University of Waterloo
Undergraduate Calendar
1982-1983
The Undergraduate Calendar

The information in this Calendar applies to the 1982-83 academic session which commences in September 1982.

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

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

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

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

The University has developed a number of services to assist students with physical disabilities. More information is on page 23 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 1982-83

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Glossary of Terms

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

Corequisite
A course required to be taken concurrently with another course which lists it as a corequisite.

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

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

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

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

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

Letter of Permission
A document permitting a student to take one or more courses at another university to be used for credit toward the University of Waterloo degree.

Minor
A group of approved courses taken by an honors 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).

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

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

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, Pre-Professional, Professional are given in the Calendar.

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

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

Term
Refers to a particular four-month (13 week) period of registration. Fall term - September to December; Winter term - January to April; Spring term - May to August. Also, used with reference to work terms for students in the co-operative system of study which occur in the above time periods.
### Academic Calendar 1982

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<thead>
<tr>
<th>Event</th>
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<tbody>
<tr>
<td>Meeting - Senate Executive Committee</td>
<td>March 1</td>
<td>Monday</td>
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<tr>
<td>Pre-registration Begins - Regular and Co-operative Programs - Fall Term</td>
<td>March 1</td>
<td>Monday</td>
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<tr>
<td>Pre-registration Ends - Regular and Co-operative Programs - Fall Term</td>
<td>March 5</td>
<td>Friday</td>
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<tr>
<td>Meeting - University Senate, 7:30 p.m.</td>
<td>March 15</td>
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<tr>
<td>Meeting - Board of Governors Executive Committee</td>
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<td>Lectures End - Winter Term</td>
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<tr>
<td>Examinations Begin - Winter Term</td>
<td>April 3</td>
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<tr>
<td>Meeting - Senate Executive Committee</td>
<td>April 5</td>
<td>Monday</td>
</tr>
<tr>
<td>Meeting - Board of Governors, 10:00 a.m.</td>
<td>April 6</td>
<td>Tuesday</td>
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<tr>
<td>Good Friday - University Holiday*</td>
<td>April 9</td>
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<tr>
<td>Meeting - University Senate, 7:30 p.m.</td>
<td>April 19</td>
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<tr>
<td>Examinations End - Winter Term</td>
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<td>Final Examination Results Due</td>
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<td>End of Course Change Period - Spring Term - See Individual Faculty Chapters</td>
<td>May 17</td>
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<tr>
<td>Meeting - University Senate, 7:30 p.m.</td>
<td>May 18</td>
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<td>Victoria Day - University Holiday*</td>
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<tr>
<td>Spring Convocation</td>
<td>May 27</td>
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<tr>
<td>Spring Convocation</td>
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<tr>
<td>Spring Convocation</td>
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<tr>
<td>Meeting - Board of Governors, 10:00 a.m.</td>
<td>June 1</td>
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<td>Pre-registration Begins - Co-operative Programs - Winter Term</td>
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<td>Lectures End - Spring Term</td>
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<tr>
<td>Examinations Begin - Spring Term</td>
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*Some University Departments may be open for limited service on these days.
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<td>August 2</td>
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<td>Examinations End - Spring Term</td>
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<td>Labour Day - University Holiday*</td>
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<td>Thanksgiving Day - University Holiday*</td>
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<tr>
<td>Meeting - Senate Executive Committee</td>
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<tr>
<td>Meeting - University Senate, 7:30 p.m.</td>
<td>December 20</td>
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<tr>
<td>Examinations End - Fall Term, 12:00 noon</td>
<td>December 23</td>
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<tr>
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<td>December 24</td>
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<tr>
<td>University Holiday*</td>
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<tr>
<td>Meeting - Board of Governors, 10:00 a.m.</td>
<td>February 1</td>
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<tr>
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<td>Meeting - University Senate, 7:30 p.m.</td>
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<td>Course-Add Deadline, Correspondence - Spring Term</td>
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<td><strong>- See Individual Faculty Chapters</strong></td>
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<tr>
<td>Meeting - University Senate, 7:30 p.m.</td>
<td>May 16</td>
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<tr>
<td>Victoria Day - University Holiday*</td>
<td>May 23</td>
<td>Monday</td>
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<tbody>
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<td>Spring Convocation</td>
<td>May 26</td>
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<tr>
<td>Spring Convocation</td>
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<td>Pre-registration Begins - Co-operative Programs - Winter Term</td>
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<td>Wednesday</td>
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<tr>
<td>Pre-registration Ends - Co-operative Programs - Winter Term</td>
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<td>Friday</td>
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<tr>
<td>Meeting - University Senate, 7:30 p.m.</td>
<td>June 20</td>
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</tr>
<tr>
<td>Dominion Day - University Holiday*</td>
<td>July 1</td>
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<td>Registration - Summer Session</td>
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<td>Lectures Begin - Summer Session</td>
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<td>Lectures End - Summer Session</td>
<td>August 12</td>
<td>Friday</td>
</tr>
<tr>
<td>Examinations End - Spring Term</td>
<td>August 13</td>
<td>Saturday</td>
</tr>
<tr>
<td>Examinations - Summer Session</td>
<td>August 13</td>
<td>Saturday</td>
</tr>
<tr>
<td>Examinations, Correspondence - Spring Term</td>
<td>August 13</td>
<td>Saturday</td>
</tr>
<tr>
<td>Final Examination Results Due</td>
<td>August 18</td>
<td>Thursday</td>
</tr>
<tr>
<td>Spring Work Term Ends - Co-operative Programs</td>
<td>August 26</td>
<td>Friday</td>
</tr>
<tr>
<td>Fall Work Term Begins - Co-operative Programs</td>
<td>August 29</td>
<td>Monday</td>
</tr>
</tbody>
</table>

*Some University Departments may be open for limited service on these days.*
<table>
<thead>
<tr>
<th>Year</th>
<th>January</th>
<th>April</th>
<th>July</th>
<th>October</th>
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</table>

<table>
<thead>
<tr>
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<th>February</th>
<th>May</th>
<th>August</th>
<th>November</th>
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<td>Feb 1-28</td>
<td>May 1-31</td>
<td>Aug 1-31</td>
<td>Nov 1-30</td>
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<td>Sep 1-30</td>
<td>Dec 1-31</td>
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<td>1984</td>
<td>Mar 1-31</td>
<td>Jun 1-30</td>
<td>Sep 1-30</td>
<td>Dec 1-31</td>
</tr>
</tbody>
</table>
Location of Kitchener-Waterloo

Routes to UW Campus

To reach UW campus from Hwy 401, take Interchange 35 and follow Hwy 8 to Kitchener; enter Conestoga Pkwy by following Hwy 7 East signs; then follow Pkwy to University Ave. W. exit; drive west on University Ave. to University of Waterloo.
The University of Waterloo

Rhodes Scholar Michael Albert receives congratulations from the University Chancellor, Dr. Josef Kates.
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 four 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 1982-83 academic session which commences in September 1982.

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 Architecture, Arts, Engineering, Environmental Studies, Integrated Studies, Mathematics, Optometry, Human Kinetics and Leisure Studies, Science and Urban and Regional Planning. The University is a member of The Association of Universities and Colleges of Canada and the Association of Commonwealth Universities.

Twenty-five Years of Co-operative Education in Canada

In 1982, the University of Waterloo celebrates its 25th Anniversary. Beginning in 1957 with a few students in a Co-operative Engineering program, the University has expanded to the point where Co-operative programs are offered in each of the six Faculties and in most Departments.

The University is planning a series of special events throughout the anniversary year. From October 21 until October 24, there will be a convocation special alumni homecoming events, and two days of Open House activities. The public is most cordially invited to view the developments that are taking place on campus and to become involved with us in the celebrations.

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 forty teaching and service buildings presently on campus include a Computing Centre, a Physical Activities Building, extensive library facilities, two theatres, four residential Church Colleges, and a variety of modern residential accommodation.

University Colours and Coat of Arms

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

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

Motto
Concordia Cum Veritate - In Harmony with Truth

The University Mace

The symbolic theme may be described as follows:

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

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

The four-fold diversity is significant because of the four faculties existing at the time the Mace was presented to the University and as well, of the four church-related colleges federated and affiliated with the University. These diverse elements together form a crown, and the points of the crown, while tending toward a union do not quite touch but remain as individuals suspended in tension and yet engaged in a deep harmony. This creative process is focused not on the traditional spherical orb of static perfection but rather on an elliptical silver ovum - the egg-shaped symbol of creativity - the marvellous potential of a new individual life.
University Jurisdiction
The University exercises its statutory jurisdiction and authority with respect to the operation, protection and control of its property and plant and the regulation of persons on campus insofar as is necessary to ensure the orderly performance of a University's functions.

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

Academic Organization
The University is organized under several academic units called faculties as follows: The Faculty of Arts, The Faculty of Engineering, The Faculty of Environmental Studies, The Faculty of Human Kinetics and Leisure Studies, The Faculty of Mathematics, and The Faculty of Science. Within this framework are various Departments and Schools.

Students who want to follow a more independent and unstructured course of study than the traditional one may wish to seek admission to the Integrated Studies Program.

Full-time enrolment for each Faculty including church colleges and off campus students (as of November 1, 1981).

- Faculty of Arts: 2840
- Faculty of Engineering: 3282
- Faculty of Environmental Studies: 1331
- Faculty of Human Kinetics and Leisure Studies: 1085
- Integrated Studies Program: 75
- Faculty of Mathematics: 3595
- Faculty of Science: 2018

Total Undergraduate Enrolment (Full-time): 14226
Graduate Student Enrolment (Full-Time): 1226

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

University of St. Jerome's College
The University of St. Jerome's College is a liberal arts college which had been affiliated with the University of Ottawa before entering into federation with the University of Waterloo in July, 1980. 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 Faculties of Arts and Mathematics. In this Calendar, St. Jerome's faculty members and courses are indicated by a J suffix. Graduates of the college receive University of Waterloo degrees in accordance with the terms of the federation agreement. A continuous building program since 1962 finds St. Jerome's presently with a teaching and administrative building, a library, a men's residence accommodating 110 and a women's residence, Notre Dame College, operated by the School Sisters of Notre Dame, which has room for 122 students. The University of St. Jerome's College is conducted by the Congregation of the Resurrection.

Renison College
Renison College was founded by a group of Anglicans committed to the principle of a small residence-teaching community. 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 with emphasis on both classroom study and community involvement. The College also offers courses in Arts, English, Fine Arts, Geography, History, and Religious Studies. Renison College faculty members and courses are indicated by an R suffix in this Calendar.

The College has two 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.
St. Paul's College

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

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

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

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

There is an attempt on the part of the College to integrate its academic life with life in the residence, but there is no requirement that a student be registered in one of the above programs in order to live in this residence. Resident life in the College provides a valuable contribution to university experience beyond that which comes from courses taken for credit. Through a program of athletics, community dinners, and interest groups engaged in various projects and issues relating to the University, the Church, personal life and society, members of the College and Associates participate in a vital and enriching community.

Degrees Offered

The University of Waterloo offers the following undergraduate degrees:

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

Regular System

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

Co-operative System

Students studying under the Co-operative System alternate academic 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

Through its Office of Part-Time Studies and Continuing Education, the University of Waterloo makes a special effort to encourage students of whatever age to work toward a degree or 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. Further, the admission policy for mature students (those who have been away from formal education for a full two years and who do not meet the regular UW admission requirements) applies equally to both full-
time and part-time students. The great majority of
mature students are in part-time studies. Tuition is
assessed as a fee per course.

The University provides special support services
for students returning to the classroom after a number
of years. Talks, workshops, and discussions on topics
such as study skills, decision-making, life-planning,
and careers are available for all students whether full-
time or part-time. These informal get-togethers give
students a chance to share their experiences and to
offer mutual support and encouragement.

Part-Time Studies on Campus
Part-time students often enrol in classes scheduled in
the evening or in late afternoon. However, if it is more
convenient, part-time students are encouraged 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.
They may pursue their studies in the fall, winter, or
spring terms or during the summer sessions.

Part-Time Studies off Campus
More than fifty University of Waterloo credit courses
are now offered each year at off-campus centres in
Kitchener and Waterloo as well as in Stratford, Halton
Most of these courses meet one evening a week for
three hours in the fall, winter, or spring terms.
Students earning credit in these courses may, if they
wish, apply them toward a degree with credits earned
on campus or through correspondence.

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

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

Diploma in Occupational Health for Registered Nurses
The University of Waterloo has assembled ten half-
credit degree courses plus two special 'nursing
process' courses 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 on a part-time basis at UW can qualify
police officers for three designations awarded by the
Canadian Police College:
- The Certificate in General Police Studies;
- The Certificate in Advanced Police Studies;
- The Diploma in Police Management Studies;

At the same time, courses taken can also count
towards a Bachelor's degree at UW.

Other Continuing Education Opportunities
In addition to its undergraduate degree-credit courses,
the University has a variety of other continuing
education offerings including:
- The Economic Development Program;
- Professional development courses in the School
  of Optometry;
- Certificate courses through Renison College;
- Courses through the Canadian Institute of
  Management;
- Correspondence courses for the Canadian
  Institute of Administration Managers' Program;
- Graduate study on a part-time basis.

Inquiries concerning part-time studies, off-campus
courses, diploma programs and continuing education
opportunities should be directed to:
Part-Time Studies and Continuing Education,
University of Waterloo,
Waterloo, Ontario
N2L 3G1
(519) 885-1211, Ext. 2000

Correspondence Courses
The University of Waterloo operates the largest
university-level correspondence program in Canada.
More than 260 university credit courses are offered
during the fall, winter, and spring terms. Students may
enter the program at the beginning of any of these
terms.

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 correspondence 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 correspondence courses
and application forms are provided in the Correspondence Program Calendar. Copies may be obtained from:

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

Cross-registration with Wilfrid Laurier University

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

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

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

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

For further details, contact the Registrar's office.

Grading System

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

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

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

<table>
<thead>
<tr>
<th>Assigned</th>
<th>Common Weighting</th>
<th>Assigned Percentage</th>
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<tbody>
<tr>
<td>Letter Grades</td>
<td>Factors*</td>
<td>Grades*</td>
</tr>
<tr>
<td>A+</td>
<td>95</td>
<td>90-100</td>
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<tr>
<td>A</td>
<td>89</td>
<td>85-89</td>
</tr>
<tr>
<td>A-</td>
<td>83</td>
<td>80-84</td>
</tr>
<tr>
<td>B+</td>
<td>78</td>
<td>77-79</td>
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<td>B</td>
<td>75</td>
<td>73-76</td>
</tr>
<tr>
<td>B-</td>
<td>72</td>
<td>70-72</td>
</tr>
<tr>
<td>C+</td>
<td>68</td>
<td>67-69</td>
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<tr>
<td>C</td>
<td>65</td>
<td>63-66</td>
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<tr>
<td>C-</td>
<td>62</td>
<td>60-62</td>
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<tr>
<td>D+</td>
<td>58</td>
<td>57-59</td>
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<td>55</td>
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</tr>
<tr>
<td>D-</td>
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<td>50-52</td>
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<td>F-</td>
<td>32</td>
<td>0-34</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>
<th>CR</th>
<th>Credit Granted</th>
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<tbody>
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<td>AEG</td>
<td>Aegrotat, credit granted due to illness</td>
</tr>
<tr>
<td>NCR</td>
<td>No credit granted</td>
</tr>
<tr>
<td>INC</td>
<td>Incomplete course work, no credit granted</td>
</tr>
<tr>
<td>DNW</td>
<td>Did not write examination, no credit granted</td>
</tr>
<tr>
<td>AUD</td>
<td>Audit only, no credit granted</td>
</tr>
<tr>
<td>NMR</td>
<td>No mark reported</td>
</tr>
</tbody>
</table>

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
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 Offenses.
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.

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

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

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

The University of Waterloo
Academic Regulations and Student Discipline
Student and Administrative Services

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

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

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

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

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

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

The Board of Co-operative Services
The Toronto bus service, the campus centre ice cream stand and a used book store are operated by the Board.

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

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

Campus Centre
The Campus Centre, managed by a Board composed of students, faculty and staff, 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. For more information contact the Turnkey on duty in the Great Hall of the Campus Centre.

**The Student Newspaper**
The University of Waterloo's student newspaper, *Imprint*, is published every Friday by Imprint Publications, Waterloo, a non-profit corporation independent of the Federation. Student involvement is welcome.

**Athletics**
The University of Waterloo offers a full and complete program of athletic activities both for students who wish to participate against athletes at other Canadian universities and for those who wish to participate at a more leisurely pace on the UW campus.

The UW Interuniversity Athletic Program offers over thirty-five activities. In the Campus Recreation Program students have their choice of literally hundreds of different programs. “Something for Everyone” is the theme of the Campus Recreation Office. Activities are conducted to suit all needs, skill levels and interest levels. Each year, over 80% of the students enrolled at the University, take part in some aspect of the Athletic Program.

More information on any aspect of the UW Athletic Program may be obtained by contacting the personnel in the Athletic Department Office, located in the Office Wing of the Physical Activities Building.

**Book Store**
**South Campus Hall**
Text books, general interest books and supplies are available at the University Book Store. Crested items are available at the Open Door Gift Shop, across from the Book Store.

**Career Information Centre**
**Needles Hall**
The Centre contains material which assists students in self-assessment and provides information about possible employers and various careers. There are calendars and educational directories for Canada and abroad. The Centre also provides materials which assist in resumé and letter preparation, creative approaches to job searching and preparation for interviews. Summer and part-time jobs are posted on a bulletin board on the first floor of Needles Hall.

**Centre for the Arts**
**Room 161, Hagey Hall of the Humanities**
Entertainment is available on campus throughout the fall and winter terms in UW's two attractive theatres, at special discounts for students. The UW Arts Centre offers a season of professional shows including stage plays, musical events, a virtuoso one-man stage series, children's live theatre, and dance presentations, as well as a season of films.

