamental principles
of lyotropic liquid crystals and
bilayers.
related spectroscopy, microscopy,
molecular rearrangements.
CHEM 465 W 2C 0.5
Special Topics in Organic Chemistry
Topics will be selected from
photochemistry, organometallics,
synthesis, heterocyclics, natural
products, molecular rearrangements
(May be taken in third and fourth year
as 465A and 465B provided topics are
different).
Prereq/Crereq: CHEM 368

CHEM 492 Y 9L 0.5
Advanced Laboratory
Laboratory work on a senior year
research project. See CHEM 492 co-
ordinator for descriptive booklet and
details.
For Honours students only

Department of Civil
Engineering

Professor, Chairman of the Department
R.C.G. Haas, BSc, MSc (Alberta), PhD
(Waterloo), PEng

Professor, Dean of Engineering
W.C. Lennox, BSc, MSc (Waterloo),
PhD (Lehigh), PEng

Professor, Dean of Graduate Studies
H.H.E. Leipholz, Dipl Eng, Dr Ing.
Docent Habib (Stuttgart), PEng,
Recipient of the Distinguished
Teacher Award

Professor, Associate Chairman Graduate
Studies
J. Roorda, BSc (Waterloo), PhD
(London), PEng

Associate Professor, Associate
Chairman, Undergraduate Studies
N. Kouiwen, BSc, PhD (Waterloo), PEng

Professors
S.T. Ariaratnam, BSc (Eng) (Ceylon),
MSc (London), PhD (Cambridge)
M.B. Dusseault, BSc, PhD (Alberta),
PEng
E.F.P. Burnett, BSc (Cape Town), DIC,
MS, PhD (London), PEng
M.Z. Cohn, CSc (Bucharest), PEng
G.J. Farquhar, BSc (Waterloo), PhD
(Wisconsin), PEng, Recipient of the
Distinguished Teacher Award
G.M.L. Gladwell, BSc, PhD, DSc
(London)
R. Green, BSc (Eng) (London), MSc
(Queen's), MSc (Waterloo), PhD
(Texas), PEng
D.E. Grierson, BASc, MASc, PhD (Waterloo), PEng
V.K. Handa, BSc (Calcutta), DSc (Eng) (London), MSc (Queen’s), MASc, PhD (Waterloo), PEng
B.G. Hutchinson, BE (Sydney). MSc (Queen’s), PhD (Waterloo), PEng
D.T. McClurkin, Assistant Professors
D.A. Godden, BASc (Toronto), LLB (Osgoode Hall) LLM (York)
D.T. McClurkin, Chartered Accountant

<table>
<thead>
<tr>
<th>Course Descriptions</th>
<th>Civil Engineering</th>
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<tbody>
<tr>
<td>CIV E 126 W.S. 2C,4L/T 0.5 Civil Engineering Concepts</td>
<td>A continuation of GEN 115 with applications of graphics, measurement and other analytic principles to introductory problems in the various disciplines of Civil Engineering; an introduction to engineering design methods as applied to Civil Engineering and including specification development, information-gathering, concept formulation, feasibility analysis and report writing.</td>
</tr>
<tr>
<td>CIV E 203 F,W 2C,2T 0.5 Statics</td>
<td>Equilibrium of rigid and deformable bodies. Analysis of internal forces in structures; beams, cables, arches, trusses.</td>
</tr>
<tr>
<td>CIV E 205 F,S 3C,1T 0.5 Mechanics of Solids 2</td>
<td>Buckling and Stability. Failure hypotheses. Virtual work. Displacement analysis. Introduction to influence lines.</td>
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<tr>
<th>Course Descriptions</th>
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<tbody>
<tr>
<td>CIV E 222 F,S 3C,1T 0.5 Differential Equations</td>
<td>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</td>
</tr>
<tr>
<td>CIV E 223 F,S 1C,2T 0.5 Computer Workshop</td>
<td>An introduction to Microcomputers and the BASIC language. Workshop to include applications selected from Year 2 Civil Engineering courses. 10 weeks only.</td>
</tr>
<tr>
<td>CIV E 230 F,W 3C,1T 0.5 Geology for Engineers</td>
<td>A study of earth processes and earth materials from an engineering point of view. Topics include: mineral and rock identification, the rock cycle, structural geology, geology of Canada, effects of water, ice and wind. Description of aggregates used in engineering works. Field trip.</td>
</tr>
</tbody>
</table>

| Course Descriptions | | |
|---------------------|------------------|
| Associate Professors | |
| R.W. Cockfield, BS, MSc (Queen’s), PhD (Waterloo), PEng |
| B. Leclercq, BEng (West Australia), MASc, PhD (Waterloo), PEng |
| E.L. Matyas, BASc (Toronto), DIC, PhD (London), PEng |
| R.M. Schuster, BS, MS (North Dakota State), PhD (Iowa State), PEng |
| J.J. Smalley, PhD (University of London), PEng |
| J.F. Sykes, BASc, MASc, PhD (Waterloo), PEng |
| J.C. Thompson, BASc (Toronto), MS, PhD (Illinois), PEng |

| Assistant Professors | |
| L. Rothenburg, Dipl Phy (Moscow), PhD (Carleton), PEng |
| F.F. Sacconanno, BSc, MCP (Manitoba), PhD (Toronto), PEng |
| Adjunct Faculty | |
| P.M. Allen |
| D.A. Godden, BASc (Toronto), LLB (Osgoode Hall) LLM (York) |
| D.T. McClurkin, Chartered Accountant |
CIV E 291 F 1 wk flld lab 0.5
Survey Camp
A one-week course in surveying. Introduction to surveying, length measurements, levelling, transit surveys. 
Approximate cost to each student $385.

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 294 F.S 2C,2T 0.5
Thermal Sciences
An introductory course in thermal science. Provides an understanding of thermodynamic principles as well as engineering aspects of heat transfer including applications to practical engineering problems.

CIV E 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. 10 weeks only.

CIV E 303 W.S 3C,1T 0.5
Structural Analysis 1

CIV E 313 F.W 3C,1T 0.5
Structural Concrete Design 1
Reinforced Concrete Members. Concrete and reinforcing steel materials. Safety, loads, design criteria. Flexure, shear, combined bending and axial force. Serviceability. One-way slabs, beams, columns, foundations and retaining walls.

CIV E 342 W,S 2C,2T 0.5
Transport Principles and Applications
The nature of intercity transport, estimating transport demands, highway transport, rail transport, air transport, pipelines.

CIV E 343 F.W 2C,2T 0.5
Transport Engineering Design
Vehicle dynamics and geometric design, road capacity, traffic signals, terminal design, pavement structure, transport facilities in permafrost areas.

CIV E 344
Urban and Regional Engineering
Natural systems behaviour; Man's impacts on ecosystems; Current environmental issues in Canada; Canadian urban system; Trends in resource consumption and waste production; Population forecasting; Economic forecasting; Urban spatial structure; Regional water management; Sources of water supply; Spatial aspects of network design; impacts of urbanization on hydrological regimes; interactions with natural systems. Not for Civil Engineering students. Cross-listed as PLAN 436.

CIV E 363 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. 6 lab sessions.

CIV E 364 F.W 3C,1T 0.5
Geotechnical Engineering 2
A course in foundation engineering; earth pressure theories; retaining walls, anchors; shallow and deep foundations; braced trenches and excavations; slope stability.

CIV E 375 F.W 3C,1T,2L 0.5
Water Quality Engineering
Basic water chemistry. Mathematical modelling of water quality. Treatment systems. Solid Waste Management. Air pollution. 7 lab sessions.

CIV E 381 W.S 3C,1T 0.5
Hydrology/hydraulics 1

CIV E 398 W.S 2S 0.0
CIV E 399 F.W 2S 0.0
Seminar
The engineer in society. Principles, methods and practice of Civil Engineering. Informal lectures.

CIV E 400 S,F 1C,3T 0.5
Civil Engineering Project 2
The purpose is to provide the students with an opportunity to demonstrate their capacity to engage in the practice of civil engineering as a profession. The students are encouraged to independently identify and resolve a problem within the scope of their chosen area of specialization utilizing knowledge gained from their academic and employment experiences. A written report and a verbal presentation are requirements.

CIV E 401 W 4T 0.5
Civil Engineering Project 3
An independent or team project dealing with engineering design or research, under the direction and with the consent of a faculty member.

CIV E 403 F.S 3C,1T 0.5
Structural Analysis 2
Advanced structural analysis of planar and space frameworks; linear and nonlinear behaviour. Computer Applications.

CIV E 404 W 2C,2T 0.5
Structural Analysis 3
Approximate methods of analysis for a variety of structural forms. Application of approximate techniques to beams, building frames, shear wall structures, plates, buckling and vibration problems. Approximate structural design.

CIV E 405 W 2C,2T 0.5
Structural Dynamics

CIV E 406 W 2C,2T 0.5
Mechanics of Solids 3
Course Descriptions
Civil Engineering
Classical Studies

CIV E 407 W 2C,2T 0.5
Building Sciences
The building process: loading; thermal; moisture, fire and smoke considerations. Enclosure (walls and roof) design. Sub-grade construction. Energy related considerations; energy load, economics, thermal inertia.

CIV E 413 S,F 3C,1T 0.5
Structural Steel Design

CIV E 414 S,F 3C,1T 0.5
Structural Concrete Design 2

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.

Pre req: CIV E 413 and CIV E 414

CIV E 421 F,S 3C,1T 0.5
Advanced Mathematics for Engineers

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,2L 0.5
Experimental Mechanics

CIV E 440 W 2C,2T 0.5
Transport Systems
Urban transport models. transport economics, system analysis and evaluation, case studies of transport systems.

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.

CIV E 454 W 2C,2T 0.5
Geotechnical Engineering 3
Detailed air-photo interpretation; terrain evaluation; remote sensing; one-half term of case histories including detailed analysis, design and reporting of geotechnical engineering projects.

CIV E 472 F,S 3C,1T 0.5
Wastewater Treatment
Introduction to wastewater treatment. Wastewater quantity; Wastewater characteristics; Primary treatment; Secondary treatment; Sludge treatment and disposal; Industrial wastewater management. Design project.

CIV E 473 W 2C,2T 0.5
Contaminant Transport

CIV E 480 W 2C,2T 0.5
Water Resources Management
A course on water resource management problems in Canada. Description of basic areas of water resource management. Application of systems analysis and operations research techniques in water resource management. Benefit-cost analysis. Social, political, legal and ecological considerations.

CIV E 486 S,F 3C,1T 0.5
Hydrology/Hydraulics 2

CIV E 491 W 3C 0.5
Engineering Law

CIV E 493 W 2C,2T 0.5
Engineering in the Canadian North

CIV E 496 W 2C,2T 0.5
Seminar
The engineer in society. Principles, methods and practice of Civil Engineering. Informal lectures.

Department of Classical Studies

Associate Professor and Chairman of the Department
P. Forsyth, AB (Mount Holyoke), MA, PhD (Toronto), Recipient of the Distinguished Teacher Award

Assistant Professor and Undergraduate Officer
R.L. Fowler, BA, MA (Toronto), DPhil (Oxford)

Professors
P. Kereszes, MA (Toronto), PhD (Graz)
D.C. Mackenzie, BA, MA, PhD (Princeton)

Assistant Professors
S.B.P. Haag, BA, MA (Queens’), MA (Waterloo), PhD (Date)
R.L. Porter, BA (McMaster), MA, PhD (Princeton)

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. Schaus, BA, MA (Delhouse), PhD (Pennsylvania)
G.H. Vattiste, BA, MA (McGill), PhD (Chicago)
Course Descriptions

CLASSICAL CIVILIZATION

(Courses in Translation)

Courses not offered in the current academic year are listed at the end of this section.

C CIV 101 F 3C 0.5
Colossos - The Major Figures of Ancient Greece
An introductory study of the achievement of ancient Greece through some of its most prominent figures. Each year 2 of the following will be featured: Thesues: The Minoan-Mycenaean Age of Bronze; Pencles and the Rise of Democracy; Socrates, Man and Martyr; Alexander the Great and The Age of Expansion.

C CIV 102 W 3C 0.5
Colossos - The Major Figures of Ancient Rome
An introductory study of the achievement of ancient Rome through some of its most prominent figures. Each year 2 of the following will be featured: Julius Caesar and the Collapse of the Republic; Augustus: The Empire Rises; Nero and the Corruption of Power; Hadrian and the Imperial Machine.

C CIV 201 F.S 3C 0.5
Ancient Greek Society
A survey of the civilization of Classical Greece, featuring such topics as the individual (male and female), political institutions, art, religion, philosophy, literature, social life and leisure activities.

C CIV 202 W 3C 0.5
Ancient Roman Society
A survey of the civilization of the Roman Republic and Empire, featuring such topics as the individual (male and female), political institutions, art, religion, philosophy, literature, social life and leisure activities.

C CIV 251 F 3C 0.5
Greek History
A survey of ancient Greece, emphasizing its political, military, social and economic aspects.

C CIV 252 W 3C 0.5
Roman History
A survey of ancient Greece, emphasizing its political, military, social and economic aspects.

C CIV 255 F 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.

C CIV 256 W 3C 0.5
Medieval Civilization 2
A study of medieval literature, art, architecture, music and other expressive forms. The period from A.D. 1200 to the Renaissance will be studied.

C CIV 266 F 3C 0.5
Ancient Tragedy in Translation
The plays of Aeschylus, Sophocles, Euripides and Seneca, with emphasis on the evolution of drama from a religious and mythological statement through to the human drama of Seneca. No knowledge of Greek or Latin is needed.

C CIV 267 F 3C 0.5
Ancient Comedy in Translation
A study of the comedies of Aristophanes, Menander, Plautus and Terence. Different types of comedy, and their evolution, will be studied in lectures and discussions. No knowledge of Greek or Latin is needed.

C CIV 268 W 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 labour force, the aged and infirm, human sexuality and sexual mores, children and education, minority groups and racial prejudice, war and conflict.

C CIV 292 F.S 3C 0.5
Problems in Antiquity
A continuation of C CIV 292. Topics included are the persecutions by the Emperors Decius and Valerian, the Great Persecution and the triumph of Christianity under the Emperor Constantine.

C CIV 301 F 3C 0.5
Ancient Myth and Religion 1
A study of Greek and Roman myth, including the birth of the gods, creation, the Olympians, Prometheus and the fall, the flood, the ages of man.

C CIV 302 W 3C 0.5
Ancient Myth and Religion 2
A study of Greek and Roman legend, including the cultures of Troy, Mycenae, Thebes; the Argonauts, the heroes, Odysseus; and the mystery religions (with their relation to Christianity).

C CIV 351 F 3C 0.5
History of Ancient Philosophy 1
From the beginnings to Plato.

C CIV 352 W 3C 0.5
History of Ancient Philosophy 2
From Aristotle to the close of classical antiquity.
C CIV 384 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 and medicine, and of the technological skills which produced and distributed raw materials, manufactured goods and agricultural products.
Prereq: First year science or engineering course, or C CIV 201 or 202 or 251 or 252 or instructor's permission

C CIV 485 F 2S 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).

C CIV 486 W 2S 0.5
Greco-Roman Civilization and History 2
Senior seminar; intensive study of various problems.
Prereq: previous work in ancient history or instructor's permission
This course is acceptable for credit by the History Department (but not as a senior seminar).

C CIV 492-498
Senior Seminars
By arrangement with the Department, an individual student or a small group of students will follow a course of study under the supervision of a faculty member.

COURSES NOT OFFERED 1984-85
C CIV 265 Ancient Epic in Translation
C CIV 351 Greek Art and Architecture
C CIV 352 Roman Art and Architecture
C CIV 366 Ancient Lyric and Satire in Translation
C CIV 401 Atlantis: The Making of Myth

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 basic reading competence in ancient Greek course.
Prereq: GRK 100A

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

GRK 231 F 3C 0.5
Intermediate Greek 1: The World of Heroes
Selections from Homer, Herodotus and Sophocles.
Prereq: GRK 100B, Grade 13 Greek or instructor's permission
Offered 1984-85 at Wilfrid Laurier.

GRK 232 W 3C 0.5
Intermediate Greek 2: The Intellectual Revolution
Selections from Euripides, Thucydides and Plato.
Prereq: GRK 231, Grade 13 Greek or instructor's permission

GRK 262 F 3C 0.5
Introduction to Plato
Selections from Plato.
Prereq: GRK 100B, Grade 13 Greek or instructor's permission

GRK 361 F 3C 0.5
The Drama of Euripides
An examination of the dramatic art of Euripides by translation of selected plays and the reading of others in translation.
Prereq: One full 200-level Greek course or instructor's permission

GRK 372 W 3C 0.5
Herodotus
Selections from the Persian Wars.
Prereq: One full 200-level Greek course or instructor's permission
Offered 1984-85 at Wilfrid Laurier.

GRK 481 W 3C 0.5
The Philosophy of Plato
Detailed study of the Republic.
Offered 1984-85 at Wilfrid Laurier.

GRK 490-499
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 1984-85
GRK 271 Hellenistic and Later Greek Literature
GRK 351 Greek Composition and Grammar
GRK 362 Thucydides
GRK 371 An Introduction to the Greek Historians
GRK 452 Homer
GRK 481 The Drama of Aeschylus
GRK 462 The Comedy of Aristophanes
GRK 472 Thucydides
GRK 482 The Philosophy of Aristotle

LATIN
Courses not offered in the current academic year are listed at the end of this section.

LAT 100A F 3C 0.5
Introductory Latin 1
A course designed for students beginning the study of Latin or who have not yet reached the level expected in LAT 203/204. The aim is to attain as rapidly as possible the ability to read simple prose. Those desiring further competence should go on to do LAT 100B.

LAT 100B W 3C 0.5
Introductory 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 W 3C 0.5
A Survey of Latin Literature 2
A general survey of Latin prose and poetry from the beginning to the fall of the Roman Empire; a continuation of LAT 203.
Prereq: LAT 203 or instructor's permission

LAT 272 F 3C 0.5
An Introduction to Vergil
Selections from the Works of Vergil.
Prereq: Grade 13 Latin, LAT 100B or instructor's permission

LAT 282 W 3C 0.5
Latin Poetry 2
Selections from Ovid and Martial
Prereq: Grade 13 Latin, LAT 100B, or instructor's permission

LAT 362 F 3C 0.5
Lucretius
Selections from the De Rerum Natura.
Prereq: One full 200-level Latin course or instructor's permission
Offered 1984-85 at Wilfrid Laurier.

LAT 372 F 3C 0.5
Tactitus
Selections from the works of Tacitus.
Prereq: One full 200-level Latin course or instructor's permission
Offered 1984-85 at Wilfrid Laurier.

LAT 381 F 3C 0.5
Medieval Latin 1
Selections from the works of the 4th to the 12th centuries A.D.
Prereq: One full 200-level Latin course or instructor's permission

LAT 382 W 3C 0.5
Medieval Latin 2
Selections from works of the 12th century A.D. to the Renaissance.
Prereq: One full 200-level Latin course or instructor's permission

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.

COURSES NOT OFFERED 1984-85
LAT 251 Latin Composition and Grammar
LAT 261 Latin Prose 1
LAT 262 Latin Prose 2
LAT 281 Latin Poetry 1
LAT 352 The History of the Latin Language
LAT 361 Cicero

LAT 363 Roman Comedy
LAT 371 An Introduction to the Roman Historians
LAT 461 Vergil 1
LAT 462 Vergil 2
LAT 471 Roman Elegy
LAT 481 Roman Satire 1
LAT 482 Roman Satire 2

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 the 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 0.5
Benesh Notation 1
A theoretical and practical introduction to Benesh Movement Notation at the elementary level.
Prereq: Two courses in dance technique or consent of the instructor
Offered alternate years.

DANCE 236 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 to the intermediate level.
Prereq: DANCE 241
Offered alternate years.

DANCE 346 F 3C,2std 0.5
Applied Movement Analysis (Part 1)
A theoretical and practical study of classical ballet technique to the Elementary level.
Prereq: 4 courses in Ballet Technique or consent of instructor
Offered alternate years.
DANCE 347 W 3C 0.5
Applied Movement Analysis (Part 2)
Applied anatomy and biomechanics for the dancer. Topics covered include posture, leg extensions, torso and arm placement, balance, turns and jumps. Prereq: DANCE 346 and KIN 200. Offered alternate years.

DANCE 350 W 2C,2std 0.5
Modem Dance Composition
This course explores major forms and theories of modern dance choreography through studio practice and seminars.

DANCE 364A F 2C IT
Developmental Aspects of Movement
A study integrating the theoretical and applied aspects of motor and perceptual motor development in children and adolescents. Tutorials will emphasize creative dance activities for school-age children. Opportunity is available to work with children in an applied setting. 
Prereq: DANCE 111
Antireq: DANCE 364B and 364C

DANCE 364B F 2C IT
Development Aspects of Movement
A study integrating the theoretical and applied aspects of motor and perceptual motor development in children and adolescents. Tutorials will focus on movement education with preschool children. Opportunity is available to work with children in an applied setting. 
Prereq: Early Childhood Education Students only
Antireq: DANCE 364A and 364C

DANCE 364C F 2C IT
Development Aspects of Movement
A study integrating the theoretical and applied aspects of motor and perceptual motor development in children and adolescents. Tutorials will emphasize movement education as a foundation for sport, gymnastics and dance and investigate movement programs for children.
Antireq: DANCE 364A and 364B

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 Injuy, 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), Plus Level III technique in appropriate dance form

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
Recommended auditing KIN 330 and PSYCH 211

DANCE 412 W 3C 0.5
Seminar in Dance
An examination of current and major issues in dance.
Prereq: Honours Dance students only

DANCE 474. F,W 0.5
Directed Study on Special Topics
For the student who wishes to pursue a particular topic in depth through guided independent research and/or reading. A faculty member must approve a student's project prior to registration. This course may be repeated in subsequent terms.
Prereq: Consent of Faculty

DANCE 480 F,W wkshp 0.5
Workshop Series
The following courses are designed to give the student an opportunity to take theoretical knowledges to the applied setting. Offerings each year are determined by student interests. Topics available include:

DANCE 480 Court Dance
DANCE 481 Ballet Choreography
DANCE 482 Dance Notation Reconstructions
DANCE 483 Modern Dance Composition
DANCE 484 Teaching Creativity and Choreography to Children and Adolescents
DANCE 485 Methods and Teachings of Formalized Technique
DANCE 486 Dance Criticism
DANCE 487 Dance Ethnology
DANCE 488 Dance Production

The Workshop series is open only to 3rd and 4th year Honours Dance students. Two workshops may be taken in the 480 series toward the Honours degrees.
Prereq: Permission of instructor

Technique Courses 0.25
Each of the following technique courses consists of 2 classes per week for 1 term. Students should consult with a faculty advisor concerning the applicability of these courses for entry into future courses and possible careers such as teaching.

Students who are not Dance majors should consult their faculty advisor regarding acceptability of these courses for degree credit.

Students entering technique courses with previous dance training must audition for placement in upper level courses. Auditions are held during registration week on Thursday, September 6, 1984: 10:30 a.m. for ballet, 1:30 p.m. for Modern Dance and 3:00 p.m. for Jazz. Students holding credentials in specific technique syllabi should see the Undergraduate Officer in the Dance Department upon arrival on campus.

Entrance without audition is only possible in the following courses: DANCE 191B and 193A.

- Ballet "B" Division: For students with limited or no previous training:

DANCE 191B Basic Ballet I F
DANCE 192B Basic Ballet II W
DANCE 291B Basic Ballet III F
DANCE 292B Basic Ballet IV W
DANCE 391B Pre-elementary Ballet I F
DANCE 392B Pre-elementary Ballet II W
Dance and Theatre Arts Group

Lecturer, Co-ordinator
C.D. Abel, BA (Queen’s), MA (Toronto), LRAM (Speech and Drama)

Associate Professor
W.R. Chadwick, BA, MA (Toronto), PhD (London)

Assistant Professor
M. Vandersky, 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 E,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.

DRAMA 222 W 6L 0.5
Intermediate Acting 1
An extension of Drama 102. This course stresses development of the actor through scene study.

DRAMA 223 F 2C,2L 0.5
Survey of Dramatic Literature and
Dramatic Theory 1
The Greek and Roman periods.

DRAMA 224 W 2C,2L 0.5
Survey of Dramatic Literature and
Dramatic Theory 2
An extension of the studies described in DRAMA 223.

DRAMA 225 3C 0.5
Survey of Dramatic Literature and
Dramatic Theory 3
French neo-classicism, the Restoration period and sentimental drama

DRAMA 226 3C 0.5
Survey of Dramatic Literature and
Dramatic Theory 4
The late 18th, 19th and early 20th centuries, romanticism and naturalism.

DRAMA 227 3C 0.5
Survey of Dramatic Literature and
Dramatic Theory 5
Dramatic literature of the 20th century.

DRAMA 228 3C 0.5
Masterpieces of Western Drama – A Study of Performance 2
Plays of film. This course will entail studying a play and then viewing it as a movie.
Course Descriptions
Drama and Theatre Arts

DRAMA 261 F 3C 0.5
Introduction to Directing 1
Analysis of production and performance problems from the director's point of view. Study in the principles of stage direction.
Prereq: DRAMA 101A, 101B, 102, at least 1 dramatic literature class and permission

DRAMA 262 3L 0.5
Introduction to Directing 2
A practical workshop course in directing problems and techniques.
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.
Prereq: DRAMA 101A and B and 2 dramatic literature classes

DRAMA 302 W 3C 0.5
Script Interpretation 2
An extension of the studies described above in 301.
Prereq: DRAMA 101A and B and at least 2 dramatic literature classes

DRAMA 306 (ABC) F std 0.5
Special Studies in Theatre Production 1
Production participation and the study of selected problems of theatrical production.
Prereq: Permission of the play director

DRAMA 307 (ABC) W std 0.5
Special Studies in Theatre Production 2
See Drama 306.
Prereq: Permission of the play director

DRAMA 321 F 6L 0.5
Advanced Acting 1
Advanced work in acting. Course involves individual and ensemble work in selections from specific plays with attention given to various periods and styles in acting.
Prereq: DRAMA 291 and DRAMA 222

DRAMA 322 W 6L 0.5
Advanced Acting 2
An extension of the studies described in DRAMA 321.
Prereq: DRAMA 321 or permission

DRAMA 326 F 4L 0.5
Seminar in Voice 1
A workshop course in voice for the actor, designed to increase vocal power, range, flexibility and variety in presenting the spoken word.
Prereq: DRAMA 222

DRAMA 327 W 4L 0.5
Seminar in Voice 2
An extension of the studio described in DRAMA 326.
Prereq: DRAMA 326

DRAMA 331 F 3LD 0.5
Design for the Theatre 1
An introduction to the problems of designing for the theatre. Work for the course will include the preparation of drawings and models as well as practical experience in the theatre.
Prereq: DRAMA 244

DRAMA 332 W 3LD 0.5
Design for the Theatre 2
An extension of the studies described in DRAMA 331, concentrating on the practicalities of set design.
Prereq: DRAMA 331

DRAMA 341 F 4L 0.5
Lighting Design for the Theatre 1
An introduction to the theory and practice of theatre lighting design through studio experience.
Prereq: DRAMA 244

DRAMA 342 W 4L 0.5
Lighting Design for the Theatre 2
Advanced studies in theatre lighting design, including major production experience.
Prereq: DRAMA 341

DRAMA 343 F 2L2C 0.5
Theatre Technology 1
Advanced studies in the theory and practice of theatre technology, including an apprenticeship program.
Prereq: DRAMA 243 and 244

DRAMA 344 W 2L2C 0.5
Theatre Technology 2
A continuation of the studies described in DRAMA 343.
Prereq: DRAMA 343

DRAMA 348 3C 0.5
Arts Administration 1
An introduction to the problems and techniques of arts administration. Topics include: budgeting, program selection, fund raising, publicity and audience analysis.

DRAMA 349 3C 0.5
Arts Administration 2
An extension of the studies in DRAMA 348.

DRAMA 351 3C 0.5
Canadian Drama
See ENGLISH 316.
Cross-listed as ENGL 316.

DRAMA 352 3C 0.5
Russian Drama
Cross-listed as RUSS 341.

DRAMA 353 3C 0.5
Russian Drama
Cross-listed as RUSS 342.

DRAMA 355 3C 0.5
The Stage as Forum: German Drama in Translation
Cross-listed as GER 355.

DRAMA 356 3C 0.5
The Stage as Forum: Russian Drama in Translation
Cross-listed as RUSS 356.

DRAMA 371 3C 0.5
Theatre History 1
A survey of theatre history from Classical Greece to 1600.

DRAMA 406 (ABC) F std 0.5
Theatre Workshop 1
Participation in stage production for advanced students.
Prereq: Permission of the play director and DRAMA 101A and B

DRAMA 407 (ABC) W std 0.5
Theatre Workshop 2
Participation in stage production for advanced students.
Prereq: Permission of play director and DRAMA 101A and B

DRAMA 409 W 3C 0.5
Theatre Criticism
Study and practice of the criticism of theatre production and performance. This course will not normally be taken until the student's final year.

DRAMA 421 F 6L 0.5
Advanced Acting Workshop 1
An intensive workshop designed to develop performance skills. Special attention given to individual acting problems.
Prereq: DRAMA 321, 322, and permission of instructor
Department of Earth Sciences

Professor, Chairman of the Department
P. Fritz, Dipl Geol, Dr. rer. nat. (Stuttgart)

Professors
J.A. Cherry, BSc (Saskatchewan), MS (California, Berkeley), PhD (Illinois), PEng
M.B. DuSseau,1 BSc, MSc, PhD (Alberta)
R.N. Farvolden, MSc (Alberta), PhD (Illinois)
P.F. Karrow, BSc (Queens), PhD (Illinois)
R.W. Macqueen, BA, MA (Toronto), PhD (Princeton)

Associate Professors
E.C. Appleyard, BSc (Western Ontario), MSc (Queens), PhD (Cambridge)
E.O. Frind, BASc, MASc, PhD (Toronto), PEng
I.L. Gibson, BSc, PhD (Imperial College, London)
R.W. Gillham, BSA (Toronto), MSc (Guelph), PhD (Illinois)
J.P. Greenhouse, BSc, MSc (British Columbia), PhD (California)
D.E. Lawson, BSc, MSc (New Brunswick), PhD (Reading)
J.A. Legault, BSc, MSc (Ottawa), PhD (Oklahoma)
A.V. Moran, BSc (Leicester), MSc (Calgary), PhD (Birmingham)
E.J. Reardon, BSc (St. Francis Xavier), PhD (Pennsylvania State)
R.G. Roberts, BA (Cambridge), MSc, PhD (McGill)
I.J. Smalley,1 BEng, PhD (City University, London)

Assistant Professors
J.F. Barker, BSc, MSc (McMaster), PhD (Waterloo)

Research Assistant Professor
S.K. Frake, MSc, PhD (Queens)

Adjunct Faculty
R.M. Brown, BSc (Bishops), PhD (McGill)
J.A. Franklin, BSc, (Gen. Civ. Eng.) (London), MSc, PhD (Imperial College, London)
J.E. Gale, BA, BSc (Memorial), MSc (Western Ontario), MEngSc, PhD (California, Berkeley), PEng
D. Lee, BSc, MSc (North Dakota), PhD (Virginia Polytechnical Institute)
I.P. Martini, PhD (McMaster)
H.C. Saunders, BA (Queens's Belfast), MA, PhD (Toronto)

Course Descriptions

Drama and Theatre Arts

Earth Sciences

G. van der Kamp, MSc, PhD (Free University, Amsterdam)
O.L. White, BSc, MASc (Toronto), PhD (Illinois), PEng

Senior Demonstrators
J.L. Lang, BSc, MBA (Queens's)
K. LaHay, BSc, MSc (Guelph)

Faculty Members holding cross-appointments from Earth Sciences to: 1Civil Engineering

Course Descriptions

Introductory Notes

1. EARTH 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 350). The cost will range from $50-$100 per student.

3. Regular Earth Sciences students are encouraged to seek geological employment in the summers.

EARTH 121 F 2C3L 0.5
Introductory Geology
An introduction to rocks and minerals and the processes of their formation. The structure of the earth, plate tectonics and its relationship to deformation, metamorphism and formation of magmas. Earth resources.

EARTH 122 W 2C3L 0.5
Introductory Geology
An introduction to processes that shape the earth's landscapes. Consideration of the time concept in geology. Introduction to fossils, their occurrence and uses in earth sciences. The geological history of North America.

EARTH 221 W 3C1T 0.5
Geochmestry

Prereq: EARTH 231 or permission of instructor
Course Descriptions
Earth Sciences

EARTH 231 F 2C,3L 0.5
Mineralogy
Introduction to systematic mineralogy. Bases of mineral classification. Interrelationships of chemical, structural and physical properties. Occurrence of major groups of rock-forming minerals. Introduction to optical properties of minerals and the use of the petrographic microscope as a tool in identifying minerals and interpreting their genetic history.
Prereq: EARTH 121

EARTH 232 W,S 2C,3L 0.5
Petrography
The study of rocks in thin section. The classification and identification of sedimentary, igneous, and metamorphic rocks.
Prereq: EARTH 231

EARTH 235 F 2C,3L 0.5
Stratigraphy
An introduction to the nature, origin and interpretation of stratified earth materials. Emphasis on principles and approaches. Stratigraphy in earth history and economic deposits.
Prereq: EARTH 121-122

EARTH 236 F 2C,3L 0.5
Principles of Paleontology
The principles of paleontology with particular stress on the species concept and evolution; examples will be drawn primarily from the fossil record of plants and vertebrates. Laboratory work will include projects related to lecture topics.
Prereq: EARTH 121-122

EARTH 238 W,S 2C,3L 0.5
Introductory Structural Geology
Prereq: EARTH 121-122

EARTH 260 F 3C,2L 0.5
Applied Geophysics 1
An introduction to seismic, gravity, electric, electromagnetic and magnetic methods of exploration geophysics.
Prereq: PHYS 111-112 or consent of instructor

EARTH 331 F 2C,3L 0.5
Igneous Petrology
The principles and theories of igneous rock genesis. Silicate phase equilibria in magmatic systems. Magmatic differentiation; distribution and occurrence of magma types.
Prereq: EARTH 231, 232

EARTH 332 W 2C,3L 0.5
Metamorphic Petrology
Prereq: EARTH 232
For Honours Earth 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 sedimentary structures. Recent sedimentary environments as a key to the interpretation of ancient sediments. Sedimentary petrology.
Prereq: EARTH 232

EARTH 336 F 2C,3L 0.5
Paleontology
Advanced paleontology emphasizing morphology, classification, evolution, paleoecology and stratigraphic value of fossil invertebrates. Laboratory study of fossil collections.
Prereq: EARTH 236

EARTH 342 F 2C,3L 0.5
Geomorphology
Antireq: 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 235

EARTH 355 F 3C 0.5
Statistical Methods in Geology
Introduction to the principles of probability and statistics and their application in the earth sciences. Evaluation of quantitative data; statistical models.
Prereq: MATH 113 and an introductory course in computer programming

EARTH 388 F 2C 0.5
Geophysics 1

EARTH 390 W fidlab
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 thermodynamics to geochemical problems. Development of the laws of Thermodynamics; Gibbs free energy and equilibrium constants. Introduction to various topics in aqueous geochemistry such as mineral equilibria, ion exchange and equilibria. Various aspects of organic geochemistry and geochemical exploration will also be treated.
Prereq: First year chemistry, EARTH 221
Restricted to fourth year and graduate students.

EARTH 427 W 2C,3S 0.5
Crustal Evolution
An analytical critique of the plate tectonics theory. Tectonic syntheses based on the theory in the light of world geology. Normally restricted to fourth year Earth Sciences students.
EARTH 432 W 3C,2L 0.5
Precambrian Geology
The geology, tectonics, stratigraphy and history of the Canadian Precambrian Shield. The early evolution of the earth’s crust. The Precambrian time scale and problems of geochronology. Life, climate and physical conditions in Precambrian time.

EARTH 433 W 2C,3L 0.5
Applied Sedimentology
The source, migration and sedimentary environment of hydrocarbons, exploration, types of traps, extraction. Carbonate sediments and their diagenesis. The environmental impact and control of recent sedimentation.
Prereq: EARTH 333

EARTH 434 F 2C,3S 0.5
Biostratigraphy
Methods of using palaeontological data to solve stratigraphic problems. Faunal provinces in space and time. Effects of continental drift and climatic change on biogeography through the Phanerzoic.
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 240

EARTH 436 Y 5L 1.0
Honours Thesis
(A course for Honours Earth Sciences students only.)
Each student will work under the direction of a member of the Department on a short research project. The results of this will be presented in thesis form and will be critically examined by members of this and, where pertinent, other departments.

EARTH 437 W 2C,3L 0.5
Rock Mechanics
Review of stress and strain. Mohr’s circle, strength theorems, laboratory tests, classification of rocks. Rock mechanics considerations in the construction of shafts, drifts, tunnels, foundations and rock slopes. Laboratory exercises will deal with uniaxial, triaxial, flexure, hardness and tensile testing of rock. Problem sets will be assigned.
Prereq: A course in Statics and Mechanics of deformable materials, or consent of instructor

EARTH 438 F, S 3C,1T 0.5
Engineering Geology
Review of basic concepts in soil and rock mechanics. Field and laboratory methods used to define and characterize the properties of geological materials and their use in selected engineering geologic design and construction problems. Laboratory assignments will focus on the determination of physical properties and site assessment problems.

EARTH 439 F, S 3C,1T 0.5
Hydrogeology
The location, exploitation, and conservation of groundwater. Groundwater-surface-water interactions, effect of man’s activities on groundwater quality, hydrogeologic aspects of subsurface waste disposal.

EARTH 440 F 2C,3L 0.5
Quaternary Geology
Stratigraphy and history of the Quaternary Period with emphasis on glaciation. Laboratory studies on glacial deposits. Field trips. A previous course in geomorphology is recommended.
Prereq: Consent of the instructor

EARTH 441 F 2C,3L 0.5
Quaternary Geology
Field trips to study the Quaternary Period. Locations and students will be announced at the beginning of each term. (An introductory course in geology is recommended.
Prereq: Consent of the instructor

EARTH 445 F 3C 0.5
Numerical Methods in Geoscience
Prereq: MATH 113 and an introductory course in computer programming

EARTH 446 W 3C,1T 0.5
Applied Geophysics 2
A detailed examination of selected topics in exploration geophysics, with an emphasis on data processing and computer modelling of geophysical responses.
Prereq: EARTH 260 and an introductory course in computer programming

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 379

EARTH 490 S fildlab 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 494 F fildlab 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.
Not to be taken by third year students.
Open to Honours Earth Sciences students only.
Course Descriptions

Economics

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)

Associate Professor, Graduate Officer
L.P. Hetcher, BComm (Mount Allison), AM, PhD (Brown)

Lecturer, Undergraduate Officer
E.W. Lau, BA (Toronto), MA (Manchester)

Professors
N.K. Stollery, Assistant Professor
F.N. Naqib, W.R. Needham, E. Carvalho, K.C. Kumar, BSc (Calcutta), MS, PhD (Wisconsin)
J.H. Hotson, BA (Colorado College), MA, PhD (Pennsylvania)
R.R. Kerton, BComm (Toronto), MA (Carleton), PhD (Duke)
L. Needleman, MA (Oxford), PhD (Glasgow)
D. Wilton, BComm (McMaster), PhD (Massachusetts Institute of Technology)

Associate Professors
S.K. Ghosh, BSc, MSc (Calcutta), MS, PhD (Western Ontario)
A.A. Andriskopoulos, BA (Athens), MA (Wayne State), PhD (Southern California)
J.A. Brox, BA (Toronto), MA, PhD (McMaster)
J.E. Cuenca, LIC (Madrid), MA (Western Michigan), PhD (Toronto)
M.C. Howard, BA, MA (Lancaster), PhD (Leicester)
S.W. Kardasz, BA (Loyola), PhD (Queen’s)
N.E. Lavigne, CR, BA (Western Ontario), MComm (Ottawa), MBA (Detroit), J (Queen’s)
W.R. Needham, BComm (Carleton), MA, PhD (Queen’s)

Assistant Professors
R.D. Bodell, BSc (Sydney, Australia), MA, PhD (York)
E. Carvalho, BA, MA, PhD (Waterloo)
R.C. Kumar, BStat (Indian Statistical Institute), MA, PhD (Toronto)
F.N. Naqib, BSc (Washington), MSc (Oregon), PhD (Queen’s)
T.N. Nguyen, BSc, CHE (California-Berkeley), MA (Simon Fraser), PhD (Western Ontario)
K. Stollery, BA (Southern California), MA, PhD (Queen’s)

Lecturers
R.A. Andriskovich, BSc (Lethbridge), MA (Western Ontario)
B.H. Bentley, BA (Mount Allison), MA (Windsor)

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes

1. Some Economics courses do not have a "term offered" indicated. This information will be available at preregistration and students can confirm 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.

ECON 101 F,W,S 3C 0.5
Introduction to Microeconomics
An introduction to the central economic problems of society, the functioning of a mixed enterprise system, the economic role of government, the composition and pricing of national output, pricing of productive factors, and income distribution.

ECON 102 F,W 3C 0.5
Introduction to Macroeconomics
Determination of national income; the banking system; government fiscal and monetary policy; international trade and finance; and current economic problems.

ECON 201 F,W,S 3C 0.5
Microeconomic Theory
Theory of consumer demand; production theory; market structure; resource pricing and allocation under perfect and imperfect competition.

ECON 202 F,W,S 3C 0.5
Macroeconomic Theory
Theory of the determination of the level of national income, employment, and the price level, and macroeconomic policies to affect these determinates.

ECON 211 F,W,S 3C 0.5
Mathematics of Economists
Application of elementary mathematics to problems in economic theory. Topics include the graphing of functions, elementary exponential and logarithmic functions and differentiation—all developed within the context of economic theory.

ECON 221 F,W 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.

ECON 231 F,W 3C 0.5
Introduction to International Economics
Theory of comparative advantage and the gains from trade, tariff theory, concepts and measurement of balance of payments; exchange rate systems; reform of international monetary system.

ECON 241 F 3C 0.5
Cost-benefit Analysis and Project Evaluation
Methods for evaluating private and public projects; decision rules, efficiency conditions and methods of conducting cost-benefit analysis. Application of the technique.

ECON 263 W 3C 0.5
Economic History of Canada
A study of the economic development of Canada; export stage theory, industrial structure and national policies analyzed in a Classical-Marxian framework.

ECON 301 F,W 3C 0.5
Intermediate Microeconomics
Theory of modern welfare economics with some applications; the meaning and measurement of economic efficiency and equity and their relationship to economic welfare.
ECON 302 F, W 3C 0.5
**Monetary Theory and Banking**
Monetary theory and banking in an open economy; national policies for achieving full employment, price stability, and equilibrium in the balance of payments.
Prereq: ECON 201, 202, 231

ECON 303 F 3C 0.5
**Economic Thought**
A critical survey of the development of economic thought from the pre-Socratics to the Post-Keynesians. Emphasis on Classical Economics.
Prereq: ECON 201, 202, 231

ECON 311 F 3C 0.5
**Introduction to Mathematical Economics**
Mathematical treatment of some micro- and macro-parital and general equilibrium models; programming and other techniques; simple growth models.
Prereq: ECON 201, 202, 211 (or MATH 130)

ECON 321 W 3C 0.5
**Introduction to Econometrics**
Introductory level course in econometrics; includes economic model building and testing, regression and correlation analysis, and price indices.
Prereq: ECON 221

ECON 331 F 3C 0.5
**International Trade and Finance**
An examination of theories of international trade and finance at an intermediate level. Topics include theories of trade structure (Ricardian, Heckscher-Ohlin, and product cycle), the effects of tariffs and multinational corporation behaviour, the balance of payments, and the workings of the exchange market.
Prereq: ECON 231, 201

ECON 333 F 3C 0.5
**Interregional Economics**
Application of economic theory to analyses of structural characteristics, growth and development in interregional systems. Models examined include integration of regional economic analysis in view of Canadian policy, export-base, shiftshare, neo-classical, cumulative causation.
Prereq: ECON 201, 231

ECON 335 W 3C 0.5
**Economic Development**
The nature of the problem of economic development; theories of economic development; major policy issues in economic development.
Prereq: ECON 201, 202, 231

ECON 341 F 3C 0.5
**Public Finance**
The economic rationale of governmental fiscal activity; cost-benefit analysis; the structure and economic effects of public expenditure and revenues; the analysis of income, consumption and wealth taxes; introduction to fiscal federalism.
Prereq: ECON 102, 201

ECON 343 W 3C 0.5
**Urban Economics**
Application of economic analysis to location decisions of firms and households: discussion of policy problems, for example, urban renewal and housing.
Prereq: ECON 101
(Prereq: ECON 211 is recommended)

ECON 344 W 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 F 3C 0.5
**Industrial Organization**
An analysis of the characteristics of industrial structure, behaviour and performance with special reference to Canada. Competition and "rationalization" policy in Canada and other selected countries.
Prereq: ECON 201

ECON 351 F 3C 0.5
**Labour Economics**
Wage theory, training and mobility theory; economics of information in Canadian labour markets; other investments in human capital; manpower policies.
Prereq: ECON 201

ECON 353 F 3C 0.5
**Population Economics**
Population objectives; demographic techniques; economic interrelationships with fertility, mortality and migration; determinants and consequences of current world population changes.
Prereq: ECON 201

ECON 355 W 3C 0.5
**Economics of Energy and Natural Resources**
An analysis of the economics of conservation, especially the adequacy of the market mechanism as an allocator of resource use over time. Issues concerning the economic behaviour of Canada's fishery, forest, fuel and nonfuel mineral industries will be considered.
Prereq: ECON 201
(Prereq: ECON 341 is recommended)

ECON 363/364 F, W 3C 0.5
**Contemporary Canadian Problems 1,2**
A "topic oriented" seminar course. The class agrees to study a Canadian problem selected from a list that includes poverty, unemployment, industrial policy, and so forth. The format assists the student in gaining analytical skill through work on the selected topics.
Prereq: ECON 201, 202

ECON 381-389 3s each 0.5
**Special Topics**
One or more special half courses will be offered at different times as announced by the Department.
Prereq: Consent of instructor

ECON 401 F 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 301

ECON 402 W 3C 0.5
**Advanced Macroeconomic Theory**
Classical and Keynesian models and recent contributions; theory of economic policy; inflation and unemployment; modern theories of economic growth.
Prereq: ECON 301, 302

ECON 403 W 3C 0.5
**Economic Analysis, Forecasting, and Public Policy**
The course focuses on the problems of forecasting economic activity (as measured by the principal macroeconomic variables), and of designing and implementing policies to control those variables; topics covered include a critical review of current forecasting models, problems associated with lags of the impact of policies, and so forth.
Prereq: ECON 301, 302, 321
Course Descriptions

Economics

ECON 421/422  F,W  3C  0.5/0.5
Economics 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 441 F  3C  0.5
Economics of the Public Sector 1
An overview of fiscal functions and institutions; the theory of social goods; expenditure and revenue structures; fiscal incidence.
Prereq: ECON 231, 301, 302, 341

ECON 442 W  3C  0.5
Economics of Public Sector 2
Fiscal stabilization, fiscal federalism, public pricing, international public finance, social security and other contemporary policy issues.
Prereq: ECON 441

ECON 451  3C  0.5
Advanced Topics in Resource Economics
Advanced analysis of selected topics in the area of energy, land, and labour resources.
Prereq: ECON 201, 202, 231, 355

ECON 461
Comparative Economic Systems
This course 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 and 202

ECON 463
Political Economy of Capitalist Development
A study of the main tools and models of modern political economy. Micro and macro tools and concepts are integrated in a Marxian framework based on the work of Robinson, Sraffa, Kaldor, Pasinetti, Rowthorn, Nell, Sweezy and others in what can be termed the "Classical Marxist" tradition.
Prereq: Consent of instructor

ECON 481-489  3S  0.5 each
Special Studies
Research and reading courses under the direction of individual instructors. Admission by consent of instructor.

COURSES NOT OFFERED 1984-85
ECON 357 Environmental Economics
ECON 361 North American Economic History
ECON 365 Economic Development of Modern Europe
ECON 411 Mathematical Economics
ECON 413 Economic Growth Theory
P.R. Bryant, MSc (London), MA, PhD (Cambridge)
Y.L. Chow, BEng (McGill), MASc, PhD (Toronto), PEng
J.D. Cross, BSc (Wales), MS, PhD (Carleton), PEng
J.A. Reid, BE (Saskatchewan), MASc, PhD (Toronto), PEng
E.L. Haassell, BSc, PhD (Imperial College, London), PEng
S.N. Kalra, BSc (Punjab), MS, PhD (Illinois), PEng
R.H. MacPhne, BSc (Toronto), MS, PhD (Illinois)
J.W. Mark, BSc (Toronto), MEng, PhD (McMaster), PEng
V.H. Quintana, BEng (Chile), MSc (Wisconsin), PhD (Toronto), PEng
H.C. Ratz, BSc (Toronto), MS (Massachusetts Institute of Technology), PhD (Saskatchewan), PEng
J. Reeve, BSc, MSc, PhD, DSc (Manchester), PEng
D.J. Roulston, BSc (Belfast), PhD (Imperial College, London), CEng
K.D. Srivastava, BSc, BE (Roorkee), PhD (Glasgow), PEng
R.G. van Heeswijk, Jr (Delft, Holland), PEng
M. Vidyasagar, BSc, MASc, PhD (Wisconsin)
T.R. Viswanathan, BSc (Madras), MSc, PhD (Saskatchewan)
J. Vlach, Dipl Ing CSc (Technical University of Prague)
L.A.K. Watt, BSc (Manitoba), MS (Chicago), PhD (Minnesota)
L.Y. Wei, BS (National Northwestern College, China), MSc, PhD (Illinois)

Department of Electrical Engineering

Professor, Chairman
I.F. Blake, BSc, MSc (Queen's), MA, PhD (Princeton), PEng

Professor, Associate Chairman for Graduate Affairs
S.G. Chamberlain, MSc, PhD (Southampton)

Professor, Associate Chairman for Undergraduate Affairs
R.S. Ramshaw, BSc, PhD (Nottingham), PEng

Professor, Director, Institute for Computer Research
E.G. Manning,1 MSc (Waterloo), PhD (Illinois)

Associate Professor, Director, Computer Communications Network Group
J.W.-N. Wong, PhD (California-Los Angeles)

Professors
J.D. Aplevich, BE (Saskatchewan), PhD (Imperial College, London), PEng

Associate Professors
S.K. Chaudhuri, PhD (Manitoba), PEng
P.P. Dasiewicz, BSc, MSc, PhD, (Waterloo)
M.I. Elnasry, BSc (cairo), MASc, PhD (Ottawa), PEng
B.A. Francis, BSc, MEng, PhD (Toronto)
J.V. Hanson, BSc (Toronto), MSc, PhD (Imperial College, London)
J.S. Keeler, BSc, MASc, PhD (Toronto), PEng
W.N. Melkie, BSc, MASc, PhD (Toronto), PEng
E.E. Sevora, Dipl. Ing (Czech Technical University), PhD (Toronto), PEng
W.J. Wilson, BE, MSc (Saskatchewan), PhD (Cambridge), PEng

Assistant Professor
G.B. Agnew, BSc, PhD (Waterloo)

Adjunct Faculty
R.G. Anthes, BSc, MASc (Toronto), PEng
J. Carr, PhD (Waterloo), PEng
Course Descriptions

Electrostatics; electric flux and potential residues. Parka1 differential equations. Integral, Cauchy's integral formula, EL E 205 W,F 3C,lT 0.5 General Seminar
Advanced Calculus for Electrical Engineers 1 Fourier Series; Ordinary differential equations; Laplace transform; applications to linear electrical systems. Review of band theory and doped semiconductors in thermal equilibrium, charge neutrality, mass action law, recombination and transport mechanisms, Boltzmann relations, derivation of p-n junction dc and ac characteristics, charge storage effects. The bipolar transistor; derivation of dc and ac terminal characteristics, equivalent circuits. The Junction Field Effect transistor (JFET) and Metal Oxide Semiconductor FET, derivation of dc characteristics.
PreReq: PHYS 125 or equivalent
Alternate weeks.