The Humanities Theatre, located in Hagey Hall is a 720-seat theatre with one balcony and proscenium stage. Most of the professional shows take place here and it is also the performing home of the UW Drama and Dance groups. 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 two theatres, seating just over 500 people and is the scene of the Arts Centre's new professional One-Man Series of chamber music and drama presentations, free noontime 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 two theatres are also rented from time to time to community organizations such as the Chamber Music Society, the Barbershoppers and more. The UW Arts Centre general offices and box office are located in Room 161, Hagey Hall of the Humanities. 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 8:30 a.m. to 5:00 p.m., Monday through Friday.

**Dean of Women**
**Room 225, Modern Languages Building**
This office serves as a general academic information and advisory centre for all students. It also arranges programs specially designed to help mature women students who are returning to the classroom.

**Health Services**
**Health Services Building**
Health Services is the Medical clinic centrally located on campus. It provides comprehensive health care to all students and emergency care to anyone on campus. Physicians, nurses and a counsellor are on staff at the clinic which is open Monday to Friday from 8:30 a.m. to 6:00 p.m. (8:30 a.m.-5:00 p.m. May-August). Also provided is a 24-hour physician-on-call service. Physicians' 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 provide faculty with information and application forms, to forward applications and proposals to appropriate agencies, to act as a centre of communications between granting agencies and faculty, to assist faculty in obtaining grants and contracts for undertaking research, and to provide financial 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 Co-ordinator is also responsible for obtaining school age children as subjects for suitable University research projects.

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

Canadian Industrial Innovation Centre/Waterloo (CIIC/W)
The CIIC/W exists to stimulate and improve innovation in Canada. The Centre promotes interest in technological entrepreneurship and assists inventors in moving scientific and technical developments towards the marketplace.

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

Information and application forms may be obtained from the CIIC/W, telephone ext. 3003.

Residences
Accommodation is available at the University for approximately 4,000 students. There are two large undergraduate residences, Village I and Village II; five smaller Federated & Affiliated College residences, St. Jerome’s, Notre Dame, Conrad Grebel, Renison, and St. Paul’s; the Minota Hagey residence for graduate students; and the Waterloo Co-operative residence.

The Co-op residence is situated just off-campus, and is owned and operated by students. Also situated just off-campus is the University Married Students’ Apartments complex which contains 240 one-bedroom and 360 two-bedroom apartments. An off-campus housing information service is also provided.

Inquiries should be made as follows:

For Village I, Village II, and Minota Hagey write:
Housing Office, Village 1,
University of Waterloo,
Waterloo, Ontario.
N2L 3G1
or phone (519) 884-0544

For off-campus information write:
Off-Campus Housing Office,
Village 1,
University of Waterloo,
Waterloo, Ontario.
N2L 3G1
or phone (519) 885-1271
For Federated & Affiliated Colleges, Waterloo Co-op Residence, and Married Students' Apartments, write:

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

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

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

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

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

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

Waterloo Co-operative 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 Brailleir, Kurzweil reading machine, and four-track tape recorders. The staff will also provide assistance for mobility impaired students.

Facilities for Physically Disabled Students

The University has appointed an Adviser 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.

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, study skills classes, 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 small library of computer-catalogued resource materials, is located in Needles Hall, Room 3005, ext. 2579.

Visitors Reception Centre
The centre, located in B.C. Matthews Hall, is open daily. Monday to Friday, from 8:30 a.m. to 4:30 p.m. Campus tours leave from the Centre at 10:30 a.m. and 1:30 p.m. each day and are about 1½ hours long. Students can also arrange to visit specific departments and meet with faculty members about 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

The Visitors Reception Centre
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 1982.

Authority to Admit

All applicants for admission to the University will be considered by the Admissions Committee for the faculty to which admission is sought. No final decision regarding the acceptability of an applicant will be made by an individual or group other than the appropriate Admissions Committee.

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

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

St. Jerome's College

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

Inquiries and correspondence should be directed to:

The Registrar, St. Jerome's College.

Renison College

Applicants may apply for the Social Development Studies Program and for General Arts 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 28-30) as well as meeting average requirements.

A program is designated "limited enrolment" because the number of qualified applicants usually exceeds the number of places available. In 1982, all Co-operative programs will have limited enrolment, as well as all Regular programs except Dance, Geography and Man-Environment Studies.

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 for other programs of their choice.
Admissions

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 normally required for admission. The following criteria are used in selecting applicants for admission: Grade 13 interim or final standing; Grade 12 final standing; Principal’s recommendation.

The 1982-83 Admission Requirements for applicants from Ontario Grade 13 Programs are shown in the chart on page 28.

Applicants - Other than Ontario Grade 13

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

Adult Students

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

Applicants applying as adult students are advised to contact the Assistant Registrar of the desired faculty to discuss admissibility and appropriate qualifying work. Generally, it is recommended that applicants who are applying to enter the University as adult students attempt to obtain standing in at least one Ontario Grade 13 level subject or its equivalent. This preparation should relate to the 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 three years of a program at an Ontario College of Applied Arts and Technology are considered for admission to Year Two of a relevant program at the University of Waterloo.

Applicants who have completed two years with first class honours or high second class honours are considered for admission to Year One.

Each application will be considered on its merits by the Admissions Committee of the desired faculty.

Letters of Permission

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

Text continued on page 31.
## Specific Faculty Program Recommendations and Requirements

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Required Grade 13 Subjects and Averages</th>
<th>Recommendations</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Arts Regular</strong></td>
<td>A 60% overall average is required in 6 Grade 13 credits</td>
<td>Applicants should include Grade 13 courses such as English, History, Languages (other than English) in their Grade 13 program. Grade 13 English courses, particularly those that stress writing skills, are especially recommended. A Grade 13 Mathematics course is recommended for applicants who are considering Social Science programs.</td>
<td>Admission to departmental programs occurs following Year 1. Students may also apply for Co-op programs in Arts Faculty disciplines during year 1 or year 2.</td>
</tr>
<tr>
<td><strong>Co-op (Applied Studies)</strong></td>
<td>A 70% overall average is required in 6 Grade 13 credits</td>
<td>Applicants should include Grade 13 courses such as English, History, Science, Mathematics and a second language.</td>
<td>Enrollment in this program is limited. Applicants not admitted to Arts Co-op (Applied Studies) will be considered for the Arts Regular program. Admission to specific departmental Co-op programs usually follows after at least one term of university work. Applicants interested in a specific departmental Co-op program should apply initially to Arts Regular.</td>
</tr>
<tr>
<td><strong>Engineering</strong></td>
<td>Relations &amp; Functions, Calculus, Algebra, Physics, Chemistry, one unspecified credit</td>
<td>Applicants with high overall standing who are missing one or two of the five specific Grade 13 requirements must contact the Admissions Officer no later than January (for September admission). Applicants will be evaluated and advised on possible courses of action required to meet the specific requirements. Since Engineering requires considerable writing of reports and reviews as well as the reading of books, articles and journals, the sixth credit for admission should be a subject requiring literary and writing performance such as English, History, or Geography.</td>
<td>Year 1 enrolment is limited to 730 students. Approximately 90% of these places are filled by Ontario Grade 13 students. In recent years, most students admitted have Grade 13 averages in the required subjects of 75% or better. A number of students with lower averages may be admitted when other evidence indicates an aptitude and interest in Engineering. The University reserves the right to withdraw offers of early admission for students receiving final marks below 60% in any of the 6 credits.</td>
</tr>
<tr>
<td><strong>Environmental Studies</strong></td>
<td>Requirements are listed below by Department or School</td>
<td>Because of the increasing use of statistics and quantitative methods in environmental research, students should consider at least one Grade 13 Mathematics course for admission to any program in Environmental Studies.</td>
<td></td>
</tr>
<tr>
<td><strong>Architecture (pre-professional program)</strong></td>
<td>In addition to the 60% minimum overall average in 6 Grade 13 credits, a 60% overall average is required in Relations &amp; Functions, Calculus, Physics, English (Français)</td>
<td>Selected applicants are normally required to come to the University for an interview as part of the admission process. Selection for the interview is based on Grade 12 and Grade 13 standings. Admission is based on the results of the interview, including a portfolio, an English writing exercise designed to test skills of analysis and expression, and on secondary school achievement. The first year program is limited to 70 students.</td>
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<tr>
<td>Faculty</td>
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<td>Recommendations</td>
<td>Comments</td>
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<tr>
<td>Geography</td>
<td>A 60% overall average is required in 6 Grade 13 credits</td>
<td>Applicants are encouraged to include Geography in their Grade 13 program.</td>
<td>The first year program is limited to approximately 70 students.</td>
</tr>
<tr>
<td>Man-Environment Studies</td>
<td>A 60% overall average is required in 6 Grade 13 credits</td>
<td>Applicants should include one of Grade 13 Algebra, Calculus, Relations and Functions.</td>
<td>The first year program is limited to 70 students. Applicants with a Grade 12 average of 66% 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 standings. Admission is based on the results of the interview and on secondary school achievement.</td>
</tr>
<tr>
<td>Urban and Regional Planning</td>
<td>A 60% overall average is required in 6 Grade 13 credits</td>
<td>Applicants should include one of Grade 13 Algebra, Calculus, Relations and Functions.</td>
<td></td>
</tr>
<tr>
<td>Human Kinetics &amp; Leisure Studies</td>
<td>A 60% overall average is required in 6 Grade 13 Credits</td>
<td>Applicants to the Honours B. So. degree program are encouraged to include Algebra, Calculus, Functions &amp; Relations, Biology and Physics 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></td>
</tr>
<tr>
<td>Dance</td>
<td>A 60% overall average is required in 6 Grade 13 credits</td>
<td>Applicants are encouraged to include Grade 13 Biology and Chemistry in their Grade 13 program.</td>
<td>Applicants with overall Grade 13 averages above 65% 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>Health Studies</td>
<td>A 60% overall average is required in 6 Grade 13 credits</td>
<td>Applicants are encouraged to include Grade 13 Biology and Chemistry in their Grade 13 program.</td>
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</tr>
<tr>
<td>Kinesiology</td>
<td>In addition to the 60% minimum overall average in 6 Grade 13 credits, applicants must present a Grade 13 Mathematics course and two Grade 13 courses from Biology, Chemistry, Physics.</td>
<td>Applicants are encouraged to include four Grade 13 courses from Biology, Chemistry, Physics, Functions &amp; Relations, Algebra and Calculus.</td>
<td>Applicants are reminded that the Kinesiology program includes required University courses in Calculus, Biology, Chemistry, Physics and Computer Science.</td>
</tr>
<tr>
<td>Recreation</td>
<td>In addition to the 60% minimum overall average in 6 Grade 13 credits, applicants must present one Grade 13 mathematics course. As of September 1983, the required Mathematics course must be one of Algebra, Calculus, Relations and Functions.</td>
<td></td>
<td>Applicants with overall Grade 13 averages above 62% are given first consideration. Applicants may be required to come to the University for an interview as part of the admission process. Admission is based on the results of the interview. If required, a “statement of interest” form, and secondary school achievement.</td>
</tr>
<tr>
<td>Integrated Studies</td>
<td>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>Mathematics</td>
<td>In addition to the 60% minimum overall average in 6 Grade 13 credits, applicants to the Regular Mathematics program must present a 60% minimum average in Calculus, Algebra, and Relations &amp; Functions. Applicants to the Co-operative Mathematics programs must present a 56% minimum average in these three Mathematics courses.</td>
<td>Students with high overall standing who are missing one of the three specific requirements are encouraged to apply. These students should contact the Assistant Registrar, Mathematics, as soon as possible for advice on how to fill any gaps in their mathematics background.</td>
<td>Competition for admission to Mathematics programs has been keen over the past several years particularly in the Co-operative programs. Applicants whose averages are close to the minimum requirements cannot be certain of admission. The precise admission cut-off averages each year are a function not only of the number of spaces but also of the quantity and quality of the applicants. Applicants not offered admission to Co-op will automatically be considered for admission to Regular.</td>
</tr>
<tr>
<td>Faculty</td>
<td>Required Grade 13 Subjects and Averages</td>
<td>Recommendations</td>
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<tr>
<td>Science</td>
<td>Requirements are listed below by Department or School</td>
<td></td>
<td>Applicants to all Science programs are advised to select both Grade 13 Chemistry and Physics courses.</td>
</tr>
<tr>
<td>Regular (and pre-professional Optometry)</td>
<td>In addition to the 65% minimum overall average in 6 Grade 13 credits, applicants must present two Science courses (one of which must be Chemistry or Physics), Calculus, and one other Mathematics course from Relations &amp; Functions or Algebra. A 70% average is required in the Mathematics courses, and 70% in Chemistry.</td>
<td></td>
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</tr>
<tr>
<td>Co-operative Biology</td>
<td>Same as Regular Science</td>
<td></td>
<td>Applicants to the Co-operative Biology program with overall averages above 70% are given first consideration.</td>
</tr>
<tr>
<td>Co-operative Biology and Chemistry</td>
<td>In addition to the 65% minimum overall average on 6 Grade 13 credits, applicants must present two Science courses (one of which must be Chemistry), Calculus, and one other Mathematics course from Relations &amp; Functions or Algebra. A 70% average is required in the Mathematics courses, and 70% in Chemistry.</td>
<td></td>
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</tr>
<tr>
<td>Co-operative Applied Chemistry</td>
<td>In addition to the 65% minimum overall average in 6 Grade 13 credits, applicants must present two Science courses (one of which must be Chemistry), Calculus, and one other Mathematics course from Relations &amp; Functions or Algebra. A 70% average is required in the Mathematics courses, and 70% in Chemistry.</td>
<td></td>
<td>Applicants to Co-operative Chemistry and Physics are advised to select both Relations &amp; Functions and Algebra in addition to the required Calculus course.</td>
</tr>
<tr>
<td>Co-operative Applied Earth Sciences</td>
<td>Same as Regular Science</td>
<td></td>
<td>Applicants to the Co-operative Applied Earth Sciences program with overall averages above 70% are given first consideration.</td>
</tr>
<tr>
<td>Co-operative Applied Physics</td>
<td>In addition to the 65% minimum overall average in 6 Grade 13 credits, applicants must present two Science courses (one of which must be Physics), Calculus, and one other Mathematics course from Relations &amp; Functions or Algebra. A 70% overall average is required in Physics and Mathematics courses.</td>
<td></td>
<td>Applicants to Co-operative Chemistry and Physics are advised to select both Relations &amp; Functions and Algebra in addition to the required Calculus course.</td>
</tr>
</tbody>
</table>
Certificate Equivalent to the Ontario Secondary School Honour Graduation Diploma

All applicants are required to hold the specific subject requirements indicated on pages 28-30 in addition to the equivalent level of education.

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

A) Applicants from Other Canadian Provinces
Alberta Grade 12
British Columbia Grade 12
Manitoba Grade 12
New Brunswick Grade 12
Newfoundland Year 1 Memorial University
Nova Scotia Grade 12
Prince Edward Island Year 1 University of P.E.I.
Quebec First Year CEGEP 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-.
Application Procedures

1. Applicants who wish to study on a full time basis must submit their applications through the Ontario University Application Centre (OUAC):
   a) Applicants presently enrolled in an Ontario Secondary School as a full time day student must complete OUAC form 101 available from the secondary school guidance departments.
   b) All other applicants (e.g. mature applicants, applicants from outside Ontario) must complete OUAC form 105. These forms may be obtained from the Registrar's Office.

2. a) Applicants requesting part-time, or non degree courses should contact the Registrar's office for the appropriate application forms. Do not apply through the Application Centre.
   b) Applicants requesting correspondence courses should write to the Correspondence Program, University of Waterloo, Waterloo, Ontario N2L 3G1 or call (519) 865-1211 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 applicants received each year, the University has established certain dates after which consideration of an application cannot be guaranteed.

   **Session/Term starting** | **Last date for application**
   --------------------------|----------------------------------
   May 3, 1982                | March 1, 1982
   July 5, 1982               | June 1, 1982
   September 6, 1982         | July 1, 1982
   January 3, 1983           | November 1, 1982

   **Correspondence Program**

   Fall Term 1982 | August 13, 1982
   Winter Term 1983 | October 22, 1982
   Spring Term 1983 | February 10, 1983

   *Applications and all supporting documentation must be received no later than May 1, 1982 for all Year 1 limited enrolment programs, with the following exceptions:

   1. Architecture requires that documents be received at the University no later than April 15.
   2. Optometry requires that applications must be dated as received at the OUAC no later than February 15.

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

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

All Ontario Grade 13 applicants will be notified on or after June 11, 1982, 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 before June will be considered when final grades are received.

Ontario Grade 13 applicants who receive an early offer of admission on June 11, 1982 are encouraged to confirm as soon as possible, but are not required to respond before June 25, 1982.

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.

Release of Academic Information

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

Registration and Fees

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

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

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

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

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

A) RETURNING STUDENTS:
1. Co-operative 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 40)

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 are also assessed Co-operative and 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.

2. Winter or Spring Term
   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.
   b) Other Regular Programs
      Students are assessed by course at the Unit Course Fee shown to a maximum of the Basic Fee. Students taking more than two term courses are also assessed Incidental Fees.

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

Payment
A) TIMING AND AMOUNTS DUE
All fees are due and payable by the end of the registration period. See pages 5-8 for appropriate dates. Students must pay or arrange fees by these dates, whether or not a final class schedule has been received.

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

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

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

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

2. In Person
   For students who cannot register by mail, a registration period is held on campus at the beginning of each term. See pages 5-8 for dates.