EL E 268 F,W 3C,1T,3L 0.5
Electronic Circuit Analysis
This is an introductory course in electronic circuit analysis which follows the first circuits course EL E 123. The topics to be discussed are: Operational amplifier applications, diodes, rectifiers, introduction to MOS and bipolar transistors, basic amplifier circuits, frequency response, elementary treatments of feedback, filters and oscillators. The student is introduced to computer-aided analysis techniques using WATAND.
PreReq: EL E 123 or equivalent
Alternate weeks.

EL E 222 W,F 3C,1T,3L 0.5
Digital Computers
PreReq: GEN E 121 or equivalent
Open

EL E 224 S,F 3C,1T 0.5
Numerical Methods
PreReq: GEN E 121 or equivalent

EL E 231 S,F 3C,1T,3L 0.5
Electronic Devices
Prerequisite course in electronics. Review of band theory and doped semiconductors in thermal equilibrium, charge neutrality, mass action law, recombination and transport mechanisms, Boltzmann relations, derivation of p-n junction dc and ac characteristics, charge storage effects. The bipolar transistor; derivation of dc and ac terminal characteristics, equivalent circuits. The Junction Field Effect transistor (JFET) and Metal Oxide Semiconductor FET, derivation of dc characteristics.
PreReq: PHYS 125 or equivalent

EL E 261 W,F 3C,1T,3L 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 and distribution system. Excitation and loss analysis of ac magnetic circuits. Principles, circuit modeling, and performance of transformers.
Alternate weeks.

EL E 262 S,F 3C,1T,3L 0.5
Energy Systems and Components 2
PreReq: EL E 261

EL E 269 S,F 3C,2T,3L 0.5
Electrical Engineering 2
Alternate weeks.

For Mechanical Engineering students only:

EL E 301 W,S 1C 0.0
Seminar
General Seminar

EL E 302 W,F 1C 0.0
Seminar
General Seminar

EL E 316 W,S 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.
Course Descriptions
Electrical Engineering

EL E 318 F,W 3C,1T,3L 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 DSB, AM, SS, etc. Angle modulation and the spectrum of frequency modulated signals. Techniques for the generation and demodulation of RF signals. Introduction to noise and its effects in AM and FM systems. Noise figure and noise temperature.

EL E 323 F,W 3C,1T,3L 0.5
Digital Circuits and Systems

EL E 332 W,S 3C,1T,3L 0.5
Electronic Circuits
Amplifier biasing networks, single and multi-stage small-signal amplifiers, the hybrid-p model, high and low frequency effects, negative feedback amplifiers; oscillators; noise in electronic circuits; introduction to large signal amplifiers; introduction to digital circuits.

EL E 342 W,S 3C,1T 0.5
Electrical Networks
Review of sinusoidal steady-state, node, and mesh analysis; the Laplace transformation and applications; transient response of second and higher order circuits.

EL E 371 W,S 3C,1T,3L 0.5
Transmission Lines and Basic Field Theory
Transmission lines: transmission line equations, steady state (sinusoidal) solution, terminated lines, matching and the Smith Chart. Basic Field Theory: vector calculus, electrostatic and magnetostatic fields, time-varying fields and Maxwell’s equations, plane wave propagation, polarization, reflection, refraction, applied boundary value problems.

EL E 380 W,F 3C,1T,3L 0.5
Systems and Control

EL E 401 S,F 1C 0.0
Seminar
General Seminar

EL E 402 W 1C 0.0
Seminar

EL E 411 S,F 3C,1T 0.5
Digital Communications

EL E 412 W 3C,1T 0.5
Data Communication
Representation of signals, gaussian processes, optimum receiver, equivalent signal sets, non-white channel noise, maximum likelihood and minimax receiver. Information and its measure, source encoding, error-free communication, channel capacity. Error-correcting codes; linear block codes, cyclic codes, convolution codes.

EL E 413 W 3C,1T 0.5
Digital Signal Processing
Discrete systems for signal processing, in particular linear filtering, are rapidly replacing analog forms. This course serves as an introduction to the analysis and design of linear, time invariant discrete systems, with both software and hardware implementations.

EL E 426 S,F 3C,1T,3L 0.5
Software Engineering
Block structured languages, actual and formal parameters, recursion, formal description, relationship to machine code. Structured programming: 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 System Engineering

EL E 428 S,F 3C,1T 0.5
Computer Communications Networks

EL E 435 S,F 3C,1T 0.5
Semiconductor Devices
Metal-Semiconductor junctions (Schottky barriers), heterojunctions, solar cell, light emitting diode, photodetector diode, JFETs, MESFETs, MOSFETs, Integrated bipolar and MOS devices, CDOS. Power devices (SCRs, power switching transistors, PIN rectifier diodes).

EL E 436 W 2C,1T,3L 0.5
Design of Integrated Circuits and Devices
Design and process details of discrete bipolar, JFET and MOSFET devices. Design and implementation of digital and analogue integrated circuits. Process, device and circuit CAD.

EL E 437 W 2C,1T,3L 0.5
Integrated Electronic Systems
Integrated system design: memory cells and systems, logic arrays, analog system design, application in digital signal processing, applications in data processing.
EL E 438 S.F. 2C,1T,3L’, 0.5
Switching and Digital Circuits
Switching characteristics of semiconductor devices, non-sinusoidal wave generation and shaping, comparators, digital integrated circuits, including ECL, TTL and PL TSL, MOS, CMOS.

1Project.

EL E 439 W 2C,1T,3L’, 0.5
Analogous Electronic Circuits

1Project.

EL E 443 W 2C,1T,3L’, 0.5
Electrical Networks 2
Topics from the following: two-port descriptions of ideal active devices, including operational amplifiers; simulation of non-ideal linear active devices; formulation and solution of network equations for arbitrary linear lumped network elements; network functions and their sensitivity in the frequency domain; introduction to passive and active filters, including approximation theory and simple synthesis; time domain solutions; computer-aided analysis and design of networks; simulation of non-ideal nonlinear devices and their use.

Prereq: EL E 342 or equivalent

EL E 446 S.F. 3C,1T 0.5
Linear Systems
Three types of linear multivariable systems are studied:

1. real time-continuous systems;
2. real time-discrete systems; and
3. modulo-two time-discrete systems.

The unifying approach of state equations is developed and the importance of linear algebra is emphasized. Topics include: time domain analysis, transform analysis (Laplace- and Z-transforms), stability considerations, system equivalence, system decomposition, system realization. The necessary matrix and linear-algebra theory is developed as required.

EL E 459 W 2C,1T,3L’, 0.5
Sound, Noise and Electroacoustics
An interdisciplinary study of acoustical physics, human response to sound and audio engineering. Main topics include: the physics of sound, electroacoustical systems, human audiology, acoustical measurements, audio electronics and applications.

1Every third week.

EL E 463 S.F. 2C,1T,3L’, 0.5
Power Electronics
Characteristics and ratings of power semiconductor devices with emphasis on the thyristor. General methods of achieving design objectives. Performance and analysis of power conversion circuits for both static and rotating loads.

1Open.

EL E 464 W 3C,3L’, 0.5
High Voltage and Insulation Engineering
Nature and origin of high voltage surges encountered on power systems. Travelling waves on transmission systems; insulation engineering; electrostatic fields in high voltage apparatus, insulation failure; corona; insulation testing; circuit breakers and surge protection devices, insulation coordination.

1Alternate weeks.

EL E 465 W 3C,1T 0.5
Power Systems
Introduction to system concepts; aspects of power system planning and operation. Energy sources; environmental and resource implications. Per unit and co-ordinate systems. Representation of equipment such as generators, 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 2C,1T,3L’, 0.5
Microwave Engineering
Review of Maxwell’s equations, rectangular and circular waveguide, microwave circuits, scattering matrix theory, microwave filters, simple waveguide discontinuities, hystrons and magnetrons.

1Every third week.

EL E 474 S.F. 2C,1T,3L’, 0.5
Antenna Engineering
An introduction to the theory of radiation and of antenna and propagation engineering: linear arrays, linear arrays, aperture antennas, frequency independent antennas, measurement theory.

Prereq: EL E 371 or equivalent

EL E 475 W 3C,1T 0.5
Guided Wave Engineering
Waveguides, rectangular and circular. Surface wave structures, fibre-optic wave theory. Fibre-optic communications system. Microstrip theory and applications.

EL E 481 S.F. 2C,1T,3L’, 0.5
Design of Analog and Digital Control Systems

1Alternate weeks.

EL E 482 W 2C,1T,3L’, 0.5
Multivariable Control Systems

Prereq: EL E 446, EL E 481

1Open lab.

EL E 485 W 2C,1T,3L’, 0.5
Computer Control Applications

Prereq: EL E 426, EL E 481

1Project.
Course Descriptions

Electrical Engineering

EL E 499A S.F 9L 0.5
Project
An engineering assignment requiring the student to demonstrate initiative and assume responsibility. The student will select a project at the end of the 3B term from an approved list prepared by the Department. A short progress report at the end of the 4A term and a full report at the end of the 4B term are required.

EL E 499B W 9L 0.5
Project
Either a continuation of EL E 499A or a separate one-term project.

Department of English

Associate Professor, Chairman of Department
W.R. Macnaughton, BA (Toronto), MA, PhD (Wisconsin)

Associate Professor and Graduate Officer
H.B. Ellis, BA (Rollins), MA, PhD (Illinois)

Associate Professor, Associate Chairman and Undergraduate Officer
R.R. Dubinski, BA, MA (Western Ontario), PhD (Toronto)

- Professor and Director of Part-Time Studies and Continuing Education
J.C. Gray, BA (Washington State), MA (Connecticut), PhD (Syracuse)

Professors
L.A. Cummings,1 AB (Washington), AM (Missouri), PhD (Washington)
J. Gold, BA (Birmingham), PhD (Wisconsin)

G.R. Hibbard, BA, MA (London)
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)
W.K. Thomas, MA, PhD (Toronto)

Associate Professors
P.D. Beam, BA (Waterloo), MA (McMaster), PhD (Toronto)
A.I. Dust, MA, PhD (Illinois)
S. Fogel, BA (Carleton), MA (British Columbia), PhD (Purdue)

R.N. Gosselink, BA (Kansas), MA, PhD (Colorado)
P.M. Hinchcliff, BA (British Columbia), MA, PhD (Toronto) J
N.C. Huftin, BA (Concordia), MA (Chicago), PhD (John Hopkins)
D.R. Letson, BA (Waterloo), MA (McMaster), PhD (Toronto) J
Recipient of the Distinguished Teacher Award
R. Lister, BA, MA, PhD (Toronto)
H.M. Logan, AB (Franklin and Marshall), MA, PhD (Pennsylvania)
E.P. McCormack, MA (Glasgow), PhD (Ontario), MA, PhD (Manitoba) J
S.E. McMillin, BA, MA (Carleton), PhD (Dalhousie)
J.S. North, BA, MA, MBA (British Columbia), MA (Alberta)
E.F. Shields, BA (Cheastnut Hill), MA (Villanova), PhD (Illinois)
G.E. Stithaug, BA (Pacific Lutheran), MA, PhD (Nebraska)
J.S. Stone, BA, MA (British Columbia)

Assistant Professors
M.A. Gerhardstein, MA (Montana), PhD (Iowa)
M. Higgins, BA (St. Francis Xavier), MA, PhD (York)
C.E. McGee, BA, MA, PhD (Toronto), J

Lecturers
L. Dorney, BA, MA, PhD (Toronto), MA, MA (McMaster), PhD (Toronto) J

Adjunct Faculty
C.F. MacRae, BA (Western Ontario), MA (Dalhousie), PhD (Toronto)

Faculty Members of English holding joint appointments to:
Architecture

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 to choose their programs, to arrange their courses and to conform with the University, Faculty, and departmental regulations, students are urged to study the Calendar very carefully because they are themselves responsible for failure to abide by these regulations.

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 151 English as an Instrument of Thought and Communication 2
ENGL 210 Report Writing
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 takes effect as of the Fall term 1984 and may not be applied retroactively.
ENGL 109 F,W,S 0.5
Introduction to Essay Writing
The course teaches the construction of the expository essay with attention to the structure of good paragraphs, techniques of putting the essay together, and to the nature of the language. Ten to 12 short writing assignments are required. Also offered at St. Jerome's College. Students may receive credit for only 1 of ENGL 109 and ENGL 129R.

ENGL 110 W 0.5
Introduction to Essay Writing 2
The course teaches the construction of the persuasive essay, with attention to the elements of logical thinking, to the techniques of successful persuasion, and to the demands of the library research paper. Six to 8 writing assignments are required. Prereq: ENGL 109

ENGL 129R F,W 1C,2L,2T 0.5
Introduction to Written English
Instruction provided in basic grammar, sentence and paragraph structure, elements of composition and essay writing including focus on theme, development of central idea, exposition and argumentation. Minimum of 4 hours of instruction each week with additional tutorial hours as required. Prereq: Open only to students whose maternal language is not English and who lack language mastery sufficient for admission to other introductory English language courses

ENGL 140R F,W 3C 0.5
The Use of English 1
The use and abuse of spoken and written English. The study and evaluation of language as it is used for various purposes (e.g., colloquial, scientific, legal, political, commercial, journalistic, literary) in order to increase critical awareness and to help students to write clearly and effectively. Prereq: ENGL 140R

ENGL 141R W 3C 0.5
The Use of English 2
A continuation of ENGL 140R. The study of factual, emotive, scientific and imaginative writing; relevance, context, meaning, tone, feeling and intention. Prereq: ENGL 140R

ENGL 150 F,W 0.5
English as an Instrument of Thought and Communication 1
The course is designed to improve the reading and writing of students from all disciplines. In order to develop clarity of thought and critical awareness, students will identify and study in several media the various ends that are served by language; objective reporting; persuasion; argument; and emotional, social and artistic expression. About 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 elementary 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 210 F,W,S 0.5
Report Writing
The many functions of the report-an orderly and objective communication of factual information which serves some specific purpose-are taught. Students will receive practice in research, in organization, and in writing many kinds of reports. Prereq: Second-year standing or above

ENGL 240R F 3C 0.5
Form and Function 1
The uses of literacy and the functions of language as acquired in ENGL 140R/141R. These will be applied to the more advanced form of the literary and critical assignment essay, involving comparison, evaluation and exposition. Prereq: ENGL 150

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 determine 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/B
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 0.5
Twentieth-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
Twentieth-Century Literature in English, 1930-80
A continuation of ENGL 105A. A close examination of a representative selection of works by major authors writing in English such as William Faulkner, Dylan Thomas, and Margaret Laurence. Prereq: ENGL 105A or consent of instructor Also offered at St. Jerome's College.

GROUP TWO
Courses in this group carry degree credit and may be counted as fulfilling the minimum requirements for a General or Honors 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 108
Themes of Literature
An exploration of the great variety of literature through thematic perspectives.

ENGL 108A 0.5
The Hero
A study of human excellence in thought and action embodied in representative men and women, as seen through works of literature.

ENGL 108E 0.5
Women in Literature
A study of the nature and role of women in British, Canadian, and American literature. Works by both men and women will be studied in which women are seen in such forms as mothers, saints, sex objects, and witches.
Also offered at St. Jerome's College.

ENGL 108F 0.5
The Rebel
A study of various works of literature in which the protagonist is a rebel against existing norms. The course will examine a number of rebel types and concepts, moral implications and final outcomes either in successful realization or tragic defeat.
Also offered at St. Jerome's College.

ENGL 108H 0.5
Isolation and Alienation
The study of a variety of works centering on the theme of man in crisis, the stress being on the individual at variance with his inner self, his fellow man, or his world. The course will discuss the process in which wisdom and maturity are gained as the ultimate products of suffering.
Also offered at St. Jerome's College.

ENGL 190 0.5
Shakespeare
Designed for students in all faculties, the course examines some of Shakespeare's comedies, history plays, and tragedies. Shakespeare's variety and flexibility in developing characters and dramatic structures are stressed, as are significant themes.
No previous work in Shakespeare is required.

ENGL 200A/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 eighteenth 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 eighteenth century to the present.
Also offered at St. Jerome's College.

ENGL 201 0.5
The Short Story
This course deals with the history and techniques of the short story with emphasis upon works by such British, American and Canadian writers as Henry James, James Joyce, D.H. Lawrence, Ernest Hemingway, and Alice Munro.
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 F 0.5
The Bible and Literature 1
Selections from Hebrew Scripture will be studied in relation to English literature.

ENGL 202B W 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.
Prereq. ENGL 202A or consent of instructor

ENGL 205F W,S 3C 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 table 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 Thurber will be studied.
Also offered at St. Jerome's College.

ENGL 208E 0.5
Women Writers of the 20th Century
A study of such major 20th century writers as Woolf, Heillman, Murdoch, McCarthy, Lessing, Laurence, Plath and Atwood. Emphasis will be on the concerns of these writers with the roles of women, the writer's search for new meanings, and their innovations in literary forms.
Also offered at St. Jerome's College.

ENGL 208H 0.5
Arthurian Legend
The story of Arthur and his knights of the Round Table will be discussed as it is treated at various times in various works and genres. Such matters will be considered as the character of Arthur, the concept of Camelot, and the Fellowship of the Round Table.
ENGL 208K 0.5
Detective Fiction
The history and characteristics of the "detective novel," the "novel of crime," and the "thriller." Attention will also be given to the novel of intrigue and espionage. Such authors as Poe, Collins, Doyle, Chesterton, Hammett, Buchan, Greene, Deighton, and Le Carre will be discussed. The course includes the examination of critical approaches to the form of detective fiction.

ENGL 209 F 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.
Prereq: Second-year standing or above.
Counts as an English Major credit as of Fall 1984.

ENGL 211/212
The Novel
The novel, by its nature, constitutes an attempt to formulate and to interpret the bewildering human experience. This course undertakes an exploration of the forms that attempt can take. British, Canadian, and American Novels will be studied. The 2 halves of the course may be taken independently.
Also offered at St. Jerome's College.

ENGL 211 F 0.5
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 218 F 0.5
The Development of Drama to 1660
A study of the origins and development of English drama, with special concentration on 16th-century non-Shakespearean drama.

ENGL 223 W 0.5
Drama from 1660
A study of the principal playwrights, plays, and movements in dramatic history from the re-opening of the theatres in 1660 to the present day.

ENGL 251A/B
The Practice and Theory of Criticism
The study and practice of skills needed for a close, analytical reading of literary texts and for the writing of critical analyses on them; studies of theories concerning literature and literary criticisms.
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 310A/B
Middle English
A study of Middle English literature with special emphasis on the work of Geoffrey Chaucer.
Also offered at St. Jerome's College.

ENGL 310A F 0.5
Middle English 1
Also offered at St. Jerome's College.

ENGL 310B W 0.5
Middle English 2
A study of Chaucer's Canterbury Tales and related Middle English poems and prose.
Also offered at St. Jerome's College.

ENGL 312 0.5
Literature of the Commonwealth
A survey of Australian poetry and prose, with some consideration of the literatures in English, from Africa and the West Indies.
Also offered at St. Jerome's College.

ENGL 313 0.5
Canadian Literature to 1920
A study of Canadian prose and verse to 1920, with particular attention to the poetry of the School of the Sixties and to the historical and idyllic novels of the 19th and early 20th centuries.
Also offered at St. Jerome's College.

ENGL 314 0.5
Canadian Poetry Since 1920
Also offered at St. Jerome's College.

ENGL 315 0.5
Canadian Drama
A study of plays by such dramatists as Merrill Denison, Robertson Davies, Gratien Gélinas (in translation), James Reaney, John Coulter, George Ryga, and Michel Tremblay (in translation).
Background for 20th-century drama will be provided in lectures.
Cross-listed as DRAMA 351.

ENGL 330A/B
Elizabethan Literature (excluding Drama)
A study of the principal writers of prose and of lyric and narrative poetry in England during and immediately before the reign of Elizabeth I.Reserved for special attention is Spenser's epic poem glorifying Elizabeth I and England - The Faerie Queene.
Also offered at St. Jerome's College.

ENGL 330A F 0.5
Elizabethan Literature 1 (excluding Drama)
A study of the principal writers of prose and of lyric and narrative poetry in England during and immediately before the reign of Elizabeth I.
Also offered at St. Jerome's College.

ENGL 330B W 0.5
Elizabethan Literature 2 (excluding Drama)
A study of the principal writers of prose and of lyric and narrative poetry in England during and immediately before the reign of Elizabeth I.
Also offered at St. Jerome's College.

ENGL 331 0.5
Canadian Prose Since 1920
The Canadian novel since the appearance of Morley Callaghan, with brief consideration of the essay and short story during the period.
Also offered at St. Jerome's College.

ENGL 332 0.5
Canadian Drama
A study of plays by such dramatists as Merrill Denison, Robertson Davies, Gratien Gélinas (in translation), James Reaney, John Coulter, George Ryga, and Michel Tremblay (in translation).
Background for 20th-century drama will be provided in lectures.
Cross-listed as DRAMA 351.

ENGL 333A F 0.5
Elizabethan Literature 1 (excluding Drama)
A study of the principal writers of prose and of lyric and narrative poetry in England during and immediately before the reign of Elizabeth I.
Also offered at St. Jerome's College.

ENGL 333B W 0.5
Elizabethan Literature 2 (excluding Drama)
A study of the principal writers of prose and of lyric and narrative poetry in England during and immediately before the reign of Elizabeth I.
Also offered at St. Jerome's College.
ENGL 335 0.5
Creative Writing
Aimed at encouraging students to develop their creative and critical potentials, the course consists of supervised practice, tutorials and seminar discussions.
Counts as an English Major credit as of Fall 1984.

ENGL 343 F 0.5
American Literature
The meaning of America—the myth, the dream and the reality—as experienced through its major literary works. 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.

ENGL 344 W 0.5
Modern American Literature
Approaches to reality amid the confusion and uncertainty of 20th century America. Emphasis on such major writers as Faulkner, Miller, and Cummings.
Prereq: ENGL 343 or consent of instructor
Also offered at St. Jerome’s College.

ENGL 345/346/347
Studies in American Literature
(Usually only 1 or 2 courses from this series are offered each year.)

ENGL 345B W 0.5
American Fiction
The Southern Myth: its origins in early literature, its flowering and ruin, as seen by white and black writers, including Twain, Faulkner, Welty, Styron, Grau, O’Connor, Wright and Ellison.
Prereq: ENGL 343 or consent of instructor

ENGL 346C W 0.5
American Fiction
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

ENGL 347A W 0.5
Contemporary American Literature
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.

ENGL 350A/B
Seventeenth-Century Non-Dramatic Literature
Special attention will be given to the poetry of Donne, Jonson, Hemick, 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 350A F 0.5
Seventeenth-Century Non-Dramatic Literature 1
A study of secular and religious lyric poetry by poets such as Donne, Jonson, Hemick, Herbert, Vaughan and Marvell.
Also offered at St. Jerome’s College.

ENGL 350B W 0.5
Seventeenth-Century Non-Dramatic Literature 2
A study of selected prose works of Bacon, Burton and Browne. A more intensive study of Milton’s English poetry and a selection of his prose works.
Also offered at St. Jerome’s College.

ENGL 362 F 0.5
Shakespeare 1
A study of the plays written before 1599-1600, excluding Julius Caesar.
Also offered at St. Jerome’s College.

ENGL 363 W 0.5
Shakespeare 2
A study of the plays written after 1599-1600, including Julius Caesar.
Also offered at St. Jerome’s College.

ENGL 350A/B
Seventeenth-Century Non-Dramatic Literature
Special attention will be given to the poetry of Donne, Jonson, Hemick, 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 373A F 0.5
An Introduction to Historical Linguistics
These lectures present language as an historical phenomenon subject to constant change. Methods of reconstruction as well as the various ways languages have undergone alteration will be discussed. Indo-European languages will be the source of examples.

ENGL 373R W 0.5
The History of English
These lectures continue the discussion begun in ENGL 373A, focusing attention upon the changing English language. Phonetic, morphological, and syntactic changes as they contribute to the creation of modern English will be considered.
Prereq: ENGL 373A or consent of instructor

ENGL 375A/B
Linguistics and English Grammar
Linguistics and its application to the study of grammar and language. Included are 1) an introduction to descriptive and historical linguistics and the principles of linguistic analysis and 2) an evaluation of English grammars ranging from the traditional to the structural and transformational-generative.

ENGL 375A F 0.5
Introduction to Descriptive Linguistics
Introduction to descriptive linguistics and the principles of linguistic analysis through an examination of the phonology, forms, syntax, and semantics of English.

ENGL 375B W 0.5
Introduction to 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 375A or consent of instructor
ENGL 410A/B
Restoration and Eighteenth-Century Literature
Literature of the period that began as neo-classical, England's August Age paralleling that of ancient Rome, and gradually, through subtle changes, became the precursor to the Romantic movement, giving rise, along the way, to new genres, such as comedy of manners, heroic tragedy, descriptive-meditative poetry, and the novel.

ENGL 410A F 0.5
Satire and Sense: The Restoration and Early Eighteenth Century
The Restoration comedy of manners, heroic and high tragedy, poetry of the court wits and other amused commentators on society, and the major writings of Dryden, Swift, Addison, Defoe, and the early Pope.

ENGL 410B W 0.5
Sense and Sensibility: The Middle and Later Eighteenth Century
The probing of mores and manners by Pope and Johnson, the emergence of the novel with Fielding and Sterne, and the transformation (in "the age of sensibility") of literary attitudes and practice from 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 F 0.5
The Romantic Movement 1
The poetry and critical theory of Blake, Wordsworth, and Coleridge. Emphasis is primarily on poetry; selected minor writers may be considered.

ENGL 430B W 0.5
The Romantic Movement 2
The poetry and critical theory of Byron, Shelley, and Keats. Emphasis is primarily on poetry; selected minor writers may be considered.

ENGL 451A/B
Literature of the Victorian Age
An historical and critical study with emphasis on the major poets (Browning, Tennyson, Arnold), novelists (Dickens, Thackeray, Eliot), and essayists (Newman, Ruskin, Mill, Huxley). Provision will be made for students who wish to study other writers such as Hopkins, Swinburne, Carroll, Morris, or Pater. Also offered at St. Jerome's College.

ENGL 451F 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 W 0.5
Literature of the Victorian Age 2
An historical and critical study of major novelists (Dickens, Thackeray, Eliot) and major essayists (Newman, Ruskin, Mill, Huxley). Also offered at St. Jerome's College.

ENGL 460A/B
British Literature from Shaw to Eliot
A study of the major writers in British literature from 1885 to World War 2, with special emphasis on such writers as Shaw, Yeats, Eliot, Conrad, Joyce, and Lawrence. Also offered at St. Jerome's College.

ENGL 460B W 0.5
British Literature, 1914-1945
A study of works by such writers as Shaw, Conrad and Yeats.

ENGL 496 Y 1.0
Supervision of Honours Essay

COURSES NOT OFFERED 1984-85
Group One
ENGL 241R Form and Function 2

Group Two
ENGL 106B Utopia and Anti-Utopia
ENGL 108C Literature and Morality
ENGL 108D The Quest Theme in Literature
ENGL 109K Literature and Science
ENGL 203 Introduction to Folklore 1
ENGL 204 Introduction to Folklore 2
ENGL 206D Modern Satire
ENGL 208D The Apocalyptic Vision in Literature
ENGL 215 Canadian Regional Literature
ENGL 305A Old English 1
ENGL 305B Old English 2
ENGL 309 Seminar in Essay Writing
ENGL 339 Contemporary British Literature
ENGL 370R Our Changing Language: Syntax and Semantics 1
ENGL 377R Our Changing Language: Syntax and Semantics 2

ENGL 369R Twentieth-Century Literature 1
ENGL 367R Twentieth-Century Literature 2
ENGL 415 Major Canadian Writers

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:

Professors
P.J. Howarth,1 BA (Cambridge), PhD (Glasgow)
C.K. Kinna,2 BA (Sheffield), PhD (Saskatchewan)
P.H. Nash, BA, MA (California-Los Angeles), CE (Grenoble), MCP, MPA, PhD (Harvard), MCP, AICP

Associate Professors
D. Estrin,3 BA, LLB (Alberta) (Part-time)
R.T. Newkirk,4 BA, MSc, PhD (Western Ontario)

Assistant Professor
M.E. Haight,5 BSc, MSc, PhD (McMaster)

Adjunct Faculty
K. Elliott, Diploma Creative Arts
S. Garrod,6 BA (McMaster), LLB, Mes (York)

Faculty Members of Environmental Studies holding cross and/or joint appointments to:
1Geography
2Psychology
3Urban-Environment Studies
4Planning

Faculty members holding cross and/or joint appointments to Environmental Studies from:

Environmental Studies
Course Descriptions

Environmental Studies

Course Descriptions.

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes

1. Students in faculties other than Environmental Studies should consult their faculty advisor regarding how term courses with 0.75 credit weight are counted for degree credit purposes.

2. There are a number of courses offered in the Faculty of Environmental Studies of an integrative nature which extend across the academic interests of the 4 units, School of Architecture, Department of Geography, Department of Man-Environment Studies, and School of Urban and Regional Planning. The courses are of a general interest and are open to all students in the University. There is no Department of Environmental Studies. Students interested in this area are urged to consult the course offerings of the 4 individual units mentioned above. These four departments/schools offer a variety of related courses allowing in-depth studies of topics covered in the Environmental Studies courses.

ENV S 195 F.W 2C,1.5S 0.5 Introduction to Environmental Studies
Theories, methods and concepts in study of the environment. Emphasis on natural and built environment and relationships between elements of the environment. Environmental planning, management, and design discussed.

ENV S 200 F.W 2C,2L 0.75 Field Ecology
Introduces the main concepts and principles of ecology; the cycling of elements; energetics and structural organization of major ecological systems; population dynamics; impact of natural resource management practices and urban and industrial development on the environment; incorporating environmental quality considerations into development activities. There are weekly field trips to study natural and disturbed ecosystems, urban and applied ecology.

ENV S 201 F.W 3C,1.5S 0.75 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 252 F.S 3C 0.5 Media Tools for Environmental Studies
Instruction in basic black and white photography relating to photography's role as a media tool; basic darkroom functions, camera operation, composition, photographic theory, and photo essay production. Much of the course work and projects will be done outside the classroom in field situations of environmental concern using initiative in project development. Students are expected to supply their own cameras. A limited number of cameras will be available on a rental basis.

ENV S 253 W 3C 0.5 Introduction to Quantitative Research Methods
An introduction to scientific method; descriptive and inferential statistics; sampling design. The course emphasizes the methodological and interpretative problems involved in using selected quantitative methods to investigate selected environmental topics.

ENV S 271 F.W 3C,1.5L 0.75 Introduction to Environmental Law
An advanced, in-depth version of ENV S 201, providing an opportunity for detailed analysis of institutional factors regulating the natural environment and resources development in Ontario and Canada. How satisfactory present statutes, court systems and boards are for improving environmental quality as well as alternatives to these legal-institutional approaches will be discussed.

ENV S 272 W 3C 0.5 Computer Programming in Environmental Studies
The course emphasizes programming skills and applications in the context of environmental problems.

ENV S 310 W 2C 0.5 Behavioural Studies
Studies of environmental perception and of the behaviour of individuals and groups in interaction with their environment. Emphasis will be divided between an explanation of the methods of social science suitable for the study of environmental behaviour and the substantive findings from such applications.

ENV S 334 F 3C,1L 0.5 Park Management
Basic administrative procedures in park management. Operational techniques are examined together with general policies of acquisition, operation and development.

ENV S 380/381 F.W C 0.5 Environmental Studies Workshop
An interdisciplinary workshop focusing upon environmental issues in a project or research format.

ENV S 401 W 3C 0.5 Environmental Law
An advanced, in-depth version of ENV S 201, providing an opportunity for detailed analysis of institutional factors regulating the natural environment and resources development in Ontario and Canada. How satisfactory present statutes, court systems and boards are for improving environmental quality as well as alternatives to these legal-institutional approaches will be discussed.

ENV S 402 W 3C 0.5 Environmenlal Studies
ENV S 402 W 3C 1.5S 0.75
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

ENV S 433 W 3C 2St 0.75
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/ENV S 334
Cross-listed as REC 433.

ENV S 434 W 3C 0.5
Advanced Park Planning and Management
A study of policies, procedures, and practices relative to the management of natural resources. Emphasis is placed on an ecological systems approach to management as it relates to parks at all levels of government.
Prereq: REC/ENV S 334
Cross-listed as REC 434.

ENV S 444 F 3C 2L 1.0
Land Evaluation and Resources Management
The course will focus on the management of land and resources. It will emphasize the techniques of inventory, critical evaluation, and policy formulation related to sensible use of these commodities. Attitudinal, legal, and political influences will be investigated, particularly as they affect the design and implementation of planning decisions.

ENV S 500 0.5
Professional Development in Environmental Management
Those interested in qualifying for professional status and those from other related disciplines such as civil engineering, planning, architecture, and geography may find a discussion of professional environmental management strategies useful. Issues of technical principles, data assessment, ethics, interdisciplinary work and costs will be discussed.
Prereq: Fourth year students or consent of instructor
Field trip fee: $15.00.

COURSES NOT OFFERED 1984-85
ENV S 111 Introduction to the Study of the Future
ENV S 202 Social Science Approaches to Environmental Problems
ENV S 411 Alternative Future Environments 1
ENV S 412 Alternative Future Environments 2
ENV S 417 Land Use History and Landscape Change 1
ENV S 418 Land Use History and Landscape Change 2

Department of Fine Arts

Professor, Chairman
A.M. Urquhart, BFA (Buffalo)

Assistant Professor, Undergraduate Officer
E. Kliman, MA, PhD (Toronto)

Professors
V. Burnett, BS (Columbia), MA (California)
N.L. Patterson, BA (Washington)

Associate Professors
P. Forsyth,* AB (Mount Holyoke), MA, PhD (Toronto) Recipient of the Distinguished Teacher Award
B. Irland, BFA (Illinois), MFA (Massachusetts)
D.I. Mackay, BFA (Mt. Allison), MFA (Cornell)
J. Uhde, MA (Purkynel's University Brno), PhD (Waterloo)

Assistant Professors
A. Green, BFA (Art, Institute of Chicago)

A. Roberts, BA (Guelph), MA (Claremont)

Adjunct Faculty
M. Bird, BA, MA, PhD (Iowa)
P. Swann, BA, MA (Oxford), DLitt (Brock), DLitt (Queen's)

Faculty members holding cross appointments to Fine Arts from:
Classical Studies

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 comparative survey of Prehistoric and Ancient Art, and of Oriental, African, New World and Oceanian Art, emphasizing visual form as an expression of its historical and cultural context.

FINE 111 W 3C 0.5
Introduction to World Art 2
A comparative survey of Western Art from the Classical to the Modern Period, emphasizing visual form as an expression of its historical and cultural context.

FINE 210 F 3C 0.5
Modern Art 1
An examination of the history of Modern Art from the late 18th century up to the time of impressionism.

FINE 211 W 3C 0.5
Modern Art 2
A continuation of FINE 210, commencing with impressionism and proceeding through the major trends of the early 20th century up to the contemporary period.

FINE 212 F 3C 0.5
Italian and Northern Renaissance Art 1
A survey of the innovations in European painting, sculpture, and architecture between 1250 and 1500.
Prereq: FINE 111 or consent of instructor
FINE 213 W 3C 0.5
**Italian and Northern Renaissance Art 2**
A continuation of FINE 212 starting with the masters of the High Renaissance and concluding with the art of the Mannerists.
Prereq: FINE 212 or consent of instructor

FINE 218 W 3C 0.5
**Western Religious Art**
An introductory survey of the visual art and architecture of Judaism and Christianity in the Common era. The development and subsequent changes in style in places of worship and ceremonial objects and ornaments, and the changing forms of religious expression through visual art will be studied.

FINE 219 F 3C 0.5
**Canadian Art**
A survey that begins with the art of British and French settlers in the 17th century and concludes with developments in contemporary Canadian Art.

FINE 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 319 F 3C 0.5
**Contemporary Art**
A seminar exploring the contemporary avant garde movements through critical analysis, historical correlation, discussions with artist and trips to Toronto and New York. Topics covered will include environmental sculpture, conceptual trends, earth works, performance, technology, postal art, and the business aspects of art.

FINE 319A f 3C 0.5
**Special Topics in 20th Century Art: 1900-1940**
A study of the major innovations in early 20th century painting, sculpture and architecture. Honours Art History majors interested in the modern period are encouraged to use this course as preparation for the 4th year honours presentation.
Prereq: FINE 211 or consent of instructor

FINE 319B W 3C 0.5
**Special Topics in 20th Century Art: 1940-1970**
A survey of the major movements during the 30 year period following the beginning of World War II, including Op Art, Action Painting, the Beat Consciousness, Happenings, Pop Art, Assemblage, Post-Painterly Abstraction and Field Painting, and Kinetic and Light Sculpture.

FINE 330 W 3C 0.5
**Fine Arts Exhibition Curatorship**
The development, design, documentation, security, conservation, installation and interpretation of arts and crafts 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 using the University of Waterloo Arts Centre Gallery in Modern Languages and the Fine Arts Studio Suite Gallery in ES 2 as laboratory facilities.

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 F 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 490A/491 and 490A.
Admission by consent of instructor.

FINE 391 W H 0.5
**Selected Subjects in Fine Arts**
Research and reading courses under the direction of individual instructors.
Admission by consent of instructor.

FINE 392 F R 0.5
**Senior Seminar 1**
Admission by consent of instructor.

FINE 393 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 1984-85**
FINE 214 Medieval Art and Architecture
FINE 310 Greek Art and Architecture (C CIV 351)
FINE 311 Roman Art and Architecture (C CIV 352)
FINE 313 Special Topics in 19th Century Art
FINE 318 Canadian Ethnic and Traditional Art

**FILM STUDIES OFFERINGS**
FINE 250 F D C 0.5
**History of Film 1 (1895-1940)**
General history of world cinema in its silent and early sound era, covering the work of outstanding directors, national productions and movements, and their contribution to the film medium's development into a prominent art form of the 20th century. Regular film screenings.
Film fee.

FINE 251 W D C 0.5
**History of Film 2 (since 1941)**
A continuation of FINE 250. From the beginnings of the modern sound cinema (Welles) to the contemporary period. Regular film screenings.
Prereq: FINE 250 or consent of instructor
Film fee.

FINE 252 F 2C,1D 0.5
**Film and the Quest for Meaning 1**
An exploration of spiritual themes and issues in the cinema. An assessment of film's special characteristics as an art form capable of addressing the human quest for a significant existence. Emphasis upon the films of Ingmar Bergman.
Cross-listed as H S 266
Film fee $5.00

**MENfee $5.00**
Cross-listed as H 5 266
FINE 253 W 2C.1D 0.5
Film and the Quest for Meaning 2
A consideration of selected themes—death, evil, guilt, fate, alienation, courage, love, redemption—in the films of several of today’s leading directors. Emphasis upon a variety of directors from divergent cultural backgrounds.
Cross-listed as R S 267.
Film fee: $5.00

FINE 255R 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 256W F 0.5
Canadian Film
A study of Canadian film, from 1895 to the present, based on the screening and analysis of selected films.
This is a WLU course for Film Studies Majors/Minors only.

FINE 259W W 0.5
German Film
A study of major works (English subtitles) of the German cinema, beginning with the “golden age” of the 1920’s and emphasizing the New German Cinema created by directors such as Fassbinder, Wenders, Herzog, Straub, Schöndorf and others.
This is a WLU course for Film Studies Majors/Minors only.

FINE 270W F 0.5
The Film as a Modern Medium
A study of the technical problems of film making, leading to the writing, production and editing of a silent film.
This is a WLU course for Film Studies Majors/Minors only.

FINE 271W W 0.5
Sound and Colour in Film
A study of the principles of sound recording for film and of the colour laboratory and its techniques. The students will produce a short colour/sound film.
Prereq: FINE 270W, any other film course or consent of instructor
This is a WLU course for Film Studies Majors/Minors only

FINE 352 F D.C 0.5
The Cinema of Science Fiction
A chronological survey of one of the richest and most intriguing of film genres. Discussion of its aesthetic, philosophical and cinematic aspects. Film screenings will present major international works in this genre (Godard, Kubrick, Lang, Lucas, Marker, Siegel, Tarkovsky, Truffaut and other directors). Regular film screenings.
Prereq: FINE 250/251 or consent of instructor
Film fee.

FINE 353 W D.C 0.5
Contemporary Italian Film
A study of major achievements of the Italian cinema in its post-Neo-Realist period. Discussion of the works of major directors since the late 1950’s. Antonioni, Bertolucci, Fellini, Olmi, Taviani, Ross, Visconti and others. Regular film screenings.
Prereq: FINE 250/251 or consent of instructor
Film fee.

FINE 355R
Special Topic in Film
Special topics will be announced from year to year.

FINE 360 F D.C 0.5
Film Theory I
Motion pictures as an art form. Discussion of the visual language and the principal structural elements of film work. Relationship between film, television and other arts. Regular film screenings.
Prereq: A film course or consent of instructor
Film fee.

FINE 361 W D.C 0.5
Film Theory II
Prereq: A film course or consent of instructor
Film fee.

FINE 390 F H 0.5
Selected Subjects in Fine Arts
Research and reading courses under the direction of individual instructors.
Admission by consent of instructor.

FINE 391 W R 0.5
Selected Subjects in Fine Arts
Research and reading courses under the direction of individual instructors.
Admission by consent of instructor.

FINE 470 F 0.5
Senior Seminar in Film Concepts 1
Film screenings.
Admission by consent of instructor.

FINE 471 W 0.5
Senior Seminar in Film Concepts 2
Film screenings.
Admission by consent of instructor.

FINE 490 F S,std,R 0.5
Senior Honours Presentation 1
Course description on last page of Studio Offerings.

FINE 491 W S,std,R 0.5
Senior Honours Presentation 2
Course description on last page of Studio Offerings.

COURSES NOT OFFERED 1984-85
FINE 350 French Film After 1945
FINE 351 East European Film After 1945

STUDIO OFFERINGS
FINE 120 F.W 6std 0.5
Fundamentals of Visual Art 1
An introduction to the fundamental principles and concepts of visual art through a series of experimental studio problems in 2 and 3 dimensional materials and media.
Lab fee.

FINE 121 W 6std 0.5
Fundamentals of Visual Art 2
A continuation of FINE 120 with emphasis on colour.
Prereq: FINE 120
Lab fee.

FINE 220 F 6std 0.5
Fundamentals of Painting 1
An exploration of the problems and possibilities of painting as a vehicle for serious creative expression. The fundamentals of composition and painting techniques will be presented through a series of studio projects.
Prereq: FINE 120/121 or consent of instructor
Lab fee.

FINE 220A F 6std 0.5
Watercolour Painting
An exploration of the technique of watercolour painting as a means of creating both non-objective and representational forms on a two-dimensional surface.
Prereq: FINE 120/121
Lab fee.
FINE 221 W,S 6std 0.5  
Fundamentals of Painting 2  
A continuation of the studio projects begun in FINE 220 with a greater emphasis on the development of individual expression.  
Prereq: FINE 220 or consent of instructor  
Lab fee.

FINE 222 F 6std 0.5  
Fundamentals of Sculpture 1  
An introduction to sculpture. Three-dimensional form will be explored with the emphasis on the handling of clay and wood as an expressive medium enhanced by surface treatment.  
Prereq: FINE 220 or consent of instructor  
Lab fee.

FINE 223 W,S 6std 0.5  
Fundamentals of Sculpture 2  
An introduction to multi-media sculpture. Additive and subtractive use of wood, metal and plaster casting together with a mastery of three-dimensional forms in a variety of media.  
Prereq: FINE 222  
Lab fee.

FINE 223A W 6std 0.5  
Clay Studies  
Using a variety of clay bodies and firing techniques, students will explore figurative and abstract sculptural concepts, to develop a working knowledge of clay as a sculptural medium.

FINE 224 F 4std 0.5  
Introduction to Drawing  
Half the time will be devoted to drawing from the model and the remainder to a series of drawing concepts. At least 1 field trip will be included: Art Gallery of Ontario or the Albright Knox in Buffalo.  
Prereq: FINE 120/121  
Lab fee.

FINE 225 W,S 6std 0.5  
Analytical Figure Drawing  
Analytical figure drawing from the model will be combined with a study of human anatomy for artists.  
Prereq: FINE 120/121  
Lab fee.

FINE 226  
Printmaking  
Introduction to materials and methods of printmaking. Current offerings are given below.

FINE 227 W 3std 0.5  
Scientific Drawing  
Through studio experiences, students will learn techniques for making accurate scale drawings of biological subjects in line and value, using various media. Methods of preparing drawings for reproduction will be included.

FINE 228  
Applied Arts  
The history, design and practice of various applied arts will be explored in slide lectures and studio projects. Specific arts will vary from year to year; current offerings are given below.

FINE 228A F 3std 0.5  
Expressive Textile Forms  
The history of textile arts and problems of design for textile media will be explored combining lectures and studio projects in both 2 and 3 dimensional expressive forms. Traditional textile materials and methods will be applied to the creation of contemporary expressive and autonomous forms. Students will supply their own materials.

FINE 228B F 3std 0.5  
Applied Graphics  
A studio course using applied graphics techniques, including illustration, typographic composition, and perspective drawing. Methods of preparing work for reproduction will also be explored.

FINE 228C W 6std 0.5  
Printmaking (Screen)  
An introduction to screen printing, with emphasis on exploration of ink properties and stencil techniques.  
Prereq: FINE 120/121 or consent of instructor  
Lab fee.

FINE 228D F 3std 0.5  
Calligraphy  
A study of the art of written forms, combining studio projects with slide lectures on the history of writing, illuminating and lettering. Students will strive for mastery in various calligraphic forms selected from among historic styles such as Roman, Uncial, Bookhand, Gothic, Italic and Fraktur.

FINE 228E F 3std 0.5  
Experimental Explorations  
This studio course will explore various contemporary approaches to the visual arts, such as performance, site-specific works, installations, earth works, etc.  
Prereq: FINE 220/221 or consent of instructor  
Lab fee.

FINE 229A W 4std 0.5  
Photography for Artists  
Introduction to photographic techniques for use as a tool for artists. Basic techniques will be taught through a series of exercises, with emphasis on applications for creative artistic expression and documentation. Intended for Fine Arts majors. Supplies at student’s expense.  
Prereq: FINE 120/121

FINE 230 F 6std 0.5  
Advanced Painting 1  
Drawing upon the experience gained in FINE 220/221 this course will emphasize the student’s individual development as a beginning painter, through independent problems, along with class discussions and individual critiques.  
Prereq: FINE 220/221 or consent of instructor  
Lab fee.

FINE 231 W 6std 0.5  
Advanced Painting 2  
A continuation of Fine arts 320 with a further emphasis on independent problems.  
Prereq: FINE 320 or consent of instructor  
Lab fee.

FINE 232 F 6std 0.5  
Advanced Sculpture 1  
An exploration of sculpture problems in a variety of media as vehicles for serious creative expression. Wood, metal, glass and soapstone will be used for visual portrayal of spatial ideas.  
Prereq: FINE 222/223  
Lab fee.

FINE 233 W 6std 0.5  
Advanced Sculpture 2  
Organization and integration of sculptural concepts in clay to develop a series of representational or abstract sculptures. Clay and glaze technology for oxidation stoneware firing will be stressed.  
Prereq: FINE 322
FINE 324 F 6 std 0.5
Advanced Drawing
A course in which drawing is investigated as a means of expression and communication. The human figure, objects, and the landscape will be studied as sources of artistic imagery. The student will be encouraged to experiment with imagery, to develop personal vision, and to devise individual formal means of expression.
Prereq: FINE 224 or consent of instructor.
Lab fee.

FINE 325 W 6 std 0.5
Advanced Drawing 2
Continuation of FINE 324

FINE 326A W std 0.5
Advanced Printmaking
A continuation of printmaking concepts for independent study.
Admission by permission of instructor.
Lab fee.

FINE 326B Printmaking (Relief)
FINE 326C Images and Effigies
FINE 323A Assemblage

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
Each student will work under the direction of a Fine Arts faculty member on an advanced creative or research project. The result of this endeavour will be presented in the form of an exhibition or its equivalent (i.e., film, illustrated book, portfolio, or essay), which will be examined by faculty members of Fine Arts and also, where pertinent, by members of other departments.
Required of all students in Honours Fine Arts.
Admission by permission only.

FINE 490A F S.std,R 0.5
Senior General Seminar
As in FINE 490, each student will work under the direction of a Fine Arts faculty member on an advanced creative or research project, and will participate in group critiques and discussions.
Required of all 4 year General Fine Arts students.
Admission by permission only.

FINE 491 W S.std,R 0.5
Senior Honours Presentation 2
A continuation of FINE 490.
Admission by permission only.

FINE 491A W S.std,R 0.5
Senior General Seminar 2
A continuation of FINE 490A.
An optional course for 4 year General Fine Arts students.
Admission by permission only.

COURSES NOT OFFERED 1984-85
FINE 226B Printmaking (Relief)
FINE 228C Images and Effigies
FINE 323A Assemblage

Department of French

Associate Professor and Chairman of the Department
W.D. Wilson, MA, PhD (Trinity College, Dublin)

Associate Professor and Undergraduate Officer
P.H. Dubé, BA, MA (Toronto), PhD (Ohio State)

Associate Professor
P.G. Stocken, BA (Toronto), MA (Iowa), PhD (Toronto)

Professors
A. Agins, 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)

Associate Professors
J.R. Dugan, BA, MA (Toronto), PhD (Yale)
D.W. Russell, BA, MA, PhD (Toronto)

Assistant Professors
I.G. Fournier, BA (Toronto), MA, PhD (Western Ontario)
R.J. Fournier, BA, MA, PhD (Western Ontario)

Sessional Appointments
C.A. Abbott, BA, MA, PhD (Ohio State)
H. McLenaghan, Licence es Phil. Rom. (Brussels), MA (Waterloo), PhD (Western Ontario)

Lecturers
M. Adriaen, BA, MA (Toronto), DEA (Paris)
N. Rolland Licence es Lettres (Laval), MA (Toronto)
Course Descriptions

First Year Courses

1. 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.

2. The Department reserves the right to refuse admission to any of its language courses to a student who has, in the view of the Department, a level of competence unsuited to that course.

3. Students who have little or no secondary school French should enrol in French 151/152.

4. Students with Grade 12 secondary school French should enrol in French 155.

5. Students with Grade 13 secondary school French should enrol in French 192A/192B and/or French 195/196.

6. All students enrolling in FR 192A/192B must take the French Language Placement Test, to be held on Thursday, September 6, 1984 from 11:30 a.m. to 1:30 p.m. in Arts Lecture 116.

7. Students should consult the Departmental brochure "French at Waterloo" for further details, and for any changes in offerings after the Calendar goes to press.

8. Linguistics, Language, Civilization, and Literature courses are listed separately below.

FR 151 F.W.S 4C 0.5
Basic French
For students with little or no high school French. An elementary course designed to give a comprehensive approach to French language study to the beginning student of French. Involves reading, writing and speaking French. Successful completion of FR 151 qualifies a student to take FR 152. The Placement Test is not required but students must consult the Department before enrolling. Also offered at St. Jerome's College.

FR 152 F.W.S. 4C 0.5
Basic French
A continuation of the work done in FR 151. Successful completion of FR 152 qualifies a student to take FR 155. Prereq: FR 151 or consent of Department

FR 155 F.W 4C,1L 0.5
Intensive Review of French
Normally, students with up to Ontario Grade 12 French are placed in this course. A 1 term course which gives an intensive review of French language study for students who do not have the equivalent of Ontario Grade 13 French. Successful completion of FR 155 qualifies a student to take FR 192A. Prereq: The equivalent of Ontario Grade 12 French or consent of the Department

The Placement Test is not required, but students must consult the Department before enrolling. Also offered at St. Jerome's College.

FR 192A 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 6, 1984 in Arts Lecture Building, Room 116, from 11:30 a.m. to 1:30 p.m.

Also offered at St. Jerome's College.

FR 192B F.W,S 4C,1L 0.5
French Language
Continuation of FR 192A.

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 198/199 will satisfy the "reading knowledge of French" requirement of the University of Waterloo Graduate program.

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. Prereq: FR 198 or consent of the Department.

FR 205 F.S 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 W.S 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 F.S 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, 205, 251 or consent of Department

Maximum enrolment of 15 in each section.

FR 208 W.S 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 251 F 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
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 W 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 F 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

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 393/394
French Civilization, 1884-1914
Offered in the Nantes Program, 1984-85.

FR 395/396
French Thought
FR 195  F  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 152, 155 or consent of Department

FR 196  W  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  F  3C  0.5
Survey of Seventeenth Century French Literature
This course will trace the development of French literature from 1600-1700. Taught in French.
Prereq: FR 192, 196 or consent of Department

FR 253  F  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  W  3C  0.5
Twentieth Century French Theatre
The study of a representative number of authors and texts from Claudel to Ionesco. Taught in French.
Prereq: FR 192, 196 or consent of Department

FR 275  F  3C  0.5
Contemporary French-Canadian Novel
A study of a limited number of texts by authors such as Gabrielle Roy, André Langis, L'heure Aquin, Gérard Bessette. Taught in French.
Prereq: FR 192, 196 or consent of Department

FR 342  F  3C  0.5
Eighteenth Century French Literature
This course will trace the development of French literature from 1700-1800. Taught in French.
Prereq: FR 192, 196 or consent of Department

FR 343  W  3C  0.5
Topics and Problems in Eighteenth Century French Literature
A more detailed study of one or more aspects of the Enlightenment. Taught in French.
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

FR 363  F  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 410  W  3C  0.5
Medieval French Literature
An introduction to French literature of the Middle Ages through the study of representative texts, including excerpts from the epic, courtly and satirical works. Taught in French.
Prereq: FR 192, 196 or consent of Department

FR 482  F.S  3C  0.5
Study of Individual Authors
Each year a different author is the subject of specialized study to permit an in-depth exploration of his/her literary contributions. Taught in French.
Prereq: FR 192, 196 or consent of Department

FR 490-496  0.5
Senior Tutorials
A small group of students follows a course of study under the supervision of a faculty member. For details, inquire of the Department.

COURSES NOT OFFERED 1984-85
FR 151A Language Workshop
FR 152A Language Workshop
FR 210 Report Writing in French
FR 232 Topics and Problems in Seventeenth Century French Literature
FR 372 Contemporary Quebec Theatre
FR 391 French Women Writers (formerly FR 491)
FR 421 French Prose of the Renaissance
FR 422 French Poetry of the Renaissance

General Engineering
Instructor
J. Lowe, BSc (Carleton), Recipient of the Distinguished Teacher Award

Course Descriptions

GEN E 010  F.W  1S  0.0
Co-ordination Orientation
Given by the Department of Co-ordination for students in Year 1 Engineering. Its purpose is to introduce the students to the various features of the co-operative program and engineering as a profession.

GEN E 061  F.W  3C  0.5
History and Philosophy of Science
The major conceptual transformations in evolution of science and technology; Greek, modern classical, contemporary periods. Scientific technology as a determining characteristic of global civilization and some critical questions it poses.
Not open to Year 1 students.

GEN E 062  F  3C  0.5
Introduction to Human Communications Systems
The processes involved in man-man, man-machine and mass communications will be discussed. Models of communication systems. The contributions and points of view of the various disciplines which make up the spectrum of communication studies today.
Not open to Year 1 students.
This course is provided to allow enrichment 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.

Information Technology and Society
The social and technological concepts of an information society. Overview of information technology; current states and future directions in computers and communications. Study of an information system, its promises and problems including privacy, security, user acceptance, retraining, control, etc. Impact of information technology on the quality of life; employment, freedom of information, leisure, creativity, etc. One application area will be selected for study each term from Computer-Aided Learning, Office Automation, Computer-Aided Design and Manufacturing, Telecomputing, etc.

Prereq: Open to third or fourth year students in any faculty with at least 1 university-level computing course, or consent of the instructor.

Technical Entrepreneurship
Technical entrepreneurship is examined considering the role of independent businesses, entrepreneurial behaviour, types of business and enterprises, business structure, sources of venture concepts and capital, company operation and control, and business start-up.

Prereq: A course in Engineering Economics (or equivalent).

Special Directed Studies
This course is provided to allow enrichment for students in Engineering who have fulfilled the requirements of 1 or more of the courses in the 4A 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.

Ethics and The Engineering Profession
An application of philosophical analysis and theories of ethics to issues of moral conduct in the engineering profession. Discussions will include such matters as the social responsibilities of engineers, standards of product safety and liability, the assessment of acceptable risk, conflicts of interest and obligation, professional loyalty and "whistle blowing", use and enforcement of professional codes of ethics, the "democratization" of the profession, and the moral implications of technology.

Not open to Year 1 students.
Department of Geography

Course Descriptions

Geography

E.F. LeDrew, BA (Toronto), MA, PhD (Colorado)
A.G. McLellon, BSc, PhD (Glasgow)
G.B. Pridde, BA (Western Ontario), MA, PhD (Clark)
S.L. Smith, BA (Wright State), MA (Ohio State), PhD (Texas A&M)

Assistant Professors

T.F. Runtting, BA (York), MA (Western Ontario), PhD (Toronto)
D. Dudycha, BA (Waterloo Lutheran), MA (Waterloo)
C. Dufoodena, BA (Sir George Williams), MA (Laval), PhD (Toronto)
R. Johnston, BA, MA (Windsor), PhD (Minnesota)
E.R. Officer, BA (British Columbia) MA (Wisconsin)
J.B. Robinson, BA (Toronto), MES (York), PhD (Toronto)

Adjunct Faculty

G. Brennan, CC
B.C. Matthews, BSA (Toronto), AM (Missouri), PhD (Toronto), LLD (Waterloo)
D.I. McKenzie, Bes, MA (Waterloo)
S. Pala, BSc (Ankara), PhD (Freiburg)

Faculty Members of Geography holding cross or joint appointments to:

1. Planning
2. History

Course Members holding cross or joint appointments to Geography from:

3. Religion
4. Environmental Studies
5. Recreation
6. Man-Environment Studies
7. Planning

Faculty Members of Geography holding cross or joint appointments to Geography from:

8. Planning

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 Environmental Studies should consult their faculty advisor regarding how term courses with 0.75 credit weight are counted for degree credit purposes.

GEOG 102 F.W 2C.2L 0.75
Introduction to Physical Geography
Emphasis on the natural environment as an integrated system. Selected aspects of weather-climate, water, soils, biota, landscapes along with flows of energy, water and matter and their effects on the subsystems of the natural environment.

GEOG 110 F 2C 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: First year Geography Majors only or 1st year Arts students intending to major in Geography or consent of instructor

GEOG 125R F 3C 0.5
Introduction to the Third World
A study of the Third World under topics such as: population issues, planning and practices; education and health in the social development process; urbanization and industrialization, planning for rural and urban development in Asia, Africa and Latin America.

GEOG 127 F 2C.2L 0.75
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 160 F.W 2C.2L 0.75
Introduction to Cartography and Map Analysis
Basic concepts involved in the analysis and use of existing types of cartographic products. Background theory of the production and reproduction of topographic and thematic maps, including historical development, collection of data and symbolization.

Formerly GEOG 260.
Lab fee $15-$25.

GEOG 201A W.S 3C 0.5
Geomorphology and Soils
The roles of geomorphological and soil forming processes in creating and modifying landscapes. The utility of geomorphological information in our everyday lives.
GEOG 201 B F.W 3C 0.5
Climatology
Study of the atmospheric regime. The general circulation model of the atmosphere together with processes involved; climatic classification; effect of climate on human activities and on the distribution of natural vegetation and soils.

GEOG 202 F.S 3C 0.5
Economic and Urban Geography
An analysis of 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 1st year human geography course

GEOG 203 W.S 2C,2L 0.75
Cultural and Regional Geography
The approach of the regional geographer is illustrated by reference to one or more world regions. Political, social and historical processes are studied as they affect man's perceptions of his environment and the identification of culture regions.
Prereq: A 1st year human geography course

GEOG 204 F 3C 0.5
Soviet Union
Introduction to the geography of the Soviet Union, with a focus on selected problems in urbanization, industrialization, resource use and regional economic development in a planned economy.

GEOG 205 F 2C,2L 0.75
Africa
The geography of modern Africa south of the Sahara in the context of changing attitudes to the continent on the part of the "developed" countries. Attention will focus on problems of the physical, social and economic environments.

GEOG 220 Y 2C,2L 1.5
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 interrelationships: resource use, population pressure, urban and rural land use, human impact on the earth.

GEOG 221 W 3C 0.5
The United States
Focuses on population shifts, environmental issues, and regional economic development in the context of the nation and selected regions.

GEOG 225 R W 3C 0.5
Food and Agriculture, and Integrated Rural Development in the Third World
Recent trends in population growth as related to the food resources situation in different areas of the Third World. Discussion of obstacles and possibilities to decelerating population growth, and accelerating food production and rural development in selected geographic regions.

GEOG 232 F 3C 0.5
Geography of Population

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.

GEOG 275 F.W 2C,2L 0.75
Introductory Air Photo Analysis and Remote Sensing
Basic characteristics of various remote sensing techniques and their application in the broad field of geographic and environmental studies. Emphasis on the analysis and interpretation of air photos in 3 dimensions.
Lab fee $20.

GEOG 300 F.S 2C,4fldlab 0.75
Geomorphology and the Southern Ontario Environment
Emphasizes field work and field trips in exploring the evolution of S. Ontario landforms. The identification of landforms, landform assemblages and their 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 201A or consent of instructor
Lab fee $10-$15.

GEOG 303 W 2C,2L 0.75
Physical Basis and the Geography of Water
The earth's water balance and cycle, oceans, lakes and swamps, snow cover, ground ice, glacier ice and streams. The impact of water on the earth's surface, the role of water in the earth's system, and water as a resource and hazard. Some field work.
Prereq: GEOG 201A and B or consent of instructor

GEOG 307 F.W 2C,1D 0.5
Social Survey Techniques
Social research and the planning process, interview and self administered surveys; questionnaire design; profile data; sampling; data processing; nonsurvey data collection techniques; practical applications.
Prereq: Second or third year students with ENV S 271 or consent of instructor
Cross-listed as PLAN 307.

GEOG 311 W 3C 0.5
Regional Industrial Development
Manufacturing and transportation in the context of economic development at regional and urban scales. Empirical focus on Canada and the U.K.
Prereq: GEOG 202 or consent of instructor

GEOG 315 F 3C 0.5
Agricultural Geography
The geographical dimensions of agricultural systems. 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 W.S 1C,2L 0.75
Multivariate Statistics
The theory and application of multivariate statistics, with particular emphasis upon the use of the computer.
Prereq: ENV S 271 or consent of instructor
Cross-listed as PLAN 316.

GEOG 317 F 3C 0.5
Nonparametric Statistics
The theory and application of nonparametric statistics, with particular emphasis upon social science problems.
Prereq: ENV S 271 or consent of instructor
Cross-listed as PLAN 317.

GEOG 318 W 3C 0.5
Spatial Analysis
Advanced quantitative analysis and sampling of spatial context. A selection of techniques from gravity models, linear programming, nearest neighbour analysis, Markov chain analysis, graph theory, simulations, and trend surface analysis.
Prereq: ENV S 271 or consent of instructor
Cross-listed as PLAN 318.
GEOG 319 F 2C,1L 0.5
Economic and Social Techniques for Regional Planning
Critical appraisal of a selection of descriptive and evaluative regional analysis techniques. Economic considerations of regional development. Reliability and applicability of data; input-output analysis; cost-benefit analysis; planning, programming and budgeting systems; and social area analysis.
Prereq: ECON 101, 102 or consent of instructor
Cross-listed as PLAN 319.

GEOG 322 F 3C 0.5
Geographical Study of Canada
Geographical basis of Canada and Canadian issues. Selected problems relating to nationalism, regionalism, environmental quality, urbanization, regional disparities and resource development.

GEOG 323 W 2S 0.5
Comparative Regional Problems
A geographical analysis of selected regions and current problems. The theme chosen in any given year will vary.

GEOG 325R W 3C 0.5
Special Topics in Development of the Third World
Geographic research methods and approaches to the study of social and economic development problems of tropical Africa, South and South-East Asia, the Caribbean and tropical Latin America.
Prereq: First or second year courses related to Third World studies or consent of instructor

GEOG 330 F 3C 0.5
Cultural geography
The Geography of culture and the role of cultural factors in environmental relationships.

GEOG 332 W 3C 0.5
Topics in Population Geography: Health and Disease
Population geography concepts and issues in studying health related problems. Areal variations and associations of diseases and environment. Topics include: morbidity, mortality patterns, "population at risk", malnutrition, poverty, access to modern health care, and alternative health care systems. Regional case studies from the developing countries.
Prereq: 2nd year students or higher

GEOG 349 F 3C 0.5
The City as a System
Theories, models, and research procedures in the study of internal urban structure. Focuses on city-wide processes, urban land use, spatial economics, interaction systems, decision-making, urban growth, and the processes of development and redevelopment.
Prereq: GEOG 202 or 251 or consent of instructor

GEOG 350 F 3C 0.5
Regional Urban Systems
Theories, models, research procedures, and analytical techniques dealing with the growth and support of urban centres and city systems, with relationships between aspects of urbanization and regional development, and with analytical techniques useful in studying such topics.
Prereq: GEOG 202 or GEOG 251 or consent of instructor

GEOG 352 W 3C 0.5
The Rural-Urban Fringe of Canadian Cities
Study of the natural, economic and cultural environments of the rural-urban fringe. Emphasis on the use, ownership, development and management of land and the interrelationships between the resource base and urban demands on it.
Prereq: GEOG 202

GEOG 356 F,W 3C 0.5
Resources Management
Reviews selected theories, methods, and terminology related to economic, behavioural, institutional and decision-making aspects of resources and environmental problems.
Prereq: ENV S 271 or consent of instructor
Field Trip fee $10-$15

GEOG 357 F,W 3C 0.5
Conservation and Resource Management
History of the conservation movement, ecological principles of conservation and resource management. Analysis, use and planning of recreational resources.
Prereq: ENV S 200
Cross-listed as PLAN 357.
Lab fee $10-$15

GEOG 358 F 3C,1L 0.75
Water Planning and Management: Strategies and Experiences
Benchmark theory and principles of comprehensive water planning and integrated river basin management. Selected international to local scale case studies.
Prereq: GEOG 356 or consent of instructor
Lab fee $10-$15.

GEOG 359 W 2C,1L 0.5
Geography of Energy
Issues related to energy resources. The course examines both Canadian energy management problems and international issues such as cartels and relationships between energy and economic development.
Prereq: GECG 212 or consent of instructor

GEOG 360 F 1C,2L 0.5
Preparation of Maps and Illustrations
Equipment, materials and techniques involved in the practical construction of maps and cartographic illustrations. Conventional drafting and plotting procedures, symbolization of data and map editing for reproduction.
Prereq: GEOG 160
Lab fee $15-$25.

GEOG 375 W 2C,2L 0.75
Air Photo Interpretation
The principles of air photo interpretation utilizing specific criteria visible in the conventional air photo. Examples from local and foreign environment.
Prereq: GEOG 275 and either GECG 201A or EARTH 121-122 or SCI 100
Lab fee $20

GEOG 381 F,W 3C 0.5
The Nature of Geography
The roots and evolution of geographic thought, conceptual approaches and pathways. Past traditions, current issues, and future trends. The politics and sociology of geography as an art, science, and profession.
Prereq: Any 3 GEOG credits or consent of instructor

GEOG 390 F,W,S 2S 0.5
Senior Honours Research Essay Proposal
Participants are responsible for developing a research proposal under the supervision of an appropriate faculty member. Normally taken in the third year.
Prereq: Honours Geography students only; cannot be counted for credit towards a general degree
Field Research
One week field camp in which a specific area will be analysed from a geographic point of view. Individual or group analysis of specific field problems.
Estimated cost to student: $100-$120

GEOG 391 FF 0.5

Field Research

GEOG 401 F, S 0.5

Glacial Geomorphology and Some Contemporary Applications
Glacial and fluvioglacial erosion and deposition and their effects on landscapes. Focus on the environmental influences of glacialation and on practical applications of glacial geomorphologists' techniques and information.
Prereq: One of GEOG 300 or EARTH 342

GEOG 402 W 1C,3L 0.75

Advanced Cartography 1
Advanced study of numerical map analysis and computer mapping techniques.
Prereq: GEOG 160 and ENV S 271

GEOG 403 W 1C,3L 0.5

Advanced Cartography 2
Advanced study of techniques of map production and design. Technical aspects include photo mechanics, scribing, process photography, typography, proofing and printing processes. Theoretical topics include the map as a communications system, advanced map design and principles of information selection and generalization.
Prereq: GEOG 360
Lab fee $25

GEOG 404 W 1C,3L 0.5

Advanced Cartography 3
Advanced study of techniques of map production and design. Technical aspects include photo mechanics, scribing, process photography, typography, proofing and printing processes. Theoretical topics include the map as a communications system, advanced map design and principles of information selection and generalization.
Prereq: GEOG 360
Lab fee $25

Tropical Geomorphology
Basic geomorphological concepts and their application in a tropical environment. Special emphasis on morphology and processes as related to the geological foundation.
Prereq: One of GEOG 300, EARTH 342 or consent of instructor

GEOG 407 F, S 0.5

Field and Lab Techniques in Geomorphology
An analysis of the range of techniques used by geomorphologists. This course will involve intensive field surveying, mapping and laboratory work.
Prereq: GEOG 300, EARTH 342 or consent of instructor
Field-trip expenses: $15 per student.

GEOG 408 F 2C,1L 0.5

Atmospheric Resource Management
Advanced study of the atmosphere as a natural resource system. Emphasis on weather modification and economic, social and political aspects of climate.
Prereq: GEOG 338 (WLU) or equivalent

GEOG 409 F 2C,1L 0.5

Energy Balance Climatology
A field and lecture course including the radiation and energy balances of various surfaces, the principles of turbulent energy exchange, and the biotic response to the energy environment. These concepts will be illustrated through the collection and examination of field data.
Prereq: GEOG 102, 201A/B, and 301.

GEOG 410 W 3C 0.5

Recreation Geography
The environmental implications of existing and potential recreational demands. Recreational travel, site capability, economic and ecological impact models will be considered as well as the behavioural aspects of amenity resources.
Prereq: GEOG 366

GEOG 414 W.S 2S 0.5

Energy Resources Management
Energy management emphasizing ecological and economic approaches. Issues related to managing conventional energy resources and development of alternatives. Techniques for studying energy issues are also presented.
Prereq: GEOG 369 and either GEOG 311 or GEOG 366 or consent of instructor

GEOG 421 Y 2C,1L 1.5

Europe and the Mediterranean
Detailed study of physical, cultural, economic and political geography, including the development of cities, problems of agriculture, changing industrial patterns, development of trade, regional disparities, and planning on the city, regional and national levels.

GEOG 425 W 3C 0.5

Africa
Examination of selected aspects of the geography of a major region in Africa with particular reference to problems of development. The region will normally be East Africa; a degree of flexibility will facilitate the selection of topics related to the interests of participants.
Prereq: GEOG 205
GEOG 475 F,W,S 2S 0.5
Special Reading and Seminar on Selected Topics
A brief outline is to be filed with the Associate Chairman, Undergraduate Studies.
Prereq: 3 full credits in GEOG and consent of instructor

GEOG 476 F,W 2S 1.0
Special Readings and Seminar on Selected Topics
A brief outline is to be filed with the Associate Chairman, Undergraduate Studies.
Prereq: 3 full credits in GEOG and consent of instructor

GEOG 462 W 2S 0.5
Geography and Education
Prereq: Environmental Studies students in third or fourth year, or consent of instructor

GEOG 460A F,W,S 3S 0.5
Senior Honours Research Essay
Preparatory work and first draft of essay.
Prereq: GEOG 390; only fourth year Honours students

GEOG 460B F,W,S 6S 1.0
Senior Honours Research Essay
Completed Essay
Prereq: GEOG 390 and GEOG 460A; only fourth year Honours students

COURSES NOT OFFERED 1984-85
GEOG 126R Development in the Third World
GEOG 225R Urbanization in the Third World
GEOG 331 Special Topics in Cultural Geography
GEOG 341 Historical Geography of Canada 1
GEOG 342 Historical Geography of Canada 2
GEOG 345 Political Geography
GEOG 376 Environmental Remote Sensing
GEOG 400 Climatic and Periglacial Morphology
GEOG 412 Geography of Manufacturing Firms and Industries
GEOG 422 Canada
GEOG 423 Central and Eastern Europe
GEOG 424 Soviet Union
GEOG 430 Field Research in Regional Geography
GEOG 448 Urban Historical Geography

GEOG 462 Land Dereliction and Rehabilitation 2
GEOG 481 Frontiers in Geography

Geological Engineering

Professor, Chairman of the Geological Engineering Board
M.B. Dusseault, BSc, PhD (Alberta), PEng

Professor, Chairman of Earth Sciences
P. Fritz, Dipl Geol Dr.re.nat. (Stuttgart)

Professor, Dean of Engineering
W.C. Lennox, BASc, MSc (Waterloo), PhD (Lehigh), PEng

Professors, Department of Earth Sciences
J.A. Cherry, BE (Saskatchewan), MS (California-Berkeley), PhD (Illinois), PEng
P.F. Karrow, BSc (Queen's), PhD (Illinois)

Associate Professors, Department of Earth Sciences
I.J. Smalley, CEng, PhD (City University, London)

Adjunct Faculty
J.A. Franklin, BSc, MSc, PhD (London) PEng

Associate Professors, Department of Civil Engineering
N. Kouwen, BASc, PhD (Waterloo), PEng
B. LeLievre, BEng (West Australia), MSc, PhD (Waterloo), PEng
E.L. Matyas, BASc (Toronto), DIC, PhD (London), PEng
L. Rothenburg, Dipl Phy (Moscow) PhD (Carleton) PEng
J.C. Thompson, BASc (Toronto), MS, PhD (Illinois), PEng

Course Descriptions

GEO E 126 W 2C.3L 0.5
Geological Engineering Concepts
An introduction to physical geology and earth processes. Geological time, introduction to earth, air and water processes including volcanism, sedimentation, weathering, lithification, continental drift, radioactive dating, hydrogeology, pedology, resources, mass wasting, erosion.

GEO E 400 F 1C.4T 0.5
Geological Engineering Project I

GEO E 401 W 1C.4T 0.5
Geological Engineering Project II

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 other appropriate department in identifying and carrying out a suitable short design or research project. The final product will be presented in thesis form and carefully scrutinized by two independent referees chosen for their familiarity with the topic. The subject may be laboratory based, analytic, numeric or field oriented. The thesis format must 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.
Department of Germanic and Slavic Languages and Literatures

Associate Professor, Chairman of the Department
D.G. John, BA, MA, PhD (Toronto)

Associate Professor, Associate Chairman Graduate Studies
M. Richter, Staatsexamen (Berlin and Bonn), MA, PhD (Toronto)

Assistant Professor, Associate Chairman, Undergraduate Studies
T. Sommer, BA, MA (Waterloo)

Professors
J.W. Dyck, AB (Bethel), MA (Missouri), PhD (Michigan)
E. Heier, BA, MA (British Columbia), PhD (Michigan) Recipient of the Distinguished Teacher Award
S. Hoefert, BA, MA, PhD (Toronto)

Associate Professors
M. Bruck-Fima, Staatsexamen (Berlin), PhD (Yale)
J. Jakobs, MA (Manitoba), PhD (Waterloo)
M. Kuxdorf, BA, MA (Waterloo), PhD (Alberta)
H.W. Pankau, BA (Waterloo), MA (Cincinnati), PhD (Waterloo)
W. Richter, MA (Ottawa), Dr.phil. (Munich)
J. Whiton, BA, MA, PhD (Minnesota)

Lecturers
H. Marsden, BA (Randolph-Macon), MA (Waterloo)
J. Pankau, Staatsexamen, Dr.phil. (Freiburg)

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 and pronunciation with an emphasis on reading and translation of elementary scientific literature from various fields.

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
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.

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.

GER 122 W 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.

GER 121 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.

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.

GER 121/122 and 151/152 are first year courses for students who have completed at least 2 years of 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
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.

GER 121/122 and 151/152 are first year courses for students who have completed at least 2 years of High School German or have an equivalent background in the language. If in doubt, consult the Department.
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 211 F 3C 0.5  
**Intermediate Scientific German**

Grammar review and more advanced study of German language structure and idiom. Reading and translating of scientific writings for vocabulary building and mastery of difficulties peculiar to technical style. Reading material is selected according to the field of the individual student.  
Prereq: GER 106, 112 or equivalent

GER 212 W 3C 0.5  
**Intermediate Scientific German**

As GER 211  
Prereq: GER 211

GER 251 F 3C 0.5  
**German Conversation and Composition**

This course offers extensive practice in both the spoken and written language. It provides vocabulary building, grammar review, and exercises in pronunciation and comprehension.  
Prereq: GER 122, 152 or equivalent

GER 252 W 3C 0.5  
**German Conversation and Composition**

As GER 251  
Prereq: GER 251, or equivalent

GER 261 F 3C 0.5  
**The Age of Goethe (Classicism)**

Reading, interpretation, and critical analysis of representative works (Goethe, Schiller, Hölderlin, etc.).  
Prereq: GER 122, 152 or equivalent

GER 262 W 3C 0.5  
**The Age of Goethe (Romanticism)**

Reading, interpretation, and critical analysis of representative works (Novalis, Tieck, Brentano, etc.)  
Prereq: GER 122, 152 or equivalent

GER 271 F 3C 0.5  
**German Thought and Culture**

A survey of cultural currents to the 18th century. Lectures will focus on major developments in literature, philosophy, religion, art, architecture, and music as seen against the historical background of the German speaking peoples.  
Taught in English

GER 272 W 3C 0.5  
**German Thought and Culture**

A survey of cultural events from the 18th century to the present. Lectures will focus on major developments in literature, philosophy, religion, art, architecture, and music as seen against the historical background of the German speaking peoples.  
Taught in English

GER 281 F 3C 0.5  
**Post-War Literature**

Reading and interpretation of major works since 1945 in prose, drama and poetry. Main authors: Brecht, Borchert, Böll, Frisch, Dürenmatt, Grass, Etc.  
Prereq: GER 122, 152 or equivalent

GER 282 W 3C 0.5  
**Post-War Literature**

As GER 281  
Prereq: GER 122, 152 or equivalent

GER 291 F 3C 0.5  
**Survey of German Literature**

Introduction to the major periods of German literature. 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

GER 311 F 3C 0.5  
**Theory of Translation**

Theory, methodology, and techniques of translation. Patterns and problems in the translation of scholarly texts from the arts and sciences, with special emphasis on idiom and structure as compared with the target language.  
Prereq: GER 212 or equivalent

GER 312 W 3C 0.5  
**Theory of Translation**

As GER 311  
Prereq: GER 311

GER 351 F 3C 0.5  
**Intermediate Conversation and Composition**

Conversation on modern topics. Exercises in advanced grammar, stylistics, and composition.  
Prereq: GER 252 or equivalent

GER 352 W 3C 0.5  
**Intermediate Conversation and Composition**

As GER 351  
Prereq: GER 351 or equivalent

GER 355 F 3C 0.5  
**The Stage as Forum: German Drama in Translation**

Major German dramas will be studied from various points of view, including historical importance, themes, and technique. The course includes theory and selected dramas of such playwrights as Lessing, Goethe, Schiller, Büchner, Brecht and Dürenmatt.  
Prereq: Open to students from all departments; not normally to first year students  
Taught in English

GER 361 F 3C 0.5  
**Young Germany and Biedermeier**

Reading, interpretation and critical analysis of prescribed prose, drama and poetry. (Grillparzer, Mönke, Siller, Gotthelf, etc.)  
Prereq: GER 122, 152 or equivalent

GER 362 W 3C 0.5  
**Poetic Realism**

Reading, interpretation, and critical analysis of prescribed prose, drama and poetry (Storm, Keller, Ludwig, Hebbel, Raabe, Fontane, etc.).  
Prereq: GER 122, 152 or equivalent

GER 371 F 3C 0.5  
**Modern German Literature**

Reading, interpretation, and critical analysis of prescribed texts relating to the "Modern" and various literary movements around the turn of the century.  
Prereq: GER 122, 152 or equivalent

GER 372 W 3C 0.5  
**Modern German Literature**

Reading, interpretation, and critical analysis of prescribed texts from the early 20th century to the end of World War II (Kafka, Brecht, etc.).  
Prereq: GER 122, 152 or equivalent
GER 391 F 3C 0.5
Masterpieces of German Literature in Translation
A study of significant prose and drama from 1770 to the present representing themes such as Man and Revolution, Duty vs. Incarnation, Flesh vs. Spirit. Modern Germany East and West. Works studied include Dantons Death (Büchner), Maria Stuart (Schiller), Demian (Hesse), Galileo (Brecht), and Cat and Mouse (Grass).

GER 392 W 3C 0.5
Masterpieces of German Literature in Translation
As GER 391.

GER 395 F 3C 0.5
Waterloo in Germany Program
Description in Arts program section.

GER 395 W 2.5
Waterloo in Germany Program
As 395Z.

GER 441 F 3C 0.5
Humanism, Reformation and Baroque
Reading, interpretation, and critical analysis of prescribed texts (Erasmus, Luther, Saks, Opitz, Gryphius, Grimmelshausen, etc.).
Prereq: Second year standing in German

GER 442 W 3C 0.5
Enlightenment and Storm and Stress
Reading, interpretation, and critical analysis of prescribed texts (Lessing, Wieland, Klopstock, Lenz, Klinger, etc.).
Prereq: Second year standing in German

GER 451 F 3C 0.5
Advanced Conversation, Grammar and Composition
This course is conducted in German and provides intensive practice in spoken and written German on the advanced level.
Prereq: GER 352 or equivalent

GER 452 W 3C 0.5
Advanced Conversation, Grammar and Composition
As GER 451.
Prereq: GER 451 or equivalent

GER 461 F 3C 0.5
Introduction to the History of the German Language with Readings in Middle High German
Prereq: GER 122, 152 or equivalent

GER 462 W 3C 0.5
Middle High German Literature
Reading and interpretation of samples from the major works of the MHG period, with emphasis on writers of the first "Blütezeit" in German literature (1170 to 1250). Early Minnesang, "Guester von der Vogelweide, Nibelungenlied, Hartmann von Aue, Wolfram von Eschenbach, etc.
Prereq: GER 461

GER 471 F 3C 0.5
German Poetry
A study of the main thoughts, themes, forms, and schools in German poetry from the beginning to Goethe.
Prereq: GER 461 or equivalent

GER 472 W 3C 0.5
German Poetry
A study of the main thoughts, themes, forms and schools in German poetry from German Romanticism to the present.
Prereq: GER 471 or equivalent

GER 495-496 F, W, S, J, A R 0.5 each
Reading Courses in Approved Topics
Prereq: Approval of the Department

DUTCH

DUTCH 101 F 3C 0.5
First Year Dutch
The basic elements of Dutch grammar with emphasis on oral practice and pronunciation, along with appropriate texts from Dutch literature. Introduction to aspects of Dutch culture.
Open to all students.

DUTCH 102 W 3C 0.5
First Year Dutch
As DUTCH 101
Prereq: DUTCH 101 or equivalent

DUTCH 201 F 3C 0.5
Intermediate Dutch
This course will be conducted partly in Dutch and offers advanced study in grammar, composition, and conversation. Special emphasis will be given to comprehension and practice in the spoken language.
Prereq: DUTCH 102 or equivalent

DUTCH 202 W 3C 0.5
Intermediate Dutch
As DUTCH 201
Prereq: DUTCH 201 or equivalent

RUSSIAN

Russian Workshop in the USSR
A "Total Immersion" Russian language workshop for a full month at the Russian Language Seminar in Leningrad. Daily instruction by Russian faculty at the elementary, intermediate, and advanced levels, according to the proficiency of the students.
Prereq: At least one year of Russian language at the University level or equivalent
Credits: 1.5 for completion of
1. first year Russian: 193, 194, 195 or equivalent
2. second year Russian: 293, 294, 296 or equivalent
3. third year Russian: 393, 394, 395 or equivalent
4. fourth year Russian: 493, 494, 495.
The Workshop may be attended more than once. However, a maximum of 1.5 credits will normally be granted towards a degree.

RUSS 101 F 3C, 1L 0.5
First Year Russian
For students with little or no knowledge of Russian. The elements of Russian grammar and composition with emphasis on oral practice and pronunciation. Language Laboratory and Visual Aids.
Open to all university students, except those who have credit for RUSS 111/112.

RUSS 102 W 3C, 1L 0.5
First Year Russian
As RUSS 101
Prereq: RUSS 101 or equivalent

RUSS 111 F S 3C 0.5
First Year Scientific Russian 1
A rapid, intensive course, designed to enable the students to master reading and translating Russian. Special emphasis on international and scientific terminology, ranging over many of the main branches of science. Notwithstanding its simplified approach, the main features of Russian grammar are treated in full.
Taught in English
Open to all students, except those who have credit for RUSS 101/102.

RUSS 112 W 3C 0.5
First Year Scientific Russian 2
As RUSS 111.
Prereq: RUSS 111 or equivalent
Taught in English.
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<td>Intermediate Scientific Russian</td>
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<td>RUSS 202 W</td>
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<td>RUSS 251 F</td>
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<td>Conversation, Composition, Grammar and Phonetics</td>
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<td>RUSS 252 W</td>
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<td>Introduction to Russian Literary Movements</td>
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<td>RUSS 261 F</td>
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<td>RUSS 262 W</td>
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<td>RUSS 317 F</td>
<td>3C</td>
<td>.5</td>
<td>Theory of Translation</td>
</tr>
<tr>
<td>RUSS 351 F</td>
<td>3C</td>
<td>.5</td>
<td>Russian Drama</td>
</tr>
<tr>
<td>RUSS 352 W</td>
<td>3C</td>
<td>.5</td>
<td>Intermediate Conversation and Composition</td>
</tr>
<tr>
<td>RUSS 356 W</td>
<td>3C</td>
<td>.5</td>
<td>The Stage as Forum: Russian Drama in Translation</td>
</tr>
<tr>
<td>RUSS 381 3C</td>
<td>.5</td>
<td>The Peoples of the Soviet Union</td>
<td>RUSS 381 or equivalent</td>
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<tr>
<td>RUSS 382 3C</td>
<td>.5</td>
<td>The Peoples of the Soviet Union</td>
<td>RUSS 382 or equivalent</td>
</tr>
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</table>
RUSS 391 F 3C 0.5
Great Russian Novels
Reading and interpretation of 19th-century novels selected from the works of Pushkin, Lermontov, Gogol, Turgenev, and Tolstoy. Lectures on social and intellectual background.
Taught in English.
Extra work in Russian required of Russian majors only.
Open to all students.

RUSS 392 W 3C 0.5
Great Russian Novels
Reading and interpretation of 19th and 20th-century novels selected from the works of Dostoevsky, Gorky, Pasternak, Zamyatin, and Solzhenitsyn. Lectures on social and intellectual background.
Taught in English.
Extra work in Russian required of Russian majors only.
Open to all students.

RUSS 441 F 3C 0.5
East Slavic Epic Tradition
A study of the origins and development of the Epic tradition in East Slavic Literature.
Taught in English.
Open to all students.

RUSS 442 W 3C 0.5
Russian Epic Tradition
As RUSS 441
Taught in English.
Open to all students.

RUSS 451 F 3C 0.5
Advanced Conversation, Grammar and Composition
This course is conducted in Russian and provides intensive practice in spoken and written Russian on the advanced level.
Prereq: RUSS 352 or equivalent

RUSS 452 W 3C 0.5
Advanced Conversation, Grammar and Composition
As RUSS 451
Prereq: RUSS 451 or equivalent

RUSS 461 F 3C 0.5
Twentieth Century Russian Literature
Reading, interpretation, and critical analysis of selected fiction and drama (Andreev, Bunin, Gorky, Katsav, Sholokhov, A. N. Tolstoy).
Taught in English.
Extra work in Russian required of Russian majors only.
Open to all students.

RUSS 462 W 3C 0.5
Twentieth Century Russian Literature
Reading, interpretation and critical analysis of selected fiction and drama (Arbusov, Bulgakov, Erenburg, Nabokov, Pasternak, Solzhenitsyn).
Taught in English.
Extra work in Russian required of Russian majors only.
Open to all students.

RUSS 481 F 3C 0.5
Russian Poetry
A study of themes and forms of representative authors of Classicism, Romanticism (Lomonosov, Derzhavin, Pushkin, Lermontov, Nekrasov, Fet, Tyutchev, etc.).
Prereq: RUSS 102 or equivalent

RUSS 482 W 3C 0.5
Russian Poetry
A study of themes and forms of representative authors from Symbolism to the present (Blok, Esenin, Mayakovsky, Akhmatova, etc.).
Prereq: RUSS 102 or equivalent

RUSS 485 F 3C 0.5
History of Russian Literature
This course deals with the emergence of the Russian national literature, emphasizing the cultural and intellectual setting from the beginning to 1917. Literary movements and major representative works not studied in other courses will be discussed.
Taught in English.
Extra work in Russian required of Russian majors only.
Open to all students.

RUSS 486 W 3C 0.5
History of Russian Literature
This second part deals with Russian literature up to the present. Literary movements and major representative works not studied in other courses will be discussed.
Taught in English.
Extra work in Russian required of Russian majors only.
Open to all students.

RUSS 496-498 F, W, S, J, A 0.5
Reading Courses in Approved Topics
Prereq: Approval of the Department
UKRAN 271 F 3C 0.5
Ukrainian Civilization (From the Beginnings to 1800)
This course presents the evolution of Ukrainian civilization from its prehistoric origins to the period of national revival in the late 18th century. Developments in literature, art, architecture, music, and the folk arts are examined against the background of Ukrainian history.
Taught in English.
Open to all students.

UKRAN 272 W 3C 0.5
Ukrainian Civilization (From 1800 to the Present)
Ukrainian 272 examines the artistic, intellectual, spiritual, and material progress of the Ukrainian people in the 19th and 20th centuries. Integral to this course are the cultural aspects of Ukrainian settlement in Canada.
Ukrainian and Ukrainian-Canadian literature.
Taught in English.
Open to all students.

UKRAN 301 F 3C 0.5
Introduction to Ukrainian Literature
Reading and critical interpretation of texts chosen from the works of Skovoroda, Kotliarevsky, Shevchenko, Franko, L. Ukrainka, and others.
Taught in English.
Open to all students.

UKRAN 302 W 3C 0.5
A Critical Survey of Literary Movements in 20th Century Ukrainian Literature
With special attention to the rise of the new angry generation of poets of the Sixties (V. Symonenko, L. Kostenko, V. Korotych, and others).
Taught in English.
Open to all students.

Gerontology

Professor, Director of the Program
W. F. Forbes, BSc, PhD, DSc (London)

Professor, Graduate Advisor
R.D. McPherson, MA (Western Ontario), PhD (Wisconsin)

Associate Professor, Undergraduate Advisor
J.C. Carlson, MSc, PhD (Massachusetts)

Associate Professor, Undergraduate Advisor
N.H. Charness, MS, PhD (Carnegie-Mellon)

Associate Professor, Part-time Studies
P. Naus, PhD (Nijmegen, Netherlands)

Assistant Professor
M.E. Haight, BSc, MSc, PhD (McMaster)

Course Descriptions

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 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 MTHEL 402b.

Department of Health Studies

Associate Professor, Chairman of Department of Health Studies
J.A. Best, BA (Queen's), PhD (Waterloo)

Assistant Professor, Associate Chairman Undergraduate Affairs
R.S. McColl, BSc (McGill), PhD (Purdue)

Assistant Professor, Associate Chairman Graduate Affairs
D. Mills, BSAg (Purdue), PhD (Indiana)

Associate Professor, Associate Dean, Special Projects
R.P. Schlegel, BA (Western Ontario), visual presentations and readings from Associate Professors
K.S. Brown, BMath, PhD (Waterloo)
A.J.R. Cameron, BA, MA, PhD (Waterloo)
M.E. Houston, BSc (Toronto), PhD (Waterloo)
M.T. Sharratt, BA, MA (Western Ontario), PhD (Wisconsin)

Assistant Professors
M.E. Haight, BSc, MSc, PhD (McMaster)
L. Hoffman-Goetz, BA (SUNY, Binghamton), MA, PhD (Michigan)
O. Martinez, BSc, MNS, PhD (Cornell)
A. Myers, BA (Winnipeg), MA, PhD (York)
K. Prkachin, BA, MA, PhD (British Columbia)
P. Wainwright, BSc (Rhodes, S.A.), MA, PhD (Waterloo)

Adjunct Faculty
N. Kreiger, BA (Pennsylvania), MH, PhD (Yale)
A.E. LeBlanc, BA (Queens), MSc, PhD (Toronto)

Faculty Members holding cross appointments to Health Studies from:
1Statistics
2Kinesiology
3Urban and Regional Planning and Environmental Studies


Course Descriptions

HLTH 140 F  3C,1T  0.5
Introduction to Health Sciences 1
An exploration of the biological basis of health and disease, strategies for prevention and treatment of disease, and the impact of innovations in health care on Canadian society. Topics include human reproduction, (conception, pregnancy and childbirth, sexual development and expression), human heredity (chromosomal disorders, genetic disease, birth defects), and acute disease states (infectious diseases, cancer, immune deficiencies).

HLTH 141 W  3C,1T  0.5
Introduction to Health Sciences 2
An exploration of the biological basis of health and disease, strategies for prevention and treatment of disease, and the moral, social and psychological impact of innovations in health care on Canadian society. Topics include the human nervous system (neurological disorders, mental illness, brain dysfunctions, drug abuse), lifestyles and health (heart disease, obesity, exercise, smoking), and health care systems (environmental health, medical abuses, aging, and dying).

HLTH 220 F  3C,1T  0.5
Health and the Family
The course familiarizes students with the issues involved in understanding how people live and develop within the context of families, and the family interaction with the larger social community. Special emphasis will be placed on health related concerns and the ways in which the family and health care institutions of the society contribute to the physical and emotional health of its members.

HLTH 241 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.

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.

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.

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 C$^{14}$ 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.

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 toxins cause human disease and disability.

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.

HLTH 346 W,S  3C  0.5
Nutrition
An elementary course in nutrition with special emphasis on diet for sport and certain physiological conditions.

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).

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.

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 cardio-respiratory implications of exercises in the rehabilitation process.
Department of History

Associate Professor, Chairman of the Department
J.W. Walker, BA (Waterloo), MA, PhD (Dalhousie)

Associate Professor, Associate Dean
J.O. Stubbbs, BA (Toronto), MSc (Econ) (London), DPhil (Oxford)

Assistant Professor, Undergraduate Officer
D.J. Horton, BA (Waterloo Lutheran), MA (Waterloo), PhD (McGill)

Professors
P.G. Cornel, ED, MA, PhD (Toronto)
M.J. Craton, BA (London), MA, PhD (McMaster) FRHistS
F.H. Epp, BA (Bethel College), MA, PhD (Minnesota), LLB (Brandon) G
F.C. Gerard, MA (Collège St. Dominique, France), BD, STM (McGill), PhD (Hartford, Conn.) P
L.T. Guelke, BSc (Cape Town), MA (York), PhD (Toronto)
P.J. Harrigan, BA (Detroit), AM, PhD (Michigan)
P. Keresztes, MA (Toronto), PhD (Graz)
W. Klaassen, BA (McMaster), DPhil (Oxford) G
J.F.H. New, BA, MA (Melbourne), PhD (Toronto), FRHistS
G.M. Ostrander, BA (Columbia), MA, PhD (California-Berkeley)

Associate Professors
M.T. Cherniavsky, MA (Oxford)
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)
R.C. Macgillivray, BA (Queen's) AM, PhD (Harvard)

Adjunct Faculty
K.R. Davis, BA (Toronto), MA (Wheaton), PhD (Michigan)
D. McNab, BA (Waterloo Lutheran), MA (McMaster), PhD (Lancaster)
W. Stanford Reid BA, MA (McGill), PhD (Pennsylvania), FRHistS

Faculty Members of History holding cross appointments to:
1Geography
2Classics

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes

100 Level: Introductory Courses. For First Year Arts students and for all other students interested.

200-248: Survey Courses. Primarily intended for non-History Majors, but open to History Majors.

250-258: Foundation Courses. Primarily intended for History Majors, but open to non-History Majors whether or not they have previously taken a history course.

300 Level: Special Topics Courses. Primarily intended for History Majors, but open to all students who have previously taken a history course.

400 Level: Senior Seminars. 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. This year's theme is "Community and Social Order," examining the dynamic relationship between individuals and their social structures, and their state.

HIST 102A W 0.5
The American Identity 1607-1980
A consideration of the shaping of American characteristics under the headings of: The Frontier, Religious Denominationalism; Libertarian Revolution; Black Slavery; New Immigrations; Mass Production; the Great Depression; War and Global Americanism.

HIST 102C W 0.5
The Origins of Wars in the Twentieth Century
An analysis of the diplomatic, political, economic, ideological, social and cultural explanations of the causes of the major wars of this century with special emphasis on Canada.

HIST 102D W 0.5
From Nationalism to Totalitarianism
The growth of nationalism and nation states since the French Revolution with attention to the Industrial Revolution, the World Wars, Fascism, Nazism and Stalinism.
Offered at Conrad Grebel College.

HIST 102E W 0.5
Canadian History
Selected major themes from pioneer life to Canadian involvement in 20th century wars.
Offered at St. Jerome's College.

HIST 102F W 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.
Offered at St. Jerome's College.

HIST 102M W 0.5
Law and Society in the Middle Ages: 500-1000
A study of the laws and legal procedures of the Early Middle Ages. Anglo-Saxon and Germanic law will be examined along with legal procedures and institutions of that era.
Offered at St. Jerome's College.

HIST 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 optional 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
Modern Quebec
The course will discuss the problem of Quebec in contemporary Canada by analyzing the historical background of key issues like separation, the survival of the French language, French-Canadian nationalism and the Quiet Revolution.

HIST 204X F 0.5
Life on the Ontario Frontier
The course examines the cultural, moral, social and economic adaptations of European settlers to the Upper Canadian frontier environment.

HIST 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.

HIST 208 F 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 210X F 0.5
History of Law
An historical introduction to law in the Ancient world. Babylonian, Assyrian, Hittite and Roman law and legal practices and concepts will be examined.
Offered at St. Jerome's College.

HIST 211 F 0.5
British History to 1603
A survey of the main stages in the transition of Britain from a remote province of the Roman Empire to a prominent state of post-Reformation Europe. Within the chronological framework, political and constitutional as well as ecclesiastical and social developments will be examined.

HIST 212 W 0.5
British History since 1603
A survey of the shaping of British society and the British experience from the time of Shakespeare to the present; constitutional conflict and compromise, rise and fall of empire, industrial and urban revolution, world wars and welfare state.

HIST 214X W 0.5
Empires and Missionaries
A survey of the role of missionaries in imperial history since 1500. Native responses to evangelization will be studied. Some comparisons will be made with indigenous response to Christianity in pre-modern times.

HIST 218 W 0.5
German History 1740-1945
The development of Germany from the Austrian-Prussian 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 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 226 S.F.W 0.5
The Middle East Conflict
A survey of regional, religious and
economic and political rivalries from ancient to modern
times, with emphasis on the 20th
century and the Arab-Israeli conflict.
Offered at Conrad Grebel College.