3. General Information
   i) Fees should be paid with cash, money order or cheque payable to “University of Waterloo”.
   ii) Students registered through Renison College or St. Jerome’s College must pay their fees directly to the appropriate College.
   iii) Fee payments by scholarships or bursaries not administered by the University or methods other than those outlined must be authorized in writing by Student Accounts, Financial Services.
   iv) Students who have received a “Notice of Assessment” under the Ontario Student Assistance Program may arrange payment of fees using this source of funds.
   v) For the 1982/83 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 1982</td>
<td>27 August 1982</td>
</tr>
<tr>
<td>January 1983</td>
<td>17 December 1982</td>
</tr>
<tr>
<td>May 1983</td>
<td>22 April 1983</td>
</tr>
</tbody>
</table>

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

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

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

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

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

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

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

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

<table>
<thead>
<tr>
<th>First Day: $10.00</th>
<th>Thereafter: $3.00 per day (No Limit)</th>
</tr>
</thead>
</table>

See pages 5-8 for 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 1982</td>
<td>30 June 1982</td>
</tr>
<tr>
<td>July 1982</td>
<td>30 July 1982</td>
</tr>
<tr>
<td>September 1982</td>
<td>29 October 1982</td>
</tr>
<tr>
<td>January 1983</td>
<td>28 January 1983</td>
</tr>
<tr>
<td>May 1983</td>
<td>30 June 1983</td>
</tr>
</tbody>
</table>
Withdrawals
A student who finds it necessary to withdraw from attendance is required to obtain a Notice of Withdrawal from the Registrar. This notice, when signed by both the Dean and the Registrar, or their delegates, may entitle the student to a refund of tuition fees calculated as follows:

a) Students withdrawing before the start of classes will receive a full refund.
b) Students withdrawing in the first three weeks of a term (first week for Summer Session) will receive a full refund less a $25 registration charge. Part-time students will be charged $10.
c) Students withdrawing during weeks 4 to 7 of a term (second week of Summer Session) will receive a refund of 50% of one term fee plus the second term payment, if applicable.
d) Refunds are not provided to students after week 7 of a term (week 3 of Summer Session).
e) Requests for refunds of refundable incidental fees must be addressed to the organization concerned. Such refunds are available for only three weeks, after the start of classes.
f) The Intercollegiate Athletic fee is refundable on the same basis as tuition fees.
g) The Health Insurance Fee is refundable on a pro rata basis if the insurance card is handed in at the time of withdrawal.
h) Certain scholarships and bursaries are given on the condition of completion of the term or session involved. Any withdrawal refunds will be credited to the agency as required.

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

Foreign Students on Student Authorizations refer to page 40.

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Session/Term (Note 1)</th>
<th>Basic Fee $</th>
<th>Co-op Fee (Note 2) $</th>
<th>Total Tuition Fees $</th>
<th>Total Incidental Fees $</th>
<th>Total Fees (Note 12) $</th>
<th>Total Course Fee (Note 3) $</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Architecture</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>- Yr 1</td>
<td>Session</td>
<td>942.00</td>
<td>—</td>
<td>942.00</td>
<td>104.69</td>
<td>1,046.69</td>
<td>194.00</td>
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<tr>
<td></td>
<td>Term</td>
<td>471.00</td>
<td>93.25</td>
<td>564.25</td>
<td>55.62</td>
<td>619.87</td>
<td>97.00</td>
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<tr>
<td>- Upper Yr, Co-op</td>
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<td><strong>Arts</strong></td>
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</tr>
<tr>
<td>- Regular</td>
<td>Session</td>
<td>900.00</td>
<td>—</td>
<td>900.00</td>
<td>99.69</td>
<td>999.69</td>
<td>194.00</td>
</tr>
<tr>
<td>- Winter, Spring</td>
<td>Term</td>
<td>450.00</td>
<td>—</td>
<td>450.00</td>
<td>45.48</td>
<td>495.48</td>
<td>97.00</td>
</tr>
<tr>
<td>- Co-op</td>
<td>Term</td>
<td>450.00</td>
<td>93.25</td>
<td>543.25</td>
<td>53.12</td>
<td>596.37</td>
<td>97.00</td>
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<tr>
<td><strong>Engineering</strong></td>
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<td>- Co-op</td>
<td>Term</td>
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<td>93.25</td>
<td>564.25</td>
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<td>622.37</td>
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<td><strong>Environmental Studies</strong></td>
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<td>- Regular</td>
<td>Session</td>
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<td>900.00</td>
<td>99.19</td>
<td>999.19</td>
<td>194.00</td>
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<tr>
<td>- Winter, Spring</td>
<td>Term</td>
<td>450.00</td>
<td>—</td>
<td>450.00</td>
<td>45.98</td>
<td>495.98</td>
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<tr>
<td>- Co-op</td>
<td>Term</td>
<td>450.00</td>
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<td>52.87</td>
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<td><strong>HKLS</strong></td>
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<td>- Regular</td>
<td>Session</td>
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<td>900.00</td>
<td>100.69</td>
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<td>- Winter, Spring</td>
<td>Term</td>
<td>450.00</td>
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<td>450.00</td>
<td>45.98</td>
<td>495.98</td>
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<td>- Co-op</td>
<td>Term</td>
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<td>596.87</td>
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<tr>
<td><strong>Integrated Studies</strong></td>
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<tr>
<td>- Regular</td>
<td>Session</td>
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<td>900.00</td>
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<td>994.69</td>
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<td>- Winter, Spring</td>
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<td>450.00</td>
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<td>42.98</td>
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<td><strong>Mathematics</strong></td>
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<tr>
<td>- Regular</td>
<td>Session</td>
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<td>900.00</td>
<td>99.69</td>
<td>999.69</td>
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<tr>
<td>- Winter, Spring</td>
<td>Term</td>
<td>450.00</td>
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<td>450.00</td>
<td>45.48</td>
<td>495.48</td>
<td>97.00</td>
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<tr>
<td>- Co-op</td>
<td>Term</td>
<td>450.00</td>
<td>93.25</td>
<td>543.25</td>
<td>53.12</td>
<td>596.37</td>
<td>97.00</td>
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<tr>
<td><strong>Optometry</strong></td>
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<tr>
<td>- Regular</td>
<td>Session</td>
<td>942.00</td>
<td>—</td>
<td>942.00</td>
<td>98.69</td>
<td>1,040.69</td>
<td>194.00</td>
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<tr>
<td><strong>Science</strong></td>
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<tr>
<td>- Regular</td>
<td>Session</td>
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<td>900.00</td>
<td>98.69</td>
<td>998.69</td>
<td>194.00</td>
</tr>
<tr>
<td>- Winter, Spring</td>
<td>Term</td>
<td>450.00</td>
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<td>450.00</td>
<td>44.98</td>
<td>494.98</td>
<td>97.00</td>
</tr>
<tr>
<td>- Co-op</td>
<td>Term</td>
<td>450.00</td>
<td>93.25</td>
<td>543.25</td>
<td>52.62</td>
<td>595.87</td>
<td>97.00</td>
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<tr>
<td><strong>Summer Session</strong></td>
<td>Half Course</td>
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<td>97.00</td>
</tr>
<tr>
<td></td>
<td>Full Course</td>
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<td></td>
<td></td>
<td>194.00</td>
</tr>
</tbody>
</table>
Fees for Foreign Students with Student Authorizations
(see also Note 4)
Regular Program fees are $1,790.00 per session or
$959.00 per term plus incidental fees as shown above.
The Unit Course Fee is $356.00 per Full Course or
$179.00 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:

| Session/Term | Intercollegiate Athletics | Health Insurance (see Note 5)
|--------------|--------------------------|--------------------------
|              | $30.00                   | $26.19 Regular
|              | $15.00                   | $8.73 Co-op
|              | $16.37                   | $179.00 per term course

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:

| Federation of Students | $23.00 | $11.50
| Student Society (see Note 7) |
|- Architecture | $10.00 | $ 5.00
|- Arts | $ 5.00 | $ 2.50
|- Engineering | $ — | $ 5.50
|- Env. Studies | $ 4.50 | $ 2.25
|- HKLS | $ 6.00 | $ 3.00
|- Int. Studies | $ | $ |
|- Mathematics | $ 5.00 | $ 2.50
|- Optometry | $ 4.00 | $ 2.00
|- Science | $ 4.00 | $ 2.00

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:

| WPIRG (see Note 8) | $ 5.00 | $ 2.50
| Sanford Fleming Foundation (see Note 9) |
| $ — | $ 2.50
| Radio Waterloo (see Note 10) | $ 6.00 | $ 3.00
| Imprint (see Note 11) | $ 4.50 | $ 2.25

Note 1 - Session/Term
Session refers to the eight month (September–April)
period of study. Term refers to the four month period
of study for students registered in a) Co-operative
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.

Note 3 - Unit Course Fee
The fee assessed at $194.00 for each full course at a
weight of 1.0; at $97.00 for each half or term course at
a weight of 0.5; and at a prorated value for other
course weights. The Unit Course Fee for Foreign
Students with Student Authorizations is shown above.

Note 4 - Student Authorizations
The Ontario Government has established a policy of
higher tuition fees for foreign students studying in
Ontario on Student Authorizations. The policy came
into effect as of 1 January 1977. The higher fees apply
to all students beginning a 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) or 10(b) of the Immigration
Act, 1976 who is sponsored and financially assisted
by the Canadian International Development
Agency (including the Commonwealth Scholar-
ships and Fellowships), or by the International
Development Research Centre, or by any program
of financial assistance to students under an aid program of the United Nations or its agencies provided such a program is recognized and directly or indirectly assisted by the Government of Canada.

7. A person admitted to and remaining in Canada under clause 10(a) or 10(b) of the Immigration Act, 1976 provided he or she is studying in Canada under a cultural exchange agreement between the Government of Canada and the government of another country or a formal agreement between a provincially-assisted institution in Ontario and a post-secondary institution in another country, provided that under such an agreement, the number of places made available in Ontario universities, Ryerson or the Ontario College of Art normally equals the number of places made available to Ontario residents in the other country or institution as the case may be.

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

In clause 4, “dependent!” means a person whose parent or guardian was admitted to and remains in Canada under clause 10(c) of the Immigration Act, 1976 who is wholly dependent upon such a parent or guardian for support and who is —

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

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

Note 5 - Health Insurance
Effective 1 September 1979, 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 of better insurance coverage is provided. Dependent (family) coverage may be obtained on request and by payment of a further $11.93 per term.

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

Further details are available from Health Services.

Note 6 - Federation of Students
Payment of the Federation of Students fee is required at registration but a student who does not wish to participate may obtain a refund by applying to the Federation of Students within three (3) weeks after the start of lectures for the term or session as indicated on pages 5 to 8 of this Calendar.

Note 7 - Society Fees
Payment of the Society Fee is required at registration, but a student who does not wish to participate may obtain a refund by applying to the respective society within three (3) weeks after the start of lectures for the term or session as indicated on pages 5 to 8 of this Calendar.

Note 8 - WPIRG (Waterloo Public Interest Research Group)
A student funded environmental and social research group.

This fée is voluntary, refundable, and not a requirement for registration. Requests for refunds or questions concerning WPIRG should be directed to the on-campus WPIRG office within three (3) weeks after the start of lectures for the term or session as indicated on pages 5 to 8 of this Calendar.

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

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

Note 10 - Radio Waterloo
The on-campus student radio station.

This fee is voluntary, refundable, and not a requirement for registration. Requests for refund should be directed to the Radio Waterloo office within three (3) weeks after the start of lectures for the term or session involved as indicated on pages 5 to 8 of this Calendar.

Note 11 - Imprint
The student newspaper.

This fee is voluntary, refundable and not a requirement for registration. Requests for refunds should be directed to the imprint office within three (3) weeks after the start of lectures for the term or session involved as indicated on pages 5 to 8 of this Calendar.

Note 12 - Other Costs
The fees shown do not include the costs of text books, class notes, Correspondence 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>Service</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miscellaneous</td>
<td></td>
</tr>
<tr>
<td>Supplemental Examination - Each Paper</td>
<td>$10.00</td>
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<td>(at outside centre half day)</td>
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<td>Returned Cheques - Handling charge (plus late registration penalty as applicable)</td>
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<td>Duplicate Fee Statement or Tax Receipt (per request)</td>
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<td>Replacement of lost Identification Card</td>
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<td>- $3.00 for first copy</td>
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<td>- $1.50 for each additional copy ordered at the same time as the first copy.</td>
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### 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 1982 to 30 April 1983 will be mailed after 1 March 1983 to the home address on record.
Scholarships
Bursaries, Prizes and Financial Aid
Scholarships, Bursaries, Prizes and Financial Aid

The Student Awards Office is responsible for the administration of all forms of financial assistance for undergraduate students. This includes the Ontario Student Assistance 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.

Undergraduate Scholarships

The Alberta Optometric Association Scholarships
The Alberta Optometric Association presents two scholarships in the amount of $250 to each of two students admitted to the First Professional Year of the School of Optometry. These are awarded on the basis of academic achievement to students who are residents of Alberta.

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

The AOCO Canada Limited Scholarship
AOCO Canada Limited presents annually a scholarship to a Canadian student admitted to the First Professional Year of the School of Optometry. This award is made on the basis of academic achievement. The value is $1000.

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

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

Association of Professional Engineers Entrance Award
The Association of Professional Engineers of the Province of Ontario provides a $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.

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

The 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.

The Bausch and Lomb Optical Company Limited Award for Clinical Proficiency
Bausch and Lomb Optical Company offers a prize to the student in the fifth professional year judged to have demonstrated the highest levels of proficiency in clinical activities. The prize is a Greens Refractor or equivalent ophthalmic instrumentation to the approximate value of $2,600.
The Bausch and Lomb, Soflens Division Outstanding Achievement Awards
Total value of these awards is $1,000. These awards are in recognition of ability and effort in the pursuit and application of knowledge in the contact lens field while a final year student.

The Bausch and Lomb Soflens O.D. Awards
Two $500 scholarships are awarded to 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.

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

Dr. Sidney Blair Scholarship in Geological Engineering
In honour of Dr. Sidney Blair’s contribution to the energy field in Canada, the University of Waterloo Alumni Association is offering an entrance scholarship of $1,200 renewable for three years to a total value of $4,800. The award will be made as funds permit to an outstanding student entering Geological Engineering.

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

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

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

CHEM 13 NEWS Research Assistantships
The Department of Chemistry offers CHEM 13 NEWS Research Assistantships to recognize academic excellence in students proceeding to a degree in Chemistry. The awards are made for one year at a time and are valued at $500 for one year. Award holders are required to work with a professor or his research group within the Department. Awards to students entering Year 1 are made on the basis of performance on an examination held in April. Students entering upper years in Honours Chemistry (co-operative or regular system) are automatically considered for the award.

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

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

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

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.

Concordia Club Scholarship in German
A scholarship in the value of $300 will be awarded annually in the Faculty of Arts by the Kitchener-Waterloo Concordia Club to promote and encourage the study of German language and literature.

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.

Charles E. De Leuw Transportation Scholarship
The De Leuw Gather and Company of Canada Limited, in memory of the company’s founder, is making an annual award available to a 4th year Civil Engineering student with the transportation option. The award is in the amount of $500 and will be given to the student showing high academic achievement, good character, and financial need. The Senate Committee on Scholarships and Student Aid will work
in conjunction with the Department of Civil Engineering in determining the winner. Applications forms should be requested from the Awards Office.

René Descartes Scholarships, Fellowships, and Bursaries
Entrance awards in varying amounts are offered through the Faculty of Mathematics to first year students enrolled in that Faculty and showing the University of Waterloo as their first choice on the application for admission to the university. In order to be eligible, a student must write the Descartes Mathematics Competition and submit an application form. These may be obtained from the Head of Mathematics or the Guidance Counsellor in the secondary schools.

Upper year prizes and fellowships in varying amounts are awarded to students in the Faculty of Mathematics based on outstanding performance in the previous year. No application is required.

Dow Chemical of Canada Scholarship in Chemical Engineering
$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.

Randy Duxbury Memorial Award
The $600 award is allocated to a student in third year Chemical Engineering who has a good academic record, has demonstrated a strong interest in extra-curricular activities and athletics and has good evidence of leadership qualities. Students must apply in writing to the Awards Office.

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

Environmental Studies Faculty and Staff Scholarships
A limited number of entrance and upper year scholarships will be made available to students enrolled in the Faculty of Environmental Studies. The amounts of each award will vary and in general the scholarships are awarded on the basis of academic achievement in prior years. Further information may be obtained from the Awards Officer.

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

L. Fejér Award in Mathematics
The Scholarship will not exceed $3,200 per annum and may be awarded wholly or in part to one or more graduate students or senior undergraduate students enrolled in the Faculty of Mathematics and proceeding to a degree at the University of Waterloo. Preference will be given to those whose field of specialization is functional equations and/or information theory. Applications should be made by letter to the René Descartes Foundation, Faculty of Mathematics, University of Waterloo.

General Motors Scholarships
The General Motors of Canada Limited Scholarship Award of $1,000 is offered annually to students enrolled in an Engineering, Mathematics with Business option, Honours Computer Science or a Business related programme of study. In addition, applicants must have a minimum average of 60% or be on the Dean's list. They must be entering their penultimate or final year of study and they must have career objectives applicable to the automotive industry. Recipients will be selected by GM on the basis of academic performance, career goals, demonstrated leadership ability, involvement in outside activities and a personal interview with representatives of the Company. Recipients must serve an internship with GM during the summer preceding the academic year in which the award is payable. For those who qualify the award is renewable.

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

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

The Percy Hermant Centennial Bursary Scholarships
These awards are the gift of Sydney Hermant. The Bursary Scholarships are awarded on the basis of financial need and academic achievement in first year General Science at any Canadian University to a student who is proceeding into Year 1, School of...
Optometry. Six scholarships are available, each of a total possible value of $1,200, being $300 per year over the four professional years (Years 1, 2, 3, and 4) provided a satisfactory standing is maintained. One scholarship is awarded to a student who is a resident of one of the Maritime provinces; two scholarships are awarded to students who are residents of Ontario; three scholarships are awarded to students who are residents of one of the Western provinces. The various Provincial Optometrical Associations are consulted in awarding these Bursary Scholarships. Applications should be submitted to The Student Awards Office before September 15 of each year.

Lynn Holmes Memorial Award
An award of $400 is presented annually to a Fine Arts student who has completed with distinction three years of studio work and elects to continue in the fourth year of the honours program.

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

Huron County Scholarships
Huron County Council is offering two $150 Scholarships to be awarded to the male and female from Huron County who obtain the highest standing regardless of the year in which he or she is registered.

Institution of Production Engineers Canadian Council Award
The value is $100 and a one-year membership in the Institution. It is awarded annually to the best all around fourth-year student in the production and manufacturing option of Mechanical Engineering, and is based on academic standing and involvement in student affairs. The award was established in memory of Stan Thurgar and all the members of the Institution who have conscientiously worked for the good of Canadian industry.

Ford S. Kumpf Scholarship
Through a bequest of the late Ford S. Kumpf of Waterloo, a number of scholarships are awarded annually to outstanding students entering the University from secondary schools in the Regional Municipality of Waterloo. Value: $1,000 for Year One and an additional $1,000 for Year Two if the recipient maintains first class honours standing.

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

John McKay Memorial Award
This award has been established in memory of a student who died in an airplane accident while on a work-term in Northwestern Ontario. Interest from an endowment is awarded annually to a 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.

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

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

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

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

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 Optometry, year 2 Optometry, Year 3 Optometry and Year 4 Optometry.

**Petro-Canada Engineering Scholarship**
Valued at $800, this scholarship will be awarded annually to an outstanding student in Chemical or Mechanical Engineering.

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

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

**Ready Mixed Concrete Association of Ontario Scholarship**
Two scholarships of $250.00 each are awarded to students in 3B Civil Engineering who are residents of Ontario, who have demonstrated particular interest in the use of concrete and reinforced concrete, and who have obtained a high average in related courses. Consideration will be given for experience gained in work terms which involved working with concrete.

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

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

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

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

**The 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 $300 award will be awarded to an outstanding student who is entering the third year of an Actuarial Science Honours Program.

**Toronto Chapter of Architects Award**
The award, valued at $4,000 is available to students registered in the final year of Architecture. Students must apply to the Director of the School of Architecture by December 31.

**Ukrainian Credit Union "Buduchnist" Scholarship in Ukrainian Studies**
The Scholarship of $100 will be awarded annually to an outstanding full-time student who attains the highest academic standing in a Ukrainian course.

**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 Scholarships**
Enterance Scholarships with a maximum value of $4,800, of which $1,200 is allocated in the first year and $1,200 may be allocated in each of three additional years, will be awarded from an endowment fund established by 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 Engineering Scholarships**
Enterance scholarships, ranging in value from $1,200 to $1,700 for first year with some renewable in subsequent years to a total value of $3,000, are awarded to students on the basis of outstanding ability in mathematics and science and demonstrated potential for success in engineering. The following criteria will be used in allocating these awards:
- minimum overall average of 85% in Grade 13;
- performance in the special Waterloo tests (Descartes Mathematics, Sir Isaac Newton Physics and CHEM 13 NEWS competitions); students must write at least one and are encouraged to write all three of these tests;
- principal’s recommendation and other supporting material

Students must submit an application form which can be obtained from the Awards Office.
**Upper Year Awards**, called Undergraduate Research Scholarships and Undergraduate Research Assistantships, are valued at $600 per term and provide an opportunity for undergraduates to participate in original engineering research. These are available to first class honours students in the 2A - 4A terms. The Scholarships are normally awarded automatically at the beginning of each term. To be eligible for an Assistantship a student must apply at the beginning of the term and show an interest in a particular field. The Assistantship is made available through the professor pursuing research in that area.

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

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

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

**Mathematics**
Students must write the Descartes Mathematics Competition.

**Physics**
Students must write the Sir Isaac Newton Physics Contest.

**Engineering**
Students must write at least one of the above and are encouraged to write all three.

An application for admission to the University will suffice as an application for any Entrance Scholarship for which the student is eligible, except in the Faculties of Engineering and Mathematics where special applications are required.

**University of Waterloo - 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 valued at $1,000 for Year One and some may be renewed for Year Two.

**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.

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

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

**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.

**Work-Term Report Awards**
All of the following are awards for work-term reports judged best for clarity, grammar and other communication skills. The technical content of the report is important but not a qualifying requirement. The awards are made each term and the winners will be determined by the Department of Co-ordination and Placement in consultation with the appropriate academic department. Reports considered confidential are not eligible.

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

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

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

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

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

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

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

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

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

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

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

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

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 and fourth year Mathematics/Management Accounting students.

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

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

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

St. Jerome's College Awards

Undergraduate Scholarships
Unless otherwise stated, no application form is necessary. Where an application is required, appropriate forms may be obtained from the office of the Dean, St. Jerome's College, and must be submitted before August 1, 1982.

YEAR 1 ADMISSION SCHOLARSHIPS

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

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

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

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

Upper year Fellowships are available in limited numbers.

The Founder's Scholarships
These scholarships, with a maximum value of $900.00 each, have been established in memory of Rev. Louis Funcken, C.R. (1883-1890), founder of St. Jerome's College. One graduate from each of St. Mary's High School, Kitchener, St. Jerome's High School, Kitchener, and St. John's College, Brantford will receive this scholarship. To be eligible, applicants must select St. Jerome's, Arts or Mathematics, first choice on the application for admission and possess an admissions average of at least 85%.

UPPER YEAR SCHOLARSHIPS

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

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

**The Father John Bullbrook Scholarships**

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

**The Father Anthony Firetto Scholarships**

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

**The Newman Scholarships**

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

**Gladys and Norman Ralter Bursary**

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

**The C.L. Siegfried Bursary**

This fund has been established in recognition of Rev. C.L. Siegfried. Bursaries in varying amounts will be awarded to students registered at St. Jerome's College who demonstrate high academic standing and financial need. Application forms are available from the Office of the Dean of the College and must be submitted by August 1.

**UNDERGRADUATE AWARDS**

**St. Jerome's College Awards**

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

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

St. Jerome's College Awards

Renison College Awards

**The Father Tony Firetto Bursary Fund**

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

**Awards for Candidates for the Priesthood**

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

**The Schill Awards**

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

**Awards for Candidates for the Congregation of the Resurrection:**

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

- **The M. Wintermeyer Award**
  One award annually in the value of $300.

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

**Awards for Candidates for the Diocese of Hamilton**

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

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

**Renison College Awards**

A number of scholarships and awards are available to Renison students. For the most part they are restricted to students who have enrolled in their studies through the College. A limited number are available to students who live in residence but are following academic programs elsewhere in the University. With the exception of the Renison College Entrance Scholarships, application is required for all scholarships and awards.

Application forms are available from the College Registrar.
SCHOLARSHIPS

A.W. Rees Memorial Award
This award was established by College personnel in memory of the first principal of the College. The award is made annually to an outstanding student for an all-round contribution to the life of the College while attaining high academic standing.

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

Leonora Monk Scholarship
This scholarship, bequeathed by Miss Leonora Monk, is awarded annually to a student graduating from a program of the College for excellence in academic performance. It is possible to award two scholarships in some years.

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

The Renison College Entrance Scholarships
These scholarships, valued at two-thirds the tuition fee for one academic year, are provided annually to students entering a program of studies at Renison College from Grade 13 or its equivalent. They are granted on the basis of excellence in academic performance. These scholarships can be extended into the second and third years of study to full-time students registered in a College program if an “A” average is maintained.

Arabelle Williams Scholarship
An entrance scholarship of $1,000 is available to students from the Diocese of Niagara who have first class standing in Grade 13 and who have been accepted in an academic program of the College. Preference will be given to the sons and daughters of Anglican clergy and to persons who have been active in Anglican parishes of the Diocese. The scholarship is provided by the Diocese of Niagara from the Arabelle Williams Scholarship Legacy.

Bishop David Ragg Scholarship
A $300 scholarship established for the offspring of Anglican clergy of the Diocese of Huron or assisted Canadian Dioceses. The scholarship is available, in the first instance, to students with high academic standing in Grade 13 registering for first year studies through the College. If no suitable candidate applies, the scholarship may be granted to a second or third year student.

Parish of St. Aidan-Elmira Scholarship
This $200 scholarship, established by the Anglican Parish of St. Aidan, is normally awarded on the basis of good academic performance to a graduate of Elmira District Secondary School entering the first year of full-time study in the Faculty of Arts and registering at Renison College. If no such individual is eligible, the scholarship may be granted to an applicant from any Waterloo County secondary school.

Renison College Achievement Scholarships
These scholarships are awarded annually to a student in each of the first, second and third years of study. They are available to students in the Social Development Studies program and to students following the General Arts Program of the University of Waterloo who have registered through Renison College.

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

Prizes

The Faculty Award
A prize in the amount of $100 will be awarded annually to the student submitting the best term paper as fulfillment of the regular requirements of a College course. It is available to students registered through the College.

Elizabeth Renison Prize for Creative Writing
A prize in the amount of $100 is available each year to the student submitting the best piece of creative writing. Original poems, short stories, essays or plays will be considered. Available to students registered in Renison College courses.

Bursaries

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

The Bobby Bauer Memorial Awards
The Foundation makes awards to deserving undergraduates on the basis of need, academic standing, and proficiency in athletics. Applications are available from the address below and must be submitted to the Foundation by September 30. The Foundation is responsible for the decisions. Bobby Bauer Memorial Foundation, 60 Victoria Street, North, Kitchener, Ontario.

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

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 one or more women, studying full time in second, third or fourth year who have attained Second Class Standing and are in need of financial assistance. Preference will be given to women not holding tuition scholarships. Mature women students meeting these requirements are encouraged to apply. 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 $1,500.00 will be awarded to a student who has successfully completed one or more years of the professional program. The award is to support student research under the direction of a faculty member of the School of Optometry. Application should be made through the Awards Officer of the University of Waterloo during March or April.

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

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

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

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

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

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

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.

Proctor and 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.

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

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

Prizes
Ambassador of Switzerland Book Prizes
The prizes are awarded annually to an outstanding student in each of the French, German and Italian 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. Included with this award is a gift of technical books valued at approximately $50.

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

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

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 founding director of Co-ordination and Placement.

The Canadian Contact Lens Society Prize (Value: approximately $100)
The proceeds of a fund invested on behalf of the Canadian Contact Lens Society will be awarded to a final year student in the School of Optometry who shows the greatest proficiency in the theoretical and practical application of Contact Lenses.
Scholarships, Bursaries, Prizes and Financial Aid

Prizes

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

a) Three General Proficiency Prizes (value $250 each) awarded to the student in the School of Optometry standing highest in General Proficiency in each of the second, third and fourth years.

b) Three General Proficiency Prizes (value $200 each) awarded to the student in the School of Optometry standing second highest in General Proficiency in each of the second, third, and fourth years.

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

d) In addition to the above, prizes are awarded for highest academic standing in certain second, third, fourth and fifth year subjects as funds allow.

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

- Alden Optical Laboratories, Forte Erie, Ont.
- Allergan Canada Ltd., Pointe Claire, Que.
- Canadian Optical Supply Co., Montreal, Que.
- Eastern Optical, Dartmouth, N.S.
- Gordon Contact Lenses, Rochester, N.Y.
- Hydron Canada Ltd., Etobicoke, Ont.
- Kahn Optical Company Limited, Toronto, Ont.
- KDS Optical, 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.

The Chemical Institute of Canada Prize
Two awards, one each to a Chemistry and a Chemical Engineering student, are made annually by the Institute. The awards, consisting of an engraved medal and a $50 gift, are given to the student with the highest academic standing in the penultimate year of either course. No application is necessary.

Classical Studies Prize
The Classical Studies Prize of $75.00 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 enroll in a further Latin or Greek course at the 200 level.

The E.T. Davies Memorial Prizes
In memory of the late Professor E.T. Davies, his colleagues in the Applied Mathematics Department offer annually two prizes of the approximate value of $100 each. One prize is for a first year student, enrolled in Applied Mathematics. The other prize is for the third year Applied Mathematics student who ranks first on the final examinations. No application is necessary.

Department of French Prize
A prize of $100 will be awarded annually by the Department of French to the fourth-year French major who attains the highest overall average in French.

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

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 are continuing in the Engineering program.

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

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

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

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

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

The K-W Optical Company Limited Prizes
Awards are made to the two students in each of the second, third and fourth professional years who have shown the greatest improvement in academic standing. In the fourth professional year the awards are for $280 and $200. In the other years the awards are for $200 and $150.

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

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

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

The Jerome T. Miller Memorial Prize
This book prize was established in 1968 by relatives and friends in memory of the late Jerome Thomas Miller, B.Sc., M.Sc. (1966) - Honours Chemistry and Physics. The book is to be awarded each year, on the basis of marks, to the student in third year of a program which combines studies in Chemistry and Physics.

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

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

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

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

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

Political Science Third Year Prize
This prize of $50 will be awarded by the Political Science Department to the fourth year Political Science major with the highest cumulative average in his or her Political Science courses at the end of third year. 
No application is necessary.

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 B.Arch. program.

Marj Schaefer Prize in Architecture
An annual award to an Architectural student who has been elected to serve on one of the School committees and who combines academic proficiency with a contribution to student affairs and student life in the School of Architecture.
Society of Chemical Industry Award
A gold key is awarded by the Society to the student with the highest standing in the final year of Chemistry.

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

The J.C. Thompson Memorial Prize (Value: $125)
The Award of the Alumni Association in memory of the late Dean J.C. Thompson is made to the final year student in the School of Optometry who has ranked highest in Optometry (Optometry 302, 312, etc.).

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

University of Waterloo Alumni Association Gold Medals
The University of Waterloo Alumni Association is providing a maximum of six gold medals annually to be awarded in recognition of academic excellence. Each medal will be awarded on the recommendation of the Dean of a Faculty. The medals may be awarded, at either the Spring or Fall Convocation, as follows: one each to a student in each of the six Faculties of the University who has demonstrated outstanding academic performance on completion of an undergraduate degree program.

University Loan Funds
The Awards Office administers a number of emergency loan funds which are intended to provide emergency assistance to students experiencing temporary, short-term financial problems. Students wishing to obtain assistance from one of the following funds should apply to the Awards Office.

To be eligible for these loans, students must be in good standing and must demonstrate adequate repayment terms.

Alpay - Nicoll Memorial Loan Fund
Established by the Sandford Fleming Foundation in memory of Professors Alpay and Nicoll, Department of Mechanical Engineering, from funds contributed by faculty, staff and others. Emergency loans are made available to students in the Faculty of Engineering.

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.

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

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

Ian Carr Loan Fund
This loan fund has been set up by the parents in memory of their son, a former student at the University of Waterloo. It is intended to provide short-term loans, interest-free, to students who may be faced with unexpected expenses during their academic year.

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

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

The Adelaide Detweiler Student Loan Fund
This loan fund has been established by Mr. J.H. Detweiler in memory of his mother, Adelaide Detweiler, to provide short-term, interest-free loans to students who may be confronted with unexpected expenses during their academic terms or their work terms. The loans are normally for $100 or $200 for up to 90 days. Application should be made to the University Awards Officer.

The fund is to represent contributions received from classmates, friends and other interested donors in memory of students who lost their lives while enrolled in the Engineering Faculty, and while at the University or on their work terms.
Environmental Studies Society Loan Fund
Short term interest-free loans are available to full time undergraduate students enrolled in the Faculty of Environmental Studies. The maximum loan is normally $100. These funds are made available by the Society and represent a part of the proceeds of functions sponsored by the Society.

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 one 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 to a maximum of $200 for a period of up to 90 days.

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

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.

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 four 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 at the graduate or professional level, or to students who are not eligible for any, or sufficient, grant assistance.

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

4. The Ontario Special Bursary Plan provides assistance based on financial need to students taking 60% or less of a normal full course load. This Plan is intended for individuals who are unemployed, receiving social assistance, or have a low family income. A personal interview is required.

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

Students from provinces other than Ontario should approach the provincial assistance authority in their home provinces concerning the possibility of assistance from that source.