HIST 232 F 0.5
Revolutions in Latin America
An evaluation of the causes and effects of
revolutions in Latin America through
an examination of such countries as
Cuba, Mexico, Chile, etc.
Offered at St. Jerome's College.

HIST 233 W 0.5
Civil-Military Relations in Latin America
A study of the relationship between
civilians and the military in the history of
Latin America. Topics explored will
include European and U.S. influences on
professionalization and on the
development of political interest, and the
post-World War II flourishing of
professional militarism.
Offered at St. Jerome's College.

HIST 235 W 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 RS 230.

HIST 238 W 0.5
Ancient Civilization 2
An introduction to the social, political
and cultural history of Rome in its
development from a Republic to an
Empire. Special attention will be placed
on the sources of political power.
Offered at St. Jerome's College.

HIST 245 F 0.5
Religious and Cultural Minorities in Canada
A comparative study of the cultural and
political conflicts with society and state of
such ethnic and religious minorities as
Dukhobors, Hutterites, Jehovah's
Witnesses, Jews, and Mennonites
(including the Amish). Emphasis on 20th
century.
Offered at Conrad Grebel College.

HIST 247 F 0.5
Mennonite History: A Survey
This course covers Mennonite origins,
teachings, migrations, settlement
patterns, divisions, leaders, institutions,
and religious and social practices, indeed all facets of Mennonite history in various national settings.
Offered at Conrad Grebel College.

HIST 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.
Offered at St. Jerome's College.

HIST 252X W 0.5
Europe in the Nineteenth Century
European social and cultural history,
1815-1914. This course will consider the
inter-relationships 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.

HIS 254X W,S 0.5
Canadian History: The National Period
This course studies the development of
Modern Canada. Themes of the course
include immigration, industrialization,
feminism, labour unrest, and regionalism.
Also offered at St. Jerome's College in Winter term.

HIST 255 F 0.5
The Expansion of England
The history of the British Empire down to
the American War of Independence,
telling the story of the Tudor seadogs, of
the plantation of Ireland, the
settlement of the North American
mainland, the establishment of slave
plantations in the Caribbean, and the
earliest British enterprises in Africa, Asia
and the Pacific.

HIST 256 W 0.5
The British Empire and Commonwealth
The history of British imperialism
between the loss of the American
colonies and the Falklands Islands War of
1982, tracing the rise of the
settlement colonies to dominion status,
the huge expansion of the dependent
crown during the age of the New
Imperialism, the imperial apogee after
World War I, and the rapid change from
Empire to New Commonwealth after
World War II.

HIST 257 F 0.5
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 290 F 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 history of the English reformation,
expansively considered from the
beginnings of the European Reformation
to the establishment of the Anglican
church in the Revolutionary and
Restoration periods in the 17th century.

HIST 307 F 0.5
British History 1760-1867
A study of people, power, thought and
culture in the world's first industrializing
society.

HIST 308 W 0.5
Britain Since 1867
A study of the British experience and of
Britain's part in world history from the
1860's to the 1980's

HIST 310 F 0.5
French-Canadian History
An examination of pre-industrial French
Canada with emphasis on the cultural,
political and economic themes which
form the background to Modern Quebec
history.

HIST 320 W,S 0.5
The History of Modern Quebec
The course will treat the history of
Quebec from 1867 to the present.
Nationalism, separatism, language and
cultural problems, economic and social
issues are all examined in their historical
context.
Dissenters as Sebastian Franck.

Dissenting from both Protestantism and its relationship to such independent political and theological content; and its education, conscription and social context include church/state conflicts in organizational proliferation, theological and issues of identity.

Shifts, changing forms of leadership, HIST 346 W 0.5

A study of 16th century Anabaptism—a religious Reformation movement nonconformity, internal divisions, and such phenomena as refugee movements, international dispersions, and conflicts in new settings. Emphasis on 20th century international context, with particular emphasis on 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 formulation of constitutional law in the United States.

Offered at St. Jerome's College.

HIST 345 W 0.5

Minorities in International Perspective

An examination of the minorities phenomenon in the context of national, regional, and international power struggles and the resulting discriminations, refugee movements, international dispersions, and conflicts in new settings. Emphasis on 20th century.

Offered at Conrad Grebel College.

HIST 346 W 0.5

Mennonite History: Canadian Issues

Special issues examined in historical context include church/state conflicts in education, conscription and social policies, and such phenomena as nonconformity, internal divisions, organizational proliferation, theological shifts, changing forms of leadership, and issues of identity.

Offered at Conrad Grebel College.

HIST 348 W 0.5

The Radical Reformation

A study of 16th century Anabaptism—a religious Reformation movement dissenting from both Protestantism and Roman Catholicism—its origins, its social political and theological content; and its relationship to such independent dissenters as Sebastian Franck.

Offered at Conrad Grebel College.

HIST 350 W 0.5

West Indian History

A study of the Caribbean region from aboriginal times, including European imperialism, the history of plantations, slavery and slave society, independence movements, and the problems posed by modernization, underdevelopment and neo-colonialism.

HIST 355 W 0.5

Russian History 1812-1825

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 378 F 0.5

The Italian Renaissance

A study, against a social and political background, of creative achievements in the age of Machiavelli, Leonardo da Vinci, the Borgias.

Offered at Conrad Grebel College.

HIST 379 W 0.5

Reformation History

An analysis of the economic changes, the rise of "new monarchs", the nature of and effect of the "religious reformation", the expansion of Europe to the "new world" with their implications for 16th century Europe.

Offered at Conrad Grebel College.

HIST 399 W 0.5

Canada in World Affairs: From Laurier to Trudeau

An analytical and historical examination of Canadian foreign policy in the international system. Domestic sources of Canadian foreign policy and international sources of Canadian foreign policy are examined in detail.

HIST 397 F 0.5

Directed Studies in Special Topics

Study in a limited field under tutorial guidance. A high standard of written work will be expected.

Prereq: Honours History standing and permission of the instructor.

Not available to students with credit for 399A or B.

All 400 courses are designed for fourth-year Honours students. They are research seminars.

HIST 401X European 1.0

HIST 403X Canadian 1.0

HIST 405X British 1.0

HIST 409X American 1.0

COURSES NOT OFFERED 1984-85

HIST 102X Imperialism in the 20th Century

HIST 202X The Individual and the Family in History

HIST 206X The History of Canadian Minorities

HIST 207 East Central European History 1914-1983

HIST 213X Modern Western Popular Culture

HIST 216 Irish History: Achievement, Unification, Revolt

HIST 217 Irish History: the 19th and 20th Centuries

HIST 223 Canadian Culture and Society to 1900

HIST 224 Canadian Culture and Society in the 20th Century

HIST 230 Church and State in Modern Latin America

HIST 231 Oil and Politics in Latin America

HIST 237 Ancient Civilization 1

HIST 302 Medieval Church History 312-1096

HIST 303 Medieval Church History 1096-1449

HIST 311 Western European Cultural History 1600-1950

HIST 321 History of Canadian-American Relations to 1914

HIST 322 History of Canadian-American Relations since 1914

HIST 344 Mystical and Utopian Movements from the 12th to the 17th Century 1

HIST 344 Mystical and Utopian Movements 2

HIST 386 Ontario History to Confederation

HIST 387 Ontario History since Confederation

HIST 393 Seven Faces of Evil

HIST 407X Imperial
ITALIAN

Associate Professor
V.F. Golini, BA (McMaster), MA (Colorado), PhD (California-Berkeley)

KINESIOLOGY

Associate Professor, Chairman of Department
M. I. 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)

Associate Professor, Associate Dean, Undergraduate Affairs
W.N. Winkley, BA (Western Ontario), BPE (McMaster), BPE (California), PhD (Illinois)

Associate Professor, Associate Dean, Graduate Affairs, Faculty of Human Kinetics and Leisure Studies
R.W. Norman, BS, BPE (McMaster), MSc (Alberta), PhD (Pennsylvania State)

Associate Professor, Associated Chairman, Graduate Affairs
F. Allard, BA, BPE, PhD (Waterloo), Recipient of the Distinguished Teacher Award

Assistant Professor, Associate Chairman, Undergraduate Affairs
J.A. Thomson, BA, MSc (McMaster), PhD (Waterloo)

Associate Professor, Head of School of Anatomy
D.A. Ranney, BA, MD (Toronto), FRCS (England)

Professors
N.J. Ashton, BSc (McGill), MS (Michigan)
H.J. Green, BA, BPHE (Queen’s), MA (Alberta), PhD (Wisconsin)
M.F. Houennot, BSc (Toronto), PhD (Waterloo)
B.D. McPherson, BA, MA (Western Ontario), PhD (Wisconsin)
D.A. Winter, BSc, MSc (Queen’s), PhD (Dalhousie)

Associate Professors
J.E. Curtis, BA, (Sir George Williams) MA (Central Michigan), MA (Cornell)
R.L. Hughson, BSc (Western Ontario), MSc (British Columbia), PhD (McMaster)
I.D. Williams, MS, PhD (Illinois)

Assistant Professors
L.R. Brawley, BPE (Calgary), MSc (Oregon), PhD (Pennsylvania State)
KIN 102 F 3C,1T 0.5
Biophysical Bases of Kinesiology
Human physical movement is discussed from mechanical, anatomical and physiological viewpoints. The course provides a general orientation to the study of Kinesiology.

KIN 103 F 3C,1T 0.5
Psycho-Social Bases of Kinesiology
An introduction to the study of human physical activity from psychological, sociological, anthropological and historical perspectives.

KIN 116 W 3C 0.5
General Organic Chemistry
An introduction to the chemical concepts of importance in kinesiology and health studies.

KIN 200 F 3C,2L 0.5
Human Anatomy of the Limbs and Trunk
Functionally-oriented study of the limbs and trunk by regions using pre-dissected cadavers. A brief introduction to Neuroanatomy is included.

KIN 222 F 3C,2L 0.5
Statistical Techniques Applied to Kinesiology
An introduction to descriptive and inferential statistics and the interpretation of data. A major consideration of the course is the use of statistics in the solution of problems in Kinesiology.

KIN 242 F 3C,2L 0.5
Introduction to Movement Disorders
An introduction to selected movement disorders and their implications for physical activity. The movement disorders examined include those which accompany neuromuscular and perceptual-motor impairment, mental retardation, cardio-vascular and respiratory diseases.

KIN 252 W,S 3C 0.5
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.

KIN 255 W 3C,2L 0.5
Introduction to Psychomotor Behaviour
An information processing approach is used to introduce the principles of learning and performing fine and gross motor skills. In addition, social psychological variables are studied as they relate to the facilitation or decrement in learning and performance.

KIN 300 F,S 3C,2L 0.5
Physiology of Physical Activity
A study of the effects of physical activity on the muscular, circulatory and respiratory systems and the mechanisms through which the body adapts to activity and environment.

KIN 317 F 3C 0.5
Human Biochemistry
An elementary course in human biochemistry including the metabolism and function of proteins, carbohydrates, lipids, and hormones. Emphasis is placed on the application of biochemical principles to human movement.

KIN 321 W,S 3C,2L 0.5
Introduction to the Biomechanics of Human Movement
Anatomical, neuromuscular and mechanical considerations in the qualitative and quantitative analysis of human movement are examined. Concepts related to the biostatics and biodynamics of linked segment models of human motion are introduced.
KIN 340 F 3C, 2L 0.5
**Introduction to Sports Medicine**
An introductory course to the area of sports medicine, including the prevention, care and rehabilitation of common sports injuries. Considerable attention is directed towards the mechanisms of traumatic injuries as well as the management in the acute, intermediate and advanced stages of injury care.
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 vertebral column, internal injuries, heat problems and the medical and non-medical use of drugs in sport.
Prereq: KIN 340

KIN 346 W, S 3C 0.5
**Nutrition**
An elementary course in nutrition with special emphasis on diet for sport and certain physiological conditions.
Cross-listed as HLTH 346.

KIN 348 W, S 3C 0.5
**Social Psychology of Health Behaviour**
The study and application of basic social psychological processes in relation to selected health-related behaviours (e.g. family planning, overeating, smoking, non medical drug use, cardiovascular risk factors, patient compliance, medical care utilization).
Prereq: PSYCH 101 or consent of instructor
Cross-listed as HLTH 348.

KIN 349 F, S 3C 0.5
**Principles of Behaviour Modification**
A course providing a general overview of behaviour modification principles and procedures. Basic principles of reinforcement, punishment, modelling and desensitization are examined as they relate to health behaviour.
Prereq: PSYCH 101 or consent of instructor
Cross-listed as HLTH 349.

KIN 352 F 3C 0.5
**Sociology of Aging**
An introduction to individual and population aging. Topics discussed include: aging from an historical and comparative perspective; aging in subcultures; aging and the social structure; aging and social processes; aging and the environment; work and retirement; and aging and leisure patterns.
Prereq: SOC 101 and one other SOC course
Cross-listed as SOC 344.

KIN 354 W, S 2C, 1T 0.5
**Social Psychology and Physical Activity**
An examination of sport and other forms of physical activity as social situations. Topics such as social facilitation, modelling, person perception, expectancies, group structure, unity, motivation, leadership, conformity, and intergroup relations are introduced in relation to motor performance.
Prereq: PSYCH 101

KIN 356 F 2C, 1T 0.5
**Information Processing in Human Perceptual Motor Performance**
An information processing model of perceptual-motor behaviour is presented. Human performance theory is used to study processes mediating input and output information. Specifically, the subprocesses of storage of information in memory, perception, retrieval of information from memory and execution of movement are examined.
Prereq: KIN 222, 255

KIN 357 W 2C, 1T 0.5
**Motor Learning**
A course focused on the bases and applications of theories of motor learning. Included are selected psychological and neuropsychological processes as they relate to these theories.
Prereq: KIN 222, 255

KIN 401 W, S 3C, 2L 0.5
**Physiological Adaptations to Physical Activity**
An analysis of the physiological adaptations that occur in response to protracted physical activity and the influence of such adaptations on the response to work, in a variety of environmental conditions. Special emphasis is given to the changes occurring in skeletal and cardiac muscles and the neuro-endocrine mechanisms involved.
Prereq: KIN 300 and 317

KIN 402 F 3C 0.5
**Hydrospace, Altitude and Aerospace Physiology**
An examination of man's cardiorespiratory responses at rest and during work to selected stresses of hyperbaric and hypobaric environments.
Prereq: KIN 300

KIN 404 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 pathologie, 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 410 W 3C 0.5
**Growth and Development, and Aging**
The physiology of human growth, development and aging is examined with special reference to the influence of diet, environment, exercise and disease on the normal processes.
Prereq: KIN 200 and BIOL 230
Cross-listed as HLTH 410.

KIN 416 W 3C 0.5
**Neuromuscular Integration**
An examination of the neural processes involved in the maintenance of posture and the control of movement.
Prereq: KIN 201 and PSYCH 261 or consent of instructor

KIN 420 W 3C 0.5
**Kinesiological Considerations in Equipment Evaluation**
The principles of analysis and assessment of equipment for human use (e.g. helmets, backpacks, shoes) and selected tasks (e.g. manual materials handling) are studied from a kinesiological perspective. The use of biomechanical analytical techniques is emphasized.
Prereq: KIN 321, 3B and 4th year students only or consent of instructor
KIN 425 is advisable and may be taken concurrently.
KIN 425 W 3C,2L 0.5
Biomechanics of Human Movement
The quantitative measurement and analysis of the movement of the human musculoskeletal 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 and statistical analyses of passive and active systems and the control systems (cardiac, respiratory, neuromuscular) associated with human movement.
Prereq: KIN 321, KIN 300, KIN 357 or consent of instructor

KIN 431 F,W,S 0.5
Research Proposal
An independent paper in the form of a research proposal on an approved topic, supervised by a faculty member (see KIN 432 for range of topics). The proposal shall consist of 3 chapters which include: (1) an introduction or statement of the problem, (2) a review of the literature, (3) methods and procedures.
Prereq: 4th year Honours Kinesiology

KIN 432 F,W,S 0.5
Research Project
An independent research project on an approved topic, supervised by a faculty member. (The first three chapters are completed as KIN 431.) The project may include survey, experimental or theoretical research, program evaluation, mathematical modelling, fitness appraisal, etc.
Prereq: KIN 432
It is strongly recommended that students planning graduate studies take KIN 431 and KIN 432.

KIN 433 F,W,S 0.5
Senior Essay
An extensive critical review of the literature on an approved topic. The topics will be broader in scope than those associated with specific research proposals.
Prereq: 4th year Honours Kinesiology

KIN 452 F,S 3C 0.5
Sport in Society
An advanced course in the sociology of sport with a particular focus on sport in Canadian society. Topics include the structure and processes of Canadian sport and its place in Canadian social structure and culture.
Prereq: KIN 252 or REC 203 or SOC 348

KIN 453 F,S 3C 0.5
The Psychology of Sport and Physical Activity
An introduction to specific psychological topics as they relate to the social psychological behaviour of the individual in motor performance situations. Topics usually examined are personality, anxiety, motivation, attribution.
Prereq: KIN 354

KIN 456 F 3C 0.5
Cognitive Dysfunction and Motor Skill
An examination of issues related to understanding the cerebral organization of motor skill. Discussion of how certain movement disorders are a reflection of disturbances at different stages in the sequence of information processing.
Prereq: One of PSYCH 206, 207, or KIN 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 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 472F 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 sport section.
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 492 Y 2T 0.5
Clinical Kinesiology - Cardiac Rehabilitation Practicum
Practical experience with cardiac patients in a rehabilitation setting; major emphasis is placed upon the cardiovascular implications of exercise and behaviour modification.
Prereq: KIN 300, 407, 349, and experience with high risk patients, plus consent of instructor.
Courses may be taken concurrently.

COURSES NOT OFFERED 1984-85
KIN 171 History of Sport and Physical Activity
KIN 280 Administration
KIN 402 Hydrospce, 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 180** Elem. Track and Field, F,S
- **KIN 188** Adv. Aquatics, W
- **KIN 185** Adv. Field Hockey, F,S
- **KIN 184** Adv. Football, W,S
- **KIN 183** Adv. Field Hockey, W
- **KIN 182** Adv. Track and Field, F,S

Department of Man-Environment Studies

Associate Professor, Chairman of the Department

G.R. Priddle, RA, (Western Ontario), MA, PhD (Clark)

Associate Professor, Undergraduate Officer

S.C. Lerner, BA (Ohio State), MA (Columbia)

Professors

- G.R. Francis, BA (Toronto), BA (McGill), MA (British Columbia), PhD (Michigan)
- P.H. Nash, BA, MA (California-Los Angeles), CE (Grenoble), MCP, MPA, PhD (Harvard), MCP, AICP

Associate Professors

- D. Estrin, BA, LLB (Alberta)
- R. Keith, BA (Guelph), MA, PhD (Michigan State)
- S. Kumar, BSc, MSc (Punjab), MA, PhD (Toronto)

Assistant Professors

- R.B. Gibson, BA (York), MA, PhD (Toronto)
- J.J. Kay, BSc (McGill), MSc (Waterloo)
- M.C. Kasik-Delfgaauw, BEcon (Amsterdam), MA, PhD (Waterloo)
- G.O. Michalenko, BA, PhD (Saskatchewan)
- J.B. Robinson, BA (Toronto), MES (York), PhD (Toronto)
- J.E. Robinson, BSc (Waterloo), MES (York)

Adjunct Faculty

- E.J. Farkas, BSE (Princeton), ScD (MIT), PEng

Faculty Members of Man-Environment Studies holding cross and/or joint appointments with:

1. Geography, Urban and Regional Planning, and School of Landscape Architecture, University of Guelph
2. Environmental Studies

Course Descriptions

Courses 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 1*

Designed to complement the introductory overview of ENV S 195 and the introduction to methods and techniques (M ENV 150/151). Selected themes and case examples are analyzed within a framework of concepts and theories from the natural and social sciences. Students undertake practical exercises to develop analytic and problem-solving skills.

Prereq: Honours Man-Environment Studies

**M ENV 101** W 2C, 1T 0.5

*Issue Analysis and Problem Solving for Environmental Studies 2*

Continuation of M ENV 100.

Prereq: Honours Man-Environment Studies

**M ENV 150** F 3C 0.5

*Environmental Methods and Techniques 1*

Workshop approach to introducing methods and techniques appropriate for investigating different environmental problems. Field studies, laboratory analyses, questionnaire design, environmental organizing and various other approaches.

Prereq: Man-Environment Studies or consent of instructor

**M ENV 151** W 3C 0.5

*Environmental Research Skills*

Course will teach basic research skills to complement the problem-solving skills taught in M ENV 100/101. Concentration on the "systems approach", 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 218** F 3C 0.5

*Introduction to Canadian Energy Issues*

Emphasis on physical concepts, terminology, units, current policy, supply and demand noting technical and economic aspects, and alternative energy strategies.
Introduction to Environmental and Social Impact Assessment
An introduction to means of assessing proposed approaches to environmentally and socially significant problems and opportunities. Special emphasis on the nature and limitations of conventional means of assessing the impacts, and overall desirability of technologies, projects, plans and policies. Close examination of case examples.

M ENV 241 W 3C 0.5
Introduction to Environmental and Social Impact Assessment
An introduction to means of assessing proposed approaches to environmentally and socially significant problems and opportunities. Special emphasis on the nature and limitations of conventional means of assessing the impacts, and overall desirability of technologies, projects, plans and policies. Close examination of case examples.

M ENV 275 F,W 2R 0.5
Special Readings
Background reading and study in consultation with Faculty. Typically utilized when a student must study a topic in connection with other work, but no course offering that topic is available.

M ENV 290 F 4S/wkshp 0.5
Seminar-Workshop
Individual or small group project emphasizing multidisciplinary treatment of environmental problems. Work encouraged on situations of interest to community organizations, government agencies or other groups.

M ENV 291 W,S 4S/wkshp 0.5
Seminar-Workshop
Continuation of project begun in M ENV 290.

M ENV 295 F 2C,1S 0.5
Development of Environmental Thought 1
Through the use of Ascent of Man films and a number of texts, this course will provide an historical perspective on the development of environmental thought, with special emphasis on the role of science and technology.

M ENV 296 W 2C,1S 0.5
Development of Environmental Thought 2
Continuation of M ENV 295.

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.

M ENV 320 W 2C,1T 0.5
Environmental Economics
Evaluation of various economic approaches to the environment. Introduction to various models used to analyze environmental quality and use in the design of environmental policy and management initiatives.

M ENV 337 W 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.

M ENV 338 F 3C 0.5
Social Impact Assessment
Introduction to the background, theory and methodology of social impact assessment (SIA). SIA as a type of social science research and as a key element in achieving more informed and responsible decision-making in society. Experience in SIA design for environmentally-relevant cases.

M ENV 350 W 2C 0.5
Community Action on Environmental Problems
The citizen's role in the solution of environmental problems. The work of various community groups is examined and evaluated. Students select topics of particular interest to them for in-depth study.

M ENV 375 F,W 2R 0.5
Special Readings or Seminars on Selected Topics
Prereq: Consent of instructor

M ENV 385 F 3C,1S 0.5
Technology/Lifestyles for a Conserver Society
What is a Conserver Society? What must we do to make our society into a Conserver Society? How do we evaluate the appropriateness of a lifestyle or technology for a Conserver Society? Is a Conserver Society realistic? This course will explore these questions, with emphasis on student participation in discussion and in seminar presentations. Lectures will focus on the basics of various technologies and lifestyles, and on quantitative techniques for comparing these.

M ENV 390A F,W 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.

M ENV 390B F 0.5
Seminar-Workshop
Same as M ENV 390A but with additional intensive investigation of the project as warranted by the project and by student ability.

M ENV 391A F,W 4S,wkshp 0.5
Seminar-Workshop
Continuation of M ENV 390A

M ENV 391B W 8S,wkshp 1.0
Seminar-Workshop
Continuation of M ENV 390B

M ENV 400 Y 3C 1.0
Senior Honours Seminar
Provides practice in applying skills that are useful to people working in different kinds of organizations. Readings, discussions and exercises emphasize problem perceptions and diagnoses, actor system analyses, and planning management and evaluation activities as these are carried out by and within organizations. Special attention given to roles that persons having an environmental studies background may be particularly well prepared to develop and refine.

Prereq: Third or fourth year Man-Environment Studies or consent of instructor
Course Descriptions
Man-Environment Studies
Management Sciences

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 475 F,W 2R 0.5
Special Readings or Seminar on Selected Topics
See course descriptions under M ENV 275 and 375.
Prereq: Consent of instructor

M ENV 476 Y 2R 1.0
selected Topics
Prereq: Consent of instructor

M ENV 490 Special Topics Seminar

M ENV 490A, B, or C Y 4 8,12C
1 02 03 0
Senior Honours Assignment

490A (1 course credit)
490B (2 course credits)
490C (3 course credits)

A project of sufficient scope to demonstrate mastery of problem-solving and communication skills on a selected problem or issue concerning man-environment interrelationships. Variable credit only by consent of faculty.
Prereq: Honours Man-Environment Studies

COURSES NOT OFFERED 1984-85

M ENV 260 Visual Perception and Communication
M ENV 331 Environmental Issues in a Global Perspective

M ENV 351 Organizations and Environmental Management
M ENV 360 Man and Nature
M ENV 361 Communication Systems and International Development
M ENV 450 Environmental Design
M ENV 470 Environmental Teaching and Learning

Department of Management Sciences

Professor, Chairman of the Department
M.J. Magazine, BS (City College of New York), MS (New York University), MEng, PhD (Florida), PEng

Associate Chairman, Undergraduate Officer
J.B. Moore, BASc (Toronto), MMath, PhD (Waterloo), PEng

Professors
J.A. Suzack, BSc, BE (Sydney), MSc, PhD (Birmingham)
D.W. Conrath, BA (Stanford), MS (Carnegie Tech), MA, PhD (California-Berkeley), PEng (London), FSS, PEng
S.D. Saleh, BA (Cairo), MA, PhD (Case Western Reserve)

Associate Professors
I. Bernhardt, BA (New York), PhD (California-Berkeley)
J.H. Bookbinder, MBA (Toronto), MS, PhD (California-San Diego)
F.E. Burke, BA (London), PEng
R.G. Vickson, BSc (British Columbia), PhD (Massachusetts Institute of Technology)

Assistant Professors
J.D. Fuller, BSc (Queen’s), MSc, PhD (British Columbia)
Y. Gerchak, BA, MSc (Tel-Aviv), PhD (British Columbia)
C.A. Higgins, BMath, MMath, PhD, (Waterloo), NSERC University Research Fellow
V. Mason, BASc, MAse (Toronto), PhD (Waterloo), PEng
F. Safyouri, BS (Idaho), MSc, PhD (Victoria)

Faculty Member holding cross appointment to Management Sciences from:
Chemical Engineering and Statistics

Course Descriptions
M SCI 21 F,W 3C 0.5
Probability and Statistics 1

M SCI 23 F,W,S 2C,1T 0.5
Managerial and Engineering Economics 1
This course is designed to satisfy Engineering Economics requirements of the Canadian Accreditation Board. Price and output decisions. Choosing among alternative inputs and production processes. Evaluating alternative investments, equipment service life, and new products.

M SCI 32 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 43 W 2C,11 0.5
Managerial and Engineering Economics 2
Prereq: M SCI 23 or equivalent

M SCI 44 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.
The second half examines the organizational processes such as conflict and communication control. Throughout, an effort is made to relate course material to organizational processes such as conflict and communication control. Applications include inventory control, reliability, equipment replacement, maintenance, design of service facilities, etc.

Prereq: M SCI 21 or equivalent and M SCI 46

M SCI 48 F,W,S 3C 0.5
Introduction to Production Management
Introduction to a number of production areas in the management of production/industrial engineering. Topics chosen from production planning and inventory control, planning/control of large projects, quality control, reliability/maintenance, facilities layout, job design, production standards and work measurement.

M SCI 47 F,S 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.

Prereq: M SCI 44
Adjunct Faculty
W.F. Ames, MS (Wisconsin)
M.A. Donelan, PhD (British Columbia)
D.J. Henderson, BS (British Columbia),
PhD (Utah), FinsP
G.W. Homsdeski, BSc (Washington), PhD
(Waterloo)
W.F. Langford, PhD (California)
H. Rund, PhD (Cape Town), Habilitation
(Freiburg)
R.E. Woolsey, PhD (Texas)

Lecturer,
B.J. Marshman, PhD (Waterloo)

Faculty Members of Applied
Mathematics holding cross
appointments to:
1Pure Mathematics
2Chemistry
3Physics

Faculty Members holding cross
appointments to Applied Mathematics
from:
4Computer Science
5Civil Engineering
6Chemistry

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DEPARTMENT OF
COMBINATORICS AND
OPTIMIZATION

Associate Professor and Chairman of
the Department
P.J. Schellenberg, PhD (Waterloo)

Professor, Associate Dean of the Faculty of
Mathematics
K.D. Fryer, BA (Western Ontario), PhD
(Toronto)

Professor and Associate Chairman for
Undergraduate Affairs
R.C. Read, MA (Cambridge), PhD
(London)

Associate Professor and Associate
Chairman for Graduate Affairs
L.B. Richmond, MSc (Manitoba), PhD
(Alberta)

Distinguished Professor
W.T. Tutte, PhD (Cambridge), FRSC

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DEPARTMENT OF
COMPUTER
SCIENCE

Professor and Chairman of the
Department
R.B. Simpson, BSc, MASc (Toronto),
PhD (Maryland)

Professor, Dean of the Faculty of
Mathematics
J.A. George, BSc, MSc (Alberta), PhD
(Stanford)

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Course Descriptions
Faculty of Mathematics

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Adjunct Faculty
W.F. Ames, MS (Wisconsin)
M.A. Donelan, PhD (British Columbia)
D.J. Henderson, BS (British Columbia),
PhD (Utah), FinsP
G.W. Homsdeski, BSc (Washington), PhD
(Waterloo)
W.F. Langford, PhD (California)
H. Rund, PhD (Cape Town), Habilitation
(Freiburg)
R.E. Woolsey, PhD (Texas)

Lecturer,
B.J. Marshman, PhD (Waterloo)

Faculty Members of Applied
Mathematics holding cross
appointments to:
1Pure Mathematics
2Chemistry
3Physics

Faculty Members holding cross
appointments to Applied Mathematics
from:
4Computer Science
5Civil Engineering
6Chemistry

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DEPARTMENT OF
COMBINATORICS AND
OPTIMIZATION

Associate Professor and Chairman of
the Department
P.J. Schellenberg, PhD (Waterloo)

Professor, Associate Dean of the Faculty of
Mathematics
K.D. Fryer, BA (Western Ontario), PhD
(Toronto)

Professor and Associate Chairman for
Undergraduate Affairs
R.C. Read, MA (Cambridge), PhD
(London)

Associate Professor and Associate
Chairman for Graduate Affairs
L.B. Richmond, MSc (Manitoba), PhD
(Alberta)

Distinguished Professor
W.T. Tutte, PhD (Cambridge), FRSC

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DEPARTMENT OF
COMPUTER
SCIENCE

Professor and Chairman of the
Department
R.B. Simpson, BSc, MASc (Toronto),
PhD (Maryland)

Professor, Dean of the Faculty of
Mathematics
J.A. George, BSc, MSc (Alberta), PhD
(Stanford)
Assistant Professors
R. Aleknas, BMath (Waterloo), MSc, PhD (Toronto)
J.C. Beatty, BA (Princeton), PhD (California-Berkeley)
B.W. Char, BA (Swarthmore), PhD (California-Berkeley)
M.L.J. Coyle, BSc, MSc, PhD (Toronto), ME (Saskatchewan)
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V.A. Dyck, BMath, MMath (Waterloo)
D. Field, BS (Maryland), MA, PhD (Princeton)
J.H. Johnson, BMath, MMath, PhD (Waterloo)
M. Kaminski, MA (Moscow), PhD (Hebrew University of Jerusalem)
K. Kumar, BSc (Indian Institute of Technology), MBA, PhD (McMaster)
A. Nait-Abdallah, MMath, MCS, Doctoral 3rd cycle, Doctorat és Science (Paris)
E.G.Y. Ng, BMath, MMath, PhD (Waterloo)
D.L. Poole, BSc (Flinders University), PhD (Australian National University)
D.J. Taylor, BSc (Saskatchewan), MMath, PhD (Waterloo)
J.H. Vellenga, BA (Western Ontario) MA (Waterloo) (Part-time)
J.W. Welch, BSc (McGill), PhD (Waterloo) (Part-time)

Adjunct Faculty
B.A. Barsky, BSc (McGill), MS (Cornell), PhD (Utah)
P.H. Dinkel, BSc, MA (Waterloo)
P.W. Dymond, BSc, MSc, PhD (Toronto)
D.C.-L. Lam, BSc (Hong Kong), PhD (Waterloo)
D.E. Morgan, BS (Rose Polytechnic Institute), MS (University of Michigan), PhD (Waterloo)

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H. Hoekstra, BSc (New Brunswick), MMath (Waterloo)
R.G. Goebel, BSc (Regina), MSc (Alberta)
R.L. Walker, BSc, MSc (Western Ontario)

Faculty Members of Computer Science holding cross appointments to:
1. Applied Mathematics
2. Electrical Engineering
3. Combinatorics & Optimization

Faculty Members holding cross appointments to Computer Science from:
4. Electrical Engineering

5. Statistics and Actuarial Science
6. Accounting Group

DEPARTMENT OF PURE MATHEMATICS
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P. Kannemann, BSc (Annamaalai), PhD (London)
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R.A. Staal, PhD (Toronto)
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J.G. Kalbfleisch, BSc (Toronto), MA, PhD (Waterloo)

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Course Descriptions
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J.C. Young, BASc (Toronto), MSc (Waterloo), PhD (Edinburgh)
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K.P. Sharp, BA (Cambridge), MA (California Berkeley), FCIA, FA
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Research Assistant Professor
J.A. Jackson, MA, MB, BChir (Cambridge), Gerontology Research Council Fellow
Adjunct Faculty
H.M. Attribu, BA (Manitoba), FSA, FCIA
J.M. Gani, BSc (London), PhD (ANU), DSc (London), DIC, FAA
J.A. Mereu, BA (Western Ontario), FSA, FCIA
Lecturer
C. Springer, BSc, MSc (McGill)
Faculty Members of Statistics and Actuarial Science holding cross appointments to
1Psychology
2Recreation
3Sociology
Faculty Members holding cross-appointments to Statistics and Actuarial Science from:
4Accounting Group
5Chemical Engineering and Management Sciences

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N. Gould, Department of Combinatorics & Optimization
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The Strategy Board was established to provide liaison between the Faculty of Mathematics and knowledgeable representatives from key sectors of the economy. Board meetings are normally held twice a year.

FACULTY OF MATHEMATICS

Introductory Notes

1. Courses with the following abbreviations are offered by the Faculty of Mathematics: ACTSC (Actuarial Science), AM (Applied Mathematics), C&O (Combinatorics & Optimization), CS (Computer Science), MATH (non-departmental Faculty courses), MTH-EL (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, these courses are normally open to students in any UW faculty, assuming that stated prerequisites have been met.

2. Courses offered by the Faculty of Mathematics which have been designed with the academic needs and backgrounds of students in other faculties in mind are identified by a note following the course description. These courses appear in the sequence described above. They are AM 101, 111; CS 112, 115, 116, 118, 316; MATH 103, 104, 105, 106, 110a/b, 111a/b, 113a/b, 114, 115a/b, 210, 211, 212, 213a/b, 215, 216; STAT 202, 204, 210, 300, 304, 311.
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: ACTSC 221
Credit will be granted for only 1 of ACTSC 221, 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
Credit will be granted for only 1 of ACTSC 222, 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 1309
Credit will be granted for only 1 of ACTSC 221, 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 and annual premiums for insurances and annuities in both the discrete and continuous case. An introduction to actuarial reserves.
Prereq: ACTSC 231, MTHEL 305a, STAT 230
Credit will be granted for only 1 of ACTSC 222, 232.

ACTSC 331 F,S 3C 0.5
Life Contingencies - Single Lives
Reserves, company expenses and gross premium and cash value calculations. Multiple decrement theory. Supplementary benefits.
Prereq: ACTSC 232

ACTSC 332 W 3C 0.5
Life Contingencies - Multiple Lives
Prereq: ACTSC 232

ACTSC 338 W 3C 0.5
Graduation of Life Tables
Theory and methods of data graduation with particular reference to life tables.
Prereq: ACTSC 222 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
Calculations of net premiums and reinsurance premiums. Ruin theory. Utility theory.
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 222 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.
Coreq: MTHEL 305b, ACTSC 331

ACTSC 452 W 3C 0.5
Selection of Risks 2
A further selection of topics on medical and non-medical risks and indemnity.
Prereq: ACTSC 451

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 331 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 305a/b

ACTSC 458 W 3C 0.5
Insurance Law
Topics in Canadian and American Insurance Law.
Prereq: ACTSC 331, MTHEL 305a/b

ACTSC 463 W 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

COURSES NOT OFFERED 1984-85

ACTSC 223 Group Life and Health Insurance
ACTSC 337 Finite Differences
ACTSC 391 Topics in Actuarial Mathematics
Course Descriptions

Actuarial Science

ACTSC 441 Advanced Topics in Actuarial Mathematics
ACTSC 464 Topic 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 101 F 3C 1T 0.5 Applications of Mathematics 1 (For Biology Students)

AM 111 W 3C 1T 0.5 Applications of Mathematics 2 (For Biology Students)

AM 260 F W 3C 0.5 Mathematical Modelling
Mathematical models for problems in the physical and biological sciences. Typical problems chosen from ecology, special relativity, spread of epidemics, rumours and tumors. Solutions to problems will be obtained primarily by differential equations.

AM 270 F W 3C 0.5 Mathematical Modelling
Further mathematical models from various disciplines. An introduction to Newtonian mechanics will also be included in the course.

AM 340 W 2C 0.5 Applications of Mathematics
Difference equations. Laplace transforms applied to discrete and continuous mathematical models taken from ecology, biology, economics and other fields.

Prereq: MATH 220b or consent of instructor

AM 362 F.S 3C 0.5 Elementary Differential Geometry and Tensor Analysis
Curves in Euclidean 3-Space (E3) and the Serret-Frenet formulas: surfaces in E3 and their intrinsic geometry. Gaussian curvature and the Gauss-Bonnet theorem. Co-ordinate transformations and tensors in n-dimensions; n-dimensional Riemannian spaces; covariant differentiation; geodesics; the curvature, Ricci and Einstein tensors. Applications of tensors in Relativity and Continuum Mechanics.

Prereq: MATH 230b or consent of instructor

Cross-listed as PMA TH 365.

AM 365 W 2C 1T 0.5 Introduction to Continuum Mechanics

Prereq: MATH 230b and AM 371 or consent of instructor

Coreq: MATH 332b

AM 371 F.S 2C 1T 0.5 Partial Differential Equations of Applied Mathematics 1
First order partial differential equations and methods of characteristics, second order partial differential equations, boundary value problems and related numerical methods, vibrating string, 2-D membranes, heat equation and related problems; introduction to vector analysis.

Prereq: AM 260, MATH 230b, or consent of instructor

AM 372 W 2C 1T 0.5 Introduction to General Relativity
Flat spacetime and Lorentz transformations, relativistic mechanics, Maxwell’s equations; curved space-time and the Einstein field equations, the Schwarzschild solution and some experimental tests of general relativity, the weak field limit; introduction to black holes and cosmology.

Prereq: AM 362 or instructor

A student may receive credit for only 1 of AM 372 or 364.

AM 380a F.S 3C 0.5 Introduction to Information Theory with Applications

Prereq: Consent of instructor

Cross-listed as PMA TH 380a.

AM 380b W 3C 0.5 Information Theory with Applications

Prereq: Consent of instructor

Cross-listed as PMA TH 380b.

AM 381 F.S 2C 1T 0.5 Ordinary Differential Equations 1
Existence and uniqueness theorems, second and higher order equations, series solutions and special functions, Laplace transforms. Application to Mathematical Physics.

Prereq: MATH 230b

AM 381 W 2C 1T 0.5 Ordinary Differential Equations 2

Prereq: AM 381.
AM 396 F 2C,1T 0.5  
**Mechanics**  
**Prereq:** MATH 230b or consent of instructor

AM 398 F 0.5  
**Reading Course**

AM 399 W 0.5  
**Reading Course**

AM 430 F 2C 0.5  
**Applications of Mathematics**  
Integral equations and integral transforms will be applied to systems with memory.  
**Prereq:** Consent of instructor

AM 440 W 2C 0.5  
**Applications of Mathematics**  
As a project, students will develop a mathematical model and interpret its behaviour.  
**Prereq:** Consent of instructor

AM 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 problem-solving course: theorems of modern algebra are applied to specific examples chosen from analysis, geometry, probability, graphs and matrices, numerical and multilinear approximation, tensors, and special functions.  
**Prereq:** MATH 224b

AM 462 F 3C 0.5  
**Measure and Integration**  
The theory of measure and the Lebesgue integral.  
**Prereq:** MATH 332a or PMATH 351a

AM 464 F 2C 0.5  
**Topics in General Relativity**  
Basic ideas of relativistic cosmology (Friedmann-Robertson-Walker universes, observational status of cosmological theories, black hole theory (the Schwarzschild and Kerr solutions, their event horizons and singularities, gravitational collapse, observable properties of black holes), and an introduction to gravitational waves. Other topics of current interest may be discussed.  
**Prereq:** AM 362 and 372 or consent of instructor

AM 465a F 2C 0.5  
**Quantum Mechanics 1**  
**Prereq:** Consent of instructor

AM 465b W 2C 0.5  
**Quantum Mechanics 2**  
**Prereq:** AM 465a

AM 466 F 3C 0.5  
**Fluid Mechanics A**  
Fundamental equations of inviscid fluids, compressibility, vorticity, two and three-dimensional irrotational, incompressible flow. Basic properties of the Navier-Stokes 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 468 F 2C 0.5  
**Topics in Applied Mathematics**  
A selection of special topics given by members of the Applied Mathematics Department.  
**Prereq:** Consent of instructor

AM 474 W 2C,1T 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 462 or consent of instructor  
**Cross-listed as PMATH 465**

AM 476 W 2C 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 468a

AM 481b W 2C 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 2C,1T 0.5  
**Calculus of Variations**  
**Prereq:** MATH 230b or consent of instructor

AM 486 F 2C 0.5  
**Electromagnetism**  
Applications of Maxwell's equations, introduction to wave guides and antennae.  
**Prereq:** PHYS 253 or consent of instructor

AM 488 W 3C 0.5  
**Statistical Mechanics**  
Applications of probability theory to theoretical Physics.  
**Prereq:** Consent of instructor

AM 488 W 3C 0.5  
**Control Theory**  
**Prereq:** Consent of instructor
Combinatorics and Optimization

Course Descriptions

Applied Mathematics

Combinatorics and Optimization

AM 489 F 0.5
Reading Course

AM 495 W 2C,1T 0.5
Elasticity
Basic equations of elasticity for homogeneous isotropic bodies; bending of beams; plane elastic waves; Rayleigh surface waves, Love waves. Solution of problems by potentials, variational methods and Saint Venants' principle.
Prereq: AM 365

AM 499 W 0.5
Reading Course

COURSES NOT OFFERED 1984-85

AM 364 Special Relativity
AM 461 Non-Linear Differential Equations
AM 463 Introduction to Differentiable Manifolds

Combinatorics and Optimization

Course Descriptions

C&O 220 F,W 3C 0.5
Introduction to Combinatorics
Credit will be granted for only 1 of C&O 220, 230. C&O 220 cannot be counted for credit toward a BMath Honours degree.
Offered at St. Jerome's College in Winter term.

C&O 230 F,W,S 3C 0.5
Introduction to Combinatorics
Introduction to the combinatorics of ordinary and exponential generating functions. Introduction to basic graph theory and graphical algorithms.
Prereq: MATH 134b
Credit will be granted for only 1 of C&O 220, 230.

C&O 270 F,W,S 3C 0.5
Introduction to Optimization
Prereq: MATH 130b, 134b
Students may not enrol in C&O 270 if they have previously completed, or are concurrently enrolled in, C&O 350 or 367.
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 224b
Offered at St. Jerome's College.

C&O 342 F,S 3C 0.5
Graph Theory 1
An introduction to the ideas, methods and applications of graph theory. Finding shortest paths and maximum matchings in weighted graphs. Determining the connectivity of a graph.
Prereq: 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

C&O 351 F,W 3C 0.5
Network Flow Theory
Prereq: C&O 350

C&O 367 F,W 3C 0.5
Deterministic OR Models
An applications-oriented course that illustrates how various mathematical models and methods of optimization can be used to solve problems arising in business, industry and science.
Prereq: C&O 350

C&O 370 F,W 3C 0.5
Stochastic OR Models
An introduction to the use of probabilistic models in operations research. Techniques and applications of queueing theory, inventory theory and reliability theory.
Prereq: STAT 221

C&O 371 W 3C 0.5
Mathematical Discovery and Invention
A course in problem solving. 100 problems are studied. Problems are taken mainly from the elementary parts of algebra, geometry, number theory, combinatorics and probability.
Prereq: MATH 130e/b, 134e/b, (220e/b, 224e/b, are recommended)
Although the mathematics for this course is technically elementary, the course is intended for third and fourth year students, and the mathematical maturity of a senior student will be assumed.
C&O 382 F 2C 0.5

**Combinatorial Geometry**

An introduction to the combinatorial aspects of the real plane. Main topics covered are the enumeration of various combinatorial objects in the plane, Sylvester's 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, Helly's theorem and certain ramifications will be explored.

Prereq: MATH 130a/b, 134a/b

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.

Offered at St. Jerome's College.

C&O 430 W 3C 0.5

**Algebraic Enumeration**

The course is an extension of C&O 330. The combinatorics of Eulerian generating functions, the algebra of sequence types, maximal decomposition theorem, Lagrangian methods and their applications. Random walks and the Hopf factorization. Symmetric functions and plane partitions.

Prereq: C&O 330

C&O 434 F 2C 0.5

**Combinatorial Design**

Topics covered include error correcting codes, resolvable designs, affine designs, weighting matrices, and their interaction.

Prereq: MATH 324

C&O 438 W 3C 0.5

**Combinatorial Computing**

A course covering a number of applications of computers to combinatorial problems. General procedures - backtrack programming, generation of permutations, partitions etc., as well as the solution of many specific problems. Includes an introduction to computational complexity.

Prereq: C&O 230

C&O 439 2C 0.5

**Topics in Combinatorics**

An undergraduate seminar in combinatorics. The primary objective is to study current work in specific areas of combinatorics. Course content may vary from term to term.

Prereq: Consent of instructor

C&O 440 F 2C 0.5

**Topics in Graph Theory**

An in-depth study of 1 or 2 topics in graph theory. Course content may vary from term to term. Topics may include planar graphs, external 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 456 W,S 3C 0.5

**Game Theory**

An introduction to the analysis, through appropriate mathematical models, of competitive situations such as those arising in social, economic, political or military conflict. Emphasis is placed on the theory of two-person games.

Prereq: C&O 350

C&O 458 F 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' accomplishments: squaring the circle, estimation of pi; Archimedes' "Method", the volume of the sphere, inscribed regular polygons.

Prereq: MATH 130a/b, 134a/b and 224a/b are recommended.

Although the mathematics for this course is technically elementary, the course is intended for third and fourth year students, and the mathematical maturity of a senior student will be assumed.

C&O 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

**Numerical Linear Programming**

Methods for the minimization and maximization of piecewise linear functions and linear functions subject to linear constraints, with applications to nonlinear 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

C&O 480 F 3C 0.5

Cross-listed as CS 473.
Course Descriptions

Combinatorics and Optimization

Computer Science

C&O 481 W 2C 0.5

History of Mathematics 2

A continuation of C&O 480 (History of Mathematics 1), but may also be taken independently. Topics include: the Fibonacci sequence, prime numbers, Fermat's last theorem, Gaussian integers, Euler's formula and regular solids, famous problems in geometry.

Prereq: MATH 130a/b, 134a/b

(220a/b, 224a/b 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 students will be assumed.

C&O 499 F,W,S 2R 0.5

Reading in Combinatorics and Optimization

Prereq: Consent of department

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Computer Science

Course Descriptions

Introductory Notes

1. The Department of Computer Science has 2 distinct streams of courses, 1 exclusively for students who have been admitted to a Computer Science Major program, and another especially designed for non-specialists who wish to become sophisticated computer users. Within this context, Computer Science Major programs include Honours Computer Science, Honours Co-op Computer Science with Electrical Engineering Electives, Honours Co-op Computer Science-Information Systems Option, all Joint and Double Honours BMath programs involving Computer Science as one of the majors.

The non-specialists' courses will not normally be open to Computer Science Major students, but they will be available to all other students in the University, subject to resource limitations. These courses are numbered with a middle digit of 0 through 3.

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. Every effort will be made to accommodate those students who preregister during published University preregistration periods. While priority will be given to these preregistrants, admission to specific courses cannot be guaranteed.

3. Co-op students will not normally be permitted to enrol in any 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 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 published below. Students are advised to consult the University Course Offerings List.

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 112, 115, 116, 118, 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 260), (CS 334 and 340), and (CS 335 and 350/354).

9. The prerequisite phrase "x-year standing" means that a student must be registered in year x or higher.

CS 112 F,W 2C,1T,1L 0.5

Introduction to Business Problem Solving by Computer

Emphasis on the solution of mathematical problems in business. Concept and properties of an algorithm. Language and notation for describing algorithms. Analysis of problems, development of models and algorithms, implementation in a procedure-oriented language (usually FORTRAN IV). Execution of these programs using several systems.

Credit will be granted for only 1 of CS 112, 116, 118, 140. CS 112 cannot be counted for credit toward a BMath degree.

CS 115 F,W 2C,1T,1L 0.5

Introduction to Commercial Problem Solving by Computer

Introduction to file processing techniques such as file maintenance, sorting and report generation. Language and notation for describing such algorithms. Analysis of problems dealing with files, and development of algorithms for their solution. Introduction to procedure-oriented languages (usually COBOL) for solving such problems.

Credit will be granted for only 1 of CS 115, 160. CS 115 cannot normally be counted for credit toward a BMath degree.
CS 116 F.W 2C,1T,1L 0.5
Introduction to Computing
This course tries to develop an appreciation of the capabilities and limitations of computing and a reasonable capability for using a programming language (usually BASIC). Topics include: computers - past, present and future; the problem solving process; algorithmic and programming techniques; file processing; text processing; applications and implications of computers.
Prereq: No mathematical background is required
Credit will be granted for only 1 of CS 116, 118, 118, 140. CS 116 cannot be counted for credit toward a BMath General or Honours degree.