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

The Co-op work term
Department of Co-ordination and Placement

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

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

Program Administrators
R. A. Fuller, BA (Western Ontario)
J. W. Hoag, BArch (Toronto)
R. A. Klawitter, BA (Western Ontario)
R. A. Pullin, BSA (Toronto)

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

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

Liaison Coordinator
O. F. Naese, BA (Waterloo)

Career Advisor
F. M. Ruszer, BA MSc (Guelph)

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

Co-ordinators, Co-operative Education
D. J. Beaupre, BComm (Loyola), CA
G. P. Berthin, BSc (Manitoba), PEng
L. R. Bricker, BSc, MSc (Waterloo)
W. G. Clapham, BMath (Waterloo), MBA (York)
W. G. Cole, BASc (Toronto), PEng
W. G. Dailey, BArch (Liverpool)
M. O. Deschenes, BA, BEd (Queen's)
G. P. Dobbin, BASc (Toronto), PEng
G. G. Ellsworth, BA (Princeton)
A. T. Girard, BASc (Toronto), PEng
R. A. Grant, BSc (Queen's), PEng
D. S. Harris, BEng (McGill), PEng
H. Hilderley, BA (York)
H. J. Hurley, BSc (Waterloo)
E. M. Johnson, BA (Queen's)
K. B. Kenning, BA (Wilfrid Laurier)
A. L. Lind, BSc (Queen's), PEng
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)
C. N. McPhun, BA (Waterloo)
C. E. Pinaud, BSc (Queen's)
D. A. Robinson, BA (Western Ontario)
W. A. Runge, BSc (Queen's), PEng
J. R. Scouler, BSc, MBA (McMaster)
V. E. Sparrow, BA (Waterloo)
S. R. Stankus, BSc (RMC)
G. Subasic, BASc (Washington), PEng

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

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

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

The Work-Study Sequence
All Year 1 students enrol in September and spend the first term together at the University. As indicated on the chart, they rejoin as a class for the last term to complete their course work and graduate together. In some programs such as Engineering, Mathematics and Science, the class is split into two approximately equal groups, one known as Stream 6, 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) | Sep/Oct | Jan/Feb | Mar/Apr | May/Jun | Jul/Aug | Sep/Oct | Jan/Feb | Mar/Apr | May/Jun | Jul/Aug | Sep/Oct | Jan/Feb | Mar/Apr | May/Jun | Jul/Aug | Sep/Oct | Jan/Feb | Mar/Apr | May/Jun | Jul/Aug |
|----------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| **Arts Applied Studies** (Arts Co-op) with Honours Major in most disciplines. | 1A 1B | 2A | 2B | 3A | 3B | 4A | 4B |
| **Arts Departmental Co-op Programs** Accountancy (Honours Chartered Accountancy (Economics Option), Honours Management Accountancy (Economics Option)) | Reg 1B | 2A | 2B | 3A | 3B | 4A | 4B |
| **Economics (Applied)** | Regular | off term | 2A | 2B | 3A | 3B | 4A | 4B |
| **English** | Regular | off term | 2A | 2B | 3A | 3B | 4A | 4B |
| **Anthropology** | Regular | off term | Reg 2B | 3A | 3B | 4A | 4B |
| **Political Science** | Regular | off term | Reg 2B | 3A | 3B | 4A | 4B |
| **Psychology** | Regular | off term | Reg 2B | 3A | 3B | 4A | 4B |
| **Sociology** | Regular | off term | Reg 2B | 3A | 3B | 4A | 4B |
| **Engineering** Chemical, Civil, Electrical, Mechanical Stream 8 | 1A 1B | 2A | 2B | 3A | 3B | 4A | 4B |
| **Stream 4** | 1A 1B | 2A | 2B | 3A | 3B | 4A | 4B |
| **Geological** | 1A 1B | 2A | 2B | 3A | 3B | 4A | 4B |
| **Systems Design** | 1A 1B | 2A | 2B | 3A | 3B | 4A | 4B |
| **Environmental Studies** 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 | 1A 1B | 2A | 2B | 3A | 3B | 4A | 4B |
| **Stream 4** | 1A 1B | 2A | 2B | 3A | 3B | 4A | 4B |
| **Math/Chartered Accountancy, Applied Math (with Computer Science), Applied Math (with electives in Engineering), Pure Math (with Computer Science or Statistics)** | 1A 1B | 2A | 2B | 3A | 3B | 4A | 4B |
| **Math Teaching Option** | Regular | term | 2A | 2B | 3A | 3B | 4A | 4B |
| **Science** Biology, Biology and Chemistry Applied Chemistry Stream 8 | 1A 1B | 2A | 2B | 3A | 3B | 4A | 4B |
| **Stream 4** | 1A 1B | 2A | 2B | 3A | 3B | 4A | 4B |
| **Applied Earth Sciences** | 1A 1B | 2A | 2B | 3A | 3B | 4A | 4B |
| **Applied Physics** Stream 8 | 1A 1B | 2A | 2B | 3A | 3B | 4A | 4B |
| **Stream 4** | 1A 1B | 2A | 2B | 3A | 3B | 4A | 4B |

- Denotes work term
- The 8-month work term consists of 6 months in a Secondary School & 2 months in the summer at Althouse College of Education, London.
- Admission occurs by January for the 2B term.
- Admission occurs by January for the 1B term. Students cannot be admitted to Co-op at the beginning of the first year.
- accordance with the Co-operative program begins in 2A, admission is made to the program at the time of the initial application to the university.
- Admission beyond 1A is possible only for the following terms: 1B - January, 2A - September, 2B - May, 3A - January.
- Admission occurs at the time of selection of 2nd year courses.
- Students cannot be admitted to Co-op in 1st year.
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, and potential, will determine whether a student is offered a job. If a student is not placed after 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 two unacceptable job rankings prior to submitting rankings for the placement process. If extenuating circumstances prevail, a student may delete more than two job rankings. In all circumstances, students must discuss the situation with a Co-ordinator prior to eliminating any rankings. Failure to discuss ranking deletions may result in the student being placed “On Own” by the Department of Co-ordination and Placement. Note that there may be instances where a student is not given a 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 six 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 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.

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

Unsatisfactory Performance
Unsatisfactory performance by a student on a work term is investigated by the student's Co-ordinator. As a result of this investigation, if benefits from further professional training are questionable, the student may be required to withdraw from the 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 four. Where other than four are required by the University, this is stated in the calendar or in the individual student's file. However, employers may require additional reports from students as part of the job. Normally for a report to be considered 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 six work terms. A student may, for one reason or another, fail to satisfactorily complete the full complement of work terms. For these students, and for students given advanced admission to a Co-op 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 four. 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 five; otherwise all work terms must be satisfactory.

Co-ordination and Placement

Graduation Requirements

Co-operative Degree Designation

Work Reports

Quantity and Grading
In most programs the submission of work reports is a requisite for graduation and generally the minimum number is four, and those four must be graded as satisfactory or better. Provision is made for students to upgrade unsatisfactory reports or submit new reports. Also provided for are situations where there are less than four work terms available to the students, as well as 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.
Career Planning and Placement

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

Group workshops for students are held on job search and interview techniques, résumé 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 Career Planning and Placement offices are located on the first floor of Ira G. Needles Hall.

Waterloo Advisory Council

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

T. E. Hogan, (President)
Petro-Canada

A. Nittenberg, (Vice-President)
Ontario Hydro

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

C. T. Baumgartner
Gandalf Data Communications Ltd.

D. J. Bernstein
Imperial Oil Ltd.

J. R. Coutts
Teklogix Ltd.

D. Dickie
Brouwer Turf Equipment

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

W. B. Foster
Syncrude Canada Ltd.

R. H. Fox
Westinghouse Canada

D. Galloway
Harlequin Enterprises Ltd.

S. Gendron
Inco Metals Co.

G. A. Hooper
Thorne, Riddell & Co.

H. S. Kerr
Spar Aerospace Ltd.

F. J. Meyer
Steel Company of Canada Ltd.

R. N. Millman
The Ontario Paper Company Ltd.

F. Ross
ADGA Ltd.

J. Schneider
Dominion Bridge

S. Sharzer
The Globe & Mail

R. C. Steele
Proctor & Redfern Ltd.

J. W. Synan
Gulf Canada Ltd.

W. B. Taylor
Ontario Cancer Institute
## Organizations Employing Co-operative Students

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

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<th>Organization Name</th>
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<td>Carr &amp; Donald Associates Limited</td>
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<tr>
<td>Ira Carr Construction Limited</td>
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<tr>
<td>Cawtha Park Secondary School</td>
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<td>CBS Records Canada Limited</td>
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<td>C. L. Industries Incorporated</td>
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<td>C.C.M.</td>
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<td>C &amp; C Yachts</td>
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<td>T. Clay Manufacturing Limited</td>
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<td>Coho Evansy &amp; Partners</td>
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<td>Coopers &amp; Lybrand</td>
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<td>Cooper Tool Group Limited</td>
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<td>Corporate Consultants</td>
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<td>Corrosion Service Company Limited</td>
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<tr>
<td>John V. Cottena Chartered Accountant</td>
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<tr>
<td>Coulter Copper &amp; Brass Limited</td>
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<td>County of Brant</td>
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<td>County of Perth</td>
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<tr>
<td>County of Waterloo Separate School Board</td>
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</table>
Co-ordination and Placement
Organizations Employing
Co-operative Students

Courtalnds (Canada) Incorporated
E & B Cowan
Cox Hyatt & Company
CPRI Recreation Services
Victor G. Cragg
Craig Kohier & Dickey
Crane Packing Company Limited
Craig & Boake
Crawford Morton Janes Jacklin
Creative Centre for Learning
Development
Cremanco Systems Limited
Crouse-Hinds Canada Limited
Crown Life Insurance Company
CTV Television Network Limited
G. G. Cunningham & Associates
Chartered Accountants
Curtis Engineering & Testing Limited
Cyanamid Canada Incorporated
DAF indai Limited
D’Angela Sorrenti Canale & Palombo
Chartered Accountants
Darcey Place
Dart C. P. Services Limited
Dascom Limited
Datacrown Incorporated
DateLimited
Datatime Limited
Data Resources of Canada
Davis Eryou & Associates Limited
Daymond Limited
Philip M. Decarlo Chartered
Accountant
John Deere Limited
Defence Systems Canada Limited
Deloitte Haskins & Sells
Deloro Stellite
Delta-Benco-Cascade Limited
Delta Enterprises (Sarnia) Limited
Denison Mines Limited
Dialectic Computer Services
A. J. Diamond Associates
Diamond Shamrock Canada Limited
Dick Hubbard Fitness Centre Limited
Diesel Equipment Limited
Digital Equipment of Canada Limited
Digital Methods Limited
Digital Video Systems Limited
M. M. Dillon Limited
Diversified Research Laboratories
Dixen Applicators Limited
Dixon Gordon & Company
D. L. Custom Limited
DMR & Associates
D. M. W. Company Limited
H. R. Doane & Company
Norman Dobell & Associates
Dofasco Inc.
Dome Exploration Canada Limited
Dome Mines Limited
Dome Petroleum Limited
Domglas Incorporated
Dominion Bridge Company Limited
Dominion Engineering Works Limited
Dominion Life Assurance Company
Dominion Stores Limited
Domtar Limited
Dorcan Limited
Dover Corporation Canada Limited
Dow Chemical of Canada Limited
Philip Doyle Limited
Dravo Manufacturing Limited
D. R. G. Limited
DSMA Atcon Limited
Dufferin Construction Company
Dufferin Peel Separate School Board
Dunlop Farrow Altken
Dunwoody & Company
Dupont Canada Incorporated
Durham Board of Education
Durham College of Applied Arts & Technology
Durst Vodden & Bender
Dyer/Brown & Associates
Dynaionic Corporation
DY 4 Systems Incorporated
Eaton/Bay Financial Services
Eaton Yale Limited
Ebasstec Lavalin Incorporated
E. B. Eddy Forest Products Limited
E. C. E. Group
ECO Informatique Limite
Ecole Linaire
T. J. Ecsedi & Associates Limited
Eudy Forest Products Limited
Eldorado Nuclear Limited
Electrohome Electronics
Elicin House
Eigin Middlesex Detention Centre
Elliot & Associates
Elliott & Botot
Elmhurst’s Four Season Resort
E. M. A. Industries
Emery Industries Limited
Empco Fab Limited
Empire Life Insurance Company
Energy Product Group
Enervac Corporation
Entwistle Adams & Hutcheson
Environco Limited
Epitex Electronics Limited
Equity Development Group Limited
Erco Industries Limited
Erindale Secondary School
Ernst & Whinney
ESB Canada Limited
Steven M. Eskin Architect
Esso Chemical Canada
Esso Resources Incorporated
E. T. S. Towers Incorporated
Evans & Martin Rycroft Clark
Excelsior Life Insurance Company
Exco Engineering
Exxon Company of Canada Limited
Facelle Company Limited
Falconbridge Nickel Mines Limited
Falk Corporation of Canada Limited
Family Service Association
Farinon Electric of Canada Limited
Faultless Doerner Company Limited
Federal Pioneer Limited
Fenco Consultants Limited
Former Paving Limited
Ferranti-Packard Electronics Limited
Ferco Engineering Limited
Ferro Industrial Products Limited
Fiberglas Canada Limited
Fielding Grossman & Associates
Limited
Financial Models Company
Fireman’s Fund Insurance Company
of Canada
Firestone Canada Incorporated
Fischbach & Moore of Canada Limited
Fisher & Porter (Canada) Limited
Fischer Controls Company of Canada
Limited
David Fisher Residence
Fisheries & Oceans Sea Lamprey
Control Centre
Henry Fries
The Footwear & Leather Research
Institute of Canada
Ford Keast Giles’Smith & Phillips
Chartered Accountants
Ford Motor Company of Canada
Limited
Forest Heights Pool
Forest Valley Day Camp
Fortinetk Canada Corporation
Foster Wheeler Limited
Fox Glickman & Company
Fram Canada Limited
Frankel Steel Limited
Franklin Manufacturing Company
(Canada) Limited
Fraser Incorporated
Frederick Parker (Canada) Limited
Gagne & Gagnon
Galtaco Incorporated
Gamsby & Mannerow Limited
Gandalf Data Communications
Limited
Gardner McDonald & Company
Garrett Manufacturing Limited
Gaviller & Company
GEAC Canada Limited
Gellman Hayward & Partners Limited
General Foods Limited
Gencor & Marine Hospital
General Mills Limited
General Motors of Canada Limited
General Refrigeration Canada Limited
General Signal Limited
General Wire & Cable Company
Limited
Genesco of Canada Limited
Genstar Development Company
Geological Survey of Canada
Geosearch Consultants Limited
GeoFerrex Limited
Getty Mines Limited
Gibbs Nathaniel (Canada) Limited
Stephen R. Gibson
Co-ordination and Placement
Organizations Employing
Co-operative Students

Giffels Associates Limited
Givens Construction Limited
Ginsberg Gluzman Fage & Levitz
Giano Canada Limited
Global Communications Limited
Global Travel Computer Services
Globe & Mail
Glos Associates Limited
Goebel-Wagner Macadam
H. Q. Gold & Associates
Goldfields Exploration Canada Limited
B. F. Goodrich Canada Limited
Gordon Graydon Memorial Secondary School
Gore Mutual Insurance Company
GO Transit
Government of Alberta
Government of Canada
Government of Manitoba
Government of Northwest Territories
Government of Ontario
Government Members' Service Bureau
Greater Niagara General Hospital
Great Lakes Bioluminology Lab
Great Lakes Forest Products Limited
Great Lakes Power Company Limited
Great West Life Assurance Company
Green Industries Limited
A. P. Green Refractories (Canada) Limited
Howard M. Greenspan Architect
Greenwood Meitz Silverstein & Herlick
Greer Flemming & Rolland
Grey-Bruce District Health Council
Griffith Laboratories Limited
Guaranty Trust Company of Canada
Guelph Engineering Company Limited
Guelph Hydro
Guideline Instruments Limited
Gulf Canada Limited
Gulf Canada Products Company
Gulf Canada Resources Incorporated
Gulf Minerals Canada Limited
Hamilton Board of Education
Hamilton Psychiatric Hospital
Hamilton Region Conservation Authority
Hammond Manufacturing Company Limited
Harris Media Services Limited
Thomas Harris Engineering Limited
Harris Title & Wasserman
Hart Chemical Limited
Havergal College
Hawthorn Mansfield Towers
Heaton & Hassal
Heat Pumps Canada Limited
H. J. Heinz Company of Canada Limited
John T. Hepburn Limited

Hercules Canada Limited
Heritage Nursing Homes
Hewlett Associates
Hewlett-Packard (Canada) Limited
H. H. Bush & Associates Limited
High Standard Mud Services Limited
Hilborn Ellis Grant & Company
Donald Hill & Partners
C. M. Hincks Treatment Centre
Hinman & Company
Home Oil Company Limited
Homeware Industries Limited
Homewood Sanitarium
Honeywell Limited
Honeywell Information Systems
Horseshoe Valley Resort
Horton Ball Walter Fedy McCargar
Hachborn
Horton CBI Limited
Hostess Food Products Limited
House of Commons
Howden Applied Research Limited
G. D. Howard Central Limited
J. G. Hrend Architect
HSA Reactors Limited
Hudson Bay Mining & Smelting Company Limited
Hudson Engineering
Hudson's Bay Oil & Gas Limited
Humberview School
Hunter Enterprises Orilla Limited
Husky Oil Limited
Hyde Houghton & Company
Hydro Electric Commission
Cambridge & North Dumfries
Hyvac Limited
IBI Group
IBM Canada Limited
ICL Computers Canada Limited
Image Video Limited
Imperial Oil Limited
Imperial Oil Enterprises Limited
Imperial Optical Company Limited
Imperial Tobacco Limited
Inco Metals Company
Indal Data Centre
Independent Order of Foresters
Industrial Lawn Mowing Service
Industrial Life Technical Services Incorporated
Informetrica Limited
Ingersoll PUC
Ingersoll Rand Canada Incorporated
Inglis Limited
Inner City Angels
Inskip & Wilczynski Architects
Institute of Man & Resources
Insurance Bureau of Canada
Insurers Advisory/Organization of Canada
Intercontinental Pulp Company Limited
International Harvester Company of Canada Limited
International Import Customs Brokers Limited
International Sytems Limited
Intersteel Consultants Limited
InterTech Remote Sensing Limited
Inuit Tapirisat of Canada
Investors Syndicate Limited
Iron Ore Company of Canada
Irving Oil Limited
Irving Pulp & Paper Limited
Istec Limited
ITT Canada Limited
ITT Grindall
William R. Jarrett
Rolf Jensen & Associates Limited
Anton Jensef & Company
Johnson Controls Limited
Johnson Cross YanoSik
Johnson & Johnson
Johnson & Matthey Limited
Johnston Soper Limited
J. H. Jorden
Joy Manufacturing Company (Canada) Limited
Jung/Brannen Associates Incorporated
Kaiser Resources Limited
Kappele Wright & MacLeod Limited
Kaptest Engineering Limited
William C. Karleff
Stephen Katz Associates
Architect & Planner
Kayoca Consultant Limited
Kearney-National (Canada) Limited
Keenan & Bell
Keeprite Products Limited
Kelslog Salada Canada Limited
Kelly McKay Lewis Stefanizzi
Kelvin Energy Limited
Kemper Insurance
Kendall Canada
Kenner Collegiate & Vocational Institute
Key Publishers
Peter Kleveland Sons Company Limited
Kilborn Engineering Limited
Kilmer Van Nostrand Company Limited
Kimberly-Clark of Canada Limited
Kindred Industries Limited
Kingston Psychiatric Hospital
R. Kirby & Associates
Kitchener Public Library
Kitchener-Waterloo Hospital
Klockner-Moeller Limited
Knud Simonsen Industries Limited
Kodak Canada Incorporated
Korin Limited
K-Tek Electro-Services Limited
John Labatt Limited
Labatt's Ontario Breweries Limited
Lackie Brothers Limited
Lady Fitness
Lakefield College School
Lakefield District Secondary School
Lakehead Region Conservation Authority
Lakehead University
Lake Ontario Cement Limited
Lake Ontario Steel Company Limited
F. Joseph Lamb Company
Gail E. Lamb
Langhorne & Lynch
Langlois Hauck & Company
Latendorf Conveying Limited
Laura Secord Candy Shops Limited
Laurentian Hospital
Laurier Life Insurance
J. D. Lee Engineering Limited
Lee Merrick & Associates Limited
Leigh Instruments Limited
Ernst Leitz (Canada) Limited
Allan Levine Architect
Levitky Feldman Wexler & Partners
Libby St. Clair Incorporated
Dan Li
Linamar Machine Limited
Linear Technology Incorporated
Lithwick Johnston & Moy
Liton Systems (Canada) Limited
Loblaws Limited
M. Loeb Limited
London Life Insurance Company
London PUC
W. P. London & Associates Limited
Longford Equipment International Limited
Long Manufacturing
R. F. Lonsdale & Associates Limited
Looby Construction Limited
Lorlea Steels Limited
Lubrizol of Canada Limited
Lummas Company Canada Limited
Lutheran Life Insurance Society of Canada
Luttor Management Consultants
Lynnhurst Hospital
MacBeth Williams Woodruff & Hadaway
MacDonald Dettwiler & Associates
John A. MacDonald
MacDonald & Zuberec
MacGillivray & Company
MacKillican & Associates
A. F. MacLaren & Company
MacLaren Engineers Planners & Scientists Inc.
MacClennan Associates Architects
MacMillan Biocedel Building
Maitland Valley Conservation Authority
Manalta Coal Limited
Mandelbaum Landau & Rosenberg
Paul Maney Laboratories Division of Canapharm Industries
Manufacturers Life Insurance Company
Maritime Telegraph & Telephone Company Limited
Marshall Macklin Monaghan Limited
Martin Tilley & Company
Masdom Corporation Limited
Massachusetts Institute of Technology
Massey-Ferguson Limited
Mathers & Haldenby
Mattabi Mines Limited
McCarney Swinarton Newland
McClain Nairne & Partners
McCay Duff & Company
McClimkin Robertson Moore Gray & Company
McColl Turner & Company
McConnell Advertising
MCC Powers
McDonnell Douglas Canada Limited
McGraw Hill Ryerson Limited
McInnis Equipment Limited
Mckee Industries Limited
Mckerlie-Miller Incorporated
McLeod Young Weir & Company Limited
McMaster University
McNeil Laboratories (Canada) Limited
McPherson Scott & Company
MDS Health Group Limited
Mecon Industries Limited
Med-Chem Laboratories Limited
Mental Health Centre
Mercantile & General Reinsurance Group
William M. Mercer Limited
The Merrick Chandler Kennedy Architectural Group
Meteorological & Environmental Planning Limited
Metrex Instruments Limited
Metropolitan Life Insurance Company
Micom Company
Midland Rose (Canada) Limited
Midwestern Regional Centre
Miles Laboratories Limited
C. Blakeway Millar
Millard Rouse & Rosebrugh
Miracle Food Mart
Mississauga Racquets Club
Mississauga Transit
Mitel Corporation
Mobil Chemical Canada Limited
Mobil Oil Canada Limited
Moffat Moffat & Kinoshita
Mohawk College of Applied Arts & Technology
Mohawk Valley Community College
Molson Companies Limited
Molson's Brewery (Ontario) Limited
Monroe Auto Equipment Company
Monsanto Canada Incorporated
Monteith Monteith & Company
Montreal Engineering Company Limited
Mony Life of Canada Limited
Moore Instrument Company Limited
Morrison & Beatty Limited
Motorola Canada Limited
MRC Alarms
MTD Products Limited
Multiple Access Computer Group
Multiple Sclerosis Society of Canada
Municipality of Metro Toronto
Murphy Oil Company Limited
Murray & Murray Griffiths & Rankin Muskoka Centre
Mutual Life Assurance Company of Canada
Mutual of Omaha Insurance Company
Nacan Products Limited
Nashua Canada Limited
National Arts Centre
National Cancer Institute of Canada
National Film Board
National Grocers Company Limited
National Life Assurance Company of Canada
National Research Council
National Sales Incentives Limited
National Trust Company Limited
Navel Limited
NCR Canada Limited
Nets Incorporated
Nestle (Canada) Limited
Niagara College of Applied Arts & Technology
Niagara Paint & Chemical Company
A. C. Nielsen Company of Canada Limited
Nightingale & Quigley
C. W. Noble Architect
Noranda Mines Limited
Noranda Research Centre
Noranda Sales Corporation Limited
Norcen Energy Resources Limited
Norpak Limited
Norrr Architects
Nortak Software Limited
North American Life Assurance Company
Northern & Central Gas Corporation Limited
Northern College of Applied Arts & Technology
Northern Secondary School
Tilley & Company
Co-operative Students
Co-ordination and Placement
Organizations Employing
Co-operatives

Ontario Cancer Institute
Ontario Cancer Treatment & Research Foundation
Ontario Centre for Remote Sensing
Ontario Centre for the Deaf
Ontario Crippled Children's Centre
Ontario Educational Communications Authority
Ontario Electrical Construction
Ontario Energy Corporation
Ontario Geological Survey
Ontario Hydro
Ontario Land Corporation
Ontario Paper Company Limited
Ontario Research Foundation
Onward Manufacturing Company Limited
Optikon Corporation Limited
Orangeville District Secondary School
George A. Ormsby Ortho Pharmaceutical (Canada) Limited
Oshawa Group Limited
Otacca Foundry
Otis Elevator Company Limited
Ottawa Board of Education
Ottawa Carleton Regional Detention Centre
Outboard Marine Corporation Canada Limited
Overhead Crane
Oxford Regional Centre
Page & Steele
Paideia Press
Pamour Porcupine Mines Limited
Pan Canadian Petroleum Limited
Papeterie Reed Limited
Park Davis & Company Limited
Parkin Architects Engineers & Planners
Participation House Hamilton & District
Partridge Skene & Company
Peace River Regional Planning Commission
Peat Marwick Mitchell & Company
Pedlar Storage Products
Perry Dean Stahi & Rogers
Peterborough PUC
Peto MacCallum Limited
Petro Canada
Petrosar Limited
Phillips Cables Limited
Pigott Construction Company Limited
Pine Ridge
Pioneer Chain Saw Corporation
Planned Computer System
Planning Initiatives
Planters Group of Nut Companies
Polycom Systems Limited
Polygram Incorporated
Polyasar Limited
Pope Starret & Company
Fort William Dry Dock
Power Tel Utilities
Pow Wow Point Lodge Company Limited
P. P. G. Industries Canada Limited
Pratt & Whitney Aircraft of Canada Limited
Prentice-Hall of Canada Limited
Preston Sand & Gravel Company Limited
Price Newfoundland Pulp & Paper
Price Waterhouse & Company
Prince Edward Heights Centre
Prince George Pulp & Paper Limited
Prior Data Sciences Limited
Procor Limited
Procter & Gamble Incorporated
Procter & Gamble Cellulose Limited
Procter & Gamble Specialties Limited
Proctor & Redfern Limited
Pro-Eco Limited
Project Dana
Provincial Crane
Provost Industrial Tankers Limited
Prudascio Data Services
Prudential Assurance Company Limited
Prudential Insurance Company of America
Puelpito Canada
Pulp & Paper Research Institute of Canada
Purolator Limited
Pye & Richards
Quaker Oats Company of Canada Limited
Quasar Systems Limited
Queen Elizabeth Hospital
Queen Street Mental Health Centre
Queen’s University
Quapro Data Systems Limited
Rapco Foam
Rapistan Systems Limited
Ray Ariss Grein & Nowak
Raytheon Canada Limited
Regional Municipality of Durham
Regional Municipality of Halton
Regional Municipality of Hamilton-Wentworth
Regional Municipality of Niagara
Regional Municipality of Ottawa-Carleton
Regional Municipality of Peel
Regional Municipality of Sudbury
Reichhold Limited
F. J. Reinders & Associates Limited
Repac Construction & Materials Limited
Restigouche & Bay Chaleur Soldiers Memorial Hospital
J. L. Richards & Associates Limited
Rio Algom Limited
Rio Tinto Canadian Exploration Limited
Wm. Roberts Electrical & Mechanical Limited
Robinson Lott & Brohman
Rogers & Associates
Rohm & Haas Canada Limited
Romm Construction Company Limited
Ronville Services (Canada) Limited
Royal Bank of Canada
Royal Canadian Mounted Police
Royal Insurance Canada
Royal Military College of Canada
Royal Ottawa Hospital
Royal Trust
Rubbermaid (Canada) Limited
Ruddy Electric Wholesale Company Limited
Murray Rumack Stern & Cohen
Ryder Smith & Ginsler Limited
Ryerson Polytechnical Institute
Rygel Home
Sacred Heart Children’s Village
Saddington Greenfield & Company
Safrans Systems Limited
Samson Belair & Partners
Sangamo Canada
Sankey Werelman Guy Architects
Sarco Canada Limited
Sault Ste. Marie Gymnastics Club
Scarborough Board of Education
Scarborough General Hospital
S & C Electric Canada Limited
Schliefel Canada Limited
Schlumberger of Canada
J. M. Schneider Incorporated
Scholars Choice Limited
H. S. Scott & Associates
Scouts Canada Oshawa Council
SDI Associates Limited
Joseph E. Seagram & Sons Limited
Seaver Limited
Secker Ross
Sears Limited
Seeburn Metal Products Limited
Selby Madgett Boier & Haar
Shaban Manufacturing Limited
I. P. Sharp Associates Limited
Shaw Industries Limited
Shawinigan Engineering Company Limited
Sheilds Engineering Limited
Sheilds Engineering Limited
Shell Canada Limited
Shell Canada Resources Limited
Shellie-Globe of Canada Limited
Sheppard Cartridge Hammond & Company
Sheppard Club
Sheridan College of Applied Arts & Technology
Sheridan Nurseries Limited
Sherman Mines
Co-ordination and Placement
Organizations Employing Co-operative Students

Sherritt Gordon Mines Limited
Shopsy's Foods Limited
Shore Tile Henschel Irwin Peters
J. E. Sievenpiper
Signmacs
Silknit Limited
Siltronics Limited
Simcoe Hall Crippled Children's Centre
Simon Fraser University
A G. Simpson Company Limited
Simpsons-Sears Limited
Sinclair & Valentine Company of Canada Limited
J. J. Singer Consulting Economists Limited
Sir James Whitney School
Smith Nixon & Company
Snap On Tools of Canada Limited
Solaray
Joseph C. Somfay
A H. Soubrine & Company
Southwestern Regional Centre
Spar Aerospace Limited
Sparton of Canada Limited
Speciality Chemicals Limited
Speedy Muffler King
Sperry-Univac
Springer Chapman & Company
Sproofesale School
Spruce Falls Power & Paper Company Limited
Sprung Instant Structures
Square D Company of Canada Limited
Stafford & Haensli
Stahl & Nicolaidis
Standard Brands Canada Limited
Standard Pressure Pipe Company
Stanstead College
Start Centre
St. Clair College of Applied Arts & Technology
St. Clair Region Conservation Authority
Stelco Inc.,
Stelco Employees Credit Union
Stephens-Adamson
Sterling Drug Limited
Sterling Varnish Company (Canada) Limited
Stevenson Raines Barrett Christie
Hutton Seton & Partners
Stewart Seeds Limited
Stewart Warner Corporation of Canada Limited
Robert Stiff Architect
Stilie & Sutton
St. John's School
St. Joseph's Exploration
St. Joseph's Hospital
St. Lawrence Cement Company
St. Lawrence College of Applied Arts & Technology
St. Lawrence Regional Centre
St. Lawrence Seaway Authority
St. Marys Cement Limited
Stone Conway Anger Snowell & Company
Stonehenge Systems Incorporated
Stratford P U C
Sudbury Board of Education
Sudbury Hydro
Sudbury Memorial Hospital
Sullivan Strong Scott Incorporated
Sunar Industries Limited
Sunbeam Home
Suncor Incorporated
Sun Life Assurance Company
Sunnybrook Medical Centre
Sunnyside Home for the Aged
Sunoco Incorporated
Sunset Home for the Aged
Swain & Rupnow
Switzer Engineering Services Limited
Sybron Canada Limited
Syncrude Canada Limited
Systemhouse Limited
Talisman Resort Hotel
Tax Time Services
Taylor Engineering
Taylor Steel Incorporated
Tectrol Incorporated
Teklogix Limited
Teleglobe Canada
Telie-Radio Systems Limited
Teleride Corporation Limited
Teslasat Canada
Temprite Industries Limited
Terra Mining & Exploration
Terralrobe Limited
Texaco Canada Incorporated
Texasgulf Incorporated
Thames Valley District Health Council
Thomas A Stewart Secondary School
J. E. Thomas Specialties Limited
Thorne Riddell & Company
Timbergate Engineering Limited
TIW Industries
Toronto Dominion Bank
Toronto Hydro Electric System
Toronto Transit Commission
Iorptt Lodge
Torrington Incorporated
Toche Ross & Company
Towers Perrin Forster & Crosby
Townend Stefura Baleshta
Town of Caledon
Town of Elliot Lake
Town of Grimsby
Town of Kincardine
Town of Kirkland Lake
Town of Lindsay
Town of Markham
Town of Richmond Hill
Town of Vaughn
Town of Whitby
Township of Sarnia
Tracor Engineering Limited
Trail Manufacturing Limited
Transcanada Pipelines

Trans Union Fasteners
Travelers of Canada
Trecan Limited
Trench Electric Limited
Truswal Systems Canada Limited
TRW Canada Limited
TRW Data Systems
B. J. Turner Incorporated
Peter Turner
Tusco Trailer & Utility Supply Limited
Umech Corporation Limited
Underwood McLellan Limited
Union Carbide Canada Limited
Union Drawn Steel Company Limited
Union Gas Limited
Union Mienen Explorations & Mining Corporation Limited
Union Oil Company of Canada Limited
Uniroyl Limited
United Carr
United Cooperatives of Ontario
United Tire & Rubber Company Limited
Universal Industries Limited
University Hospital (London)
University of Alaska
University of Guelph
University of Notre Dame
University of Toronto
University of Waterloo
University of Western Ontario
University of Windsor
Upjohn Company of Canada
Upper Canada College
Upper Thames River Conservation Authority
Uranex Exploration & Mining Limited
Urangsgesellschaft Canada Limited
Utah Mines Limited
Valcom Limited
Valleyview Home for the Aged
Varian Canada Limited
T. M. Vari & Associates Limited
C. A. Ventin
Versatile Manufacturing Limited
Vic Tanny's Health Spa
Victaulic Company of Canada Limited
Victoria & Grey Trust
Volker Craig Limited
Webco Limited
Wabco Equipment of Canada
Wabco of Canada
Wabush Mines
Wallbar Machine Products of Canada Limited
Walbrook Appointments
B. P. Walker Associates Limited
Walker Brothers Quarries
Walker Exhausts
Hiram Walker & Sons Limited
Hiram Walker-Consumers Home Limited
Walter Fedy McCargar Hachborn
Wampole Limited
Ward Mallette
Warner-Lambert Canada Limited
Mykola Wasylko
Co-ordination and Placement
Organizations Employing Co-operative Students

Waterloo County Board of Education
Waterloo Manufacturing Company Limited
Waterloo Region District Health Council
Weall & Cullen Nurseries
Jervis B. Webb Company of Canada Limited
Webb Zerafa Menkes Housden
Geo. A. Welch & Company
Welding Institute of Canada
Wellesley Hospital
Wellington County Board of Education
Welsh & Galloway
WES Industrial
West Bend of Canada Limited
Westeel-Rosco Limited
West-End City YMCA
Western Central Electric Limited
Westinghouse Canada Limited
West Scarborough Boy’s Club
Wheelabrator Corporation of Canada Limited
White Psychiatric Hospital
White Farm Equipment
White Oaks Tennis & Racquet Club
White Oaks Village
Wilfrid Laurier University
Wilk Engineering Limited
Wilkinson & Company
Wilson Newton Roberts Duncan Architects Planners
George Wimpey Canada Limited
Windsor Western Hospital
Jack Winston Designs Incorporated
R. E. Winter & Associates Limited
Woodbridge Foam Corporation
Wood Brown & Associates
Wood Gundy Limited
Woodingford Lodge
Carson Woods
Woods Gordon
Woodstock P U C
W. C. Wood Company Limited
Workmen’s Compensation Board
Worthington Canada Incorporated
James Wright
Xerox Canada Incorporated
Xerox Research Centre of Canada Limited
YMCA Belleville
YMCA Burlington
YMCA Hamilton
YMCA Kitchener-Waterloo
YMCA Guelph
YMCA Toronto Central
York Borough Board of Education
York Finch General Hospital
Yorklea Children’s Centre
York-Ryerson Computing Centre
York Steel Construction Limited
York-Toronto Lung Association
York University
Yorkville Sound Limited

YWCA Hamilton
YWCA Vancouver
Zeidler Partnership
Stanley Zippan Architect
3M Canada Incorporated
The Automated Circulation System at the Engineering, Mathematics, and Science Library
The University Library

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

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

Business Administrator
J. Jorgensen, BA (Toronto)

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

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

Support Services

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

Acquisitions Department Head
F. Waterman, BA (McMaster), BLIS (Toronto)

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

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

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

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

Reader Services

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

Dana Porter Arts Divisional Library

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

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

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

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

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

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

Engineering, Mathematics and Science Divisional Library

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

Circulation Department Head
C. McDonald, BA (California)

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

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

Reference & Collections Development Librarians
N. Bastedo, BA (Rollins), (Toronto), MLS (W. Ont.)
J. Macdonald, BSc, BEd (Dalhousie)
W. Maepherson, BSc, MLS (Dalhousie)
D. Morton, BSc, MLS (W. Ont.)
J. Parrott, BSc (Queen’s), MSc, BLIS (Toronto)
B. Toth, BA (Queen’s), MLS (McGill)

University Map and Design Librarian
R. Pinnell, BSc, MSc (Toronto), MLS (W. Ont.)
The University Library

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

The 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 two 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 Kurzweil 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 ten stories, is the focal point of the University. The lower floors house the main reader services and support services departments. Reader services located on the first floor include a large Reserve Reading Room with seating for 160 readers, a Rare Book Room, a Listening Room with facilities for both phonodiscs and audio cassettes and eight typing cubicles. The second or main floor contains the public catalogue, the circulation counter and the Information Desk. Also on the main floor is the Current Periodical Reading Room, the Interlibrary Loan Office and the Reference Collection. The periodical and newspaper collections and microforms are located on the third floor.