CS 118 F.W 3C,1L 0.5
Introduction to Scientific Problem Solving by Computer
An introduction to the analysis of scientific problems, development of mathematical models and algorithms for their solution; implementation in a procedure-oriented language (normally FORTRAN). Topics discussed are: solution of equations, computation of integrals, graph plotting, and simulation.
Prereq: Grade 13 mathematics is recommended
Credit will be granted for only 1 of CS 112, 116, 118, 140. CS 118 cannot normally be counted for credit toward a BMath degree.

CS 140 F.W,S 3C,2L 0.5
Introduction to Mathematical Problem Solving by Computer
An introduction to the analysis of mathematical problems, development of mathematical models and algorithms for their solution; implementation in a procedure-oriented language (normally FORTRAN). Topics discussed are: solution of equations, computation of integrals, graph plotting, and simulation.
Prereq: Full-time degree registration in the Faculty of Mathematics
Credit will be granted for only 1 of CS 112, 116, 118, 140.
Special sections of this course will use PASCAL rather than FORTRAN/77.

CS 180 F.W 2C,2L 0.5
Introduction to File Processing
Introduction to the use of computers. Concept of an algorithm. Language and notation for describing algorithms. Analysis and solution of problems dealing with files. Introduction to a procedure-oriented language (usually COBOL). The preparation and debugging of programs in such a language. Topics include: file processing and maintenance, sorting, report generation, and file design.
Prereq: Full-time degree registration in the Faculty of Mathematics
Credit will be granted for only 1 of CS 115, 180.

CS 234 F.W,S 2C,2T 0.5
Programming Principles and Practice
To develop a sophisticated user-oriented understanding of software. A disciplined approach to program design. The need for and use of various control structures and data structures. Features of several high-level languages; techniques for their effective use. Specific topics include: structured programming, linked-list processing, recursion, string processing, tree processing and language development.
Prereq: One of CS 118, 140, 180 or two of CS 112, 115, 116
Credit will be granted for only 1 of CS 234, 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. 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
Credit will be granted for only 1 of CS 235, 250.

CS 240 F.W,S 2C,2T 0.5
Programming Principles, Languages, and Techniques
To develop a thorough understanding of software as needed for program design. The need for and use of various control structures and data structures. Features of several high-level languages, techniques for their effective use. Specific topics include structured programming, linked-list processing, recursion, string processing, tree processing and language development.
Prereq: CS 250 and second-year standing in a Computer Science Major program
Credit will be granted for only 1 of CS 234, 240.

CS 250 F.W 3C.1T 0.5
Fundamentals of Computers and Computer Systems
To give a through 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
Credit will be granted for only 1 of CS 235, 250.

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
CS 316 cannot be counted for credit toward a BMath degree.
CS 330 F.W.S 2C 0.5
Computer Applications in Business:
Introduction
A discussion of the implementation of business procedures on computers.
Students study and modify a computerized accounting system as an
illustration of the methods used. The accounting system is then extended to
consider other applications such as inventory control and also more
complicated file structures to improve the performance of the system.
Prereq: One of CS 118, 140, 180 or 2
of CS 112, 115, 116
CS 330 cannot be counted for credit
forward to 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
Credit will be granted for only 1 of
CS 334, 340.
CS 334 cannot be counted 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
Credit will be granted for only 1 of
CS 335, 350.
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 130b, 134b
and third-year standing. MATH 230b,
234a are recommended
Credit will be granted for only 1 of
CS 210, 337, 370/371, 375
CS 337 cannot be counted for credit
toward a BMath Honours Computer
Science degree.

CS 338 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 330 or 334, and third-year
standing
Credit will be granted for only 1 of
CS 338, 448. CS 338 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 storage. Introduction to the
analysis of algorithms.
Prereq: CS 240, C&O 230 and third-
year standing in a Computer Science
Major program
Credit will be granted for only 1 of
CS 334, 340.

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 369 or EL E 323 is recommended.
Credit will be granted for only 1 of
CS 335, 350.

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
taxon of programming languages.
Unsolvable problems and their relevance
to the semantics of programming.
Concepts of computational complexity
including algorithm optimality.
Prereq: CS 240, MATH 234b, and
third-year standing in a Computer
Science Major program

CS 369 F.W,S 3C 0.5
Digital Networks
Combinational networks. Integrated
circuit modules. Boolean algebras.
Boolean functions, expressions and their
simplification. Asynchronous sequential
networks. Latches and flipflops.
Synchronous operations. Analysis and
synthesis of synchronous sequential
networks. Sequential integrated-circuit
modules; shift registers, counters,
memories.
Prereq: CS 250 or EL E 222, and
third-year standing in a Computer
Science Major program

CS 375 F.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 computer techniques for
solving mathematical problems.
Prereq: CS 240, MATH 230b, 234a
and third-year standing in a Computer
Science Major program
Credit will be granted for only 1 of
CS 210, 337, 370/371, 375
CS 430 F 3C 0.5
Applications Software Engineering
An investigation into the role and function of software engineering practice in the construction of computer based systems. Topics include: requirements and specification; documentation techniques; analysis and design; implementation; testing and maintenance; management issues.
Prereq: CS 234 and a CS half-credit 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 394 or 396, and third-year standing
Credit will be granted for only 1 of CS 432, 434, 482. CS 342 cannot be counted for credit toward a BMath Honours Computer Science degree.

CS 435 W 3C 0.5
Topics in Computing Systems
An overview of some more advanced computer techniques, with an emphasis on their application in the analysis and design of systems. Topics include: data communication; queuing theory fundamentals; 2-D graphics; advanced software and hardware architectures; computer selection.
Prereq: CS 336 and third-year standing
CS 345 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 394 or 396, and STAT 220, and third-year standing
Credit will be granted for only 1 of CS 437, 457. CS 437 cannot be counted for credit toward a BMath Honours Computer Science degree.

CS 442 W 3C 0.5
Comparative Programming Languages
This course is designed to give students a critical understanding of programming language concepts and to provide them with an appreciation for the implications of various language design decisions. Students also learn some fundamentals about language processors.
Prereq: CS 340, 360 and fourth-year standing in a Computer Science Major program

CS 444 W 3C 0.5
Compiler Construction
Prereq: CS 340, 350, 360, and fourth-year standing in a Computer Science Major program

CS 446 F,W,S 3C 0.5
Software System Design and Implementation
An investigation into the role and function of software engineering practice in the design and implementation of computer based systems. Topics include: structural design; procedural design; testing and reliability; management topics; programming languages and coding; portability techniques; maintenance; performance measurement and analysis.
Prereq: CS 240 and fourth-year standing in a Computer Science Major program
CS 354 is a recommended 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
Credit will be granted for only 1 of CS 336, 448.

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 369 or EL E 323, and 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
Basic concepts of computer hardware; program translation; program loading and linking; co-operating sequential processes – computational data structures, critical section problem, process synchronization primitives, parallel programming; introduction to multiprogramming; operating system nucleus; file systems; reliability; protection; system performance, measurement and evaluation.
Prereq: CS 350, 354 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 340, 450, STAT 231, 339 and fourth-year standing in a Computer Science Major program
CS 457 is a recommended corequisite.
Computer Science

CS 457 W 3C 0.5
Queuing Models: Analysis, Simulation, and Computer Applications
An introduction to the basic results of queuing 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, CS 240, 350 and fourth-year standing in a Computer Science Major program
Credit will be granted for only 1 of CS 437, 457.

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.

CS 468 W 3C 0.5
Program Verification
Methods of program verification. Implications for structured programming. Inductive reasoning about recursive programs and recursively defined data structures.
Prereq: CS 360 and fourth-year standing.

CS 472 W 3C 0.5
Numerical Linear Algebra
Prereq: CS 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.
Prereq: (1 of CS 337, 375, C&O 350, consent of instructor) and fourth-year standing.
Cross-listed as C&O 459.

CS 474 S 3C 0.5
Numerical Approximation
Prereq: CS 337 or 375, and MATH 332b, and fourth-year standing.

CS 476 F 3C 0.5
Numerical Solution of Differential and Integral Equations
Initial value problems; existence and uniqueness of solutions, one step methods, multistep methods, stability, error analysis. Boundary value problems; shooting and discretization methods, implementation problems especially for non-linear equations. Integral equations; correspondence to ordinary differential equations, initial value and boundary value problems, solution techniques.
Prereq: CS 337 or 375, and fourth-year standing.

CS 478 W 3C 0.5
Numerical Solution of Partial Differential Equations
Prereq: CS 337 or 375, and fourth-year standing.

CS 482 F S 3C 0.5
Techniques in Systems Analysis
Techniques in organization and management theory. Organization of large software systems. Data base concepts. Implementation of computer based information systems. Survey of current topics of interest such as distributed processing, microcomputers and on-line systems.
Prereq: CS 340 and fourth-year standing in a Computer Science Major program.
Credit will be granted for only 1 of CS 432, 434, 482.

CS 486 W 3C 0.5
Introduction to Artificial Intelligence
Prereq: 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.
Prereq: CS 240, MATH 334 and fourth-year standing in a Computer Science Major program.

CS 488 F W S 3C 0.5
Introduction to Computer Graphics
Software and hardware for interactive computer graphics. Implementation of device drivers, 3-D transformations, clipping, perspective, and input routines. Data structures, hidden surface removal, color shading techniques, and some additional topics will be covered.
Prereq: CS 340, 350, MATH 234a and fourth-year standing in a Computer Science Major program.
CS 492 F,W 2C,1D 0.5
The Social Implications of Computers
This course is designed to consider the problems caused by organizations and society by the advent of computer technology so that constructive solutions to these problems may be discussed. Prereq: CS 340 and fourth-year standing

CS 498 0.5
Advanced Topics in Computer Science
Prereq: Fourth-year standing in a Computer Science Major program

CS 499 0.5
Readings in Computer Science
This course cannot be used to satisfy any 400-level course requirement in a Computer Science Major program. COURSES NOT OFFERED 1984-85

CS 117 Computers and Microcomputers: Principles of Operation and Programming
CS 434 Computer Auditing

Mathematics

Course Descriptions

Introductory Notes
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 Honours level course(s) for any required Honours level course(s). Similarly, a student pursuing a Pass or General degree may substitute the corresponding Honours level course(s) for any required General level course(s), unless the student has been required by the Standings & Promotions Committee to change from an Honours program to General or Pass. In this case, the student must enroll in General level courses. The following table sets out corresponding Advanced, Honours and General Courses.

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<tr>
<th>Advanced Honours</th>
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<td>MATH 140/a/b</td>
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Prerequisites involving these core courses will be given in terms of the lowest level acceptable (e.g. Prereq: MATH 230e implies that MATH 240b is also acceptable but MATH 220b is not).

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 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 on some 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 during the period when midterm 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.

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.

MATH 105 F 3C 0.5
Mathematics (For Environmental Studies Students)
Quantitative analysis in environmental research. Elementary concepts in Algebra: notation, terminology, operations. Probability Theory. Permutations and Combinations, approaches to probability, dependent and independent events, conditional probability, distribution functions, including Binomial, Poisson and Normal distributions, with applications to problems in Environmental Studies.

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.

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.

MATH 110b F 3C,2T 0.625
Calculus 2a

Not open to students in the Faculty of Mathematics.

MATH 111a F 3C,1T 0.5
Calculus 3a

Not open to students in the Faculty of Mathematics.
MATHEMATICS

Applications to real life problems.

MATH 1138 W X, 2T 0.5
A continuation of MATH 113A. Further
Elementary differential equations.

Cakulua

MATH 113A F 3C, 2T 0.5
Calculus
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.

MATH 115b W, S 3C, 2T 0.5
Linear Algebra and Solid Geometry
(For Arts and Science Students)
Determinants, vectors, matrices,
elementary solid geometry, systems of
linear equations.

MATH 114 F 3C, 2T 0.625
Algebra and Vector Geometry (For
Engineering Students)
Matrix algebra. Systems of linear
equations. Determinants. Vectors in
Euclidean space, lines, planes, spheres.
Eigenvalues. Introduction to vector
spaces.

MATH 115a F 3C, 2T 0.5
Calculus (For Co-op Physics and
Chemistry)
Techniques of integration. Improper
integrals. Indefinite forms and
L'Hôpital's rule. Infinite series. Parametric equations and polar
coordinates. Partial derivatives.

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.

MATH 134a F, W 3C, 1T 0.5
Algebra
Basic set theory, cardinality, elementary
number theory, number systems,
polynomials.

MATH 140a F 3C 0.5
Calculus
MATH 140a is an advanced-level,
enriched version of MATH 130a.

MATH 144a F 3C 0.5
Algebra
MATH 144a is an advanced-level,
enriched version of MATH 134a.

MATH 144b is an advanced-level,
enriched version of MATH 134b.

MATH 140b W, S 3C 0.5
Calculus
MATH 140b is an advanced-level,
enriched version of MATH 130b.

MATH 144b is an advanced-level,
enriched version of MATH 134b.
MATH 210 F,W 3C 0.5 Calculus 2 (For Chemical Engineers)
Partial differentiation, the gradient, multiple integrals with applications, line and surface integrals, divergence and curl, theorems of Green and Stokes. Applications to physical problems.
Prereq: MATH 110b
Not open to students in the Faculty of Mathematics.

MATH 211 W,F 3C,1T 0.5 Advanced Calculus for Electrical Engineers
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.

MATH 212 S,F 3C,1T 0.5 Advanced Calculus for Electrical Engineers 2
Prereq: MATH 211
Not open to students in the Faculty of Mathematics.
Cross-listed as EL E 206.

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 MATH 115b and MATH 111b, or equivalent
Not open to students in the Faculty of Mathematics.

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.

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.

MATH 216 F,S 3C 0.5 Differential Equations (For Physics or Chemical Engineering students)
Prereq: MATH 113b or 115b, or equivalent
Not open to students in the Faculty of Mathematics.

MATH 220a F 3C,1T 0.5 Advanced Calculus
Differential calculus for functions of several variables.
Prereq: MATH 130b or equivalent
Coreq: MATH 134b
Credit will be granted for only 1 of MATH 220a, 230a, 240a.
Not open to Honours Mathematics students.

MATH 220b W 3C,1T 0.5 Advanced Calculus
Prereq: MATH 220a
Credit will be granted for only 1 of MATH 220b, 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
Credit will be granted for only 1 of MATH 224a, 234a, 244a.
Also offered at St. Jerome's College in Fall term.

MATH 224b F,W,S 3C 0.5 Abstract Algebra 1
Groups, fields and other topics in abstract algebra.
Prereq: MATH 134a, 224a
Credit will be granted for only 1 of MATH 224b, 234b, 244b.
Also offered at St. Jerome's College in Winter term.
Mathematics Electives

Course Descriptions

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)
Credit will be granted for only 1 of MATH 220a, 230a, 240a.

MATH 240b F,W,S 3C 0.5
Advanced Calculus
MATH 240b is an advanced-level, enriched version of MATH 230b.
Prereq: MATH 240a (or permission of instructor)
Credit will be granted for only 1 of MATH 220b, 230b, 240b.

MATH 244a F 3C 0.5
Linear Algebra 2
MATH 244a is an advanced-level, enriched version of MATH 234a.
Prereq: MATH 234b (or permission of instructor)
Credit will be granted for only 1 of MATH 224a, 234a, 244a.

MATH 244b W,S 3C 0.5
Abstract Algebra 1
MATH 244b is an advanced-level, enriched version of MATH 234b.
Prereq: MATH 244a (or permission of instructor)
Credit will be granted for only 1 of MATH 224b, 234b, 244b.

MATH 322a 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)
Credit will be granted for only 1 of MATH 322a, PMAITH 331, 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
Credit will be granted for only 1 of MATH 322b, 332b, PMAITH 352a
Not open to Honours Mathematics students.

MATH 324 F,W 3C 0.5
Abstract Algebra 2
Topics in abstract algebra: groups, rings, fields and applications.
Prereq: MATH 224b
Credit will be granted for only 1 of MATH 324, PMAITH 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 230b
Credit will be granted for only 1 of MATH 322b, 332b, PMAITH 352a.

MTHEL 100 F,W,S 2C 0.5
Commercial and Business Law for Mathematicians 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,W 2C 0.5
Introduction to Mathematics Education
Current trends in education, professional practices and administration, the role of the department head, lesson planning, techniques of teaching, evaluation of students, special students, extracurricular activities, the relationship between elementary and secondary school mathematics, audio-visual materials.
This course is open only to students in the Co-op Math/Teaching Option.

MTHEL 302a F 2C 0.5
Introduction to Biomathematics 1
Biometry is a biological discipline requiring both a knowledge of mathematics and some basic understanding of specific biological phenomena. The course material has been selected from Genetics and Gerontology to provide examples of where both mathematics and biology have contributed to the advancement of knowledge in interdisciplinary areas.
Cross-listed as HLTH 302.

MTHEL 302a W 2C 0.5
Introduction to Biomathematics 2
A continuation of Biomathematics 1. Topics considered are first order reaction kinetics in biological systems, including statistical considerations in enzyme kinetics, models for and the measurement of Evolution from a knowledge of genetics and protein structure and assessing the relative importance of environmental factors as evolutionary determinants.
Prereq: MTHEL 302a
Cross-listed as HLTH 303.

MTHEL 305a F,W,S 3C 0.5
General Life Insurance 1
Types of Life Insurance contracts and their uses, basis of risk measurements, deficiency reserves, modified valuation methods, non-forfeiture values, dividend formulae, selection of risks, substandard risks, and principles of reinsurance.
Pure Mathematics

Course Descriptions

Introductory Notes
More detailed course descriptions and course outlines are available upon request from the Pure Mathematics Department.

PMATH 331 F,W 3C 0.5
Real Variables
Topology of $\mathbb{R}$, 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 (MATH 230b desirable)
Will be of particular interest to students in programs outside of Pure Mathematics.
Credit will be granted for only 1 of MATH 322a, PMATH 331, 351a.
Not available for credit to students in Honours Pure Mathematics Programs. Formerly MATH 332a.

PMATH 334 F,S 3C 0.5
Abstract Algebra
Groups, rings, fields and applications.
Prereq: MATH 244b, or consent of instructor
PMATH 334 may be substituted for 334 whenever this is a requirement in an Honours program.

PMATH 351a F,S 3C 0.5
Real Analysis
Theory of functions of real variables. The notions of compactness, connectedness and uniformity are used in a study of continuity, differentiation, and integration.
Prereq: MATH 230b
PMATH 351a may be substituted for 331 whenever this is a requirement in an Honours program.

PMATH 351b W 3C 0.5
Real Analysis
Continuation of PMATH 351a.
Prereq: PMATH 351a

PMATH 352a F,S 3C 0.5
Complex Analysis
Holomorphic functions, Cauchy’s integral theorem, Cauchy’s integral formulas, Taylor and Laurent expansions, classification of isolated singularities, the residue theorem.
Prereq: MATH 244b
PMATH 352a may be substituted for MATH 332b whenever this is a requirement in an Honours program.

PMATH 352b W 3C 0.5
Complex Analysis
Continuation of PMATH 352a.
Prereq: PMATH 352a

PMATH 360 F 3C 0.5
Geometry
An introduction to affine, projective and non-Euclidean forms of geometry. Conic sections in the projective plane. Inversion in circles.
Prereq: MATH 224b
Will be of interest to all math students.
PMATH 365 F,S 2C,1T 0.5
Differential Geometry and Tensor Analysis
Curves in Euclidean 3-space (E3) and the Serret-Frenet formulas; surfaces in E^3 and their intrinsic geometry, Gaussian curvature and the Gauss-Bonnet theorem. Coordinate transformations and tensors in n dimensions; n-dimensional Riemannian spaces, covariant differentiation, geodesics, the curvature, Ricci and Einstein tensors. Applications of tensors in Relativity and Continuum Mechanics. 
Prereq: MATH 230b, or consent of instructor
Cross-listed as AM 382.

PMATH 367 W 3C 0.5
Set Theory and General Topology
Intuitive set theory, metric spaces, point set topology. 
Prereq: MATH 230a

PMATH 380a 3C 0.5
Introduction to Information Theory with Applications
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. Transmission capacity. Applications to problem solving, information science, linguistics and communications (TV, music, etc.). Determination of practical measures of information. 
Cross-listed as AM 380a.

PMATH 380b 3C 0.5
Information Theory with Applications
Cross-listed as AM 380b.

PMATH 390
Readings in Pure Math

PMATH 400a F,W,S 2C,1T 0.5
Introduction to Mathematical Logic
Continuation of PMATH 430b. Axiomatic approaches (eg. Natural Deduction and Gentzen sequences). Briefer introduction to the logic of predicates and the foundations of mathematics. Will be of interest to all math students.
Credit will be granted for only 1 of PMATH 400a, 430a.

PMATH 403b W 2C,1T 0.5
Introduction to Mathematical Logic
Continuation of PMATH 403a. Godel's incompleteness theorem (in outline). Logicism, intuitionism, formalism. Selected topics (some of intuitionistic logic, modal logic, the representation theorem for Boolean Algebras normally are treated).
Prereq: PMATH 430a
Will be of interest to all math students.
Credit will be granted for only 1 of PMATH 430b, 432b.

PMATH 403a W 3C 0.5
Mathematical Logic
First order languages and theories. This course is more specialized and at a more advanced level than PMATH 430. Credit will be granted for only 1 of PMATH 430a, 432a.
Offered in Winter 1985 and each alternate Winter thereafter.

PMATH 403b F 3C 0.5
Mathematical Logic
Continuation of PMATH 432a. A treatment of at least one of the following: set theory, model theory, undecidability.
Credit will be granted for only 1 of PMATH 430b, 432b.
Next offered in Fall 1985 and each alternate Fall thereafter.

PMATH 411a F 2C 0.5
Number Theory
Elementary theory of numbers, quadratic reciprocity, applications to Diophantine equations.
Prereq: Third or fourth year standing or consent of instructor
Credit will be granted for only 1 of PMATH 340, 411a.
Offered in Fall 1984 and Winter 1985, and each alternate Winter thereafter.

PMATH 411b F 2C 0.5
Number Theory
Continuation of PMATH 411a.
Prereq: PMATH 334 or 344 and 411a.
Next offered Fall 1986, and each alternate Fall thereafter.

PMATH 445 F 2C 0.5
Ring Theory
Continuation of the theory of rings and modules.
Prereq: PMATH 334 or 344
Next offered in Fall 1985.

PMATH 446 W 2C 0.5
Group Theory
Permutations, Cayley Theorem, Sylow Theorem, Jordan-Hölder Theorem, nilpotent and solvable groups, direct and semidirect products, free groups.
Prereq: PMATH 334 or 344

PMATH 447 F 2C 0.5
Field Theory
Field extensions and Galois theory.
Prereq: PMATH 334 or 344
Offered in Fall 1984.

PMATH 451a F 3C 0.5
Measure and Integration
An introduction to integration and measure theory with emphasis on the real line.
Prereq: PMATH 331a or 351a.

PMATH 451b W 3C 0.5
Functional Analysis
Banach spaces and linear operators.
Prereq: PMATH 451a.

PMATH 465 W 2C,1T 0.5
Topics in Differential Geometry
Grassman algebras, differential forms, Lie derivatives, isometries, Killing vector fields, applications to continuum mechanics, differentiable manifolds and applications of differential forms to physics.
Prereq: AM 362/PMATH 365 or consent of instructor
Cross-listed as AM 474.

PMATH 467 F 2C 0.5
Topology
Topics from algebraic, combinatorial and geometric topology.
Prereq: PMATH 367 and MATH 234b.

PMATH 470a F 3C 0.5
Functional Equations
Cauchy’s, Peicier’s, and similar equations. Equations for polynomials and trigonometric functions. Reduction to different equations. Applications.

PMATH 499
Readings in Pure Math

COURSES NOT OFFERED 1984-85
PMATH 230a Introduction to Pure Mathematics
PMATH 230b Introduction to Pure Mathematics
PMATH 443 Linear Algebra 2
PMATH 452a Complex Analysis 2A
PMATH 452b Complex Analysis 2B
PMATH 461 Finite Geometries
PMATH 463 Differentiable Manifolds
PMATH 470b Functional Equations
Statistics

Course Descriptions

STAT 202 F 2C,1L 0.5
Elementary Statistics for Biologists
Elementary probability, populations, samples and distributions with biological examples. Methods for data summary and presentation including an introduction to interactive programming. Estimation, hypothesis testing, two-sample techniques and paired comparisons. Contingency tables. Credit will be given for only 1 of STAT 220, 230.

STAT 204 F 2C,1L 0.5
Statistics for the Physical Sciences 1
Descriptive statistics. Probability, random variables, discrete and continuous distributions. Estimation and hypothesis testing, goodness of fit. Credit given for only 1 of STAT 210, 220.

STAT 210 F,W 3C,1T 0.5
Applied Probability and Statistics
Laws of probability. Discrete and continuous random variables. Uniform, binomial, Poisson, normal distributions. Sampling from a normal population. Student t, chi-square, F distributions. Estimation and hypothesis testing. Credit will be given for only 1 of STAT 220, 230.

STAT 220 F 3C,1T 0.5
Introduction to Statistical Methods
Probability theory, discrete and continuous random variables. Expectation. Credit will be given for only 1 of STAT 220, 230.

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. Credit will be given for only 1 of STAT 221, 231.

STAT 230 F,W,S 3C,1T 0.5
Probability
The laws of probability, discrete and continuous random variables, expectation, central limit theorem. Credit will be given for only 1 of STAT 220, 230.

STAT 231 F,W,S 3C,1T 0.5
Statistics
Estimation, tests of significance, probability plots. Contingency tables, normal distribution theory, simple linear regression. Credit will be given for only 1 of STAT 221, 231.

STAT 300 W 2C,1T 0.5
Principles of Survey Design
The design of surveys of human or natural populations for research and planning. Credit may not be given for both STAT 300 and MATH 2308. Credit will be given for only 1 of STAT 231, 331.

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. Nonparametric statistics. Credit will be given for only 1 of STAT 221, 331.

STAT 311 F 3C 0.5
Regression and Sampling Methods for Accounting
Review of tests of significance, confidence intervals, and properties of the normal distribution. Normal linear models. Elementary sampling theory. Credit will be given for only 1 of STAT 320, 330.

STAT 320 W 3C 0.5
Statistical Methods and Theory
Random variables and distributions. Transformations. Estimation. Testing hypotheses. Large sample theory and maximum likelihood. Credit will be given for only 1 of STAT 320, 330.

STAT 321 F,W 3C 0.5
Applied Regression Analysis

STAT 330 F,W,S 3C 0.5
Statistical Theory and Methods
Random variables and distribution theory. Functions of random variables. Limiting distributions. Hypothesis testing. Credit will be given for only 1 of STAT 320, 330.

STAT 331 F,W,S 3C 0.5
Applied Linear Models
Review of normal theory. The multivariate normal distribution. Normal linear models. Variable selection. Extensions to weighted least squares and non-normal models. Credit will be given for only 1 of STAT 321, 331.

STAT 332 F,S 3C 0.5
Sampling
Introduction to survey sampling of populations. Elementary sampling designs. Efficiency comparisons for sampling designs and estimation procedures. Credit will be given for only 1 of STAT 332, 454.

STAT 333 F,W,S 3C 0.5
Applied Probability
Review of basic probability. Generating functions. Theory of recurrent events. Markov chains, Markov processes, and their applications. Credit will be given for only 1 of STAT 330, 339.

STAT 430 F 3C 0.5
Experimental Design 1
Introduction to designed experiments. Basic experimental designs. Factorial arrangement of treatments. Confounding and fractional replication. Selected topics. Credit may not be offered in 1984-85.

STAT 431 W 3C 0.5
Experimental Design 2
Selected topics in the design and analysis of experiments. Credit may not be offered in 1984-85.
Course Descriptions

Statistics

Mechanical Engineering

STAT 440 F 3C 0.5
Data Analysis and Computing
Computing and statistical problems involved with the analysis of data. Discussion of statistical program packages applied to a selection of analysis techniques.
Prereq: STAT 331

STAT 433 W 3C 0.5
Stochastic Processes
Point processes. Renewal theory. Stationary processes. Selected topics.
Prereq: STAT 333 or consent of instructor

STAT 442 S 2C 1T 0.5
Statistical Methods for Business and Industry
Prereq: STAT 320 or 330

STAT 443 W 3C 0.5
Forecasting
Prereq: STAT 321 or 331

STAT 444 3C 0.5
An Introduction to Econometrics
Prereq: STAT 331
May not be offered in 1984-85.

STAT 445 0.5
Topics in Econometrics
Continuation of STAT 444.
Prereq: STAT 444
May not be offered in 1984-85.

STAT 450 F S 3C 0.5
Estimation and Hypothesis Testing
Discussion of general inference problems under the headings of point and interval estimation, hypothesis testing and decision theory. Large sample normal likelihoods, maximum likelihood estimation, theory of UMV estimation, least squares, Neyman-Pearson theory of hypothesis testing.
Prereq. STAT 330

STAT 451 W 2C 0.5
Topics in Statistical Inference
Logic of tests of significance; exact tests and confidence intervals; normal approximations accurate for small samples and relationship to the normality of the likelihood function. Introduction to problems involving more than one parameter.
Prereq: STAT 450 or consent of instructor

STAT 454 W 3C 0.5
Sampling Theory and Practice
Introduction to sample theory and practice. Elementary sampling and design of experiments. Statistical inference in survey sampling. Introduction to problems involving more than one parameter.
Prereq: STAT 331; STAT 330 is recommended
Credit will be given for only 1 of STAT 332, 454.

STAT 455 S 3C 0.5
Sample Survey Design
A continuation of STAT 454. May not be offered in 1984-85.

STAT 464 0.5
Topics in Probability Theory
Prereq: STAT 333 or consent of instructor
May not be offered 1984-85.

STAT 466 0.5
Topics in Statistics 1
Prereq: STAT 330/331 or consent of instructor
May not be offered 1984-85.

STAT 467 0.5
Topics in Statistics 2
May not be offered 1984-85

STAT 468 0.5
Readings in Statistics 1

STAT 469 0.5
Readings in Statistics 2

Department of Mechanical Engineering

Professor, Chairman of the Department
H.W. Kerr, BASc, MASC, PhD (Toronto), PEng

Professor, Vice President Academic
T.A. Brzustowski, BASc (Toronto), AM, PhD (Princeton), PEng

Professor, Associate Chairman Graduate Studies
P.R. Slawson, BASc, MASC, PhD (Waterloo), PEng

Professor, Associate Chairman Undergraduate Studies
J.H.G. Howard, BSc (Queen's), MSc, PhD (Birmingham), PEng

Professor, Director, Office of Research
E.L. Holmes, BSc (Bristol), MASC, PhD (Toronto), PEng

Professors.
G.M. Bragg, BASc (Toronto), PhD (Cambridge), PEng
E. Brundrett, BSA (Ontario Agricultural College), BASc, MASC, PhD (Toronto), PEng
D.J. Burns, BSc, PhU (Bristol), PEng, CEng
R.M. Dubey, BSc (Hons), (Patna), BSc (Eng) (Bihar), PhD (Waterloo), PEng
D. French, BSc (Aston), CEng, PEng
K.G.T. Holland, BASc (Toronto), PhD (McGill), PEng
H.R. Martin, BSc, MSc (Queen's Belfast), PhD (Nottingham), DSc (Queen's Belfast), PEng
P. Niessen, BSc (McMaster), MASC, PhD (Toronto), PEng
G.F. Pearce, BASc (British Columbia), MASC (Toronto), PEng
R.J. Pick, BASc (British Columbia), MSc (Imperial College), PhD (Waterloo), PEng
A. Plimmet, BSc, PhD (Nottingham), PEng, CEng, FIM
G.D. Rainby, BSc, MSc (Western Ontario), PhD (Minnesota), PEng, Recipient of the Distinguished Teacher Award
J.A. Schey, Dip ing., CSC (Budapest), PEng
A.B. Strong, BASc (Waterloo), MSc (London), PhD (Waterloo), PEng
J. Thoma, Dip Phys, Dr Sci Tech, (Swiss Federal Institute of Technology)
Course Descriptions

M E 100 F,W 3C -0.5
Introductory Survey of Law
The rights and responsibilities of the engineer as a citizen of Ontario and Canada under the law; brief history of Canadian law differentiating between Civil and Criminal Law, the rights and duties of citizens and police, a review of Domestic Law, Real Estate Law, Landlord and Tenant Law. The law as it may pertain to the engineer in his profession, brief reviews of the Laws of Contracts, Patents, Trademarks, industrial design, and copyright, Bills of Exchange, Company law, incorporation of companies. Common and Preferred shares, the Law of Master and Servant, Surveying Law, Constitutional Law, Private International Law, and other topics. This course is restricted to senior Mechanical Engineering students.

M E 126 W,S 2C,4L 0.5
Engineering Concepts 2
A continuation of GEN E 115 with applications of graphics, measurement and other analytic principles to introductory probelms in the various disciplines of Mechanical engineering; an introduction to engineering design methods as applied to Mechanical Engineering and inclucding specification development, information-gathering, concept formulation, feasibility analysis and report writing.
Prereq: GEN E 115

M E 200 F,W 1C 0.0
Introduction to Mechanical Engineering 1
Discussion of Structure of Mechanical Engineering curriculum, operation of Department, Faculty, University, technical societies.

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; Jacobians. 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
Equivalent to M SCI 21.

M E 203 S,F 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 role of materials to engineering practice. The microstructure of materials, crystalinity 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 superposition, energy theorems, theories of failure, elastic and inelastic analysis of symmetrical bending, torsion of circular members, columns and stability, and virtual work.
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.

- Modelling physical systems with distributed parameters. Boundary and initial conditions. Division into hyperbolic, parabolic and elliptic equations by means of discriminant.

M E 435 F,W 3C 0.5
Industrial Metallurgy
This course is intended for those students interested in acquiring a working knowledge of metallurgy. It will cover: Metals and alloy systems, iron-carbon alloys, heat treatment and the function of alloying elements in steel, corrosion and scale resistant alloys, copper and nickel base alloys, light metals and their alloys; casting, hot and cold working of metals; soldering, brazing and welding; corrosion and oxidation; metal failure analysis.

M E 443 W 3C 0.5
Metal Casting Processes

M E 448 W 3C,2T 0.5
Production Engineering: Design of Manufacturing Systems
The interaction and relationship of manufacture to the factory organization. Product design and development, planning and control of production. Principles of mass and flow production. Machine loading and line balancing. Design analysis and evaluation techniques of plant layout and materials handling systems as basic components of a manufacturing facility and system.

M E 452 W 3C 0.5
Energy Transfer in Buildings
Thermodynamic properties of moist air; psychrometric charts; humidity measurements; direct water contact processes; heating and cooling of moist air by extended surface coils; solar radiation; heating and cooling of loads on buildings; effects of the thermal environment; air conditioning and calculations; air flow in and around buildings, diffusers.

M E 456 F S 3C 0.5
Heat Transfer 2
Selected topics in heat transfer fundamentals and applications. Topics to be covered include the fundamentals of convection with analytical solutions to simple laminar flow problems and approximate solutions to turbulent flow problems based on analogies between momentum and heat transfer. Also covered is radiant exchange in grey enclosures and in black enclosures containing emitting-absorbing gases. The remaining topics will be chosen from design of heat exchangers; condensation heat transfer; boiling heat transfer; and the treatment of problems in heat conduction.

M E 459 S,F 3C 0.5
Energy Conversion
Review of reserves and consumption trends of Canada's and the world's energy resources. Design of fossil-fuel central power plants, including boiler efficiency calculations and advanced steam and binary cycles. Review of atomic physics including fission and fusion energy. Design of nuclear fission power plants including design of reactor core for critical conditions, fuel cycles and radiation hazards. Design considerations for solar energy conversion devices including: availability of solar energy, solar-thermal converters, thermal storage and photovoltaics. Principles of fuel cells and some aspects of their design. Other topics as appropriate.

M E 462 S,F 3C,2T,3L 0.5
Introduction to Automation
Number systems, Codes and Coding, minimization techniques applied to design of logic systems. Comparison of microprocessors, memories, input/output logic elements, design and application of Digital systems, computer architecture, and control of pneumatic, hydraulic and mechanical systems; comparison of software and hardware techniques in such applications.

M E 463 F,W 3C 0.5
Tribology 1
The science of friction, lubrication and wear. The topography and contact mechanics of real surfaces. The measurement of friction and wear. Friction and wear theories for elastic and plastic contact. Lubrication mechanisms; hydrostatic, hydrodynamic, elastohydrodynamic, boundary, extreme pressure, and solid film. Physical and chemical properties of lubricants. Bearings and their selection.

M E 469 F,W 3C 0.5
Introduction to the Environmental Sciences

M E 482 S,F,W 9L 0.5
Mechanical Engineering Projects
Engineering assignments requiring the student to demonstrate initiative and assume responsibility. Student activity is guided and co-ordinated by a faculty supervisor. In selecting projects, particular account is taken of the student's field of specialization. Projects, in general, involve technical disciplines beyond the strictly mechanical engineering field.

M E 524 W 3C,1T 0.5
Advanced Dynamics and Stress Analysis in Design
This course is related to M E 423, although M E 423 is not an essential prerequisite. M E 524 brings together dynamics and stress analysis in an application to design of dynamic machinery. Basic kinematic and dynamic concepts are reviewed and extended. Lagrangian and computer simulation methods are introduced. Basic stress analysis methods are reviewed and indeterminate structures are discussed, along with finite-element and other computer techniques. A design project (involving synthesis), utilizing the concepts studied, is usually included.

M E 525 F S 3C 0.5
Mechanical Vibrations in Machines

M E 527 W 3C 0.5
Mechanics of Deformable Solids 3

Welding

Features and advantages of the various welding processes. Welding arc characteristics. Temperature distributions around welds. Metallurgy of the weld metal and heat affected zone in various alloys, including carbon and stainless steels, and aluminum alloys. Origin of various weld defects and methods of detecting them. Static and dynamic design of welded joints. Residual stresses, distortion and fracture of welds.

Numerical Control of Machine Tools 1


Fluid Mechanics 3


Noise Analysis and Control


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.
Music

Assistant Professor, Chairman
L. Enne, ARCT (Toronto), BSM (CMBC), BMus (Wilfrid Laurier), MMus, PhD (Northwestern)

Associate Professors
H. Martens, ARCT (Toronto), LRSM, BA, MA (Minnesota), PhD (Columbia)
W. P. Matus, BS (EMC), BMus (Peabody Conservatory), MMus, PhD (Indiana)

Lecturer
K. Hull, ARCT (Toronto), BA (Waterloo), BMus, MMus (Western Ontario)

Part-time Lecturers
N. Browne, BA (Alberta), MMS (Kansas)
D. Harrison, BIS (Waterloo)
G. Holmes, BSo (Columbia)
W. Janzen, BMus (Manitoba), MMus (Wisconsin)
M. Jarrett
C. Johnson, BMus (Queen's), BEd (Western Ontario), MA (Toronto)
A. Martin, ARCT, BMus (Toronto), MMus (Eastman)

Studio Instructors
Janet Auger, BMus (Toronto); Double Bass
Nina Brickman, BMus (Manhattan School of Music, N Y); French Horn
Ronald Brown, BM (New England Conservatory, Boston); Percussion
Cedric Coleman, BM, MM (New England Conservatory, Boston); Bassoon
Gisela Depkat; Cello
Bruce French, Classical Guitar
Kenneth Hull, ARCT (Toronto), BA (Waterloo), BMus, MMus (Western Ontario); Piano
Thomas Kay, BM (Boston); Rute
Lilian Kilianak, 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; Tuba
Victor Sawa, BM (McGill), MM (New England Conservatory, Boston); Clarinet
John Tickner; Trumpet
Dianne Werner, BMus (Toronto), Art Dip (Western Ontario); Piano

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
The Basics of Music
An introduction to music terminology, techniques and styles, through lectures and listening, with examples from all eras of music history.

MUSIC 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: Choir, Concert Band, Stage Band, Orchestra. Regular attendance at rehearsals and performances is required. Offered on a credit/fail basis.

MUSIC 102 F,W,S 2L 0.25
Music Ensemble
(See MUSIC 101 for course description.)

MUSIC 111 F,W,S 3C,1L 0.5
Fundamentals of Music Theory
An introduction to the primary skills of music practice emphasizing the reading and writing of musical notation. Students will learn elementary keyboard, listening, and sight-singing skills. For students with minimal musical background. Does not fulfill music major or minor requirements.

MUSIC 125 F 3C 0.5
Popular Music and Culture
An examination of the popular music world and the interplay between rock, folk, jazz and gospel idioms and classical music. The social, commercial and technological elements of popular music are considered.

MUSIC 150 F 3C 0.5
Introduction to Music 1
An introduction to music from early Christian chant to Beethoven through listening, lectures, discussion and analysis.

MUSIC 151 W 3C 0.5
Introduction to Music 2
An introduction to the music of the 19th and 20th centuries through listening, lectures, discussion and analysis. Compositions include symphonies, concertos, chamber music, operas, electronic and computer music.

MUSIC 201 F,W,S 2L 0.25
Music Ensemble
(See MUSIC 101 for course description.)

MUSIC 202 F,W,S 2L 0.25
Music Ensemble
(See MUSIC 101 for course description.)

MUSIC 241 S 3C 0.5
Principles of Music Therapy
An introduction to the history, theory, and practice of music in 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,S 3C,1L 0.5
Music Theory 1 (Medieval and Renaissance)
The study of scales, melody, two-part counterpoint, and basic harmonic concepts emphasizing the Middle Ages and Renaissance. Ear-training and sight-singing lab sessions will cover diatonic melodic and simple two-part exercises.

MUSIC 251 W 3C 0.5
Introduction to Music 2
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.

MUSIC 252 W 3C 0.5
Introduction to Music 3
A study of the music written for solo piano from the 17th century to the present.

MUSIC 253 W 3C 0.5
Piano Literature
A study of the music written for solo piano from the 17th century to the present.

MUSIC 254 W 3C 0.5
Piano Literature
A study of the music written for solo piano from the 17th century to the present.

MUSIC 255 W 3C 0.5
Piano Literature
A study of the music written for solo piano from the 17th century to the present.
## Course Descriptions

### Music

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Days</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUSIC 266</td>
<td>F,W,S std 0.5</td>
<td>Music Studio</td>
<td>Private music studio in Voice, Piano, Organ, Classical Guitar and orchestral instruments. This course is available only to Music majors and minors. Prereq: Audition with Music Faculty. Studio Fee.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 267</td>
<td>F,W,S std 0.5</td>
<td>Music Studio</td>
<td>(See MUSIC 266 for course description.) Prereq: MUSIC 266 and consent of Music Faculty. Studio Fee.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 273</td>
<td>F,W,S 3C 0.5</td>
<td>Traditional Folk Music</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 274</td>
<td>W 3C 0.5</td>
<td>Introduction to Jazz</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 275</td>
<td>W 3C 0.5</td>
<td>Computer Applications in Music</td>
<td>A survey of computer applications in music history, analysis and composition. Concepts from computer science and specific techniques and implementations of these various music activities are examined. Theoretical study is coupled with practical hands on experience. Prereq: MUSIC 100 or 150/151 or consent of instructor.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 301</td>
<td>F,W,S 2L 0.25</td>
<td>Music Ensemble</td>
<td>(See MUSIC 101 for course description.)</td>
<td></td>
</tr>
<tr>
<td>MUSIC 302</td>
<td>F,W,S 2L 0.25</td>
<td>Music Ensemble</td>
<td>(See MUSIC 101 for course description.)</td>
<td></td>
</tr>
<tr>
<td>MUSIC 353</td>
<td>F 3C 0.5</td>
<td>Music of the Romantic Period (19th Century)</td>
<td>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, Tchaikowsky, Verdi, and Wagner. Prereq: MUSIC 150/151 or MUSIC 100, or consent of instructor.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 354</td>
<td>W 3C 0.5</td>
<td>Music of the Twentieth Century</td>
<td>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 150/151 or MUSIC 100 or consent of instructor.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 360</td>
<td>F 3C 0.5</td>
<td>Music of the Church</td>
<td>A study of the music and the philosophies of music of the Christian church from the beginning to the present. Singing and/or listening to the music will be an integral part of the course. Prereq: MUSIC 150/151 or consent of instructor.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 361</td>
<td>W 3C 0.5</td>
<td>Music of the Church</td>
<td>Continuation of MUSIC 360. Prereq: MUSIC 360 or consent of instructor.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 366</td>
<td>F,W,S std 0.5</td>
<td>Music Studio</td>
<td>(See MUSIC 266 for course description.) Prereq: MUSIC 267 and consent of Music Faculty. Studio Fee.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 367</td>
<td>F,W,S 3C,1L 0.5</td>
<td>Music Studio</td>
<td>(See MUSIC 266 for course description.) Prereq: MUSIC 366 and consent of Music Faculty. Studio Fee.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 370</td>
<td>F 3C,1L 0.5</td>
<td>Music Theory 3 (19th Century)</td>
<td>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 260/251 or consent of instructor.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 371</td>
<td>W 3C,1L 0.5</td>
<td>Music Theory 4 (20th Century)</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 372</td>
<td>F 3C 0.5</td>
<td>Choral Music, Repertoire and Techniques 1</td>
<td>A study of conducting techniques, rehearsal procedures, and score analysis. Prereq: MUSIC 150/151 and 250/251 or consent of instructor.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 373</td>
<td>W 3C 0.5</td>
<td>Choral Music, Repertoire and Techniques 2</td>
<td>Continuation of MUSIC 372. Prereq: As in MUSIC 372.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 380/381</td>
<td>F,W 0.5/0.5</td>
<td>Directed Study in Music</td>
<td>Prereq: Advanced standing in music and consent of instructor.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 390</td>
<td>F 3C 0.5</td>
<td>Special Topics in Music 1</td>
<td>Study of a limited field under tutorial guidance. Prereq: MUSIC 100 or MUSIC 150/151 and consent of instructor.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 391</td>
<td>W 3C 0.5</td>
<td>Special Topics in Music 2</td>
<td>Study of a limited field under tutorial guidance. Prereq: MUSIC 100 or MUSIC 150/151 and consent of instructor.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 466</td>
<td>F,W std 0.5</td>
<td>Music Studio</td>
<td>(See MUSIC 266 for course description.) Prereq: MUSIC 367 and consent of Music Faculty. Studio Fee.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 467</td>
<td>F,W std 0.5</td>
<td>Music Studio</td>
<td>A continuation of Music Studio. A recital is required. Prereq: MUSIC 466 and consent of Music Faculty. Studio Fee.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 490/491</td>
<td>F,W 0.5/0.5</td>
<td>Senior Honours Seminar</td>
<td>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).</td>
<td></td>
</tr>
</tbody>
</table>

### COURSES NOT OFFERED 1994-95

- MUSIC 253 Medieval and Renaissance Music
- MUSIC 254 Baroque and Classical Music
- MUSIC 259 Vocal Literature
- MUSIC 260 Canadian Music
- MUSIC 355/356 Music and Culture in Vienna
- MUSIC 374 Composition Seminar
- MUSIC 375 Electronic Music
School of Optometry

Professor, Director of School
W.S. Long, BA (Toronto), OD (College of Optometry of Ontario), FAAO

Professor, Associate Director
J.G. Strong, LScO (Montreal), MS (Indiana), PhD (Cornell), OD (Pennsylvania College of Optometry), FAAO

Assistant Professor, Graduate Officer
J.V. Lovasik, 8.9 (McGill), OD, MSc, PhD (Waterloo), FAAO

Lecturer, Undergraduate Officer
W.G. Wyszecki, Dipl Ing, Dr Ing (Technical University, Berlin), FRSC

Lecturers
R.D. Pellowe, OD (College of Optometry of Ontario), FAAO
D.R. Remole, BFA (Manitoba), OD (College of Optometry of Ontario), MS, PhD (Indiana), FAAO
M.E. Woodruff, OD (College of Optometry of Ontario), PhD (Indiana), FAAO
G.C. Woo, OD (College of Optometry of Ontario), MS, PhD (Indiana), LOSc (Melbourne), FAAO, Dipl.V

Associate Professors
R.D. Beauchamp, BA (McMaster), MA, PhD (Drown)
M.G.E. Callender, OD (College of Optometry of Ontario), BSc (Sir George Williams), MSc (Waterloo), FAAO
D.A. Ranney, BA, MD (Toronto)
R.D. Sein, BA (Queen's), PhD (Waterloo)
T.D. Williams, OD (College of Optometry of Ontario), MS, PhD (Indiana), FAAO

Assistant Professor
G.Y. Mousa, BSc, MSc (American University-Beirut), PhD (Western Ontario) OD (New England College of Optometry)

Adjunct Faculty
I. Baker, OD (College of Optometry of Ontario), FAAO
E.L. Buchner, OD (College of Optometry of Ontario)
E.J. Fisher, BA, MA (Toronto), DSc (Pennsylvania College of Optometry) (Part-time), FAAO
M.S. Kannan, BVSc (Madras Veterinary College), MSc (All India Institute of Medical Science), PhD (Alberta)
R.G.R. Lawrence, QC
W.M. Lyle, OD (College of Optometry of Ontario) MS, PhD (Indiana) (Part-time), FAAO
G.W. Wyszecki, Dipl Ing, Dr Ing (Technical University, Berlin), FRSC

Lecturers
B.H. Chou, BSc (Toronto), OD, MSc (Waterloo), FAAO
D.J. Egan, BS (St. Johns), BS, OD (Pennsylvania College of Optometry), FAAO
S. Hoffman, MD, DPH (Toronto)

Senior Demonstrator
D.J.H. Thompson, BA (Waterloo)

Faculty Members of Optometry holding cross appointments to:

1. Biology

Faculty Members holding cross appointments to Optometry from:

2. Kinesiology
3. Psychology

Clinic Supervisors – Full-time (1983-84)
K.S. Ames, BS, OD (Ohio State)
J.D. Bender, OD (Waterloo)
D.B. Buck, OD (College of Optometry of Ontario), FAAO, Chief of Clinics
D. Lulzi, OD (Waterloo)
R. Pace, OD (Waterloo), FAAO
S.D. Riome, OD (Los Angeles College of Optometry), FAAO
K.M. Robertson, OD (College of Optometry of Ontario), MSc (Waterloo), FAAO
L. Sorbata, OD (Waterloo)
J.G. Strong, OD (College of Optometry of Ontario), MSc (Waterloo)
R. Wiggins, BS, OD (Indiana), FAAO

Clinic Supervisors – Part-time (1983-84)
W.B. Andrews, OD (Waterloo)
W.R. Andrews, OD (College of Optometry of Ontario)
D.R. Bock, OD (Waterloo)
R.R. Bock, OD (College of Optometry of Ontario)
M.O. Boermans, OD (Waterloo)
J.A. Brisson, OD (Waterloo)
J.W. Capell, OD (Waterloo)
R.R. Chen, OD (College of Optometry of Ontario)
L. Cz, OD (Waterloo)

T.A. Dietrich, OD (Waterloo)
J.J. Dippel, OD (Waterloo)
M.H. Falke, OD (Waterloo)
B.B. Fresco, Dipl Optom (S.A.), BS, OD, MS (Houston), FAAO
G.A. Grant, OD (College of Optometry of Ontario), FAAO
D. Hansen, OD (Waterloo)
L. Hirano, OD (Waterloo)
B. Johnson, OD (Waterloo)
D.J. Klein, OD (Waterloo)
D. Lowy, OD (Waterloo)
R.J. MacKenzie, OD (Waterloo)
E.E. Miller, BSc (Toronto), OD (Waterloo)
J.M. Newman, OD (Waterloo)
R.L. Saan, OD (Waterloo)
R.J. Scheid, OD (Waterloo)
P.H. Sohier, OD (Waterloo)
S.C. Tail, OD (Waterloo)
R. Thompson, OD (Waterloo)
V. Tippano, OD (Waterloo)
J.S. Walcott, OD (Waterloo)
R.R. Watson, OD (College of Optometry of Ontario)
R.L. Wilson, OD (Waterloo)

Course Descriptions

Introductory Note
Students in other disciplines may register for Optometry courses only upon the approval of the Director of the School of Optometry.