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

The Arts Library collection numbers over 1,700,000 items including books, pamphlets, theses, microforms, documents, reports, sound recordings and other material. The Library subscribes to over 5,400 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 three principal reader services - the catalogue, the circulation counter and the Information Desk are visible from the entrance to the Library. Seating is provided for 570 readers.

The E.M.S. Library collection numbers over 519,000 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 75,000 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 11,000 items, which include a special collection on Peace Studies. It is also the home of a Mennonite Archive which consists of church records and documents of the Mennonites of Ontario. St. Jerome's College Library has a collection of about 28,000 volumes. St. Paul's College Library has about 4,000 books specializing in the areas of Religious Studies and Canadian Studies. The 3,000 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, and the University of Guelph Libraries have reciprocal borrowing agreements which allows 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 circulation staff are on
duty to assist in the use of collections, facilities and services. The library building remains open after reference and circulation services close.

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

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

A CMS Terminal Room
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) - IS & P
R. W. Watt, BSc, MMath (Waterloo) - Systems

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

Computer Communications Network Group

Director
E. G. Manning, MSc (Waterloo), PhD (Illinois)

Arts Computing

Director
P. Smith, BA (Harvard), PhD (Pennsylvania)

Computer Systems Group

Director
J. W. Graham, MA (Toronto)

Associate Directors
E. W. Mackie, BA (Waterloo)
J. C. Wilson, BASc (Toronto) MSc, PhD (Waterloo)

Mathematics Computing Facility

Director
R. H. Bartels, MSc (Michigan), PhD (Stanford)

The University of Waterloo has a wide variety of computer systems. Access to these systems depends on the particular course taken and is usually arranged by the instructor. Most access is via CRT terminals which are located in many parts of the campus, although the majority of terminals are located in the Mathematics and Computer Building.

Department of Computing Services

The Department of Computing Services, located on the first two floors of the Mathematics and Computer building, provides computing facilities and services for faculty, staff, graduate and undergraduate students. The facilities include keypunches, terminals and program preparation areas, an input/output area for submission of batch jobs and retrieval of printed output, an incremental plotting facility, and a variety of computing hardware and software chosen to handle the wide range of computing applications in a university community. Faculty, academic staff, graduate and undergraduate students use the computing facilities to aid them in their research; in addition, many academic courses require the use of the computer in course assignments. Administrative staff also use the computer in applications such as student records, course timetables, examination results and financial accounting.

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

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

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

The Honeywell 66/60 provides a general-purpose time-sharing facility to undergraduates, graduates, faculty and staff in the Faculty of Mathematics. MFCF also provides several mini-computers for use in graduate and undergraduate courses as well as for research. These include a PDP 11/45 running UNIX, a DEC VAX 11/780 running Berkeley Unix, a Honeywell Level 6, two T1 990's, and a MODCOMP. A new Microcomputer Laboratory containing a number of microcomputers has recently been equipped to support computer science courses. Several graphics display terminals are used in on-going research projects and computer graphics courses. This equipment is available to computer science students involved with graphics projects.

Arts Computing Office

The Arts Computing Office operates an input-output facility in the basement of the PAS building. This installation includes keypunches and terminals for the preparation of data and programs for the computer, a card reader for submitting jobs to the Computing Centre's large computer, and a printer for receiving the output from the computer.

Several consultants are available throughout the working day to help users with problems they may have in developing and running their programs.

The Computer Systems Group

The primary interest of the group is the construction of software tools aimed at the program development task. Such software tools include compilers which provide good diagnostic messages and fast compilation, interactive programming systems and interactive editors with appropriate human interfaces. These tools have been used in educational institutions to support teaching and research, and in business and government organizations to support scientific and commercial programming activities. Some of the well known pieces of software which have been developed by the Computer Systems Group include:

- WATFOR and WATFIV - compilers for the FORTRAN language
- WATBOL - a compiler for the COBOL language
- WIDJET - an interactive editor
- WATERLOO BASIC - an interactive system for programming in the BASIC language
- WATERLOO PASCAL - a compiler for the PASCAL language

These pieces of software all operate on a large variety of digital computers including those made by IBM and DEC.

The Computer Systems Group has been involved with microprocessors and microcomputers for a number of years and has built several microprocessor-based systems. They have constructed microcomputer systems to support programming in different languages including APL, BASIC, FORTRAN, PASCAL, and assembler.

Computer Communications Network Group (CCNG)

This group is funded through research grants and has been in existence since 1971. Its goal is to build a Canadian centre of excellence in Computer Communications technology, able to assist industry, business and government in their efforts to harness this new technology.

Research in progress includes data switching techniques, distributed processing and data management, performance measurement in computer networks, network simulation protocols and interconnection. Extensive laboratory facilities are available to support research in these areas.

Other Facilities

In addition to the major centres, a large number of computer systems are located in various laboratories across the campus. Some of these are used in particular courses that are also arranged by the instructor.
A History discussion in the MacKirdy Reading Room.
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 student’s University of Waterloo average.

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

Arts Programs

GENERAL PROGRAMS

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

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

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

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

There are no minors or double majors in General Programs.

Note 1
In Year 1, students are encouraged to select an introductory course(s) in any discipline(s) in which they may specialize in later years. For further information on Selection of Year 1 Programs, refer to page 86.

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

HONOURS PROGRAMS

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

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

Almost any 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 must be arranged by consultation between the student and the two departments concerned. 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. 91.

Note 1
In Year 1, students are encouraged to select an introductory course(s) in any discipline(s) in which they may specialize in later years. For further information on Selection of Year 1 Programs, refer to page 86.

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.

Note 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.

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.

Students in an interdisciplinary program (either major or minor) may not use the same course to meet the minimum requirement of both the major and the minor.

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 16)
- Legal Studies (Option, see “Departmental Programs” and Chapter 16)
Management Studies (Joint Honours or Minor, see Chapter 16)
Peace and Conflict Studies (Option or Minor, see “Departmental Programs” and Chapter 16)
Personnel and Administrative Studies (Minor, see Chapter 16)
Studies in Personality and Religion (Option or Minor, see "Departmental Programs" and Chapter 16).

SELECTION OF YEAR 1 PROGRAMS
All Year 1 students are officially classified as being in the General Arts Program or in the Arts Co-op Program. Students in both programs may not select a specific major or an 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 usually choose 5 term courses in both the fall and winter terms (or a combination of year and term courses equivalent to 5 term courses per term). Students usually select 2 courses from disciplines in Group A and 2 from disciplines in Group B (see Degree Requirements), with 1 or 2 more courses as electives. As well, students are encouraged to select courses in any discipline in which they may hope to major. (Students are advised that a 6-course work load may be quite heavy.) The Faculty of Arts recommends that its students take at least one course in mathematics or science.

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

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

Note 3
Students interested in Social Development Studies should consult the Undergraduate Officer at Renison College before selecting a Year 1 program.
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 one area of specialization, or
- 14 credits in two subjects (no fewer than 6 in each) for two areas of specialization.

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

Degréé Requirements

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

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

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.

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.

Note

When students who are completing all their Arts degree requirements through Correspondence courses or at off-campus centres have reached the halfway point toward the General BA degree - that is, when they have finished 15 of their 30 term courses - they will be required to sit the English Language Proficiency Examination during a normally scheduled examination time at a convenient location.
Group A and B Requirements

All Arts students must meet the Faculty of Arts Group A and B requirements. Group A comprises courses in the humanities, and Group B comprises courses in the social sciences:

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

In order to complete the Group A and B requirements, an Arts student in either a Major or an Honours Program must complete with passing marks:

- A minimum of two term courses from Group A (i).
- A minimum of two term courses from Group A (ii).

An Arts student in a Non-Major program must complete with passing marks a minimum of four term courses from Group A and a minimum of four term courses from Group B. Of the four term courses used to satisfy the Group B requirement, no more than two may be in the same discipline. The student should note that Group A is further sub-divided into Group A (i), Group A (ii), and Group A (iii).

Of the six term courses from Group A, the student must complete with passing marks:

1. A minimum of two term courses from Group A (i).
2. A minimum of two term courses from Group A (ii).

Note 1

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

Note 2

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

Note 3

Arts students should note that they may elect to meet the Group A (ii) requirement in their second or subsequent years by completing with passing marks a minimum of two term courses from Group A (i) and only one term course in one other discipline is not acceptable.

Arts

Degree Requirements

Examinations and Standings

one of the following courses: French 291/292, German 271/272, Russian 271/272, Spanish 203/204, Classical Civilization 201/202 or Italian 291J/292J. These courses are taught in English and are not open to first year Arts students. These courses are the only approved alternative to the A (ii) requirement.

Examinations and Standings

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

1. The Faculty constitutes the examining body for all examinations. When a final written examination is required it is normally held at the end of the course. Oral examinations may be required at the discretion of individual departments. The normal time for written examinations is three hours.

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

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

4. No instructor shall be permitted to administer - and no student shall be required to sit - final examinations in the formal lecture period.
Grading System
1. Normally all courses should be completed within the term in which they are offered. Letter grades are used to signify evaluation in individual courses. For the purpose of striking averages, the following weights will be assigned to grades received in individual courses:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>95</td>
</tr>
<tr>
<td>B+</td>
<td>78</td>
</tr>
<tr>
<td>C+</td>
<td>68</td>
</tr>
<tr>
<td>D+</td>
<td>58</td>
</tr>
<tr>
<td>F+</td>
<td>46</td>
</tr>
<tr>
<td>A</td>
<td>89</td>
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<tr>
<td>B</td>
<td>75</td>
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<tr>
<td>C</td>
<td>65</td>
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<tr>
<td>D</td>
<td>55</td>
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<tr>
<td>F</td>
<td>38</td>
</tr>
<tr>
<td>A-</td>
<td>83</td>
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<tr>
<td>B-</td>
<td>72</td>
</tr>
<tr>
<td>C-</td>
<td>62</td>
</tr>
<tr>
<td>D-</td>
<td>52</td>
</tr>
<tr>
<td>F-</td>
<td>32</td>
</tr>
</tbody>
</table>

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

Note
When a course is repeated, the two marks are not averaged together. Rather, both marks are entered with all other marks in calculating the student's cumulative overall average. A passed course may be repeated once with the approval of the department concerned.

2. Students may request that their performance in any given Arts course be marked as either Credit (Cr) or Fail (F). The instructor of the course and the student’s department must agree to this arrangement at the outset of the course and the student must communicate the decision in writing to the Arts Faculty Examinations and Standings Committee before the end of the three week drop and add period.

In satisfaction of the minimum degree requirements students in general 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 Type A Specialist Fields.

3. An incomplete "INC" may be assigned by an instructor in exceptional circumstances, with the consent of his Department. This extension of completion date is granted to students as a privilege for a limited and specified time and in normal circumstances shall be no longer than three months for a half-course and seven months for a full course.

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

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

Course Load
Regular full-time students in both General and Honours Arts 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 one 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 six week summer program or by correspondence. There is no distinction between part-time and full-time students as to admission requirements, grading practices, or promotion policies.

Standing
1. To be considered in good standing in a General program, a student must maintain a cumulative overall average of at least 60%, as well as an average of at least 65% in all courses taken in the Major discipline (unless the department specifies a higher average). If a student's overall average falls between 56 and 60%, or the major or non-major average below 65% (unless the department specifies a higher average), the student may be granted conditional status for one year. During this period the student must make reasonable progress toward obtaining good standing or the student will be required to withdraw from the Faculty of Arts.
2. To be considered in good standing in an Honours program, a student must maintain a cumulative overall average of at least 60%, as well as an average of at least 75% in all courses taken in the Honours discipline (unless the department specifies a higher average). A student in a Joint Honours program must maintain a cumulative average of 75% in all courses taken in the two Honours disciplines (unless the departments specify higher averages).

If an Honours degree candidate's major average falls below the prescribed minimum the candidate will be considered for the General degree and the regulations in (1) above will apply. If subsequently the student raises the average to the required level, he may, through his Department Chairman, petition the Examinations and Standings Committee to review his case.

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

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

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

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

Each student's academic record is examined once a year in time to determine eligibility. To be eligible for consideration the student must have completed at least ten term courses. Each record is examined again after the completion of a minimum of ten further term courses from the point of any previous considerations. 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 six months of receipt of the grade) try to work the matter out informally with the instructor concerned. If the problem cannot be resolved in this way, the student may submit a formal, written appeal to the appropriate department chairman or head of the affiliated colleges or dean of the federated college. Because of their familiarity with problems specific to their disciplines, departmental or collegial review bodies offer the appellant the best opportunity for a thorough and a fair review of his appeal.

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

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

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

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

Departmental Programs

Accounting

Students may earn a degree in Accounting through three Honours programs.

The Honours Accounting degree program consists of a three-year Accounting program following the pre-admission university-level work needed as preparation. This is a limited enrolment program and students are admitted to the Accounting program only after they have demonstrated a high level of academic ability in the preparatory studies. As set out below, the Accounting program includes a required one-year internship with the work experience related to the option chosen within the program.

Honours Accounting is an integrated program of Accounting and related area and general studies, intended to prepare students for careers as professional accountants. It includes a broad basic education as well as requiring each student to attain some depth in an area by completing one of three available options. Most important, it is intended to serve the students throughout their careers in that they have a foundation for learning and development.

Graduates of the program will be educated to serve in careers in public accounting, industry, finance, government and not-for-profit organizations. Application has been made to the Ontario Institute of Chartered Accountants for approval of this program which would allow graduates with the public accounting option to write the Chartered Accountants' Uniform Final Examinations upon graduation. It is expected that graduates with the managerial accounting option will receive the maximum credit presently available toward the RIA designation of the Society of Management Accountants of Ontario.

Honours Management Accountancy Studies (Economics Option) and Honours Chartered Accountancy Studies (Economics Option) are programs intended for students who wish to combine a less-extensive preparation in Accounting with a firm grounding in Economics. The programs are structured so as to enable the student to qualify for membership in the respective professional accounting organizations. Both programs may be taken as Co-op or Regular. Students intending to go into either of these programs must notify the Undergraduate Officer by December 15 of the Fall term in Year 1.

The Honours Accounting Degree Program

In order to qualify for the degree of Bachelor of Arts (Honours Accounting), the student must complete a minimum of forty-three term courses. The degree program consists of the Accounting program, set out below, which includes 32 term courses, plus a minimum of 11 courses that must be completed before entry. The 32 term courses in the Accounting program must be completed regardless of the work 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.

Requirements for Admission

Students who are completing the pre-admission studies, whether at the University of Waterloo or elsewhere, must apply for admission to the Accounting program. It is a limited-enrolment program and serious consideration will be given only to applicants who are adequately prepared academically, in terms of work already completed, and who have demonstrated a high level of academic performance. To meet the minimum requirements, applicants must have completed the following course-work at the University of Waterloo or elsewhere:

- One term course in each of financial accounting, managerial accounting, statistics, computer science, calculus, linear algebra, a behavioural science, and English.
- Two term courses in economics;
- A further term course from the Faculty of Arts Group A elective requirements (see page 00).

Further work in the humanities, social sciences, science or mathematics is recommended to serve as a basis for worthwhile use of the electives available in the Accounting program. Students intending to prepare themselves for admission to the Accounting program should consult with the Undergraduate Officer in Accounting concerning their program of studies. Application for admission should be made to the Director, Accounting Program, Hagey Hall, University of Waterloo.

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 twelve months prior to the registration day of the Fall term. Proof of permanent resident status must accompany the application. Applications will not normally be accepted from foreign students on student authorizations.

The Accounting Program

The program consists of three calendar years, including both academic studies and work experience:
Accounting Program One (AP1) consists of three consecutive terms of academic work starting with the Fall term.

Accounting Program Two (AP2) is a one-year (12 month) required internship.

Accounting Program Three (AP3) consists of three consecutive terms of academic work, beginning with the Fall term.

The Program includes a required Core of integrated accounting and related-area courses and the required completion of one of the three options of Public Accounting, Managerial Accounting or Taxation. The Core courses, required of all students regardless of option chosen, are the following:

Economics 201, 202
Philosophy 215
English 210
Psychology 333 or approved equivalent, and one course in each of Statistics and Computer Science specifically designed for this program.