OPTOM 100 F 2C 0.5

History and Orientation
A brief history of the profession and the development of visual science; a consideration of legal and organizational development of optometry, the role of professional associations. The role and scope of optometry and its relationship to other professions and the community.

OPTOM 104 F 3C 3L 0.5

Anatomy of the Eye and Associated Structures
The gross, microscopic and ultra structure of ocular tissues. The embryology and comparative anatomy of the eye will be emphasized. The relationship of the eye to the vascular supply of the head and the nervous system will be studied. This course is credited only upon completion of OPTOM 114.

OPTOM 105 F 3C 1T 0.5

General Pathology
Basic disease processes, including inflammation, degeneration, neoplasia; pathogenic microbiology and related diseases; immunity and hypersensitivity; disease caused by physical agents; diseases of the organ systems.
Course Descriptions

Optometry

OPTOM 106 F 3C,3L,1T 0.5
Geometrical Optics

OPTOM 109 F 2C,1T 0.5
Light and Illumination
Principles of radiometry and photometry; illumination and related factors involved in the design and control of the visual environment in relationship to the human visual system; lighting surveys.

OPTOM 111 W 3C,3L 0.5
Physiological Optics

OPTOM 114 W 3C,2L 0.5
Anatomy of the Eye and Associated Structures
A continuation of OPTOM 104. Prereq: OPTOM 104

OPTOM 115 W 4C,1T 0.5
General Pathology
A continuation of 105. Prereq: OPTOM 105

OPTOM 116 W 3C,4L 0.5
Ophthalmic Optics 1
Properties of optical glass and plastic, single vision lenses and prisms, lens combinations. Optics of contact lenses and clinical instruments. Ophthalmic laboratory procedures. Prereq: OPTOM 106

OPTOM 241 F 3C,3L 0.5
Physiological Optics
Ocular motility; Kinematics of eye movements, muscle actions, measurements of eye movements, innervation systems subserving eye movements, clinical application. Prereq: OPTOM 111

OPTOM 242 F 3C,3L 0.5
Clinical Optometry
Lectures and laboratories on clinical techniques for examination of the optical properties of the eye. Prereq: OPTOM 111

OPTOM 244 F 3C,2L 0.5
Neurophysiology of Vision
The neural processing of colour, brightness, movement and form by the retina, lateral geniculate, cortex, superior colliculus and other brain centres. Neural mechanism underlying binocular depth perception, the accommodative response and eye movement. Prereq: OPTOM 104/114

OPTOM 245 F 3C 0.5
Ocular Pathology
Signs, symptoms, clinical detection of primary and secondary ocular disease; instrument techniques: record keeping, patient counselling, referral procedures; management of ocular emergencies; primary health care responsibilities. Prereq: OPTOM 106/115

OPTOM 261 F 3C,3L 0.5
Physiological Optics

OPTOM 274 W 2C 0.5
Genetics for Optometrists
A brief review of Mendelian genetics, and the molecular basis of modern genetics. Inherited conditions of particular interest, e.g., colour vision, anisometria, refractive error, retinoblastoma. Genetic counselling, and the detection of carriers. Prereq: OPTOM 265

OPTOM 282 W 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.

OPTOM 344 F 2C 0.5
Sensory Physiology
Peripheral and central nervous system pathways. The skin senses, pain and adaptation to pain, especially as they relate to cornea. The vestibular sense and its influence on eye-movements, muscle sensory organs, including those in extra-ocular muscles; audition, olfaction, taste, visceral sensations and the origin of headaches.

OPTOM 346 F 2C,4L 0.5
Ophthalmic Optics 3
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, 265

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 348 Y 8 Clinic 1.0
Optometry Clinic
The student is assigned to various areas of the clinic and under direct faculty supervision, participates in the provision of optometric services to clinic patients.
Prereq: OPTOM 242, 252

OPTOM 350 W 4C 0.5
Optometric Jurisprudence and Practice Management

OPTOM 351 W 3C,3L 0.5
Physiological Optics
Prereq: OPTOM 261

OPTOM 352 W 3C,2L 0.5
Clinical Optom: Strabismus and Orthoptics
Detection and evaluation of sensory and motor characteristics of vision in strabismus. Classifications, diagnosis, prognosis, modes of therapy for strabismus and amblyopia.
Prereq: OPTOM 242, 252, 342

OPTOM 353 W 2C 0.5
Optometric Communication
A series of lectures and role-playing exercises designed to enhance the student’s skills in verbal and written communication with patients and other professionals.

OPTOM 357 W 2C,2L 0.5
Optometric Specialties
A. Low Vision. A series of lectures and labs demonstrating the optometric assessment and management of low vision patients. Optical characteristics of various aids will be included (2/3 term).
B. Aniseikonia. The theory, assessment and treatment of aniseikonia is outlined (1/3 term).
Prereq: OPTOM 342

OPTOM 358 W 3O Clinic 1.0
Each student is required to complete 120 hours of clinical practice during the spring.
Prereq: Successful completion of Year 3

OPTOM 364 F 4C,1L 0.5
Ocular Pharmacology
Neurohumoral theory, response to drugs, use of sterile techniques, disinfectants. Drugs used, topically on the eye. Systemically administered drugs which may affect the eye and vision. Drugs and contact lenses.
Prereq: OPTOM 245, 255

OPTOM 372 W 2C 0.5
Pediatric Optometry
Special aspects of the management of vision problems of infants and young children.
Prereq: OPTOM 242, 262

OPTOM 400 F 2C 0.5
Optometric Practice Management
A continuation of the practice management section of OPTOM 360.

OPTOM 441 F 3L 0.5
Optometry Research Project
Students with an interest in research may arrange with a professor to undertake a research project of mutual interest.
This course serves as an alternative to PSYCH 357. Contact the course coordinator for details.

OPTOM 442 F 3C 0.5
Advanced Contact Lens Practice
A series of lectures and practical demonstrations of the principles and procedures of advanced contact lens materials and resources including their physiological implications.
Prereq: OPTOM 347

OPTOM 448 Y 24 Clinic 1.0
Optometry Clinic
The clinical program teaches the student how to provide optometrical services including pathology detection, strabismus evaluation and the application of spectacle therapy, contact lenses and vision training. The patients cared for extend from the pediatric to the geriatric, and include those with perceptual problems, or with low vision.
Prereq: OPTOM 348, 358

OPTOM 449 F 4C 0.5
Community Health Optometry
Governmental and social aspects of health and vision care delivery are discussed in relation to the epidemiology of vision problems.

OPTOM 450 W 3L 0.5
Optometry Research Project
A continuation of 441. An elective may be chosen as an alternative to OPTOM 451.
Prereq: OPTOM 441

OPTOM 452 W 2C 0.5
Special Populations
A. Visual Aspects of Learning
Difficulties. The aspects of vision problems related to learning difficulty including tests and measurements taken by optometrists. The role of the optometrist in conjunction with the parents, teachers, and psychologists in assisting children to achieve is discussed.
B. Elderly or Mentally Retarded Populations. The optometrical management of problems of the elderly, and of mentally retarded individuals. The effect of aging on the visual system. Special vision problems associated with mental retardation.
Prereq: OPTOM 342, 352, PSYCH 101

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 468 F Clinic 0.0
Vision Care Projects
Between the third and fourth professional years, students may be required to participate in vision care projects of varying durations. These will be arranged by faculty.
Prereq: Successful completion of OPTOM 348, 355, and permission of the Chief of Clinics

OPTOM 480 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 499-A-E W,S
Comprehensive Examinations
In Anatomy and Physiology, Pathology and Pharmacology, Physiological Optics, Ophthalmic Optics, and Optometry. Graduation in Optometry is contingent upon successful completion of these comprehensive examinations involving oral, written and clinical applications of optometry. These examinations are ordinarily held in the final exam period of the winter term, fourth professional year. These exams have been approved for purpose of licensure by the Council of the College of Optometrists of Ontario.
Peace and Conflict Studies

Associate Professor, Director of the Program
C.G. Brunk, BA (Wheaton), MA, PhD (Northwestern), G

Lecturer, Undergraduate Officer
T.R. Neufeld, BA (Manitoba), MDiv (Havard) G

Research Associate, Institute of Peace and Conflict Studies
E.E. Regehr, BA (Waterloo). Funded by Project Ploughshares G

Members of the Peace and Conflict Studies Faculty Group

Professors
K. Westhues, BA (Conception), MA, PhD (Vanderbilt)

Associate Professors
C.G. Brunk, BA (Wheaton), MA, PhD (Northwestern) G
J.G. Holmes, BA, MA (Carleton), PhD (North Carolina) G
M.F. McDonald, BA (Toronto), MA, PhD (Pittsburgh) G
R.J. Sawatsky, BA (Bethel), MA (Minnesota), MA, PhD (Princeton) G
J.O. Stubbs, BA (Toronto), MSc Econ (London), DPhil (Oxford) G
A.F. Thompson, BA (Toronto), Bthn (Huron), MA (Western Ontario), STM, PhD (McGill) G

Assistant Professors
G.O. Michalenko, BA, PhD (Saskatchewan) G
W.B. Moul, BA, MA, PhD (British Columbia) G
M. Smyth, BA (Toronto), MA, PhD (York), R

Course Descriptions

A) CORE COURSES

PACS 301 F 2C,1D 0.5 
Roots of Conflict and Violence
An examination of the influential theories of the nature and roots of human conflict on both the interpersonal and intergroup level. Contributions of the behavioural and social sciences, as well as the humanities, will be explored.

PACS 302 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 301 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 302 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 his own work.

PACS 499 W T 0.5 
Senior Honours Seminar 2
Continuation of PACS 498.

B) INTERDISCIPLINARY PACS-RELATED COURSES

PACS 230 F 3S 0.5 
The Politics of Nonviolence
An examination of the possibilities of a nonviolent approach to resolving human conflict with special emphasis on the nature and uses of power, the nature of the nation state and the problem of relating a personal ideal to the realities of communal life.

PACS 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 
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.

Personnel and Administrative Studies

Associate Professor, Course Director and Undergraduate Advisor
E.S. Lucy BA (Hobart)

Course Descriptions

PAS 260 F 3L,2T 0.5 
Basic Personnel Administration
Examines the management environment in which personnel administration takes place. Includes some of the organizational theories and motivational theories on which personnel administration is based. Students have the opportunity to develop operational skills in the basic technical areas of personnel administration, and to examine the organizational development responsibilities often assigned to Personnel Departments.

PAS 300 W 3S 0.5 
Concepts and Issues in Personnel Administration
Offers students an opportunity to converse, in a seminar setting, with people who have achieved a senior leadership role in the fields of personnel, management, government, labour relations, and organizational change. Each seminar will address a major conceptual, social or policy issue in the broad field of employee relations. 
Prereq: PAS 260 or permission of the instructor.
Department of Philosophy

Professor, Chairman of the Department
R.A. George, MA, PhD (Michigan State)

Professor, Associate Dean, Graduate Affairs, Faculty of Arts
B.H. Suits, BA, MA (Chicago), PhD (Illinois) Recipient of the Distinguished Teacher Award

Professor, Associate Chairman and Graduate Advisor
J.L. Hasworth, BA (Rollins), MA, PhD (Illinois)

Professor, Associate Chairman and Undergraduate Advisor
J.R. Horne, BA, MA (Western Ontario), BTh (Huron), PhD (Columbia)

Professor Emeritus
J.R. Horne, MA (Western Ontario), PhD (Michigan State) Professor, Associate Chairman and Graduate Advisor

T.W. Tucker, BSc, BA, PhD (London)

Pure Mathematics

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes

1. Any full course or 2 half courses in Philosophy can be used to satisfy the Group A (I) requirements.

2. Special courses are offered in response to student demand or special interests of the faculty. Each spring, the Department will publish a list of these courses offered for the following academic year. This list will include descriptions of those courses whose content is not specified below and names of instructors for each course.

3. Courses suffixed with "J" are administered by St. Jerome's College.

PHIL 101X F,W,S 3C 0.5
Introduction to Formal Logic
Elementary sentence and predicate logic. Translation from English into the formalism, decision methods and deductions. Application of Graphic Methods to Logic. This course is a preparation for courses in the foundations of mathematics, scientific methods, and more advanced logic courses.

PHIL 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
"Who am I?" "What can I hope for after death?" "How can I tell what to do?" "What can I know?" are questions that have led many to philosophize. The course will examine what lifestyles and attitudes major philosophers, stoics, skeptics, pleasure-seekers, mystics, pragmatists, etc. have promoted, and why.

PHIL 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 1028 F.W 3C 0.5
Philosophy of Science
Introduction to the history of science. An examination of the meaning of scientific theories and the nature of scientific discovery. The course will consider the role of science in society, the relationship between science and religion, and the place of science in the modern world.

PHIL 101X F,W,S 3C 0.5
Introduction to Formal Logic
Elementary sentence and predicate logic. Translation from English into the formalism, decision methods and deductions. Application of Graphic Methods to Logic. This course is a preparation for courses in the foundations of mathematics, scientific methods, and more advanced logic courses.

PHIL 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.
Course Descriptions

Philosophy

PHIL 200 Y 2C,1D 1.0
Great Works of Western Philosophy
An examination of some of the greatest writings in Western Philosophy. Students will be encouraged to come to a critical appreciation of such masterworks as Plato's Republic, Descartes' Discourse on Method, Hobbes' Leviathan, Hume's Enquiry, Kant's Prolegomena, Nietzsche's Zarathustra, and an outstanding work in contemporary philosophy.

PHIL 200A F 2C,1D 0.5
Great Works of Western Philosophy: Part 1
Outstanding works from the ancient and medieval periods.

PHIL 200B W 2C,1D 0.5
Great Works of Western Philosophy: Part 2
Outstanding works from the early modern and contemporary periods.

Either PHIL 200A or PHIL 200B may be taken separately.

PHIL 200J F 3C 0.5
Intentional Logic
An introduction to the understanding of how words are used, the formation of propositions, the construction of arguments and the examination of fallacies to help the student argue with order, facility and without error.

PHIL 201 W 2C,1D 0.5
Love
A philosophical analysis of different forms and functions of love. Among the topics to be considered: love and sexuality, religious love, love and knowledge. Classical and contemporary sources will be treated.

PHIL 202 F,W 3C 0.5
Philosophy of Women
A study of some of the issues raised by the Women's Liberation movement. Philosophical writings of the past and present will be used on such subjects as: the 2 sexes, physiological femininity, personal and social relations between the sexes, the position of women in public life, marriage and its alternatives, the importance of childcare.

PHIL 203 F 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 204J W 3C 0.5
Philosophy and Culture
An analysis of the philosophical assumptions in Western culture as reflected in various mass media and in current modes of production and consumption.

PHIL 205 W 3C 0.5
Science, Technology, and Society
Alternative philosophical perspectives on problems raised by scientific and technological developments including moral issues (e.g. privacy and data-gathering, 'clean' vs. 'dirty' energy). Also an examination of the nature and scope of scientific and technical knowledge as it bears on the responsibilities of scientists and engineers.

PHIL 205J F 3C 0.5
Philosophy of Nature
An examination of ancient and modern accounts of the natural world. Problems include whether matter alone can account for change, whether there is more than one cause, whether nature operates by purpose or chance.

PHIL 206J W 3C 0.5
Philosophy of Science
A philosophical study of the approaches to the material world used by contemporary physical science. The nature and the value of the experimental method in the writings of scientists past and present will be examined.

PHIL 210 W 2C,1D 0.5
Philosophy in Literature
Each term, philosophical themes (such as alienation, freedom and responsibility) will be explored through appropriate literary works (e.g. works by Camus, Dostoevsky, Kafka, and Sartre).

PHIL 210J F 3C 0.5
Philosophy of Man
What is Man? What is man's place among other creatures? Is man an accident of evolution? What are the major views on man as a species? How are love and sex aspects of man's life?

PHIL 215 F,W 3C 0.5
Professional and Business Ethics
Study of ethical and moral issues that typically arise in professional and business activity. What responsibilities to society at large do people in such business and professional activities as teaching, engineering, planning, architecture and accounting have? How far should professional autonomy extend?

PHIL 216 W 3C 0.5
Rational Behaviour and Decision-Making
An elementary introduction to the subject of 'rational' behaviour and decision-making for individuals and groups. Emphasis is on the definition and measurement of utility functions and various criteria employed in models of decision-making. This course is intended to help those whose work will involve them in making decisions in either the public or private sectors.

PHIL 218J F 3C 0.5
Ethical Theory
A normative approach, employing several of the classic Western traditions of rational thought, to general ethics. The various schools of ethical thought will be discussed.

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 1
This course is intended to be both a history of and an introduction to moral philosophy. Views on the foundations of ethics of the great philosophers from classical antiquity to about 1900 are systematically examined. Writers studied include: Plato, Aristotle, Aquinas, Kant, Mill and Nietzsche.

PHIL 224 W, 3C 0.5
Mankind and Nature
An examination of some of the issues raised by recent discussions on ecology. Various theories of nature, the human being, and relations between the two will be explored. Possible foundations for duties of mankind toward nature will be examined.
PHIL 225 F 3C 0.5
**Social and Political Philosophy:**
Canadian Problems
Basic ideological perspectives-conservative, socialist, and liberal-on Canadian problems such as native rights, nationalism, separatism, and regionalism are philosophically presented and assessed.
*Prereq: PHIL 102 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 live 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 230 J S 3C 0.5
**God and Philosophy**
An investigation of several aspects concerning the meaning and existence of God. Is God talk possible? Can faith and reason be reconciled? Is religious experience a meaningful argument? A wide range of different views will be considered.

PHIL 236 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 237 F 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 240 V 3C 1.0
**Logic**
A systematic development of the propositional calculus and of the first-order functional calculus. Some attention will be devoted to extensions and interpretations of such formal systems.
*Prereq: None for second-year students and above; consent of instructor for others

PHIL 241 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 F 3C 0.5
**Conflict, Contract and Choice**
Basic concepts of game and decision theory are introduced and applied to ethical theory and problems in social philosophy.
*Prereq: PHIL 140, 145 or consent of instructor*

PHIL 258 F 3C 0.5
**Introduction to the Philosophy of Science**
A discussion of the fundamental concepts on which science is based. Consideration is given to such topics as scientific theories, the nature of law-likeness, the grounds for scientific confirmation, and the debate between rationalism and empiricism in science.

PHIL 265 W 3C 0.5
**The Existentialist Experience**
An introduction to the existentialist view of man using both literary and philosophical texts from such authors as Kierkegaard, Unamuno, Nietzsche, Ortega y Gasset, Camus, Sartre, Heidegger and others.

PHIL 300 J F 3C 0.5
**The Western Philosophical Tradition (1600 to Present)**
An intensive overview of the major recurring themes in Western intellectual history from both an historical and a philosophical viewpoint.
*Prereq: Second year standing*

PHIL 301 J W 3C 0.5
**The Western Philosophical Tradition (1600 to present)**
A continuation of 300J. Descartes to Existentialism.
*Prereq: Second year standing*

PHIL 300 X W 3C 0.5
**Sources of Twentieth-Century Thought**
An examination of major writings that have shaped present-day consciousness. Works by such thinkers as Marx, Darwin, Freud, Nietzsche and Mill will be included.

PHIL 302 W 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, particularly that of Peters, Hirst, and Dearden. Special attention will be paid to the question of the desirability of a core curriculum and its proposed content.
*Prereq: PHIL 311 or consent of instructor*

PHIL 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.

PHIL 316 J A.W 3C 0.5
**Philosophy of the Family**
A philosophical examination of the family, its foundation, its purpose, its importance in personal growth and its relation to political community.
*Prereq: 1 course in moral philosophy or consent of instructor*
PHIL 322 W 3C 0.5
Contemporary Ethical Theory
Continues the history and discussion of ethics begun in PHIL 221 with writings from 1900 to the present. Theories such as intuitionism, emotivism, utilitarianism, and relativism are examined via the writings of such people as Moore, Hare and Warnock.
Prereq: PHIL 221 recommended

PHIL 327A F 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 W 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 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 1029 or 322 or consent of instructor

PHIL 331 W 3C 0.5
Aesthetics
Philosophical consideration of works of art and the problems of beauty using selected readings to enable the student to recognize and formulate his own views in a philosophic manner.
Prereq: One full or two half courses in Philosophy, or consent of instructor

PHIL 350 Y 3C 1.0
Epistemology
An analysis of human knowledge, its conditions and types. The first part concentrates on criteria of meaningfulness, the possibility of a priori knowledge, and the concept of knowledge. The second part deals with our knowledge of the physical world and other minds.
Prereq: One full or two half courses in Philosophy

PHIL 350A F 3C 0.5
Epistemology 1
The first part of PHIL 350.

PHIL 350B W 3C 0.5
Epistemology 2
The second part of PHIL 350.
Either PHIL 350A or 350B may be taken separately.

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 360 F 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 361 W 3C 0.5
History of Ancient Philosophy 1
From the beginnings to Plato.
Prereq: One full course in Philosophy or consent of instructor

PHIL 362 W 3C 0.5
History of Ancient Philosophy 2
From the beginnings to Plato.
Prereq: One full course in Philosophy or consent of instructor

PHIL 363 W 3C 0.5
Medieval Philosophy 1
The early period from the 13th century. Among those considered will be: Bonaventure, Aquinas, Scotus, and Ockham.
Prereq: One half course in Philosophy or consent of instructor

PHIL 364 F 3C 0.5
History of Modern Philosophy 1
Earlier period beginning with Descartes.
Prereq: One half course in Philosophy or consent of instructor

PHIL 365 F 3C 0.5
19th Century Philosophy
The 19th century. Philosophers covered may include Hegel, Mill, Schopenhauer, James and Kierkegaard.
Prereq: One half course in Philosophy or consent of instructor

PHIL 365J W 3C 0.5
The Thomistic Tradition in Philosophy
An examination of the work of Thomas Aquinas, his philosophical relation to his time, the revival of Thomism in the modern era.
Prereq: One full course in Philosophy and third year standing, or consent of instructor

PHIL 395J W 3C 0.5
The Thomistic Tradition in Philosophy
An examination of the work of Thomas Aquinas, his philosophical relation to his time, the revival of Thomism in the modern era.
Prereq: One full course in Philosophy and third year standing, or consent of instructor

PHIL 396J-397J F,W 0.5 each
Special Topics/Directed Readings
A series of readings and/or seminars on 1 or 2 topics or thinkers, with periodic reports and discussions.
Prereq: Consent of instructor and permission of College Discipline Coordinator

PHIL 420/421 F,W 3C 0.5
Studies in Ethics
Various half courses dealing with special topics; 1 or more of these will be offered each year as announced by the Department.
Prereq: At least one half course in ethics

PHIL 422 W 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 half course in ethics
PHIL 423 3C 0.5
Political Philosophy 2
A detailed discussion of contemporary theories.
Prereq: At least one half course in ethics

PHIL 425 3C 0.5
Philosophy of the City
Analysis and evaluation of the philosophical points of view that underlie current criticism of urban life and prevalent schemes for its reconstruction.
Prereq: One half course in Philosophy

PHIL 435-439 3C 0.5
Studies in Philosophy of Religion
A study of a particular philosopher or problem. The topic will be announced in advance each year.
Prereq: Consent of instructor

PHIL 440 Y 3C 1.0
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 half course in formal logic, or consent of instructor

PHIL 440A F 3C 0.5
Logical Theory
The first part of PHIL 440.

PHIL 440B W 3C 0.5
Logical Theory
The second part of PHIL 440.

PHIL 441-444 3C 0.5
Studies in Logic
Various half courses dealing with specific topics; one or more of these will be offered each year as announced by the Department.
Prereq: PHIL 240, 241, 242, 440A/440B or PMATH 430A

PHIL 446 3C 0.5
Philosophy of History
Consideration of various possible views about the ultimate nature of history and historical knowledge.
Prereq: One full course equivalent in Philosophy, or consent of instructor

PHIL 450J F 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 technique of linguistic analysis will be employed. Also, the very possibility of any kind of metaphysics will be discussed.
Prereq: Third year standing or consent of instructor

PHIL 455 Y 3C 1.0
Metaphysics
Studies of reality, metaphysical problems and issues. The first part (ontology (nature of being)) considers objects, their properties, and causation. The second part (cosmology (principles of the universe)) examines space, time, and motion.

PHIL 455A F 3C 0.5
Ontology
The first part of PHIL 455.

PHIL 455B W 3C 0.5
Cosmology
The second part of PHIL 455.

PHIL 463 Y 3C 1.0
Philosophy of Language and Linguistic Analysis
The first part examines issues in the philosophy of language, such as synonymy, propositions, meaning, semantics, reference. The second part will consider ordinary language analysis as a method for solving philosophical problems as compared with structural linguistics.
Prereq: At least one full course equivalent in Philosophy or consent of instructor

PHIL 463A F 3C 0.5
Philosophy of Language
The first part of PHIL 463.

PHIL 463B W 3C 0.5
Linguistic Analysis
The second part of PHIL 463.

Either PHIL 463A or PHIL 463B may be taken separately.

PHIL 470 3C 1.0
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: One full or two half courses in Philosophy, or consent of instructor

PHIL 471-479 3C 0.5
Special Subjects
One or more half courses will be offered at different times, as announced by the Department.
Prereq: Consent of instructor

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 496J-497J F,W 0.5 each
Special Topics/Directed Readings
A series of readings and/or seminars on one or two topics or thinkers, with periodic reports and discussions.
Prereq: Consent of instructor and permission of College Discipline Coordinator

PHIL 498(A-B) F,W,S R 0.5
Directed Reading in Special Areas
Prereq: Consent of instructor

PHIL 499 Y S 1.0
Senior Seminar and Honours Essay
All senior honors students attend this seminar in which a selection of major philosophical problems is discussed. They will also prepare a senior essay and discuss it with this group.

PHIL 499J Y 1.0
Tutorial and Honours Essay
Students wishing to enrol in 499J should consult the College Discipline Coordinator.

COURSES NOT OFFERED 1984-85
PHIL 100 Introduction to Philosophy
PHIL 237J Ethics and Society
PHIL 260J Issues in Higher Education
PHIL 300 The Philosophy of Games
PHIL 328 The Philosophy of Karl Marx
PHIL 333J Contemporary Philosophical Problems in Art
PHIL 335 Philosophy of Religion
Course Descriptions

Physes

Department of Physics

Professor, Chairman of the Department
J. Grindlay, BSc (Glasgow), DPhil (Oxford)

Professor, Dean of the Faculty of Science
D.E. Brodie, BSc, MSc, PhD (McMaster)

Associate Professor, Associate Chairman of the Department
H.M. Morrison, BSc, PhD (Edinburgh)

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)
J.A. Cowan, BSc (Manitoba), MA, PhD (Toronto)
I.R. Dagg, BSc (Manitoba), MS (Pennsylvania State), PhD (Toronto)
S.G. Davison, PhD, DSc (Manchester)
M.D. FitzCeriel, BSc, MSc (Toronto), PhD (Case)
F.O. Goodman, BSc, PhD, DSc (London), FInstP, FAIP
N.R. Isenor, BSc (Acadia), MSc, PhD (McMaster)
J. Kruuv, BASc (Waterloo), PhD (Western Ontario)
J.W. Leech, BS, PhD (London), FInstP
J.D. Leslie, BASc (Toronto), MS, PhD (Illinois)
S.P. Lipshtiz, BSc (Natal), MSc (South Africa), PhD (Witwatersrand)
R.A. Moore, BSc, MSc (McMaster), PhD (Alberta)
A.D.S. Nagi, BA, BSc, MSc (Panjab), PhD (Delhi)
J.L. Ord, BASc (Toronto), MS, PhD (Illinois)
R.K. Pathria, BSc, MSc (Panjab), PhD (Delhi), recipient of the Distinguished Teacher Award
W.B. Pearson, DFC, MA, DSc (Oxford), FRSC, FOC
M.M. Pintar, BSc, MSc, PhD (Ljubljana)
L.W. Reeves, BSc, PhD, DSc (Bristol), FRSC, FOC
G. Scoles, BSc, PhD (Genova)
R.A. Snyder, BSc, PhD (Western Ontario)
S.F. Wang, DSc (Nagoya)

Associate Professors
J.K. Brandon, BSc, PhD (McMaster), MA (Cambridge)
J.M. Corbett, BASc (Toronto), MSc, PhD (Waterloo)
A.E. Dixon, BSc (Mt. Allison), MSc (Dalhousie), PhD (McMaster)
P.C. Eastman, BSc, MSc (McMaster), PhD (British Columbia)
H.K. Ellenton, BSc (Western Ontario), MA (Toronto)
D. Hemming, BSc, PhD (Bristol)
J.R. Lepock, BS, MS (W. Virginia), PhD (Pennsylvania State)
C.C. Lim, BA (Delft), MA (Nebraska), PhD (Toronto)
H.J.T. Smith, BSc, PhD (London)
B.H. Torrie, BASc (Toronto), PhD (McMaster)
J. Vanderkooy, BEng, PhD (McMaster)
K.A. Woolner, BSc (London)

Senior Demonstrators
A.B. Haner, BSc, MSc (Waterloo)
C.R. Jayasundera, BSc (Waterloo)
D.S. McVicar, BS (Waterloo)

Research Assistant Professors
J.W. Hepburn, BSc (Waterloo), PhD (Toronto), NSERC University Research Fellow
W.K. Liu, BS, MS, PhD (Illinois), NSERC University Research Fellow
C.J. Moore, BSc, MSc, PhD (Waterloo), NSERC University Research Fellow

Adjunct Faculty
J.A. Blackburn, BSc (Manitoba), MSc, PhD (Waterloo)
W.E. Harris, BSc, MSc, PhD (McMaster)
M.L. Klein, BSc, PhD (Bristol)
J. Lit, BSc, DipEd (Hong Kong), DSc (Laval)
L.A.A. Read, BA, MSc (McMaster), PhD (Waterloo)

Faculty Members of Physics holding cross appointments to:
1. Biology
2. Chemistry

Faculty Members holding cross appointments to Physics from:
3. Applied Mathematics
4. Chemistry

Introductory Note
Prerequisites are given as a guide to the student and may be waived with the consent of the instructor.

PHYS 001 0.0
Pre-University Physics
This course covers the topics in Ontario Grades 11 to 13 essential for first year university physics. The course includes mechanics, gravitation, vibrations and waves, heat, electricity, light and optics. Successful completion of this course fulfills the University admission requirements where high school Physics is necessary.

No University Credit.

Offered by Correspondence only.

PHYS 010 F.W.S 1C 0
Physics Seminar
This seminar brings together Honours Physics (including Co-op students) in Years 2, 3, and 4, to receive information concerning the Physics Department and to hear invited speakers.

PHYS 103 W 3C3L2T 0.5
Mechanics in Human Movement
An introduction to the physical principles required for the analysis of the mechanics of human movement.
Prereq: MATH 106
For Kiniesiology students.
Lab alternate weeks; optional tutorial.

PHYS 105 F 3C3L2T 0.5
Electrical Science
Basic electricity, magnetism and electronics. An introduction to the physical principles required for an understanding of the electrical instruments used in Kiniesiology.
Prereq: PHYS 103
For Kiniesiology students.
Lab alternate weeks; optional tutorial.

PHYS 111 F 3C1T 0.5
Physics for the Life Sciences 1
An introduction to physics for students intending to concentrate their further studies in biology, medicine or dentistry; includes particle kinematics and dynamics, energy and momentum conservation, gravitation, rotational mechanics, fluid mechanics, elasticity and oscillations.
PHYS 111 F, L 3L 0.25
Physics for the Life Sciences 1 Laboratory
For students taking PHYS 111.
Lab alternate weeks.

PHYS 112 W,S 3C,1T 0.5
Physics for the Life Sciences 2 Laboratory
A continuation of PHYS 111; includes wave motion, normal modes of vibration, sound, hearing, temperature, heat, kinetic theory of gases, thermodynamics, electrostatic force and potential, electric current and power, DC circuits, magnetic fields and induction.
Prereq: PHYS 111

PHYS 112 L W,S 3L 0.25
Physics for the Life Sciences 2 Laboratory
For students taking PHYS 112.
Lab alternate weeks.

PHYS 115 F 3C,2T 0.5
Mechanics
Prereq: Ontario Grade 13 Mathematics; Functions and Relations, Calculus; Ontario Grade 13 Physics recommended
Science students must take 121L with this course

PHYS 121 F 3C,2T 0.5
Introductory Physics 1
An introductory course in physics for students intending to concentrate their future studies in the physical sciences, optometry or mathematics; includes particle kinematics and dynamics, forces in nature, work and energy, conservation of energy and linear momentum, rotational kinematics and dynamics, and conservation of angular momentum.
Prereq: Ontario Grade 13 Mathematics; Functions and Relations, and Calculus; Ontario Grade 13 Physics recommended
Science students must take 121L with this course

PHYS 121 L F 3L 0.25
Introductory Physics 1 Laboratory
For students taking PHYS 121.
Lab alternate weeks.

PHYS 122 W,S 3C,2T 0.5
Introductory Physics 2
This course is a continuation of PHYS 121; includes fluid statics, wave motion, oscillating systems, gravitation, electrical currents and resistive circuits, capacitative and inductive circuits, alternating currents and resonant circuits.
Prereq: PHYS 121
Science students must take 122L with this course.

PHYS 122 L W,S 3L 0.25
Introductory Physics 2 Laboratory
For students taking PHYS 122.
Lab alternate weeks.

PHYS 125 W,S 3C,2T 0.5
Physics for Engineers
Oscillations; simple harmonic motion. Wave motion, travelling and standing waves; transverse and longitudinal waves, including sound. Geometrical optics; reflection and refraction. Physical optics; interference and diffraction. Quantum physics; quantization of radiation; hydrogen atom.
Prereq: PHYS 115

PHYS 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 226 L F 3L 0.25
Geometrical Optics Laboratory
For students taking PHYS 226.
Lab alternate weeks.

PHYS 243 F,W,S 3C 0.5
Electricity and Magnetism
Electrostatics, interaction of charges, fields, potential, capacitors and dielectrics. Magnetism, fields due to moving charges, Ampere's law, Faraday's law. Instruments, energy.
Prereq: First year physics and calculus

PHYS 243 L F,W,S 3L 0.25
Electricity and Magnetism Laboratory
For students taking PHYS 243.
Lab alternate weeks.

PHYS 246 W 3C,1T 0.5
Physical Optics
Prereq: First year physics and calculus
Coreq: PHYS 246L

PHYS 246 L W 3L 0.25
Physical Optics Laboratory
For students taking PHYS 246.
Lab alternate weeks.

PHYS 251 W,S 3C 0.5
The Stellar System
An introduction to the astronomy and astrophysics of the solar system for students with a background in (elementary) University Physics and Mathematics.
Prereq: First year PHYS and MATH

PHYS 253 W,S 3C 0.5
Electricity and Magnetism
An introductory course in electricity and magnetism, includes Coulomb's Law, electric fields, Gauss’ Law, electric potential, capacitance and dielectrics, magnetic forces and fields, inductance, magnetization, Maxwell's equations, electromagnetic waves. 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 253 L 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 259L W,S 3L 0.25
Crystallography and X-Ray Diffraction Laboratory
For students taking PHYS 259
Lab alternate weeks.

PHYS 263 W,S 3C 0.5
Classical Mechanics and Special Relativity
Newtonian dynamics and particles and systems of particles; Lagrangian dynamics and generalized coordinates; the Lorentz transformation and relativistic dynamics.
Prereq: First year physics and calculus, differential equations.

PHYS 270 F 3L 0.25
Laboratory
Further experiments in optics and properties of matter, for students taking PHYS 256L.
Lab alternate weeks.

PHYS 271 W,S 3L 0.25
Laboratory
Further experiments in electricity, magnetism and properties of matter, for students taking PHYS 253L.

PHYS 301 F 3C 0.5
Physical Techniques for Biologists 1
Visible, UV, dark field, phase, interference, polarizing and fluorescence microscopy; electron microscopy; visible and UV spectroscopy; polarography; pH and ion electrodes; osmometers; densitometers; radioactive tracers and counters; introductory electronics; data analysis.
Prereq: First year physics
Offered alternate years with PHYS 302.
Physics students may not take this course for credit.

PHYS 302 W 3C 0.5
Physical Techniques for Biologists 2
Infrared, Raman and fluorescence spectroscopy; nuclear magnetic and electron paramagnetic resonance spectroscopy; optical rotary dispersion and circular dichroism; X-ray diffraction; chromatography and electrophoresis; differential scanning calorimetry; ultra centrifugation; flame photometry; X-ray and atomic absorption spectroscopy; cell counting, cytofluorometry and cell viability.
Prereq: First year physics
Offered alternate years with PHYS 301.
Physics students may not take this course for credit.

PHYS 324 F 3C 0.5
Atomic and Nuclear Physics 1
Fundamentals of modern physics, special theory of relativity, quantization of electromagnetic radiation, wave properties of particles, the hydrogen atom.
Prereq: Year 2 electricity and optics courses
Recommended for students in Honours programs.

PHYS 325 W 3C 0.5
Atomic and Nuclear Physics 2
Many electron atoms, atomic and X-ray spectra, nuclear structure, nuclear reactions, molecular and solid state physics.
Prereq: PHYS 324
Recommended for students in Honours programs.

PHYS 350 W 3C 0.5
Astrophysics 1
Atomic and molecular spectra, forbidden and permitted transitions. Emission and absorption of radiation, Planck, Saha and Boltzmann equations. Line broadenings effects, Radiation transfer theory. Sources of opacity. The spectra of the sun and stars.
Prereq: PHYS 251 or consent of instructor
For third and fourth year students.
Offered in odd calendar years.

PHYS 351 S,F 3C 0.5
Astrophysics 2 - Stars and Stellar Systems
Physical properties of the stars. Stellar distance determination. Distribution of the stars in space. The solar motion, Galactic rotation, Stellar dynamics. Characteristics and structure of our galaxy and external systems.
Prereq: PHYS 251 or consent of instructor
For third and fourth year students.
Offered in odd calendar years.

PHYS 449, PHYS 451, are also open to third and fourth year students. PHYS 350 alternates with PHYS 451 and PHYS 351 alternates with PHYS 449.

PHYS 352 W 3C 0.5
Analogue Electronics
DC and AC circuit theory, p and n materials, pn diodes, junction and FET transistors. Transistor amplifiers and their equivalent circuits. Operational amplifiers. Feedback, oscillators and power supplies.
Prereq: Knowledge of determinants, elementary calculus and elementary electricity
Coreq: 352.

PHYS 352L W 3C 0.25
Analogue Electronics Laboratory
For students taking PHYS 352
Lab alternate weeks.
**PHYS 353** F.S 3C 0.5

**Digital Electronics**
Logic gates, flip-flops and shift registers. Binary numbers and Boolean algebra. An introduction to microprocessors is discussed based on the 68000. This will include arithmetic logic units, parallel input/output ports, assembly language and a number of examples.

Coreq: PHYS 353L

**PHYS 353L** F.S 3L 0.25

**Digital Electronics Laboratory**
For students taking PHYS 353

**Lab alternates weeks.**

**PHYS 354** F.S 3C 0.5

**Atomic Molecular Physics**
The Schrödinger equation applied to simple one and three-dimensional potentials, hydrogen atoms, angular momentum and spin, molecular vibrations and rotations, many electron atoms, radiation processes.

Prereq: PHYS 263, second year calculus

Antireq: CHEM 355

**PHYS 358** F.S 3C 0.5

**Thermodynamics**
Thermodynamic systems, equation of state, the laws of thermodynamics with applications. Change of phase.

Prereq: MATH 213a-213b, PHYS 254, Differential Equations

**PHYS 359** W 3C 0.5

**Statistical Mechanics**

Prereq: PHYS 358

**PHYS 360a** F.S 3L 0.25

**Intermediate Laboratory**
Selected experiments in mechanics, atomic physics, solid state physics, optics and electronics.

18 hours of experiments

**PHYS 360b** W 3L 0.25

**Intermediate Laboratory**
Continuation of 360a.

18 hours of experiments

**PHYS 363** W 3C 0.5

**Classical Mechanics**
Application of the methods of classical mechanics to central force motion, rigid body rotation, coupled oscillations and motion in non-inertial frames; survey of Hamiltonian dynamics.

Prereq: PHYS 263, second year calculus

Primarily intended for Honours Physics students.

**PHYS 364** F.S. 3C 0.5

**Mathematical Physics 1**
Vector analysis and applications. Vector operators using curvilinear coordinates. Cartesian tensors. Inertia tensor; stress, strain and rate of strain tensors. Applications to elasticity, fluids, electromagnetism and relativity.

Prereq: MATH 213a-213b and 216

Primarily intended for Honours Physics students.

**PHYS 365** W 3C 0.5

**Mathematical Physics 2**

Prereq: MATH 213a-213b and 216

Primarily intended for Honours Physics students.

**PHYS 368** F 2C 0.5

**Geophysics 1**

Prereq: First year physics and calculus

Cross-listed as EARTH 368.

**PHYS 369** W 3C 0.5

**Geophysics 2**
The geology of the ocean basins. Topics in physical oceanography. Physical properties of ocean water, heat budget of the world oceans. Oceanic circulations. Coriolis effects. Some idealized current regimes.

Prereq: First year physics and calculus

Cross-listed as EARTH 369.

**PHYS 371a** F.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 390** F 3C 0.5

**Molecular Biophysics**
Macromolecular structure and function, weak interactions, DNA replication, protein synthesis, energy production, photosynthesis, control of intracellular processes, structure of viruses, physical techniques.

**PHYS 381** W 3C 0.5

**Cell Biophysics**
Structure and function of cellular membranes and organelles, membrane potentials and ion transport, nerve conduction, muscle contraction, vision and interaction of light with cells intercellular communication, growth control.

**PHYS 432** W 3C 0.5

**Physics of Solid State Devices**
The theories of solid state physics are applied to explain the operation and use of several modern electronic devices, including the p-n junction, transistors, thyristors, tunnel diodes, field effect devices, optical devices, etc.

Prereq: PHYS 435

**PHYS 433** Y 3L 1.0

**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.

Students in the regular Honours Physics program must take either PHYS 433 or PHYS 437.

Although students in the Co-operative Applied Physics (Hons) program are advised to take 1 of these courses, enrolment may be limited.

**PHYS 434** F 3C 0.5

**Introductory Quantum Mechanics**

Prereq: PHYS 354, 364, and 365
Course Descriptions

PHYS 435 F 3C 0.5
Solid State Physics
Introduction to concepts in crystal diffraction and the reciprocal lattice. Crystal bonding. Lattice vibrations, thermal properties of insulators, free-electron theory of metals, band theory.
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 Honours 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 0.6
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 441 Y 3C 1.0
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 364-365

PHYS 442 W 3C 0.5
Structure of Solids
Prereq: PHYS 435

PHYS 443 W 3C 0.5
Continuum Mechanics
Prereq: PHYS 364-365

PHYS 444 W 3C 0.5
Nuclear and Particle Physics
Prereq: PHYS 445, and PHYS 434

PHYS 445 F 3C 0.5
Modern Optics
Prereq: PHYS 256 and PHYS 364

PHYS 449 W 3c 0.5
Radio Astronomy
Radio telescopes. Radio sources including the sun, H II regions, H I regions. The galactic centre, pulsars, quasars, other extragalactic sources, cosmological implications.
Prereq: PHYS 253 and PHYS 250-251 or consent of instructor
Offered in even calendar years.

PHYS 450 F 3C 0.5
Astrophysics 3
Solar system astrophysics (excluding the sun). The physical nature of planetary (and satellite) surfaces, atmospheres and interiors. Asteroids, meteories and comets. The interplanetary medium (solar wind). Solar interactions with the interplanetary medium and earth’s magnetosphere.
Prereq: PHYS 250 or consent of instructor
Familiarity with the contents of PHYS 250-251, however, will be assumed.

PHYS 451 S,F 3C 0.5
Astrophysics 4
The structure of stellar interiors, nuclear reactions and energy sources in the stars of the main sequence, early evolution of stars from the main sequence. Lifetimes of the stars.
Prereq: PHYS 251 or consent of instructor
Familiarity with the contents of PHYS 250-251, however, will be assumed.
Offered in even calendar years.

PHYS 449, PHYS 451 are also open to third and fourth year students. PHYS 350 alternates with PHYS 441 and PHYS 351 alternates with PHYS 449.

PHYS 453 W 3C 0.5
Advanced Analogue Electronica
A variety of topics in the operation of systems. Transistors, modern circuit techniques, noise, stability under feedback, information theory, and possible student motivated topics. Includes laboratory demonstrations.
Prereq: PHYS 352-353

PHYS 454 W 3C 0.5
Quantum Mechanics
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
Department of Political Science

Assistant Professor, Chairman of the Department
H.J. Williams, BA, MA (McMaster), PhD
(Toronto)

Associate Professor, Graduate Officer
A.D. Nelson, AB, AM, PhD (Chicago)

Professor, Undergraduate Officer
T.H. Qualter, BA (New Zealand), PhD
(Toronto)

Professors
I.L. Campbell, BA (Carleton), MSc
(London) R
J.E. Kerael, BA, MA (Queen's) PhD
(London) J.M. Wilson, BA, MA (Toronto)

Associate Professors
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(Leicester) A. Kapur, BA (Punjab), MA (George
Washington), PhD (Carleton)

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(Oxford) T.J. Downey, BA (Waterloo), MA, PhD
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Columbia) J.E. Surch, BA, MA (Waterloo)
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(Western Ontario), LLM (London) W.W. Johnston, QC, BA (Memorial), LLB
(Queen's) W.J. Morrisson, QC, BA (Western
Ontario), LLB (Osgoode)

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes
Extensive descriptions of the content of Political Science courses are available in the Department at the time of preregistration.

P SCI 101 F 0.5
Introduction to Politics 1
An introduction to the nature of politics and to the conflict of modern political ideas. The course involves a common lecture series and tutorials led by faculty members.

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 A W 0.5
Imperialism in International Relations
A discussion of the idea of imperialism in ancient and modern international relations, the causes and motives of imperialism, changes in imperial strategies, and the difference between the 'old' and the 'new' imperialism.

P SCI 102 C W 0.5
Politics in Action
An examination of the way in which society's conflicting demands are organized, articulated, and translated in action. The part played by the various political and economic forces in society will be examined in a comparative framework.
Course Descriptions

Political Science

P SCI 102D W 0.5
The Political Process in the Modern Democracies
A study of power and influence in the modern democracies, based on an examination of 3 contending models in the political process - the liberal-democratic or popular rule model, the pluralist model, and the elitist model.

P SCI 102E W 0.5
Political Rights and Obligations
An introductory examination of the idea of individual rights as a limitation on legitimate governmental authority, the possible grounds for such claimed rights, and their relationships to political obligations (duties).

P SCI 102F W 0.5
Politics in the Third World
This course examines worker and peasant political movements and parties in the Third World with emphasis on Latin America and Africa.

P SCI 102H W 0.5
Citizen Participation in Canada
An investigation of the relationship between political participation and democracy-exploring the question of how much participation is good and the ways in which it can be exercised - leading to an in-depth examination of the distribution of power in Canada.

P SCI 102K W 0.5
Mass Political Violence
A distinctive social feature of our century is the amount of political violence. Man-made deaths number approximately one hundred million. This course will describe and evaluate various theories of political violence.

P SCI 102M W.S 0.5
Contemporary Issues in Canadian Public Policy
An evaluation of various public policy responses to some contemporary Canadian social, cultural, economic, environmental, and political problems, as well as the process of policy-making.

P SCI 214 2C,1L 0.5
Quantitative Analysis
An introduction to the use of quantitative methods in Political Science. Only a rudimentary understanding of mathematics is required.
Prereq: Second year standing
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 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,W 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 0.5
American Government and Politics
The theory and practice of the American political system as revealed by the institutions and operations of American national government.
No prereq for students in the second year and above.

P SCI 266 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 284 F 2C 0.5
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
National principles and concepts applicable to current emotional criminal issues are analyzed by a practising crown attorney, for example, abortion, euthanasia, pornography, seat belts, homosexuality, marijuana, policy power, civil rights, criminal trials, jury, capital punishment, prisons, etc.
Prereq: Open to all students in the second year and above

P SCI 315 0.5
Research Design in Political Science
Introduction to the logic and limitations of experimental and non-experimental research designs. Selected studies of politics are examined to demonstrate how plausible threats to validity are made less plausible with appropriate design and data analysis.
Prereq: P SCI 214 or consent of instructor

P SCI 321 F 2S 0.5
Marxist Theory
An examination of the formation of Marx's method and of its significance for the proletariat.
Prereq: Consent of the instructor

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,1T 0.5
The Politics of Local Government
A study of the political process in selected Canadian cities focusing on citizen participation, internal decision-making, leadership, and the allocation of power.
Prereq: P SCI 343 or consent of instructor

P SCI 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 2S 0.5
Comparative Federal Systems
A comparative examination of federal systems, with an emphasis on the problems and processes of integration and disintegration.
Prereq: Consent of the instructor

P SCI 352 F 3S 0.5
Comparative Legislative Systems
A comparison of the institutional and behavioural characteristics of legislatures in a comparative framework, with emphasis on Canada, the United States, Great Britain, and Australia.
Prereq: Consent of the instructor

P SCI 363 F 0.5
Canadian Constitutional Law
An introduction to the nature and basic principles of constitutional law. This course will deal especially with the distribution of powers in the Canadian federation, and its evolution, notably by judicial decision. Leading cases will be examined.
Prereq: P SCI 260A and 260B or 260A and consent of instructor

P SCI 375 W 0.5
The Politics of Self-Management
An examination of the participation of citizens in decision making, both at work and in politics. The self-management system of Yugoslavia will be studied in detail.
Prereq: Second year standing or above

P SCI 380A F 0.5
World Politics 1
An examination of the structure of the world capitalist system concentrating upon warfare between core states during 1815-1945 and assessing the impact of the nuclear revolution. A number of classic theories of imperialism are considered.
Open only to students in the third year and above.
Course Descriptions
Political Science

P SCI 380B W 0.5
**World Politics 2**
An examination of the allocation of misery in the world capitalist system. The focus is on core/periphery relations and a number of theories of imperialism are considered.
Pre: Open only to students in the third year and above

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 424 W 0.5
**Contemporary Socialist and Communist Thought**
This course examines recent trends in Marxist theory and its contribution to the analysis of capitalist and socialist societies.
Pre: Consent of instructor

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 periods.
Pre: Consent of the 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.
Pre: Consent of the instructor

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.
Pre: Consent of the instructor

P SCI 429 W 0.5
**Labour Organization in Advanced Capitalist Society**
This course presents an analysis of western approaches to the integration of workers into the capitalist production process through the intervention of the state.
Pre: Consent of the instructor

P SCI 431 F 0.5
**Canadian Public Policy**
An examination of the way that policy making processes and institutions have responded to the problems of governing, especially at the federal level in Canada.
Pre: Consent of the 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.
Pre: Consent of the 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.
Pre: Consent of the instructor

P SCI 436 F 3S 0.5
**Comparative Public Policy: 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.
Pre: 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 role of issues relating to minerals, water, oceanic fisheries, oil energy, timber and labour.
Pre: Consent of the instructor

P SCI 442 W 3S 0.5
**Politics in Ontario**
A critical examination of the distinct elements of government and politics in the Province of Ontario.
Pre: Consent of the instructor

P SCI 443 2S 0.5
**Politics in Western Canada**
A critical examination of the distinctive elements of government and politics in the provinces of Manitoba, Saskatchewan, Alberta and British Columbia.
Pre: Consent of the instructor

P SCI 453+ F 3S 0.5
**Comparative Politics of Latin America**
The course examines the politics 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.
Pre: Consent of the instructor

P SCI 454 W 3S 0.5
**Comparative Politics**
Selected topics in the politics of the Third World.
Pre: Consent of the instructor

P SCI 461 F 2C.1S 0.5
**Problems in Canadian Politics 1**
Selected aspects of Canadian national politics.
Pre: Consent of the instructor

P SCI 462 W 0.5
**Problems in Canadian Politics 2**
Selected aspects of Canadian provincial politics.
Pre: Consent of the 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.
Pre: Consent of the instructor

P SCI 473 2S 0.5
**Voting Behaviour**
Pre: Consent of the instructor

P SCI 475 F 2S 0.5
**Political Socialization**
A study of the processes and agents of political socialization and their effects on political stability or change in liberal-democratic societies.
Pre: Consent of the instructor
16.130 Course Descriptions

P SCI 476 W 0.5
Research Seminar in Political Behaviour
A research-oriented seminar on selected theoretical works in political behaviour, with an emphasis on the development of research projects dealing with Canadian topics.
Prereq: Consent of the instructor

P SCI 479 2S 0.5
Senior Research Seminar: Violence in the Political Process
Politics can be brutal. This seminar deals with violence in the political process. The focus 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
This theory course examines the evolution of the international system, the capacity of the system of states to cope with the demands on it, meanings of international and regional power and order.
Prereq: Fourth year standing or consent of the instructor

P SCI 484 W 3S 0.5
Contemporary Strategies: Theories and Policies
The course examines strategic studies and their premises, the evolution of strategic thinking, the role of national policies of military 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 490-498 0.5 each
Special Subjects
From time to time courses of special study may be added to the program at the fourth year level. Students wishing to add such courses should consult the Department's Undergraduate Officer.

P SCI 499 Y 0.5
Special Honours Essay
Students wishing to undertake a senior honours essay in their fourth year should consult the Department's Undergraduate Officer.

COURSES NOT OFFERED 1984-85

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 325 Radical Political Theory
P SCI 327 Political Science and Political Values
P SCI 341 Provincial Politics
P SCI 354 Politics in Italy
P SCI 362 Soviet Government and Politics
P SCI 373 Political Parties
P SCI 374 Interest Group Politics
P SCI 411 Theories and Methods of Political Science
P SCI 425 English Political Theory of the 19th Century

Department of Psychology

Professor, Chairman of the Department
P.M. Menkile, BA (Knox), MA, PhD (Virginia)

Professor, Dean, Faculty of Arts
R.K. Rankes, RA, MA, PhD (Toronto)

Associate Professor, Associate Dean, Undergraduate Affairs, Faculty of Arts
G.A. Griffin, BA (Colgate), MA, PhD (Wisconsin), Recipient of the Distinguished Teacher Award

Associate Professor, Associate 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), MS, 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)
H.M. Lefcourt, BA (Antioch College), MA, PhD (Ohio State)
M.J. Lerner, BA, MA (Ohio State), PhD (New York)
R.G. Martenius, BPE, MA (Alberta), EdD (California)
D. Meichenbaum, AB (City College of New York), MA, PhD (Illinois)
S. Reins, MD, SCs (Charles)
H. Ross, BA (Toronto), PhD (North Carolina)
M.A. Ross, BA (Toronto), MA, PhD (North Carolina)
P.M. Rowe, BA (Toronto), MA (Dalhousie), PhD (McGill)
K.H. Rubin, BA (McGill), MA, PhD (Penn State)
D.A. Sprott, RA, MA, PhD (Toronto), FSS
R.A. Steffy, BA (Albright), MA, PhD (Illinois)
D.L. Wahlsten, BS (Alma College), PhD (California, Irvine)

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)

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M.J. Lerner, BA, MA (Ohio State), PhD (New York)
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D. Meichenbaum, AB (City College of New York), MA, PhD (Illinois)
S. Reins, MD, SCs (Charles)
H. Ross, BA (Toronto), PhD (North Carolina)
M.A. Ross, BA (Toronto), MA, PhD (North Carolina)
P.M. Rowe, BA (Toronto), MA (Dalhousie), PhD (McGill)
K.H. Rubin, BA (McGill), MA, PhD (Penn State)
D.A. Sprott, RA, MA, PhD (Toronto), FSS
R.A. Steffy, BA (Albright), MA, PhD (Illinois)
D.L. Wahlsten, BS (Alma College), PhD (California, Irvine)
Course Descriptions

Psychology

T.G. Wailer, BS, MS (Southern Mississippi), PhD (Vanderbilt)

Associate Professors
R.J. Alpack, BA (Scotiabank), MA, PhD (Duquesne), J
D.M. Amorrato, BA, MA (Toronto), PhD (Waterloo)
J.M. Anglin, BA (Toronto), PhD (Harvard)
P.E. Bowers, BA (Queen's), MA, PhD (Illinois)
T.E. Cadell, BA (British Columbia), MA (Massachusetts), PhD (Wisconsin)
N. Charness, BA (McGill), MS, PhD (Carnegie-Mellon)
J.A. Cheyne, BA (Waterloo Lutheran), MA, PhD (Waterloo)
J.M. Cornell, BA, MS, PhD (Washington)
R.H. Lahue, BSc (Fordham), PhD (Waterloo), R
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), PhD (Waterloo)
J.A. Van Eura, BA (Vallparaiso), MA (Bowling Green), PhD (Michigan State), J
E.E. Ware, BA, MA (Richmond), PhD (Illinois)

Assistant Professors
D. Besner, BA ( Loyola College), MSc (Memorial), PhD (Reading), NSERC University Research Fellow.
S. Hymel, BSc, MA, PhD (I linois)
R.L. Silver BA, PhD (Northwestern)
J. Iheis, BA ( Western Ontario), MA (Notre Dame), PhD (Windsor), J
E.Z. Woody, BA (Reed), MS (Oxford), PhD (Duke)

Adjunct Faculty
J.R. Amdur, BS (Portland State), MA, PhD (Denver)
D.S. Barnes, BA, MD (Western Ontario)
R.J. Dart, BS (Washington), MA, PhD (Waterloo)
B.S. Francis, BS (Ursinus), MA, PhD (Arizona)
J.J. Hartford, MD (Toronto)
C.B. Lowry, BA (McGill), MA, PhD (Michigan State)
G. Sumner-Smith, MRCVS, BSc (Liverpool), FR-CVS, MSc (Quegh)
J.L. Williams BA, MA (Alberta), PhD (Missoun)

Lecturer
L. Dyck, BA, MAsc (Waterloo)

Faculty Members holding cross appointments to: Statistics

Cross appointments to:
G. J.L. Williams
Faculty Members of Psychology holding
L. Dyck, Lecturer
J.J. Hartford, MD
C.B. Lowry, BA, MA, PhD (Illinois)
R.J. Dart, B.S.
J. Theis, D.S.
'Statistics

Course Descriptions

Introductory Note
See departmental course listing for specific terms of the various course offerings in 1984-85.

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.
Also offered at St. Jerome's College.

PSYCH 102
Introductory Psychology Special Topics
An in-depth study of selected broad issues and problems introduced in PSYCH 101.
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 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
Focus on research which investigates the everyday task of coping with ourselves, our environment, and the people we encounter. Topics will focus on the themes of knowing the self, interpersonal relationships, and of the way in which our social and physical environment affects our behaviour.

PSYCH 102G 3C 0.5
Introduction to Neuroscience
The relation between brain as a substrate and mind as a process is an important scientific and philosophical problem. In this course, those biological aspects of brain function will be discussed which are directly related to the functioning of the human mind.

PSYCH 200 3C, 3L 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.
Prereq: 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 intellectual giftedness.

PSYCH 214 3C 0.5
Psychology of Adolescence
A study of the psychological processes in the second decade of human development. Consideration is given to such areas as intellectual, emotional and social growth, and identity formation. Current concepts, issues, and research are stressed.
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 interpreting 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
Offered at St. Jerome's College.

PSYCH 235 3C 0.5
Psychological Perspectives on Gender and Sex
The course focuses on the existence of and bases for sex and gender differences with emphasis on biological, psychological and cultural issues.
Prereq: PSYCH 101 or permission of instructor
Offered at St. Jerome's College.

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 theories and research on people in their physical and social environment. Topics such as conformity, persuasion, attraction, prejudice, communication, aggression, the psychology of freedom, justice and human exchange will be introduced.
Prereq: PSYCH 101
Cross-listed as PSYCH 220R.

PSYCH 254 3C 0.5
Interpersonal Relations
A psychological analysis of social interaction. The development of interpersonal attraction from first impressions to long-term relationships. The roots of hostility, conflict, and communication problems.
Prereq: PSYCH 253
Cross-listed as PSYCH 221R.

PSYCH 258 3C 0.5
Principles and Evolution of Psychoanalytic Thought
This course expresses the fundamental psychoanalytic vision as articulated by Sigmund Freud, and its relevance to the humanities. The theme is to understand the potentially liberating spirit which is at the root of psychoanalysis.
Prereq: PSYCH 101
Offered at St. Jerome's College.

PSYCH 261 3C 0.5
Physiological Psychology
Introduction to brain, basic physiological processes, and their roles in behaviour. Course covers sensing and perceiving; neural bases of action; motivation; learning and memory; and consciousness. Both 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, sociology 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,1L 0.5
Basic Research Methods
An introduction to the logic and methods of inferential statistics with emphasis on application in Psychology. Also included is a more detailed treatment of the methods and projects introduced in PSYCH 291.
Prereq: PSYCH 291 and Honours standing

PSYCH 292 3C,1L 0.5
Basic Data Analysis
An introduction to the logic and methods of inferential statistics with emphasis on application in Psychology. Also included is a more detailed treatment of the methods and projects introduced in PSYCH 291.
Prereq: PSYCH 291 and Honours standing

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 neurophysiological basis of perceptions.
Prereq: PSYCH 206

PSYCH 307 3C 0.5
Cognitive Neurology
An introduction to current human experimental neuropsychology. The course will review evidence for brain-behaviour interactions obtained from studies of human brain damage and from investigations of the normal brain. Topics such as the representation of language, hemispheric specialization, memory, spatial ability, dyslexia, movement disorders and affective disorders will be considered.
Prereq: One of PSYCH 206, 207, 261, or KIN 356

Prereq: PSYCH 101 for all courses.
Course Descriptions

Psychology

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
Offered at St. Jerome's College.

PSYCH 316 3C 0.5
Moral Development
A consideration of psychological theory and research dealing with the nature and origin of moral development, developmental differences in moral judgement, and various approaches to teaching moral behaviour with its consequent effects on the individual.
Prereq: PSYCH 211
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 322 Y 2C 1.0
Principles and Practice in Early Childhood Education 1
Current principles of teaching preschool-aged children. An emphasis is placed on those curricula which aim to foster social and cognitive development. Topics include: characteristics and needs of children in group-care settings; classroom management; curriculum planning.
Prereq: Acceptance into the Early Childhood Education and Care Option

PSYCH 323 Y 3P 0.5
Practicum in Early Childhood Education 1
Directed supervision with young children in group settings. The course requires 3 hours of field work per week. Must be taken concurrently with PSYCH 322.
Prereq: Acceptance into the Early Childhood Education and Care Option (Honours)

PSYCH 325 Y 3P 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-day weeks in block placements during the academic year. Must be taken concurrently with PSYCH 322.
Prereq: Acceptance into the Early Childhood Education and Care Option (General)
Pass/Fail Grading.

PSYCH 332 Y 3P 0.5
Practicum in Early Childhood Education 2
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-day weeks in block placements during the academic year. Must be taken concurrently with PSYCH 322.
Prereq: Acceptance into the Early Childhood Education and Care Option (Honours)

PSYCH 333 3C 0.5
Industrial/Organizational Psychology
An introduction to the methods and problems in Industrial Psychology.
Prereq: PSYCH 101

PSYCH 334 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 339 3C 0.5
Personnel Psychology
An examination of the following major topics in personnel psychology: employment planning, selection and recruitment, selection techniques, career development, performance appraisal, training programs, labour relations, compensations systems.
Prereq: PSYCH 333

PSYCH 340 3C 0.5
Community Psychology
Theory and practice are integrated in an attempt to identify and to understand the social factors which inhibit or facilitate healthy development of the individual. The adequacy of existing social structures and institutions in the treatment of various personal problems is assessed.
Prereq: PSYCH 253
Offered at St. Jerome’s College.

PSYCH 341 3C 0.5
Psychology of Early Childhood Education
An introduction to theories and issues in early childhood education. Topics include issues differentiating preschool programs and application of psychological theory/research to 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.
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.
Prereq: PSYCH 101
Cross-listed as PSYCH 323R.
PSYCH 363 (A-Z) 366 (A-Z) 3C 0.5

Special Subjects
One or more half courses will be offered at different times as announced by the Department.

Prereq: Consent of instructor

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, territoriality, crowding, subjective impressions of environments, and research paradigms.

Prereq: PSYCH 101 and 292 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 Honours standing

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 Program (Honours, Joint Honours, General, Minor) who have Honours standing.

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 Program (Honours, Joint Honours, General, Minor) who have Honours standing.

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 Program (Honours, Joint Honours, General, Minor) who have Honours standing.

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 Program (Honours, Joint Honours, General, Minor) who have Honours standing.

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 Program (Honours, Joint Honours, General, Minor) who have Honours standing.

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 Program (Honours, Joint Honours, General, Minor) who have Honours standing.

Prereq: PSYCH 203 or 271, and 391 (acceptable as a corequisite)

PSYCH 410 3C 1.0

History and Systems
An examination of current theoretical approaches to psychological problems presented in an historical context.

PSYCH 422 Y 2C 1.0

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 322 and 323

PSYCH 423 Y 6P 0.5

Practicum in Early Childhood Education II
Practicum for advanced students in early childhood education. The course requires 6 hours of field work per week in preschool, kindergarten, or daycare settings. Must be taken concurrently with Psychology 422.

Prereq: PSYCH 322 and 323

PSYCH 425 Y 6P 0.5

Practicum in Early Childhood Education B
For advanced students in early childhood education. The course requires 6 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 322 and 325

PSYCH 440 Y 3C 1.0

Group and Individual Counselling
The practice of counselling in terms of current psychological theories and research. The demonstration and development of these concepts are aided by personal participation, exercises, role play and videotape simulation.

Prereq: PSYCH 334 and 344 or suitable alternative and permission of instructor

Offered at St. Jerome's College.

SEMINARS
Departmental listing of seminar offerings for 1984-85 should be consulted.

PSYCH 451 2S 0.5

Senior Seminar in Learning
Admission by consent of instructor.

PSYCH 452 2S 0.5

Senior Seminar in Perception
Admission by consent of instructor.

PSYCH 453 2S 0.5

Senior Seminar in Developmental Psychology
Admission by consent of instructor.

Offered at St. Jerome's College.

PSYCH 454 2S 0.5

Senior Seminar in Educational Psychology
Admission by consent of instructor.

PSYCH 455 2S 0.5

Senior Seminar in Social Psychology
Admission by consent of instructor.

PSYCH 456 2S 0.5

Senior Seminar in Personality
Admission by consent of instructor.

PSYCH 457 2S 0.5

Senior Seminar in Clinical Psychology
Admission by consent of instructor.
PSYCH 458 2S 0.5  
**Senior Seminar in Cognitive Processes**
Admission by consent of instructor.

PSYCH 459 2S 0.5  
**Senior Seminar in Motivation**
Admission by consent of instructor.

PSYCH 461 2S 0.5  
**Senior Seminar in Physiological Psychology**
Admission by consent of instructor.

PSYCH 462 2S 0.5  
**Senior Seminar in Animal Behaviour**
Admission by consent of instructor.

PSYCH 463 (A-Z) - 486 (A-Z) 2S 0.5  
**Senior Seminar in Special Topics**
Admission by consent of instructor.

PSYCH 480 Y,M R 1.0  
**Directed Studies in Special Topics**
For the student who desires to pursue a particular topic in depth through independent experimental research and/or extensive reading. A faculty member must approve a student's project prior to registration for this course. Open to exceptional students with permission of the instructor and the Department.

PSYCH 498 Y,M R 1.0  
**Senior Honours Essay - Review Paper**
Each student will work under the direction of a member of the department on a critical integrative review of an issue in research of literature. The result of this review will be presented in the form of a thesis, which will be critically examined by members of the department.
Open to fourth year Honours or Makeup only.

PSYCH 499 Y,M R 1.0  
**Senior Honours Essay - Experimental Study**
Each student will work under the direction of a member of the department on an experimental study. The result of this investigation will be presented in the form of a thesis, which will be critically examined by members of the department.
Open to fourth year Honours or Makeup only.

The following courses are administered by Renison College. Since these courses are intended primarily for students in the Social Development 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 220 R F 3C 0.5  
**Social Psychology**
Cross-listed as PSYCH 253.

PSYCH 221 R W 3C 0.5  
**Interpersonal Interaction**
Cross-listed as PSYCH 254.

PSYCH 322 R F 3C 0.5  
**Personality Theory**
Cross-listed as PSYCH 355.

PSYCH 323 R W 3C 0.5  
**Abnormal Psychology**
Cross-listed as PSYCH 357.

PSYCH 367R-369R  
**Special Topics in Psychology**

PSYCH 368 R W 3C 0.5  
**Advanced Topics in Counselling Psychology**

PSYCH 398R/399R S,F,W R 0.5  
**Independent Study**
Open to senior Social Development Studies majors only.

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**Department of Recreation**

Associate Professor, Chairman of the Department  
D. Ng, BA (Lingnan), MA (Carver), MS ReD (Indiana)

Assistant Professor and Associate Chairman, Undergraduate Affairs  
P. Eagles, BSc (Waterloo), MSc (Guelph), PhD (Waterloo), MCIP

Associate Professor, Associate Chairman, Graduate Affairs  
J. Zuzanek, CSc (Prague Institute of Sociology), PhD (Charles University, Prague)

Professors  
E.M. Avedon, BSS (William and Mary), MA, EdD (Columbia)
W.R. Forbes, BSc, PhD, DSc (London), DIC, ARCS

B.D. McPherson, BA, MA (Western Ontario), PhD (Wisconsin)

Associate Professors  
J. Levy, BA (Waterloo Lutheran), BPE (Waterloo), MSW (Waterloo Lutheran), PhD (Waterloo)
S.L.J. Smith, BA (Wright State), MA (Ohio State), PhD (Texas A&M)

Assistant Professors  
W. Frisby, BPE (Alberta), MPH (Windsor), PhD (Waterloo)
D. Getz, BES (Waterloo), MA (Carleton), PhD (Edinburgh)
L. Heywood, BA (North Dakota), MA (Florida State), PhD (Wisconsin)
M.L. Hutchison, BA (Queer's), MS (Dalhouse), EdD (Boston)
R.C. Mannell, BA ( McMaster), MPE, PhD (Windsor)
R. Payne, BA (Guelph), MA (New England, Australia), PhD (Calgary)

Lecturers  
R.D. Graham, BA, MA (Western Ontario)

Adjunct Faculty  
A. Gilbert, BA, MA (Waterloo)

Faculty Members of Recreation holding cross appointments to:  
1Sociology  
2Planning  
3Geography  

Faculty Members holding cross appointments to Recreation from:  
4Statistics  
5Kinesiology
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
An overview of the total field of recreation emphasizing the understanding of leisure phenomena and implications for contemporary society.

REC 101 W 2C,1T 0.5
Introduction to Leisure Services
An introduction to various leisure service agencies and the services provided. Field trips to municipalities, specialized institutions, and voluntary agencies.

REC 200 F.S, 3C 0.5
Theories of Play
A critical analysis of definitions, concepts and assumptions of classical, recent and modern theories of play with implications for research strategies, programming and planning for play.

REC 201 F 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
Recreation Program Development
A study of the scope of community recreation programs and the factors involved in program leadership. Emphasis will be placed on the goals in recreation for the leader and participant, effective leadership of individuals and groups, individual and group creativity.

REC 230 W 3C 0.5
Introduction to Outdoor Recreation
A study of outdoor recreation in relation to contemporary lifestyles, natural and human resource systems. Includes the examination of outdoor settings as an integral part of an outdoor recreation continuum. Includes the role of selected governmental and non-governmental bodies.

REC 241 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.

REC 252 W,3 3C 0.5
Recreation and Mental Retardation
An analysis of the motoric and psychosocial behavioural dimensions specific to the retarded with direct and obvious applicability to the planning, implementing and evaluating of recreational programs.

REC 254 F,S 3C 0.5
Recreation and Mental Health
A psycho-social analysis of the determinants and consequences of recreational behaviour as related to positive and negative mental health, discussing in detail, structure, semiotic factors and interaction patterns.

REC 270 F 3C 0.5
Statistical Techniques Applied to Leisure Studies
An introduction to descriptive and inferential statistics and the interpretation of data. A major consideration of the course is the use of statistics in the solution of problems in recreation and leisure.

REC 300 W 3C 0.5
Philosophy of Leisure
Examination of major philosophical themes through the ages with reference to contemporary viability and effect upon social behaviour.

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.

REC 302 W 3C,1L 0.5
Travel and Tourism
The scope and nature of travel and tourism as contemporary leisure experiences. Economic, political and social ramifications, research strategies employed, implications for the future.

REC 304 F 3C 0.5
Community and Cultural Development
A study of major issues of Canadian cultural policy from a socio-historical, political and sociological perspective. Students will examine the role and organizational structure of the arts and major cultural agencies, and discuss social, economic and administrative aspects of professional, amateur, commercial and public art organizations and services.

PREREQ: REC 100 or consent of instructor.

PREREQ: REC 250, PSYCH 312.

PREREQ: REC 250, permission of instructor.

PREREQ: Consent of Instructor, third year standing.

PREREQ: Two item courses in Sociology.

Cross-listed as KIN 252 and SOC 348.
Course Descriptions
Recreation

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 discretionary time. Current theory and research focusing on the impact of leisure on the socio-psychological adjustment of the individual, and applications to human problems associated with leisure will be examined.
Prereq: PSYCH 101 and REC 201

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 research, organizational structure, short and long range planning, financial analysis and promotions.
Prereq: REC 210 and BUS 121, or consent of instructor

REC 311 S 3C 0.5
School Recreation
An analysis of the 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 201

REC 312 W 3C 0.5
Recreation and Community Action
The role of the citizen in recreation systems with regard to social change. Students will examine models for social change which interact with recreation systems and power relationships between citizen's groups and recreation systems.
Prereq: REC 210

REC 316 F 3C,1L 0.5
Principles of Recreation Planning
An exploration of alternative approaches to the planning of recreation opportunities. The demand for and supply of recreation opportunities; standards, models and systems; recreation planning policies and agencies; and selected recreation planning issues.
Prereq: PLAN 156 or a full credit in Geography, or consent of instructor

REC 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 analysis are stressed. Students conduct field evaluations in local community agencies.
Prereq: REC 270

REC 321-329 0.5
Selected Topics in Recreation

REC 321 F 0.5
Analysis of Tourism and Recreation

REC 325 0.5
Marine Recreation

REC 327 0.5
Leisure and Environmental Design

REC 328 0.5
Area Tourism Development

REC 329 0.5
Computer Applications in Leisure Services

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,S 2C,2L 0.5
Applied Methods in Outdoor Recreation
Emphasis on methods and techniques for the selection, development, and implementation of programs and projects through the utilization of diverse and unique natural settings and environments.
Prereq: REC 230

REC 334 F 3C,1L 0.5
Park Management
Basic administrative procedures in park management. Operational techniques are examined together with general policies of acquisition, operation and development.
Prereq: REC 210, REC 230 or equivalent
Cross-listed as ENV S 334.

REC 361 F,S 3C 0.5
Aging and Leisure
Social parameters of the aging process with particular reference to the Leisure Service Industry.
Prereq: HEC 301

REC 370 F,W,S 0.5
Directed Study in Special Topics
For the student who desires to pursue a particular topic in depth through guided independent research and/or reading. A faculty member must approve a student's project prior to registration. May be repeated once in a subsequent term.
Prereq: Faculty approval

REC 371 F,W 3C 0.5
Research Design Applicable to Leisure Studies
An introduction to the methods and techniques of research as applied to leisure studies and services. General consideration will be given to the technical problems involved in various stages of research methodology with emphasis on the logic underlying the research process.
Prereq: REC 270

REC 372 W 2C,2L 0.5
Introduction to Statistical Problem Solving by Computer
This is an applications oriented course which prepares the nonmathematical student to use the computer as a research tool. Topics include aids for statistical analysis and the preparation of documents such as reports and theses. The course provides sufficient background for application to other problems specific to the individual's field.
Prereq: A 1 term statistics course

REC 373 W 2C,2L 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
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.

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

Interpretation
Concepts, philosophy and practices of interpretation related to understanding the use of cultural and natural heritage resources.
Prereq: REC 332 or consent of the instructor

People in Natural Areas
Designing and managing for people in natural areas. Behavioural research and its relevance to the design and operation of natural areas and facilities will be emphasized. Means of understanding and involving neighbouring and visiting publics and indigenous people in the design and management of natural areas will be studied.
Prereq: REC 334/ENV 334
Cross-listed as ENV 343.

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 343.

Recreation Resource Policy
A study of policies, policy development and policy gaps related to recreation resources in Canada. Based on a literature review and discussion of decision-making procedures, roles and tools used in the recreation field; students are required to research real and theoretical situations for seminar presentation.
Prereq: REC 100 and REC 230 or consent of instructor

Research Project
An independent research project on an approved topic supervised by a faculty member. Required of all students enrolled in the Honours Recreation program.
REC 470 includes an approved design and completion of the first segment of the paper.
Prereq: REC 270, 371
REC 471 requires the completion of the project begun in REC 470.

COURSES NOT OFFERED 1984-85
REC 399 Seminar in Recreation and Leisure
REC 402 Colloquium on Religion and Leisure

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. Bryant, BA (Concordia), STB (Harvard), MA, PhD (St. Michael's) R

Professor
W. Klaassen, BA (McMaster), BD (McMaster Divinity School), PhD (Oxford) G

Associate Professors
W.J. Bildstein, BA (Western Ontario), STB (Gregorian); MA (Windsor), STD (Angelicum) J
M.S. Bird BA, MA, PhD (Iowa) R
F.C. Gérard, 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) P
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. Kiley, BA (Boston), STM, PhD (Harvard) J

A.J. Reimer, BA (Manitoba), MA (Toronto), MA, PhD (St. Michael's) G

Lecturers
A.L. Evans, BA (Toronto), BD (Emmanuel), STM (McGill), DMin (Andover-Newton) P
R. Kooistra, BTh (Kampen), DTh (Amsterdam) P
S.A. MacDonald, BA, STB (Western Ontario), MA (San Francisco) J
T. Neufeld, BA (Manitoba), MDiv (Harvard) G

Faculty designated with suffix G (Conrad Grebel), J (St. Jerome's), P (St. Paul's), and R (Renison) are located in the respective Colleges.

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.

R S 100A.5
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.

R S 100A 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

R S 100B F,W 3C 0.5
Religions of the West
Encounter with Judaism, Christianity and Islam: the characteristics and interaction of the 3 major religious traditions that have shaped the image of the Western World.

Area 1

R S 100C F, W 3C 0.5
Religious Quests
Profiles, biographies and autobiographies of individuals in search of ultimate meaning. Person's studied are spiritual seekers from all walks of life: traditional religious figures, artists, novelists, scientists and others.

Area 5
A survey of the literature, history and religion of ancient Israel as seen in its cultural setting in the ancient Near East.

Area 3

A study of the principal teachings of the Catholic Theology community during the New Testament period as seen in its cultural setting in the Greco-Roman world.

Area 3

The Hebrew Prophets
A study of the prophetic movement from Amos to Malachi in the historical, social, and religious context of Israel and the ancient Near East.

Area 3

Modern Study of Jesus
An examination of recent approaches to the study of Jesus of Nazareth to determine his significance for the beginnings of the Christian Church and for modern men.

Area 3

The Apostle Paul: Life and Letters
An examination of the careers and thought of Paul as seen in his letters and in the Acts of the Apostles.

Area 3

Hinduism
A study of the developments of religious thought in India from the Vedic Period to the present. The course will combine an historical survey with a study of representative texts from the religious, philiosophical, social and political thought of the Hindus.

Area 1

Buddhism
An introduction to the unifying beliefs and philosophical presuppositions of the Buddhist world-view, and an overview of the diverse forms of Buddhism in South and South-East Asia, Tibet, China and Japan.

Area 1

Islam
An introduction to the Islamic faith and practice, with a review of the development, achievements and impact of the Muslim community from Muhammad the Prophet to the present day.

Area 1

R S 217 S 3C 0.5
Judaism
An introduction to the religious tradition of the Jews, in terms of beliefs, practices, ideals and institutions from the beginning to the present time.

Area 1

R S 220 F 3C 0.5
Evangelical Christianity
A descriptive, historical and theological review of the wing of North American Christianity known as evangelicism, fundamentalism, or revivalism.

Area 2

R S 221 W 3C 0.5
Sects, Cults and New Religious Movements
An analysis of minority religions considered deviant by the dominant society such as the Amish, Mormons, and Jehovah's Witnesses with special consideration of the recent new religious movements including Unification (Moonies), Scientology and Krishna consciousness.

Cross-listed as SOC 225.

Area 5

R S 230 W 3C 0.5
History of Christianity
The development of Christianity in its Roman Catholic, Eastern Orthodox and Protestant traditions from the time of Christ to the present.

Cross-listed as HST 235.

Area 2

R S 231 F 3C 0.5
History of Christian Thought
An analysis of the major theological developments in the Christian traditions from the apostolic era to the present.

Area 4

R S 236 F.W 2C, 1D 0.5
Human Sexuality and Christian Morality
An investigation of the moral implications of an evolving sexual consciousness in the Christian tradition.

Prereq: Second year standing or consent of instructor

Area 4

R S 238 F 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
Emphasis upon the films of Ingmar
Quest for a significant existence.

An exploration of spiritual themes and
capable of addressing the human
issues in the cinema. An assessment of
Film and
 pluralism.

Education and social reform, political
issues raised by the

interaction of religious faith with modern
 architectures and folk-literature of

and perennial themes of Indian religion
Hinduism, Indian Buddhism and Jainism.

Psychology of Religion
A study of theories of the psychological
sources of religious experience, the
religious significance of psychological
phenomena. Topics include faith, doubt,
evangelism, conversion, faith healing,
mysticism, drugs and religious
experience, tongues-speaking.

Religious Perspectives in
An examination of the development of
Christian ethics, the Christian Doctrine of
Man, Christian ethics and society, and
faith and reason in ethical decisions.

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.

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.

Religion in the Canadian Experience
An examination of the role of religion in
Canadian immigration and settlement,
education and social reform, political
and national identity, secularization and
pluralism.

Film and the Quest for Meaning
An examination 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.

Cross-listed as FINE 252.

Film fee $5.00.

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 liturgical signs in contemporary
Roman Catholicism.

Prereq: Second year standing or
consent of instructor

Studies in Church and Society

Gospel and Liberation
A multi-disciplinary study of the Christian
Gospel as a means to liberation and
oppression in pre-modern and modern
societies; its role in the theory and
practice of Liberation Theologies,
especially with respect to Latin America
and the Women's Movement.

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.

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.

Personality and Religion
A study of the psychology of personality
in its relationship between personality
and religious thought, experience and
behaviour.

Religious Approaches to Personal
Crises
A critical historical review of Jewish-
Christian approaches to emotional and
interpersonal problems, with an analysis
of the clinical and pastoral education
movement in the church.

Cross-listed as FINE 252.

Film fee $5.00.

Area 5
The Church in the Modern World
A critical study of the church's roles in contemporary secular society.

A study of modern thinkers (for theology), with special emphasis on their influence on nineteenth century and Kierkegaard), with special emphasis on the characteristic polemic literature which each community produced against the other.

Prereq: R S 100A or consent of the instructor

Area 1

Islam and Christianity
A survey of the history of the Muslim-Christian relations from the time of the emergence of Islam to the present, with a special emphasis on the characteristic polemic literature which each community produced against the other.

Prereq: Second year standing

Area 2

Radical Reformation
A study of Anabaptism and its place in the history of the Christian Church and of the Reformation period.

Prereq: R S 100B or consent of the instructor

Area 2

The Orthodox Church
A study of "Eastern" Christianity; its history, theology, culture, spiritual experience, and its situation in modern Greece, Russia, Eastern Europe, the Middle East, and in the West.

Prereq: R S 100C or 230 or 231 or consent of the instructor

Area 2

The Church in the Modern World
A critical study of the church's roles in contemporary secular society.

Area 2

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

Area 4

Contemporary Theology
A study of major themes and movements in contemporary theology, with reference to selected thinkers, such as Barth, Tillich, Buber, de Chardin and Hahner.

Prereq: R S 231 or consent of instructor

Area 4

Luther and Calvin: The Reformation in Theological Outline
This course will examine the religious experience and the theologies of Martin Luther and John Calvin in their respective historical contexts.

Prereq: One of R S 100H, 230, 231 or consent of the instructor

Area 4

Christian Spirituality and Mysticism
A study of the spiritual experience and mystical knowledge of great Christian mystics, from the desert Fathers and Hesychasts in the Eastern Orthodox tradition to the mystical schools of the Western Catholic tradition.

Prereq: R S 230 or 231 or consent of instructor

Area 4

Religion and the Arts
A consideration of the spiritual dimension in art, both sacred and secular. An exploration of the quest for meaning in the various arts—painting, music, architecture, sculpture, dance, and cinema—encountered through slides, films, recordings, and readings.

Prereq: R S 100C or 266 or 267, or consent of the instructor

Area 5

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

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

Directed Reading in Special Subjects
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

Honours Seminar
A continuation of the above.

Every student in the Honours R S Program is required to take R S 490A and 490B.

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

Directed Research in Special Subjects for Graduate Students

COURSES NOT OFFERED 1984-85

R S 203 Wisdom Literature in the Old Testament

R S 206 The Parables of Jesus

R S 232A Jesus Christ in Contemporary Perspective

R S 232B Jesus Christ in Historical Perspective

R S 261 Women and the Great Religions

R S 263 Religion and Politics

R S 265 Unity and Diversity in Canadian Religion

R S 268B Religious Perspectives in Contemporary Canadian Literature

R S 275 Religion and Psychotherapy

R S 281 Theology of Worship and Sacrament
Faculty of Science

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 bonds 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. 6 weeks. A special course available to students in the Mathematics Faculty who do not have a strong science background, especially at the Secondary School Year 5 level. Not open to students registered in the Faculty of Science.

SCI 202 F 3C 0.5 Energy

SCI 219 F 2C 0.5 Chemistry in Modern Society
The impact of chemistry on modern society will be considered by discussion of a number of topics including: marijuana and other non-medical drugs; food additives; birth controls; cancer-causing chemicals; pesticides and other chemical methods to control insects; chemical warfare.

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.)

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 systems, stars, the galaxy, galaxies and the universe. Open to first year or upper year students.

SCI 238 W, S 3C 0.5 Descriptive Astronomy
A survey course in astronomy intended for Mathematics, Engineering and Science students. The solar system, stars, the galaxy, galaxies and the universe. Open to first year or upper year students.

Students in Honours Physics may not take this course for credit.

Students interested in the above courses in Astronomy (i.e. SCI 237, 238) should note that because of overlapping material both courses may not be taken for credit - only the one most suitable to their background. In addition, students who have taken PHYS 250 and/or PHYS 251 may not take SCI 237 or 238 since PHYS 250/251 covers the same material at a much more advanced and comprehensive level. Students with a weak background in Physics and Mathematics may well find it advisable to take SCI 238 for credit before taking PHYS 250/251 for credit.
Course Descriptions

SCI 250 W 3C 0.5
Environmental Geology
The influence of geological factors on the natural environment: natural hazards; efforts of engineering works on the environment; geological aspects of water resources and water disposal with particular attention to solid waste (garbage) and deep well injection of liquid wastes.
Prereq: Students will find a course in Physical Geography or Earth Sciences to be an advantage. Students whose major field is Earth Sciences may not take this course for credit.

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 1984-85.

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 1984-85.

SCI 255 W 2C,1T 0.5
The Biology of Aging
An introduction to the biological mechanisms of aging at the molecular, cellular and systemic levels. Topics to be discussed will include the theories of aging, methods for studying the aging process, the role of diseases in aging and chronological changes in organisms during aging.

SCI 260 W 3C 0.5
The Science of Human Senses
Sight, hearing, smell and taste from biological, chemical and physical perspectives. Sensory overload and pollution. Cultural aspects of sensory perception.

SCI 270 W 3C 0.5
Nuclear Science
A non-mathematical general treatment of the following areas of nuclear Science: historical development and discovery of new fundamental particles; artificial transmutation of elements; nuclear sources of energy; biological effects of radiation and use of radioisotopes in industry, medicine and agriculture. The impact of nuclear science on social, economic and political systems will be discussed.
Prereq: At least 1 year Secondary School Chemistry or Physics.

SCI 312 F 2C 0.5
Physics of Music 1
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.
Prereq: BIOL 233
Offered only by Correspondence for 1984-85.

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.
Prereq: BIOL 233
Offered only by Correspondence for 1984-85.

SCI 355 F 2C 0.5
Biology of Cancer
An introduction to cell and developmental biology in relation to cancer in the human body.
Students whose major field is Biology may not take this course for credit.
Not open to students who have taken SCI 351.
Offered in 1985-86 and alternate years thereafter.

SCI 400a F 2C 0.5
The History of Science 1
The development of scientific concepts from the Renaissance to the early 19th century. Astronomy from Copernicus to Newton, physics from Galileo to Newton. The physics and biological sciences during the 18th century. Lavoisier and La Révolution Chymique. The beginnings of the industrial revolution. Emphasis will be on reading the works of the originators of Science.
Prereq: First year Science or equivalent.

SCI 400b W 2C 0.5
The History of Science 2
The growth of scientific ideas in the 19th and early 20th centuries. Developments in physics, chemistry, geology, biology (particularly Darwin) and technology. Emphasis will be on reading the works of the originators of science.
Prereq: First year Science or equivalent.

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 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. Four satisfactory reports are required prior to graduation but this number will be reduced to 3 for students transferring to Co-op Science in 2B or later terms. A word Grading system will be used and will range from Excellent to Unsatisfactory. This course will be added to the student's transcript at the completion of Year 4 and will be given 0.5 course credit; this credit is to be in addition to the regularly required number of course credits shown in the program listings.

SCI 453 F 2C 0.5
The Seas and Man's Effects Upon Them
Study of the oceans from a biological point of view, and consideration of the effects of exploitation and pollution upon the animals and plants that inhabit them.
Students whose major field is Biology may not take this course for credit.
SCI 454 W 2C 0.5
The Inland Waters and Man's Effects Upon Them
Study of lakes, rivers and streams from a biological point of view, and consideration of the effects of pollution upon the animals and plants that inhabit them. Not available to students who have taken BOL 400.

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 1984-85
SCI 201 Contemporary Science 2
SCI 350 Canadian Non-Renewable Natural Resources

Social Development Studies

Professor, Principal of Renison College
I.L. Campbell, 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

Professor
J.O. Towler, BA (Toronto), MEd, PhD (Alberta) R

Associate Professors
J.T. Harris, BMus (Temple), MSW (Pennsylvania) R
R. Lalhau, BSc (Purdue), PhD (Waterloo) R
M.I. Nagler, BA (British Columbia), MA (Chicago), PhD (Stirling) R
M. Zentner, BA (Temple), MSW (Kansas) R

Co-ordinator of Placements-Diploma Program
K. Bailey-Robinson, BA (MacMurray College), MSW (Wilfrid Laurier), R

Associated Faculty

Associate Professors, Religious Studies
M. Bird, BA, MA, PhD (Iowa) R
D. Bryant, BA (Concordia College), STB (Harvard), MA, PhD (St. Michael's) R

Associate Professor, Geography
B. Hyma, BSc, MSc (Madras), MA (Sheffield), PhD (Pittsburgh) H

Co-ordinator of English Language Programs
J. Miller, BA, BLS (McGill), MA, MPhil (Waterloo), PhD (York)

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

INTERDISCIPLINARY SOCIAL SCIENCE

ISS 131R W 3C 0.5
Social Ideas, Social Policy and Political Practice 1
An introduction to some of the major social and political ideas of Western civilization. Attention is given to the influence and applicability of these ideas to social policy and political practice in contemporary Canada.

ISS 150R S,F,W 3C 0.5
Lifespan Processes: The Normal Events
An examination of the significant psychological 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 S,F 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 231R W 3C 0.5
Social Ideas, Social Policy and Political Practice 2
Concentration will be on selected social and political ideas of the 19th and 20th centuries and their influence on social policy and political practice in contemporary Canada.

Prereq: ISS 131R

ISS 250R F 3C 0.5
Social 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

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.

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 320R F 3C 0.5
Critical Encounter with the Nature of Man
An attempt to increase students' understanding of human nature and deepen their awareness of some fundamental issues in the life of 20th century man. Interdisciplinary approach 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 "problematic" 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 3C 0.5
Family Law and Social Work
An introductory examination of family law as it applies to the practice of social work. Topics will include history of family law, divorce, custody, child welfare legislation.

Prereq: Second year standing

ISS 350F W 3C 0.5
Values in the Social Sciences
The impact that the activities of social scientists have upon the values of society will be contrasted with the limiting effect of society's extant values upon the activities and practice of social scientists and various social science oriented professionals.

Prereq: At least 2 social science courses

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 396R/399R S,F,W R 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 409R Y S 1.0
Senior Seminar Workshop
Social and human phenomena will be examined holistically. Students will be encouraged to synthesize knowledge learned in other social science courses in an intensive study of specific social issues and human concerns. The issues examined will vary from year to year reflecting social change, immediate community concerns, developments in the social sciences and the interests of students and instructors. Students will be required to engage in field projects, including community based learning experiences.

Prereq: Open to senior honours students only

ISS 499R Y T 1.0
Senior Honours Essay
The essay will normally be related to the student's chosen theme area, supervised by only one faculty member, but critically examined by faculty from all areas of the program.

Prereq: Open to senior honours students only

**PSYCHOLOGY**

PSYCH 120R F 3C 0.5
Introductory Psychology
Basic concepts and techniques of modern psychology as a behavioural science, with special emphasis on social aspects of behaviour. Topics may include the nervous system, perception, learning, memory, cognition, motivation, emotion, development, personality, social influences, psychopathology and psychotherapy.

PSYCH 121R W 3C 0.5
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

PSYCH 322R F 3C 0.5
Personality Theory
An examination of the major theories of personality including consideration of the psychoanalytic, dispositional, humanistic, and behaviourist models.

Prereq: An introductory Psychology course

Cross-listed as PSYCH 355

PSYCH 323R W 3C 0.5
Theories of Individual Counselling Psychology
An introduction to the methods, theories and problems in Individual Counselling Psychology.

Prereq: An introductory Psychology course

PSYCH 367R-369R 0.5
Special Topics in Psychology
One or more term courses will be offered from time to time as announced by the Social Development Studies Program. Subjects will be dependent upon special research and/or instructional interests of faculty.

PSYCH 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.G. Laing, the basic dimensions of interpersonal behaviour, and social exchange.

Prereq: PSYCH 220R or PSYCH 253
Cross-listed as PSYCH 254.

PSYCH 323R W 3C 0.5
Abnormal Psychology
A survey of concepts, theory, and research dealing with the nature and etiology of behavioural abnormality. Topics include neurosis, schizophrenia, depression, psychophysiological and behavioural disorders.

Prereq: An introductory Psychology course

Cross-listed as PSYCH 357
SOCIAL WORK

SOCWK 120R S,F,W 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 121R W 3C 0.5
Contemporary Social Problems
A study of contemporary social problems with which social work is concerned. Emphasis is divided between theoretical and practical approaches to understanding the problems and study of societal response to and intervention in the problem.

SOCWK 220R S,F 3C 0.5
Social Casework 1
A presentation of some of the theoretical constructs necessary for an 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.

SOCWK 221R S,F,W 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.

SOCWK 222R F 3C 0.5
Community Organization 1
An examination of social work practice as it relates to functional and geographical communities. The course will explore the theoretical foundations of organization practice as well as a variety of models.

SOCWK 230R W 3C 0.5
Religion and Social Work Practice
The course explores the relevance 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.

SOCWK 320R W 3C 0.5
Social Casework 2
An examination of some of the more complex intellectual components of the social work skills necessary to work with individuals in casework. Social work theories of the individual will be examined in order for the student to learn some clinical casework applications.

SOCWK 321R S,F,W 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.

SOCWK 322R W 3C 0.5
Community Organization 2
An investigation of methods and models of social work intervention used in the process of change as it affects functional and geographic communities.

SOCWK 326R W 3C 0.5
Medical Social Work 1
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.

SOCWK 356F 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 disenagement.

SOCWK 355R S,F,W 3C 0.5
Child Abuse: Identification and Treatment
The objectives of this course are to provide an understanding of the dimensions and causes of child abuse, to develop skills identifying cases of this social problem and to explore current methods of management and treatment of persons involved in child abuse situations.

SOCWK 367R W 3C 0.5
Social Work with the Elderly
An examination of social work theory and practice concerning the needs of the elderly. Social work strategies of intervention with the healthy and frail aged will be considered from the individual, group, family, community, and bureaucratic perspectives.
SOCIOLOGY

SOC 120R W 3C 0.5
Fundamentals of Sociology 2
An examination of the fundamental concepts of sociology and their application in seeking to understand the changing patterns and life-styles taking place specifically in Canada, and in general, within North American society.

SOC 223 S.F 3C 0.5
Deviance: Perspectives and Processes
The deviance-making process is examined in a variety of social contexts. Examines the emergence of rules and control agencies, the processes by which persons become involved in deviant activities, and the contingencies affecting persons' careers as deviants.
\[ \text{Prereq: An introductory SOC course or consent of instructor} \]

SOC 367R 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.
\[ \text{Prereq: An introductory Sociology course} \]

SOC 368R/399R S.F.W R 0.5
Independent Study
An independent in-depth study of a selected area of concern to the student within the discipline of Social Work. Available to individuals or small groups of third or fourth year Social Development Studies students and arranged with one of the faculty members from the program.
\[ \text{Prereq: Permission of Undergraduate Officer} \]

SOC 369R 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.
\[ \text{Prereq: An introductory Sociology course} \]

SOC 386R W 3C 0.5
The Sociology of Spolied Identity
Spoiled identity resulting from deviant status inhibits if not prevents acceptance and social mobility. Consequences of spoiled identity, lowered status positions and deviant criminal and "social" adaptations are examined from a symbolic interactionist perspective.
\[ \text{Prereq: An introductory Sociology course} \]

SOC 398R/399R S.F.W R 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.
\[ \text{Prereq: Permission of Undergraduate Officer} \]

COURSES NOT OFFERED 1984-85

ISS 221R Community Issues
ISS 240R Art and Society
ISS 343R Interdisciplinary Investigation of Human Sexuality
ISS 350A The Non-Medical Use of Drugs, Drug Dependency and its Management
ISS 350B Adult Education: Interdisciplinary Examination
PSYCH 369R Advanced Topics in Counselling Psychology
SOC 121R Fundamentals of Sociology
SOC 220R The Individual, Society and Religion
SOC 221R Master Trends in Modern Society
SOC 225R Race and Culture in the Third World 1
SOC 226R Race and Culture in the Third World 2
SOC 327R Minority Status in Canadian Society
SOC 328R Canadian Ethnic and Cultural Minorities
SOCWK 368R Medical Social Work 2

Department of Sociology

Associate Professor, Chairman
A.A. Hunter, BA (British Columbia), MA, PhD (Wisconsin)

Professors
L.A. Costa-Pinto, BA, Lic, Doctor in Sociology (Federal University of Brazil)
H.J. Fallding, BA, BSc, MA (Sydney), PhD (Australian National), FRSC
W.F. Fulwes, BSc, PhD, DSc (London), DIC, ARCS
H.D. Kirk, BS (City College, N.Y.), MA, PhD (Cornell)
D. Kubat, MA (Kansas), PhD (L. Maximillian, Munich)
C. Redekop, BA (Goshen), MA (Minnesota), PhD (Chicago) G
E.W. Vaz, BA, MA (McGill), PhD (Indiana)

Assistant Professors
J.E. Curtis, BA (Sir George Williams), MA (Central Michigan), MA (Cornell)
F.A. Fasich, BA (Pennsylvania State), MA, PhD (Columbia)
J. Goyder, BA (Bishop's), MA, PhD (McMaster)
R.D. Lambert, BA, MA (McMaster), PhD (Michigan)
S.A. McDaniel, BA (Massachusetts), MA (Cornell), PhD (Alberta) of the Distinguished Teacher Award
M.I. Nagler, BA (British Columbia), MA (Chicago), PhD (Webster) R
R.C. Prus, BA (Manitoba), MA, PhD (Iowa)
W.G. Scott, BA (Western Ontario), MA (Toronto)
M. Shimo, BA (International Christian, Japan), MA, PhD (British Columbia) J
A. Wipper, BA, MA (McGill), PhD (California, Berkeley)

Assistant Professor
F. Desroches, BA (Waterloo), MA (Toronto), PhD (Waterloo) J

Associated Faculty

Professors
G.L. DeGré, BSS (City College, N.Y.), MA, PhD (Columbia), Caled Hon (San Marcos, Lima)

Associate Professors
B. McPherson, BA, MA (Western Ontario), PhD (Wisconsin)
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.

Theberge, J. Zuzanek; MA (Moscow State University), CSc, PhD (Charles University, Prague)

Faculty Member holding cross-appointment to Sociology from: Statistics and Actuarial Science

Course Descriptions

SOC 101 S,F,W 2C 0.5
Introduction to Sociology
An introduction to the basic concepts and frames of reference of sociological investigation and interpretation. Topics for analysis will include communities, associations and institutions, classes and status groups, crowds and publics, social processes, and social change. Special attention is given to Canadian society.

Not open to students who have taken SOC 101(m), 101(u). 101(m) is an introductory course intended as an elective for mathematics students or as a basis for a combined honours in Mathematics and Sociology. 101(u) is especially designed for Planning Students.

Also offered at Conrad Grebel, Renison and St. Jerome's Colleges.

SOC 102 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 103 2C 0.5
Canadian Society
An introductory survey of Canadian society. This course will examine issues in the socio-historical development of Canadian society, its present social structure, organizations and ideologies.

SOC 104 2C 0.5
Social Psychology and Everyday Life
Introducing students to symbolic interaction, a sociological social psychology, this course examines the impact of culture on socialization experiences; the development of self-identities and social reputations; and interaction patterns in a variety of casual, occupational and deviance contexts.

SOC 106 2C 0.5
Collective Behaviour
The sociological analysis of the behaviour of crowds, mobs, publics and related phenomena and their relationships to social organization and social change.

SOC 107 2C 0.5
Social Structure and Character
This course will examine the connections between organized social life and types of personalities found in it. Examples will be drawn from contemporary as well as historical situations.

SOC 190 2C 0.5
Sociology of Discontent
A study of social change and innovation from the perspective of the role of individuals who dissent from the dominant norms and institutions. Jesus, Conrad Grebel, Marx, Woodsworth and King will be considered among others.

Offered at Conrad Grebel College.

SOC 200 F,W 2C 0.5
Marriage and the Family
A survey of sociological perspectives on marriage and the family in urban-industrial societies. Special attention is given to marriage and the family in Canada. Comparisons with U.S and Britain will be undertaken.

Prereq: SOC 101 or consent of instructor

Also offered at St. Jerome's College.

SOC 204 F,W 2C 0.5
Sociology of Adolescence
The social definitions of adolescence in cross-cultural and historical perspective. Social roles of adolescence in the institutional structures of urban-industrial societies with special emphasis on the family, education, and the economy. The relationship of adolescents' social roles to processes of social change and stability.

Prereq: SOC 101 or consent of instructor

SOC 206 F,W 2C 0.5
Sex Roles
An examination of male and female roles in contemporary Canadian society. Current and past roles of both sexes in different societies are considered. Selected topics of interest include sex role identity and its development, male role change, media images of men and women and men's and women's liberation.

Prereq: SOC 101 or consent of instructor

SOC 207 S,F 2C 0.5
Sociology of Education
Attention will be focused on the concepts and theories of sociology as they apply especially to the educational system. This course is designed for Co-op and Regular students who plan to enter the teaching field.

Prereq: SOC 101 or consent of instructor

Offered at Conrad Grebel College.

SOC 208 F,W 3C 0.5
Education and Native Peoples
An examination of some of the limitations and alternatives to formal schooling employed mainly by Canadian and Australian indigenous groups (Indian, Inuit, and other aboriginal groups). Special emphasis is placed on skill training and the group's search for identity.

SOC 209 F,W 2C 0.5
Family Origin and Personal Identity
This course focuses on the intersection of biography and social structure within the family. Application of sociological theory and methods to students' own family backgrounds will be used to illustrate the social bases of identity.

Prereq: SOC 101 or consent of instructor

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 220 F,W 2C 0.5
Sociology of Business Management
A study of the structure, stratification and social roles in the organization, operation and management of small businesses. Attention will also be given to decision making, labour-management relations, the institutionalization of value systems, and job satisfaction.

Offered at Conrad Grebel College.

SOC 222 F,W 2C 0.5
Juvenile Delinquency
A systematic analysis and criticism is presented of biological, psychological, psychoanalytical and sociological theories of juvenile delinquency. Attention is given to statistics and contemporary research with special emphasis on the distribution and types of delinquent subcultures.

Prereq: SOC 101 or consent of instructor
SOC 223 S.F. 2C 0.5
Deviance: Perspectives and Processes
The deviance-making process is examined in a variety of social contexts. Examines the emergence of rules and control agencies, the processes by which people become involved in deviant activities, and the contingencies affecting their careers as deviants.
Prereq: SOC 101 or consent of instructor
Also offered at Renison College.

SOC 224 2C 0.5
Law and Order: Regulating Deviance
Focusing on the "processes and problematics 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 W 3C 0.5
Sects, Cults and New Religious Movements
An analysis of minority religions considered deviant by the dominant society such as the Amish, Mormons, and Jehovah's Witnesses, with special consideration of the recent new religious movements including Unification (Moonies), Scientology and Krishna movements including Unification and Jehovah's Witnesses, with special consideration of the recent new religious
Cross-listed as RS 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 229 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 230 2C 0.5
Communication
An analysis of the role of language and other symbol systems in social interaction; the interplay between communication and the social system, the formation of attitudes through language; social and individual disorders as caused by, and reflected in, the breakdown in the communication process.
Prereq: SOC 101 or consent of instructor

SOC 231 2C 0.5
Sociology of Mental Illness
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. Emphasis on immigration and immigration policy.
PreReq: SOC 101 or consent of instructor

SOC 254 2C 0.5
Comparative Social Structure
General theoretical and methodological issues facing comparative sociology; comparative methods at work in the treatment of Western and non-Western societies (including Canada).
PreReq: SOC 101 or consent of instructor

SOC 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 264 2C 0.5
Sociology of Religion
Religion is defined broadly and its relation to phenomena like totalitarian movements, psychoanalysis, and drug experience examined. The features common to all religions are explained, viz. myth, dogma, church, ritual, ethics, and religious experience.
PreReq: SOC 101 or consent of instructor
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 266 2C 0.5
Sociology of Militarism
A sociological approach to the role of the military corporation in different structural and historical contexts. Topics include the professionalization of the military, the development of military technology and its implications for national and international society.
PreReq: SOC 101 or consent of instructor

SOC 267 2C 0.5
Sociology of the Contemporary University
How have recent demographic and economic changes in North America affected the organization and goals of higher learning? This course explores organizational crises and various attempts at containing and managing them.
PreReq: SOC 101 or consent of instructor

SOC 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 W 2C 0.5
The Mennonites as a Sociological Community
A case study of the Waterloo County Mennonites as a social system. Attention is paid to a methodology for studying a religious-cultural group by engaging in direct field studies. The community, charter resources, integration, family system, life ceremonies, adaptation to change, and survival techniques will be examined.
PreReq: An introductory social science course
Offered at Conrad Grebel College.

SOC 280 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

SOC 281 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 282 W 2C 0.5
Methods 2
Continuation of Methods 1. The course involves seminar meetings emphasizing the critical evaluation of research techniques.
PreReq: SOC 101 or consent of instructor

SOC 285 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 290 F 2C 0.5
Community, Communes and Utopias
Using communes and the writings of utopian visionaries as case studies, the nature and definition of community, the place and problem of community in modern societies, and the function of community in local and worldwide societal harmony will be analyzed.
Offered at Conrad Grebel College.

SOC 302 2C 0.5
Comparative Sociology of Youth
The aim of this course is mainly to study the prevailing patterns and resulting problems connected with the ways in which different societies react to the emergence of new generations. Concentrates on an analysis of the 1960s.
PreReq: SOC 101 or consent of instructor
SOC 307 W 2C 0.5
Problems in Contemporary Education
A study of problems arising from the interplay between institutionalized education and the forces of rapid social change in the contemporary society. It emphasizes the changing roles of the learners and instructors and social dimensions of new learning theories and programs. Themes will be selected and studied in depth on a seminar basis.
Prereq: SOC 101 and 207
Offered at Conrad Grebel College.

SOC 310 W 2C 0.5
Seminar in Group Dynamics
An analysis of naturally occurring and experimental groups from a social structural perspective. The study of processes of internal differentiation, integration, authority, etc., and the relationships between small groups and their environments.
Prereq: SOC 101 or consent of instructor
Offered at Conrad Grebel College.

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 340 2C 0.5
Complex Organizations
Examines the role of large-scale organizations in industrial society, and their impact and influence. Illustrations will be drawn from commerce and industry, as well as education, health services, and government.
Prereq: SOC 101 and SOC 242

SOC 342 2C 0.5
Sociology of Industrial Relations
Using sociological concepts and theories, the course will examine the nature of the relationship between employers and employees, current issues facing unions and management, and the character of accommodation which may be realized between the two.
Prereq: SOC 101 and SOC 242

SOC 343 2C 0.5
Sociology of Health Care
Examination of the organizations which provide health care, including assumptions under which they operate, interactive roles played by all members, including patients, alternative arrangements for providing health care, and the social positions held by health professionals.
Prereq: SOC 101 and SOC 248

SOC 344
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 Sociology course
Cross-listed as KIN 362

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 REC 301

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.
Prereq: 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.
Prereq: SOC 101 and SOC 253

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.
Prereq: SOC 101 and 1 other Sociology course

SOC 366 2C 0.5
Urban Sociology
The comparative study of urbanization as a process; the culture and organization of cities, urban problems; special attention is given to industrial cities of Canada, with comparative reference to the principal cities of Western societies.
Prereq: SOC 101 and 1 other Sociology course

SOC 370 W 2C 0.5
Sociology of Law
Special attention will be paid to the growing public awareness of the failure of law to provide justice or social control in a number of situations. Local judges, lawyers and police officials are invited to discuss such issues as the jury system, police and violence, civil rights and mass media.
Prereq: Third year standing or by permission
Offered at Conrad Grebel College.
SOC 371 3C 0.5
Philosophy of Social Science
Problems about the fundamental methods and aims of the social sciences generally, the problems specific to Psychology, Sociology, Political Science, etc., and their relations to one another will be considered.
Prereq: Some previous work in 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.
Prereq: 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 on-going group life. While doing field work, students have an opportunity to examine basic features of interactionist thought.
Prereq: 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.
Prereq: 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.
Prereq: 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.
Prereq: SOC 101 and 1 other Sociology course (SOC 271 is recommended)

SOC 440A-X S,F,W 0.5
Directed Readings
Selected readings and essay assignments under the direction of a faculty member.
Prereq: Fourth year standing in Sociology

SOC 440A S,F,W 0.5
Directed Readings in Deviance, Criminology, and Corrections.

SOC 440B S,F,W 0.5
Directed Readings in Social Psychology

SOC 440C S,F,W 0.5
Directed Readings in Social Inequality

SOC 440D S,F,W 0.5
Directed Readings in Quantitative Methods and Statistics

SOC 440E S,F,W 0.5
Directed Readings in Social theory

SOC 440H S,F,W 0.5
Directed Readings in the Family

SOC 440J S,F,W 0.5
Directed Readings in the Marketplace

SOC 440K S,F,W 0.5
Directed Readings in Industry, Work and Complex Organizations

SOC 440M S,F,W 0.5
Directed Readings in Religion

SOC 440N S,F,W 0.5
Directed Readings in Demography

SOC 440S S,F,W 0.5
Directed Readings in Developing Nations

SOC 440V S,F,W 0.5
Directed Readings in Sex Roles

SOC 440X S,F,W 0.5
Directed Readings in Medical Sociology

SOC 499A/B S,F,W 1.0
Senior Honours Essay
Required of all Honours students in Sociology or by election by Joint Honours students in their fourth year. For students electing Honours Sociology (Canadian Studies), the essay should bear on some topic of particular sociological significance for Canadian society.
Prereq: Fourth year Sociology Honours
SOC 499A is a prerequisite for SOC 499B.

Sociology courses offered at Renison College are listed in the Social Development Studies section.

COURSES NOT OFFERED 1984-85
SOC 219 Catholic Sociological Thought

Department of Spanish

Assistant Professor and Chairman of the Department
B. Thalman, BA (DePauw), MA, PhD (Ohio State)

Associate Professor
C.M. Fernández, Lic en Arq (Madrid), MA (Tulane), D Lit et Phil Universitas Complutensis (Madrid)

Participating Adjunct Faculty at Wilfrid Laurier University
Professor
A.A. Borras, BA (Kentucky), MA (Indiana), PhD (Pennsylvania State)

Assistant Professors
M. Bortolussi, BA, MA (Carleton), PhD (Laval)
M. Ratcliffe, BA, MA (Carleton), PhD (Toronto)
### Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPAN 101 F/W 3C,1L 0.5</td>
<td><strong>Introduction to Spanish 1</strong></td>
<td>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).</td>
</tr>
<tr>
<td>SPAN 102 W,S 3C,1L 0.5</td>
<td><strong>Introduction to Spanish 2</strong></td>
<td>A continuation of SPAN 101. Prereq: SPAN 101 or consent of Department (WLU 101/152-40).</td>
</tr>
<tr>
<td>SPAN 111 W 3C,1L 0.5</td>
<td><strong>Conversational Spanish</strong></td>
<td>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 111/161-40).</td>
</tr>
<tr>
<td>SPAN 201A F 3C,1L 0.5</td>
<td><strong>Intermediate Spanish 1</strong></td>
<td>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 121/177-30).</td>
</tr>
<tr>
<td>SPAN 201B W 3C,1L 0.5</td>
<td><strong>Intermediate Spanish 2</strong></td>
<td>A continuation of SPAN 201A. Prereq: SPAN 201A or consent of Department (WLU 122/172-03).</td>
</tr>
<tr>
<td>SPAN 203 F 3C 0.5</td>
<td><strong>Spanish Civilization 1</strong></td>
<td>Development of Spanish Civilization and culture from the earliest times to the present. Taught in English. (WLU 203/253-30).</td>
</tr>
<tr>
<td>SPAN 204 W 3C 0.5</td>
<td><strong>Spanish Civilization 2</strong></td>
<td>A continuation of SPAN 203. Taught in English. (WLU 213/263-03).</td>
</tr>
<tr>
<td>SPAN 205 F 3C 0.5</td>
<td><strong>Survey of Spanish Literature 1</strong></td>
<td>Readings of major authors and study of the main literary trends from the Middle Ages to the 18th century. Prereq: SPAN 227 (WLU 205/255-30).</td>
</tr>
<tr>
<td>SPAN 206 W 3C 0.5</td>
<td><strong>Survey of Spanish Literature 2</strong></td>
<td>A continuation of SPAN 206 from the 10th century to the present. Prereq: SPAN 206 (WLU 206/256-03).</td>
</tr>
<tr>
<td>SPAN 217 F 3C 0.5</td>
<td><strong>Spanish American Civilization 1</strong></td>
<td>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).</td>
</tr>
<tr>
<td>SPAN 218 W 3C 0.5</td>
<td><strong>Spanish American Civilization 2</strong></td>
<td>A survey of the art, music and literature of Spanish America from pre-Columbian times to the present. Taught in English. (WLU 233/283-03).</td>
</tr>
<tr>
<td>SPAN 228 F 3C 0.5</td>
<td><strong>Survey of Spanish American Literature 2</strong></td>
<td>A continuation of SPAN 227. Prereq: SPAN 227 (WLU 208/259-03).</td>
</tr>
<tr>
<td>SPAN 251A F 3C 0.5</td>
<td><strong>Composition and Conversation 1</strong></td>
<td>Intensive language study based on literary texts, including vocabulary, grammar and syntax, introduction to commercial Spanish. Essay writing, translation and discussion. Prereq: SPAN 201B or consent of the Department (WLU 211/261-30).</td>
</tr>
<tr>
<td>SPAN 251B W 3C 0.5</td>
<td><strong>Composition and Conversation 2</strong></td>
<td>A continuation of SPAN 251A. Prereq: SPAN 251A (WLU 212/262-03).</td>
</tr>
<tr>
<td>SPAN 265 F 3C 0.5</td>
<td><strong>The Spanish Short Story</strong></td>
<td>Selected stories from outstanding writers in Spain, primarily of the 20th century. (WLU 204/254-30).</td>
</tr>
<tr>
<td>SPAN 266 W 3C 0.5</td>
<td><strong>The Spanish American Short Story</strong></td>
<td>Selected stories from outstanding writers of the 19th and 20th centuries in Spanish America. (WLU 214/264-03).</td>
</tr>
<tr>
<td>SPAN 304 F 2C 0.5</td>
<td><strong>Romanticism in Spain</strong></td>
<td>Readings of selected 19th century plays, poetry and novels. Prereq: SPAN 206 (WLU 304/354-30).</td>
</tr>
<tr>
<td>SPAN 305 W 2C 0.5</td>
<td><strong>The Spanish Realist Novel</strong></td>
<td>Study of the fundamental narrative techniques and ideology in some of the most representative realist novels of the 19th century. Prereq: SPAN 206 (WLU 305/365-03).</td>
</tr>
<tr>
<td>SPAN 327 F 2C 0.5</td>
<td><strong>The Spanish Golden Age: Don Quijote</strong></td>
<td>A literary analysis of Don Quijote through diverse criticism of the masterpiece. Prereq: SPAN 206 (WLU 327/477-20).</td>
</tr>
<tr>
<td>SPAN 333 F 2C 0.5</td>
<td><strong>Modern Spanish American Poetry</strong></td>
<td>A study in depth of major poets and movements since Modernism. Prereq: SPAN 227 (WLU 319/469-20).</td>
</tr>
<tr>
<td>SPAN 334 W 2C 0.5</td>
<td><strong>Modern Spanish American Prose</strong></td>
<td>A critical study of masterpieces in prose from Sarmiento to the present. Prereq: SPAN 227 (WLU 308/358-02).</td>
</tr>
<tr>
<td>SPAN 344 F,W,S 2T 0.5</td>
<td><strong>Special Topics in Hispanic Studies</strong></td>
<td>By special arrangements, an individual student or a small group of students will follow a course of study under the supervision of a faculty member. (WLU 317/467-20).</td>
</tr>
</tbody>
</table>
Course Descriptions

Spanish

Systems Design Engineering

Department of Systems Design Engineering

Professor, Chairman
K. Huseyin, MSc (Istanbul), PhD (London), DSc (Eng)(London), PEng

Professor, President of the University
D.T. Wright, BAsc (Toronto), MS (Illinois), PhD (Cambridge), DEng (Carleton), LLD (Brock) DSc (Memorial), LLD (Concordia), PEng

Professor, Associate Dean,
Undergraduate Studies
P.H.ON. Roe, BAsc (Toronto), MAsc, PhD (Waterloo), PEng

Professor, Associate Chairman, Graduate Studies
G.J. Savage, BAsc, MAsc, PhD (Waterloo), PEng

Associate Professor, Associate Chairman, Undergraduate Studies
M. Chandrashekar, BTech (Indian Institute of Technology, Kanpur), MAsc, PhD (Waterloo), PEng

Professors
T.M. Fraser, MB, ChB (Edinburgh), MSc (Ohio State), LMCC, FACPM, PEng
H.K. Kesavan, BSc, BE (Mysore), MS (Illinois), PhD (Michigan State), PEng
S.S. Sengupta, MA, DPhil (Calcutta)
K. Singhal, BTech (Indian Institute of Technology, Kanpur), MS, EngScD (Columbia), PEng
G.N. Soulis, BAsc (Toronto), PEng
D.A. Winter, BSc (Queen's), PhD (Dalhousie), PEng
A.K.C. Wong, BSc, MSc (Hong Kong), PhD (Carnegie), PEng

Associate Professors
C.K.G. Hahn, MAsc (Waterloo)
K.W. Hipel, BAsc, MAsc, PhD (Waterloo), PEng
M.E. Jernigan, SB, SM, PhD (Massachusetts Institute of Technology), PEng
G.F. Rabideau, BA, MA (Wisconsin), PhD (Purdue)
P.L. Seeley, BAsc (Toronto)
B.L. Willis, BAsc, MAsc, PhD (Waterloo), PEng

Assistant Professors
P.H. Calamai, BAsc, MAsc, PhD (Waterloo)

J.J. Kay2 BAsc (McGill), MAsc, PhD (Waterloo)
H.C. Shen, BMath (Waterloo), MSc (Toronto), PhD (Waterloo)

Adjunct Faculty
J.W. Chinneck, BAsc, MAsc, PhD (Waterloo)
M.L. Constant, BSc (Toronto)
N.M. Fraser, BAsc, MAsc, PhD (Waterloo)
M. Kamel, BSc (Alexandria), MSc (McMaster), PhD (Toronto)

Faculty members holding cross appointments to Systems Design Engineering from:
1Kinesiology
2Man Environment Studies

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 Engineering courses are given on the basis of 3 formal lectures and 1 tutorial hour each week. The department endeavours to ensure that the formal course schedule remains below 30 hours per week in each term. Beyond this, other, less formally scheduled meetings between students and faculty are required. It is expected that the average student will spend, in total,
Course Descriptions
Systems Design Engineering

between 45 and 55 hours per week on his/her studies.

SY DE 101/102 F,S 1C 0.0
Tutorial
Systems Design first year students will meet with a faculty member designated as their class professor. Performance in assignments, conceptual difficulties with courses, interrelation of coursework, later work and engineering practice will be discussed. Non-credit courses.

SY DE 111 F 3C,1T 0.5
Calculus 1

SY DE 112 S 3C,1T 0.5
Calculus 2

SY DE 113 F 3C,1T 0.5
Linear Algebra

SY DE 121 F 3C,1T 0.5
Digital Computation
Introduction to electronic computation, computers; hardware and software organization, basic features of 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,1T 0.5
Introduction to Ergonomics
The man-machine environment complex; the nature of the operational environment, human sensory processes, human information processing; motor function; human work, thermal regulation and metabolism, skill, fatigue; shift work and circadian rhythms, problems of acoustic noise, vibration, heat, cold; needs of ventilation and lighting, information displays and control systems.

SY DE 161 F 3C,3L 0.5
Introduction to Systems Design Engineering
Introduction to the ideas and techniques of systems analysis and design. Fundamentals of graphic techniques. The use of graphics as an aid to idea generation in design. Principles of planning, innovation, creation of design solutions, feasibility analysis, solution evaluation and selection. The systems approach to value and utility.

SY DE 161 F 3C,1T 0.5
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 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, inter-relation of coursework, later work and engineering practice will be discussed. Non-credit courses.

SY DE 211 W 3C,1T 0.5
Differential Equations
First order differential equations, integrating factor, higher order differential equations. Complex variables, forced and free solutions to differential equations, transient and steady state solutions, applications. Laplace transforms and applications.

SY DE 212 F 3C,1T 0.5
Applicable Mathematics for Systems Design 2
Models and analysis of linear systems, discrete time systems, continuous time systems; difference and differential equations; impulse and frequency response. Complex frequency, functions of complex variables, transform domain techniques; Z transform; Fourier analysis, Laplace transform. Transfer functions and frequency response, frequency domain analysis of linear systems, sampling theory, stability, and linear filters.

SY DE 213 W 3C,1T 0.5
Theory and Applications of Probability

SY DE 214 F 3C,1T 0.5
Theory and Applications of Statistics

SY DE 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
Electrical, 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; Kirchhoff's laws; step response of first and second order networks; sinusoidal 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, interrelation of coursework, later work and engineering practice will be discussed. Non-credit courses.

SY DE 311 S 3C,1T 0.5
Introduction to Optimization
Deterministic operations research models. Topics will include: mathematical techniques of unconstrained and constrained optimization, followed by the construction, evaluation and applicability of various models in allocation, inventory, replacement, sequencing and related problems.

SY DE 322 W 3C,1T 0.5
Computer Simulation of Systems
System modeling, 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,1T 0.5
Introduction to Occupational Hygiene
Man-machine function and human reliability; human stress and adaptation; work and skill in industry and the operational environment; human factors in industrial safety and occupational hygiene.

SY DE 351 S 3C,1T 0.5
Physical Systems 2
The subject matter is similar to SY DE 252 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 361 W 1C,3L 0.75
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.
Course Descriptions
Systems Design Engineering

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 382 W 3C,1T 0.5
Fluid Mechanics

SY DE 383 S 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 381 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 401/402 F,W 1C 0.5
Tutorial
Systems Design fourth year students will meet with a faculty member designated as their class professor. Conceptual difficulties, the internation of course work and engineering practice will be discussed. Non-credit courses.

SY DE 411 F 3C,1T 0.5
Probabilistic Modelling
A continuation of SY DE 311, with emphasis on stochastic operations research models. Topics will include: decision making under uncertainty, queuing models and related probabilistic techniques, feedback control, probabilistic inventory, competitive strategies and related topics.

SY DE 413 F 3C,1T 0.5
Linear Graph Theory and Applications
Important concepts in graph theory, their properties, relationships among them and useful graph algorithms are given in the context of various applications. Applications include but not restricted to number of variables for electrical network equations, graph theoretic solutions to electrical network equations, sparse matrix techniques, graph models for fault diagnosis, optimum distribution of traffic through network and other network flow problems.

SY DE 421 F 3C,1T 0.5
Computer Aided Design
Issues and directions in computer aided design (CAD); fundamental principles and concepts required in actual design and building of CAD systems; state-of-the-art of CAD systems on the market; criteria upon which to evaluate CAD systems. Additional topics such as computer-aided manufacturing, flexible manufacturing and expert systems, may be included.

SY DE 423 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 445 F 2C,1T,2L 0.5
Measurement Methods in Human Engineering
Requirements of human measurement and its roles in design. Techniques of environmental measurement with respect to noise vibration, heat, lighting, air sampling, etc., and selected studies in the methods of anthropometry.

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.
Topics in Physical Systems Theory
This course applies physical systems theory to problems where the physical process is continuously distributed throughout a medium. The course contents include introduction to field and continuum problems; overview of approximate solution methods - including the finite difference method and the finite element method; identification of field variables; spatial discretization, modelling the field characteristics; formulations and computer solutions; applications of multi-terminal representations.

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.

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.

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.

Man-Machine Communications
The nature and design of machine-mediated human communication systems. Displays, computer graphics, computer-aided instruction and mass communication media (film, T.V., radio, print). A systems approach will be adopted with special attention to the socio-economic aspects of such systems.

Computer-Aided Simulation and Design
System modelling and simulation techniques, fundamentals of 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.

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 within the criteria concerning social, environmental and economic considerations are important. Both deterministic and probabilistic situations are discussed.

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.

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.
Course Descriptions

Urban and Regional Planning

School of Urban and Regional Planning

Professor, Director
D.W. Hoffman, RSA, MSA (Trenton), PhD (Waterloo), PAIGC, MCPP

Assistant Professor, Associate Director
N.A. McLellan, BSc (Toronto), MA, MCP, PhD (Queens), MRP, NCDC, AICP

Professor, Graduate Officer
G.G. McLellan, BSc (Toronto), MA, MRP, PhD (Yale), AICP

Assistant Professor, Associate Director
N.M. Lazarowich, BA (Saskatchewan), MA, MCP, PhD (Cincinnati), AICP

Professor, Graduate Officer
G. G. Mulamoottil, BSc (Mysore), MSc (Bombay), PhD (Delhi)

Associate Professor, Associate Dean
L.C. Mathews, BA (Queen's), MA, MRP, PhD (Ontario), MCIP

Professor, Special Programs
L.R. Newkirk, BSc (Saskatchewan), MA, MCP, PhD (Cincinnati), AICP

Associate Professor, Undergraduate Officer
S. Herzog, BArch (Toronto), MRAIC

Professional Liaison Officer
H.T. Lemon, FCIP

Professor
H.S. Costentz, BA Honours (Dundurn), MRP (North Carolina), FRTP, AICP, FSS, MES

Assistant Professors
G.B. Priddle, BA (Western Ontario), MA, PhD (Clark)
S.G. Rich, MCP, MRAIC, ARBA, AICP, MRCP
W.I. Shalinsky, BA, BSW (McGill), MSc, DSW (Western Reserve)

Assistant Professors
E. Baxter, BA, MA (British Columbia), PhD (Umbria)
T.J. Downey, BA (Waterloo), MA, PhD (Western Ontario)
P. Eagles, BSc (Waterloo), MSc (Guelph), PhD (Waterloo)
M.E. Haight, BSc, MSc, PhD (McMaster)
J.D. Robinson, BA (Toronto), MES (York), PhD (Toronto)
J.E. Robinson, BSc (Waterloo), MES (York)
R.C. Suffling, BSc, MSc (Waterloo), MES (Guelph)

Adjunct Faculty
H.C. Abell, PhD (Western Ontario), MA, PhD (Cornell)
A. deVos, BSc, MSc, PhD (Western Ontario)
S. Garrod, BA (McMaster), LLB, MES (Western Ontario)
B.C. Matthews, BSc (Toronto), MA, MSc (Western Ontario)
N.F. White, BSc (Queens), MD, CM (McGill)

Planning Graphics Resource Person
K.H. Hammond, BSc (Guelph)

Faculty Members of Planning holding cross and/or joint appointments to:

1. Biology
2. Geography
3. Environmental Studies and Health Studies
4. Recreation
5. Environmental Studies
6. Political Science

Courses not offered in the current academic year are listed at the end of this section.

Introductory Note
Students in faculties other than Environmental Studies should consult their faculty advisor regarding how term courses with 0.75 credit weight are counted for degree credit purposes.

PLAN 100a F 4C,1D 0.5

Introduction to Urban and Regional Planning Concepts and Techniques

The development of contemporary planning concepts and principles; the nature, purpose and scope of urban planning; the planning process and decision-making in a democratic society; methodological aspects of designing a planning program; identification of objectives and constraints, conduct of basic surveys and analysis, plans and policies preparation, evaluation and implementation.

Prereq: Planning students only

PLAN 100b W 4C,1D 0.5

Introduction to Urban and Regional Planning Concepts and Techniques

Continuation of PLAN 100a.

Prereq: PLAN 100a, Planning students only

PLAN 156 F.W 2C,1D 0.5

Introduction to Urban and Regional Planning Concepts

An introduction to contemporary planning ideas for students whose subsequent work might bring them into contact with professional planners.

Planning concepts and principles; the development of contemporary planning ideas; the nature, purpose and scope of urban and regional planning; the planning process and decision making in a democratic society.

Prereq: None

(Not available for credit to planning students. Restricted to first and second year students in other programs.)

PLAN 159 F.W 3rd 0.5

Graphics for Planning

Basic instruction in graphic techniques used in planning. Emphasis will be placed on the use of graphics for the communication of ideas.

Prereq: Planning students or consent of instructor

Estimated cost to student: $50.
PLAN 222 W 2C,1D 0.5
**Canadian Regional Issues**
Selective study of Canadian development issues pertaining to the use of land, urbanization, regional and resource development; issues will be related to structural and functional forces that are characteristics of the major regions of Canada, e.g., Atlantic Provinces, British Columbia.

PLAN 230 F 3C 0.5
**The Small Group in the Planning Process**
The small group and its relevance to the planning process. Focus on work groups such as committees, councils and boards. Various important elements of small groups such as leadership, goal setting, influence, decision-making and interpersonal relationships will be examined and related to planning.
Prereq: SOC 101 or consent of instructor
For planning students only.

PLAN 231 F 3C 0.5
**Citizen Involvement, Planning and Social Change**
The theory and practice of citizen involvement and social change in relation to planning and policy formulation. Included are the ideology of involvement, social change and intervention strategies, policy planning and local area planning. Canadian case materials are emphasized, and there is some skills training.
Prereq: SOC 101, Planning students; students from other Departments with consent of instructor

PLAN 232 F 4C 0.5
**Rural Planning and Development**
Advanced analysis of the process followed for rural planning and development in Canada and other selected countries. Problems and their solutions as noted in various jurisdictions are presented. Emphasis is placed on government approaches to planning and development.
Prereq: Second-year Planning students or consent of instructor

PLAN 255 W 2C,2wkshp 0.5
**Planning Surveys and Analyses**
Sources of data for planning and their analyses. The course will emphasize the sources, methods of collection and analysis of urban and regional land-use data. Particular attention is paid to the types of land-use information essential to transportation, housing, public facilities and recreation planning. Both lecture and workshop are related to a significant problem of land-use planning in Ontario.
Prereq: PLAN 100 or consent of instructor

PLAN 256a F 2C,2std 0.5
**Environmental Design 1**
Design concepts in urban and Regional Planning illustrated by recent work individual and group projects in planning design in urban and regional settings, using graphic, model and verbal presentations.
Prereq: Second year Planning or Environmental Studies students with consent of instructor

PLAN 256b W 2C,2std 0.5
**Environmental Design 2**
Continuation of PLAN 256a.
Prereq: PLAN 256a

PLAN 259 W 2C,2wkshp 0.5
**Regional Planning and Development**
The relationship of economic planning to regional planning. Theory and practice of regional planning and development to urban-centred, broad socio-economic, and frontier regions. A series of workshops focus upon the social and economic problems of a particular Canadian region and the role of federal, provincial and local governments in formulating and applying remedial policies in other nations.
Prereq: One of PLAN 100, 156 or consent of instructor

PLAN 270 W 2C 0.5
**Concepts and Ideas in Contemporary Urban Planning**
An overview of the modern movements and philosophical roots underlying urban planning and civic design. Philosophes 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 275 F,W 3R 0.5
**Readings and Research Planning**
Special readings and research on planning topics chosen in consultation with an instructor. This course gives the opportunity for supervised individual reading and study of planning or related topics in which the student is particularly interested.
Prereq: PLAN 100 or consent of instructor
Prior to registering for this course, students must arrange with a faculty member to serve as advisor.

PLAN 300a F 6wkshp,2lclab 1.0
**Seminar/Workshop Project in Urban and Regional Planning 1**
An integrated approach to the analysis of communities; identification and synthesis of factors related to function, structure, environmental context, regional framework, etc., in the preparation of comprehensive development programs. A major project undertaken in small project groups. Project reports summarizing findings are completed and presented at end of term. Field trip related to theme of problems includes follow-up discussion, assignments and preparation of individual research paper.
Prereq: Third-year Planning students only
Estimated cost to student: $70

PLAN 300b W 6wkshp,2lclab 1.0
**Seminar/Workshop Project in Urban and Regional Planning 2**
The transformation of analytical concepts of community into planning designs on selected sites. On-site visits, collection and analysis of field data and relevant social, economic, physical and administrative information. Public presentations of analyses, plans and proposals as well as preparation of comprehensive reports.
Prereq: PLAN 300a

PLAN 301 F 4std 0.5
**Urban Design**
A study of the design of the environment in urban and regional contexts through lectures and studio projects.
Prereq: Planning students or consent of instructor
Course Descriptions

Urban and Regional Planning

PLAN 307 F,W 2C,1D 0.5
Social Survey Techniques
Social research and the planning process; interview and self-administered surveys; questionnaire design; profile data; data processing; sampling, non-survey data collection techniques; practical applications.
Prereq: Second or third year Planning students with ENV S 271; other ENV S students with consent of instructor
Cross-listed as GEOG 307.

PLAN 316 W,S 3S 0.5
Multivariate Statistics
The theory and application of multivariate statistics, with particular emphasis upon the use of the computer.
Prereq: ENV S 271 or consent of instructor
Cross-listed as GEOG 316.

PLAN 317 F 2C,1L 0.5
Nonparametric Statistics
The theory and application of nonparametric statistics with emphasis upon social science problems.
Prereq: ENV S 271 or consent of instructor
Cross-listed as GEOG 317.

PLAN 318 F 3C 0.5
Spatial Analysis
Advanced quantitative analysis of spatial patterns and related technologies and the role selection of techniques from gravity models, linear programming, nearest neighbour analysis, Markov chain analysis, graph theory, simulation and trend surface analysis.
Prereq: ENV S 271 or consent of instructor
Cross-listed as GEOG 318.

PLAN 319 F 2C,1L 0.5
Economic and Social Techniques for Regional Planning
Critical appraisal of a selection of descriptive and evaluative regional analysis techniques. Economic considerations of regional development. Reliability and applicability of data; input-output analysis; cost-benefit analysis; planning, programming and budgeting systems; and social area analysis.
Prereq: ECON 101, 102 or consent of instructor
Cross-listed as GEOG 319.

PLAN 330 W 2C,1S 0.5
Urban Social Planning
This course looks at social planning as a way of attacking urban social problems. Will examine the different types of social planning and the relationship between physical and social planning.
Prereq: SOC 101 or consent of instructor

PLAN 333 F 2C 0.5
The Sociology of Regional Planning
Power structures, basic social institutions, attitudes and values related to the implementation of regional plans; regional development of human natural resources in Canada and abroad.
Prereq: SOC 101 or consent of instructor

PLAN 344 W 2C,1S 0.5
Recreation Planning
An exploration of the nature and functions of recreation in modern urban-industrial societies and an analysis of alternative approaches to the planning of recreation opportunities in urban-centred regions. Application of the planning process to rural and urban recreation. Historical development of recreation planning; problems, assumptions and myths in recreation planning; recreation use/needs, resources, allocation, evaluation of services/programs; selected recreation

PLAN 357 F,W 4C 0.5
Conservation and Resource Management
History of the conservation movement; ecological principles of conservation and resource management. Analysis, use and planning of recreational resources. Issues, values and techniques of project evaluation.
Prereq: ENV S 200
Cross-listed as GEOG 357.
Estimated cost to students: $10.

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 370 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 414 F 2C 0.5
Housing Policies
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 256 or consent of instructor

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 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.
Prereq: Three-months' work experience and equivalent of introductory anthropology, sociology, psychology, or political science.
PLANT 435 W 2C,3st 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 436 F 3C,3L U/lb

Urban Spatial Management
Urban areas consist of 3 broad subsystems: human, built and natural. Urban managers are concerned with interactions between these subsystems. Students are introduced to a range of quantitative analysis tools to be used as aids to urban spatial management. Emphasis is on tools that bridge across the subsystems.
Cross-listed as CIV E 344.

PLANT 449 Y 3C 1.0

Canadian Urban and Regional Planning
An overview of the evaluation of Canadian urban and regional planning covering the Canadian Planner's heritage, colonial planning, growth stages of post colonial planning, planning principles with an indeph examination of comprehensive planning and zoning, and the scope of planning education especially in our School.
Prereq: Consent of School

PLAN 451 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

PLANT 456b W 3C 0.5

Political and Administrative Processes in Urban and Regional Planning 2
Continuation of PLAN 456a.
Prereq: PLAN 456a

PLANT 475 F,W 3S 0.5

Projects, Problems and Readings in Planning
Special planning projects and problems chosen in consultation with instructor.
Prereq: Consent of instructor
A student must arrange with a faculty member to serve as advisor prior to registering for this course.

PLANT 476 Y 3S 1.0

Projects, Problems and Readings in Planning
Special planning projects and problems, chosen in consultation with instructor.
Prereq: Consent of instructor
A student must arrange with a faculty member to serve as advisor prior to registering for this course.

PLANT 480a F 3S 0.5

The Philosophy and Methodology of Urban and Regional Planning 1
A seminar course on some current and changing social philosophies, the image of man, the notions of ethics, morality, authority, equity, etc., and the related perceptions and perspectives and conceptions of social and environmental realities and their relevance to planning, its human information base, processes and procedures.
Prereq: Fourth-year planning students only

PLANT 480b W 3C 0.5

The Philosophy and Methodology of Urban and Regional Planning 2
Continuation as outlined in Part 1 with the focus on the theories or foundations for the development of an environmental ethic and the implications of the notions discussed in Part 1 as the philosophical base for planning.
Prereq: PLAN 480a

PLANT 490a F 1.0

Seniors Honours Essay 1
Practical experience in the identification of a problem in the planning field. Conduct of individual research into this problem and presentation of the results in a form that meets both professional and academic standards. Prior elaborated in a policy statement available from the undergraduate advisor.
Prereq: Fourth-year planning students only

PLANT 490b W 1.0

Senior Honours Essay 2
Completion of essay.
Prereq: PLAN 490a

COURSES NOT OFFERED 1984-85

PLANT 344 Recreation Planning
PLANT 430 Social Policy Planning

Women's Studies

Assistant Professor, Coordinator of Women's Studies
H.S. Fournier, BA (Toronto), MA, PhD (Western Ontario)

Lecturer, Assistant to the Coordinator of Women's Studies
L. Dormey, BA, MA (Louisville) J (Part-time)

Members of the Women's Studies Advisory Committee

Professors
M.P. Bryden, BS (Massachusetts Institute of Technology), MSc, PhD (McGill)
D.C. Makondele, BA, MA, PhD (Princeton)
M.E. Thompson, BSc (Toronto), MSc, PhD (Illinois)

Associate Professors
C.M. Fernandez, Lic en Arq (Madrid), MA (Tulane), D Lit et Phil (Madrid)
B. Hyma, BS, MS (Madras), MA (Sheffield), PhD (Pittsburgh)
M. Kuxdort, BA, MA, PhD (Waterloo), PhD (Alberta)
R. Lister, BA, MA, PhD (Toronto)
H. Martens, ARCT, LRSM, BA, MA (Minnesota), PhD (Columbia)
A.C. Minas, BA (Radcliffe), MA, PhD (Harvard)
A.F. Thompson, BA (Toronto), BTh (Huron), MA (Western Ontario), STM, PhD (McGill)
A. Wipper, BA, MA (McGill), PhD (California-Berkeley)

Assistant Professors
S.D. Bunt, BA, MA (Waterloo), PhD (York)
M. van Dijk, BA, MA (Wellington), PhD (Toronto)
V.F. Golini, BA (McMaster), MA (Colorado), PhD (California-Berkeley)
Course Descriptions

Women's Studies

M.C. Howard, BA, MA (Lancaster), PhD (Leicester)
S.K. Johannesen, BA (Evangel College), MA, PhD (Missouri)
J.A. Legault, BSc, MSc (Ottawa), PhD (Oklahoma)
A. Roberts, BA (Guelph), MA (Claremont)
N. Theberge, BA (Massachusetts), MA (Boston), PhD (Massachusetts)

Lecturer
J. Miller, BA, BLS (McGill), MA, MPhil (Waterloo), PhD (York), R

Instructor
J. Lowe, BSc (Carleton), Recipient of the Distinguished Teacher Award

Dean of Women
H. Marsden, BA (Randolph-Macon), MA (Waterloo)

Library
S. Bellingham, BA (Waterloo Lutheran), MLS (Western Ontario)

Integrated Studies
D. Di Cocco, BIS (Waterloo)

1983-1984

University of Waterloo

Professor
M.P. Bryden, BS (Massachusetts Institute of Technology), MSc, PhD (McGill)

Associate Professors
M.D. Bryant, BA (Concordia), STB (Harvard), MA, PhD (St. Michael's) R
R. Lister, BA, MA, PhD (Toronto)

Assistant Professors
S.D. Burt, BA, MA (Waterloo), PhD (York)
H.S. Fournier, BA (Toronto), MA, PhD (Western Ontario)
W. Frisby, MHK (Windsor)

Lecturers
L. Dorney, BA, MA (Louisville), J (Part-time)
J. Miller, BA, BLS (McGill), MA, MPhil (Waterloo), PhD (York) R

Writer in Residence
S. Mulgrave

Wilfrid Laurier University

Associate Professors
A. Guinsburg, BA (Valparaiso), AM, PhD (Stanford)
P. Tiessen, BA (Waterloo Lutheran), MA, PhD (Alberta)

Assistant Professors
J. Clarke, BA (Windsor), MA (York), PhD (Waterloo)
C.A. Weaver, BM, MM (Indiana)

Lecturer
U. McNab, BA (Waterloo Lutheran), MA (McMaster) (Part-time)

Course Descriptions

W S 200
Introduction to Women’s Studies
An interdisciplinary survey which introduces students to the questions which have been posed concerning women’s nature, roles, problems and accomplishments. Special emphasis will be given to the methodologies which a variety of disciplines in the Arts and Sciences use to examine these questions.

W S 300
Seminar in Women’s Studies
A seminar in which students will examine the origins and course of the women’s movement from an interdisciplinary perspective, with special attention to topics such as the Canadian woman.

Women's Studies core courses and approved courses are listed in the Interdisciplinary Options, Chapter 15.
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R.L. Knight

From Senate
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G.F. Atkinson
P.C. Brillinger
J.D. Lawson
R.W. Macqueen
E. Rhodes
K.D. Srivastava
N. Theberge

Undergraduate Students
T.C. Allison
M.D. Longo
S.K. Mullarkey

Graduate Students
vacancy
M.A. Marion

Senate

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Vice-President, University Services, D.P. Robertson, BComm
Treasurer, J.G. Robb, CGA
Librarian, M.C. Shepherd, BEd, MA(LS)
Registrar, C.T. Boyes, BA
President, Federation of Students, T.C. Allison
President, Graduate Association, M.A. Marion, BA, MA

The Principal or President of each Federated or Affiliated College
N.L. Choate, CR, BA, MA (President, St. Jerome's)
R. Lebold, BA, BD, MTh (President, Conrad Grebel)
I.L. Campbell, BA, MSc (Principal, Renison)
F.C. Gérard, MA, BD, STM, PhD (Principal, St. Paul's)
The Dean of each Faculty
R.K. Banks, BA, MA, PhD (Arts)
W.C. Lennox, BASc, MSc, PhD (Engineering)
J.H. Bater, BA, MA, PhD (Environmental Studies)
R.G. Marteniuk, BPE, MA, EdD (Human Kinetics and Leisure Studies)
J.A. George, MSc, PhD (Mathematics)
D.E. Brödie, BSc, MSc, PhD (Science)
The Dean of Graduate Studies and the Dean of Computing and Communications
H.H.E. Leipholz, Dip.Eng, Dr Ing, Docent Habil, PEng (Graduate Studies)
J.W. Graham, BA, MA (Computing and Communications)

Elected Members

Faculty Representatives
To 1984
J.O. Stubbs, BA, MSc, DPhil (Arts)
G.M. Bragg, BASc, PhD, PEng (Engineering)
vacancy (Environmental Studies)
N. Theberge, BA, MA, PhD (Human Kinetics and Leisure Studies)
B. Forte, PhD, Habil DSc (Mathematics)
G.F. Atkinson, MA, PhD (Science)
J. Theis, BA, MA (St. Jerome's College)
M. Smyth, BA, MA, PhD (Renison College)
G.E. Cross, MA, PhD (At large)
J.C. Gray, BA, MA, PhD (At large)
B.G. Hutchinson, BE, MSc, PhD, PEng (At large)
H.B. Ellis, BA, MA, PhD (At large)
vacancy (At large)
vacancy (At large)

To 1985
L.G. Eckel, BA, BComm, MBA, PhD (Arts)
J.A. Schey, Dipl Ing, CSc, PEng (Engineering)
L.W. Richards, BArch, MArch (Environmental Studies)
N.J. Ashton, BSc, MS (Human Kinetics and Leisure Studies)
J.D. Lawsson, BASc, PhD (Mathematics)
K.A. Woolner, BSc (Science)
P.M. Hinchcliffe, BA, MA, PhD (St. Jerome’s College)
R.D. Legge, BA, STB, PhD (St. Paul’s College)
I.F. Blake, BSc, MSc, MA, PhD, PEng (At large)
M.P. Bryden, BS, MSc, PhD (At large)
R.A. George, MA, PhD (At large)
W.U. Ober, BA, PhD (At large)
E. Rhodes, BSc Tech, MSc Tech, PhD, PEng (At large)
P.H. Roe, BASc, MASc, PhD, PEng (At large)
vacancy (At large)

To 1986
G.A. Griffin, BA, MA, PhD (Arts)
C.W. Robinson, BASc, PhD (Engineering)
D.W. Hoffman, BSA, WA, PhD (Environmental Studies)
S.L.J. Smith, BA, MA, PhD (Human Kinetics and Leisure Studies)
P.C. Brillinger, BA, MA (Mathematics)
R.W. Macqueen, BA, MA, PhD (Science)
V.F. Golini, BA, MA, PhD (St. Jerome’s College)
R.J. Sawatsky, BA, MA, PhD (Conrad Grebel College)
J.B. Capindale, MA, DPhil (At large)
R.N. Dubey, BSc, BScEng, PhD, PEng (At large)
H.K. Ellenton, BSc, MA (At large)
L. Needleman, MA, PhD (At large)
G.E. Slethaug, BA, MA, PhD (At large)
R.G. Woolford, MSc, PhD (At large)

Student Representatives

To 1984
Undergraduate
M. Longo, (Arts)
E. Van Groll, (Environmental Studies/Integrated Studies)
E.J. Rensink, (Science)
R.J. Dobrucki, (At large)

Graduate
vacancy
H.J. Kommel, BS, MS, AM
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University Secretary
E.M. Barnes
Associate University Secretary
R.J. Bullen, BMath
Associate University Secretary
G.P. Johannesen, BA
Associate University Secretary

Internal Audit
W. Haufschild, BMath, CA
Director

Security
A.E. Romenco, BSc
Director

Development and University Relations
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Director
J.S. Roberts, BA, MA
Director, Alumni Affairs

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Dean of Arts
G.A. Griffin, BA, MA, PhD
Associate Dean, Undergraduate Affairs
B.H. Suits, BA, MA, PhD
Associate Dean, Graduate Affairs
J.O. Stubbs, BA, MSc, PhD
Associate Dean, Special Programs
J.F. Willms, BA
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