Accounting Program: Core Courses Only

<table>
<thead>
<tr>
<th>Term AP1A</th>
<th>Term AP1B</th>
<th>Term AP1C</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACC 291,</td>
<td>ACC 292,</td>
<td>ACC 231,</td>
</tr>
<tr>
<td>Financial</td>
<td>Financial</td>
<td>Business</td>
</tr>
<tr>
<td>Accounting</td>
<td>Accounting II</td>
<td>Law</td>
</tr>
<tr>
<td>STAT', CS'</td>
<td>ACC 371,</td>
<td>ACC 372,</td>
</tr>
<tr>
<td>ECON 201,</td>
<td>Finance 1</td>
<td>Finance II</td>
</tr>
<tr>
<td>Microeconomic</td>
<td>Auditting I</td>
<td>ECON 202,</td>
</tr>
<tr>
<td>Theory</td>
<td>ACC 251,</td>
<td>ECON 202,</td>
</tr>
<tr>
<td>ACC 461,</td>
<td>ACC 381,</td>
<td>Macroeconomic</td>
</tr>
<tr>
<td>Taxation I</td>
<td>Managerial</td>
<td>Theory</td>
</tr>
<tr>
<td>Accounting I</td>
<td>ACC 382,</td>
<td>Accounting II</td>
</tr>
<tr>
<td>ACC 462,</td>
<td>ACC 463,</td>
<td>Taxation III†</td>
</tr>
<tr>
<td>Taxation II</td>
<td>ENGL 210,</td>
<td>Communications</td>
</tr>
</tbody>
</table>

* The courses in Statistics, Computer Science and Operations Analysis are specifically designed for this program.
† Those electing the Public Accounting or Managerial Accounting options will substitute Operations Analysis for Taxation III, which will then be taken in term AP3c.

Accounting Program Two

Required 12-month internship

Accounting Program Three

<table>
<thead>
<tr>
<th>Term AP3A</th>
<th>Term AP3B</th>
<th>AP3C</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACC 491,</td>
<td>ACC 431,</td>
<td>Management</td>
</tr>
<tr>
<td>Financial</td>
<td>Management</td>
<td>Decisions</td>
</tr>
</tbody>
</table>

and, in the three terms, Philosophy 215, Psychology 333, the requirements of one of the options, and electives to total 18 term courses.

Option Requirement

All students must complete one of the three options:

- Public Accounting: ACC 402, 451, 452, 453, 494
- Managerial Accounting: ACC 402, 454, 481, 482
- Operations Analysis, and an approved course in Computer-based Decision Support Systems. 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.

Honours Management Accountancy Studies (Economics Option)

(Regular and Co-op)

This program is intended for students who wish to prepare themselves to qualify as Registered Industrial Accountants (RIA). Students can presently qualify for twelve RIA exam exemptions, with an opportunity, while still enrolled at the University, to write three RIA Uniform National Examinations.

Forty-four term courses are required for the degree.

The following are the required courses:

Accounting 101, 102, 231, 251, 291, 292, 371, 372, 381, 382, 401, 461, 491
Economics 101, 102, 201, 202, 211, 212, 221, 231, 301, 302 plus two term courses numbered 300 or above.

Management Sciences 44

Recommended Program

<table>
<thead>
<tr>
<th>Year 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounting 101, 102</td>
</tr>
<tr>
<td>Economics 101, 102</td>
</tr>
<tr>
<td>Computer Science 112, 115</td>
</tr>
<tr>
<td>English 109</td>
</tr>
<tr>
<td>Five additional term courses.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2A</th>
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</thead>
<tbody>
<tr>
<td>Accounting 291, 231</td>
</tr>
<tr>
<td>Economics 201, 221, 231</td>
</tr>
<tr>
<td>One additional term course.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2B</th>
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</thead>
<tbody>
<tr>
<td>Accounting 292, 251</td>
</tr>
<tr>
<td>Economics 202, 211</td>
</tr>
<tr>
<td>Two additional term courses.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounting 381</td>
</tr>
<tr>
<td>Economics 301</td>
</tr>
<tr>
<td>Three term courses.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounting 382</td>
</tr>
<tr>
<td>Economics 302</td>
</tr>
<tr>
<td>Management Sciences 44</td>
</tr>
<tr>
<td>Three additional term courses.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 4A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounting 491, 461, 371</td>
</tr>
<tr>
<td>Three additional term courses.</td>
</tr>
</tbody>
</table>
Arts
Accounting
Anthropology

Honours Chartered Accountancy Studies (Economics Option)
(Regular and Co-op)
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 requirements for qualification as a C.A. are a minimum of two years of work experience with a public accounting firm, successful completion of the Institute's School of Accounting (offered in May-June by the Institute) and successful completion of the Uniform Final Examinations. Forty-four term courses are required in order to receive the degree of Honours Accounting with the C.A. option. The following are the required courses:

Accounting 101, 102, 131, 132, 231, 251, 291, 292, 371, 372, 381, 382, 401, 461, 491
Economics 101, 102, 201, 202, 211, 221, 231, 301, 302, 341 and one additional term course at the 300 level or above.

Recommended Program

Year 1
Accounting 101, 102, 131, 132
Economics 101, 102
Computer Science 112, 115
English 109
Two additional term courses.

Year 2A
Accounting 231, 291
Economics 201, 221, 231
One additional term course.

Year 2B
Accounting 251, 292
Economics 202, 211
Two additional term courses.

Year 3A
Accounting 381
Economics 301
Four additional term courses.

Year 3B
Accounting 382
Economics 302, 341
Three additional term courses.

Year 4A
Accounting 371, 461, 491
Three additional term courses.

Year 4B
Accounting 372, 401
Four additional term courses.

Prerequisite
It is desirable that students planning to enter Honours Chartered Accountancy Studies (Economics Option) complete a minimum of one Ontario Grade 13 credit, or the equivalent in Mathematics. Students without this mathematics background will be required to complete Mathematics 103/104 as an elective in Year 1.

Advanced Standing Examinations
Early in the Fall term, students who have completed Accounting in Grade 13 can elect to write a test in Accounting 101/102. Any student who scores at least 70% in this test will be exempted, without any credit accumulated, from Accounting 101/102 and may register for Accounting 291.

Anthropology

General BA in Anthropology
The student must pass ten term courses or equivalent in Anthropology. Eight of these Anthropology courses must be in 200-level courses or above. The following core courses are required of all General Anthropology students:

ANTH 101  ANTH 103  ANTH 201  ANTH 102A  ANTH 283  ANTH 202
ANTH 102B  ANTH 290  ANTH 260  ANTH 330

Honours Anthropology
The student must pass 20 term courses or equivalent in Anthropology. Eighteen of these Anthropology term courses must be in 200-level courses or above. The following core courses are required of all Honours Anthropology students:

ANTH 101  ANTH 103  ANTH 201
ANTH 102A  ANTH 283  ANTH 202
ANTH 102B  ANTH 290  ANTH 260
ANTH 300  ANTH 451  ANTH 499
ANTH 330  ANTH 452

The Honours Anthropology student needs 40 term courses or equivalent to graduate.

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.

Anthropology Joint Honours Program
The recommended Anthropology program for Joint Honours includes fourteen term courses in Anthropology. Twelve term courses in Anthropology must be at the 200-level or above. The following core courses are required of all Anthropology Joint Honours students.
ANTH 101 ANTH 103 or ANTH 201
ANTH 102A or ANTH 263 or ANTH 202
ANTH 102B ANTH 290 ANTH 260
ANTH 300 ANTH 451 or ANTH 499
ANTH 330 ANTH 452

Note
ANTH 499 (The Anthropology Honours Essay is optional if an Honours Essay is written in the Joint Discipline.)

Joint Honours programs have been approved for Anthropology and Biology, Classical Studies, English, French, Geography, German, History, Man-Environment Studies, Political Science, Psychology and Sociology.

Honours Anthropology (Co-operative) Program
Co-op Anthropology students will pursue a normal first year Arts program, taking Anthropology 101 and either Anthropology 102A or 102B. In the second year and thereafter the student is required to pursue a normal Honours program. It is strongly advised that Anthropology 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.

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

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

Note 3
Students planning a Joint Honours program are advised to consult the undergraduate officers of both departments before formulating their program of study.

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

Recommended Program

Year 1A
A second language
ACC 131
CS 112 or 116 or ARTS 198
Proposed Major Subject and Electives (3 term courses)

Year 1B
A second language
ACC 132, ENGL 109
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
Two approved courses in Applied Studies
Major Subject and Electives (4 term courses)

Year 3B
An approved Applied Studies course
Major Subject and Electives (4 term courses)

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

Year 4B
An approved Applied Studies course
Major Subject and Electives (4 term courses)

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

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

Note 3
A list of approved Applied Studies courses is available from the Director of the program in ML 119.
Note 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)

General Programs
Students choosing a three year General program in Latin must complete ten term courses in Latin (normally not more than two of the ten may be in Classical Civilization). Students choosing a three year General program in Greek must complete ten term courses in Greek (normally not more than two of the ten may be in Classical Civilization). Students choosing a three year General program in Classical Civilization must complete ten term courses in Classical Civilization (normally not more than two of the ten may be in Latin or Greek).

Students choosing a four year General program in Classical Civilization must complete fourteen term courses in Classical Civilization (normally not more than four of the fourteen may be in Latin or Greek).

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

Honours Programs

Honours Classical Studies
Recommended Program

Year 1
GRK 100, or LAT 100, or LAT 203/204
C CIV 101/102
Six additional term courses

Year 2
LAT 203/204, or two term courses in Latin at the 200 level, or two term courses in Greek at the 200 level
C CIV 251/252, 265/266
Four additional term courses

Year 3
Two term courses in Greek or Latin at senior level
C CIV 301/302, 351/352
Four additional term courses

Year 4
Four term courses in Classical Civilization
Six additional term courses

Note 1
In the single honours program in Classical Studies, six term courses out of twenty must be either Greek or Latin or both. Before graduation 40 term courses must be completed.

Honours Classical Studies (Applied Studies Co-op)
A student may combine an Honours Classical Studies program with Applied Studies Co-op. The requirements in Classical Studies are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 94.

Joint Honours Classical Studies
Recommended Program

Year 1
GRK 100 or LAT 100, or LAT 203/204
C CIV 101/102
Six additional term courses

Year 2
LAT 203/204, or two term courses in Latin at the 200 level, or two term courses in Greek at the 200 level
C CIV 251/252, 265/266
Six additional term courses

Year 3
C CIV 301/302, 351/352
Six additional term courses

Year 4
Two term courses in Classical Civilization
Ten additional term courses

Note 1
In the joint honours program in Classical Studies, four term courses out of sixteen must be either Greek or Latin or both. Before graduation 44 term courses must be completed.

Honours Latin
Recommended Program

Year 1
LAT 100 or 203/204
Eight additional term courses

Year 2
Four term courses in Latin
Two term courses in Classical Civilization
Four additional term courses

Year 3
Four term courses in Latin
Two term courses in Classical Civilization
Four additional term courses

Year 4
Four term courses in Latin
Two term courses in Classical Civilization
Four additional term courses
Note
Normally not more than six term courses in Classical Civilization are permitted to complete the total of twenty term courses required for Honours Latin. Before graduation forty term courses must be completed; it is strongly recommended that students complete two of Latin 251/352/451 before graduation.

Honours Latin (Applied Studies Co-op)
A student may combine an Honours Latin program with Applied Studies Co-op. the requirements in Latin are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 94.

Joint Honours Latin
Students choosing a Joint Honours Program involving Latin must complete sixteen term courses in Latin (normally not more than four term courses in Classical Civilization are permitted to complete the total of sixteen term courses required for Joint Honours Latin). Before graduation 44 term courses must be completed; it is strongly recommended that students complete two of Latin 251/352/451 before graduation.

Minor Programs
Minor programs are offered in Classical Civilization, Greek and Latin. Students interested in planning a sequence of ten term courses to complement their major field of study are encouraged to consult the Undergraduate Advisor in Classical Studies. All minor programs must be approved by the Department.

Drama and Theatre Arts

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

The Honours 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. Students planning to major in Drama and Theatre Arts should confer with the Undergraduate Advisor before registering.

Drama and Theatre Arts General Program
1. A total of thirty term courses including Faculty of Arts Groups A and B courses required with an overall cumulative average of at least C- and a cumulative major average of C.
2. At least twelve term courses must be in Drama and Theatre Arts.

3. DRAMA 101A and 101B are the required prerequisites for most Drama and Theatre Arts courses.
4. In addition students must satisfy the following requirements:
   a) DRAMA 102
   b) DRAMA 243
   c) Three of DRAMA 251, 252, 253, 254, 255, 351, ENGL 362, 363, 190 (See Note 1).
   d) DRAMA 371 or DRAMA 372
   e) DRAMA 409
   f) Any three other DRAMA courses or other approved courses in related departments.

Note 1
A student who has taken ENGL 362/363 may not also take ENGL 190.

Note 2
Students taking DRAMA 221, 222 or both, 321, 322 or both, and 421, 422 or both, must take one DANCE Technique course in the first or second term.

Honours Drama and Theatre Arts
1. A total of forty term courses including Faculty of Arts Groups A and B requirements with an overall cumulative average of at least C- and a cumulative major average of at least B.
2. At least twenty term courses must be in Drama and Theatre Arts.
3. DRAMA 101A and 101B are the required prerequisites for most Drama and Theatre Arts courses.
4. In addition students must satisfy the following requirements:
   a) DRAMA 102
   b) DRAMA 243
   c) Two from DRAMA 221, 222, 226, 227, 231, 232, 243, 244, 261, 262, 306, 307, 321, 322, 343, 344, 361, 362 (See Note 4)
   d) DRAMA 371 and DRAMA 372
   e) Six of DRAMA 251, 252, 253, 254, 255, 351, ENGL 362, 363.
   f) DRAMA 409
   g) DRAMA 499 (See Note 3).
   h) Any three other DRAMA courses or other approved courses in related departments.

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

Note 2
The Honours BA program in Drama will enable the student to proceed towards the Ontario College of Education Type A Certificate provided at least four term course equivalents in another teaching subject are acquired (see current calendar requirements).
Note 3
For a description of DRAMA 499 see Course Descriptions.

Note 4
See Note 2 under the General Program.

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 94.

Joint Honours Programs, Drama and theatre Arts
1. Fifteen term courses must be in Drama and Theatre Arts.
2. DRAMA 101A and 101B are the required prerequisite for most Drama and Theatre Arts courses.
3. In addition, students must satisfy the following requirements:
   a) DRAMA 102
   b) DRAMA 243
   c) DRAMA 371 and DRAMA 372
   d) Three of DRAMA 251, 252, 253, 254, 255, 351, ENGL 362, 363.
   e) DRAMA 409.
   f) DRAMA 499. This is a year course. Also see Note 4 below.
   g) Three other term courses (See Note 5).

Note 1
Joint Honours programs other than those already approved may be arranged by consultation with the Drama and Theatre Arts group and the Department concerned.

Note 2
See Faculty of Arts requirements for other required courses.

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

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

Note 5
See Note 2 under the General Program.

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

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

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

Students in Year 1 are required to notify the department of their intention to go into the Applied Economics Option by March 15.

Advanced Standing Examinations
Early in the fall term the Department of Economics administers a test in Economics 101/102 for students who have completed Economics in Grade 13. Any student who scores at least 70% in this test will be exempted, without any credit accumulated, from Economics 101/102 and may register for Economics 201/202.

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

Four Year General Program
Forty term courses are required for the degree. Of these, a minimum of 14 term courses must be in Economics. The required cumulative major average is 65%. The required Economics courses are Economics 101/102 or 100a/100b, 201, 202, 211 or 221, 231, six term courses at the 300 level or above, plus two additional term courses at the 400 level.
Honours Programs

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

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

Recommended Program

Year 1
ECON 101/102 or 100a/100b
Eight additional term courses
*Students without Ontario Grade 13 Mathematics or equivalent should select Mathematics 103/104 as an elective.

Year 2
ECON 201, 202, 231
Three additional term courses in Economics
Four term courses

Year 3
ECON 301, 302
Four additional term courses in Economics
Four additional term courses

Year 4
ECON 401, 402
Two additional term courses in Economics
Six additional term courses

Honours Programs with Special Options

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 94.

Honours Economics with Applied Economics Option (Co-op)
Forty-four term courses are required. The required Economics courses are:

ECON 101/102 or 100a/100b, 201, 202, 211, 221, 231, 241, 263, 301, 302, 303, 321, 401, 402, 421, 422.

In addition students are required to do two additional term courses numbered above 300.

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

Recommended Program

Year 1
ECON 101/102,
ACC 101/102
CS 112, 115
ENGL 109 or 150
MATH 120A
Two additional term courses

Year 2A
ECON 201, 221, 231
MATH 124B
Two additional term courses

Year 2B
ECON 202, 241
Four additional term courses

Year 3A
ECON 263, 302, 321
STAT 300
Two additional term courses

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

Year 4A
ECON 401, 422
Three additional term courses

Year 4B
ECON 402, 403
Three additional term courses

Accounting Studies
The attention of students in Economics is drawn to the courses in Accounting and to the Accounting programs. Honours Accounting, Honours Management Accountancy Studies (Economics Option), Honours Chartered Accountancy Studies (Economics Option). These programs are listed on page 91.

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

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

In addition, students must meet the requirements of the other department, as well as the Faculty of Arts.
Groups A and B requirements. Selection of courses will be made with the assistance of the appropriate undergraduate officers. For Joint-Honours programs, 44 term course equivalents are required. Joint-Honours programs have been approved with Environmental Studies, Geography, German, Political Science, Sociology, Mathematics, and Russian. The following notes pertain:

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

**Note 2**
Students are advised to consult the undergraduate officer of both Departments before formulating their program of study.

**Note 3**
Economics and Political Science
Economics 263 must be taken along with the above core courses.

**Note 4**
Economics and Mathematics
Substitute Economics 311, 321, for Economics 211, 221. Economics 421, 422 to be included in the above core courses. Students in Years 1 and 2 may take this 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.

**Note 5**
Economics and Sociology
Students may take either Economics 221 or Sociology 202.

**Minor in Economics for Honours Students in other Departments**
Economics 101/102 or 100A/100B, 201, 202, 231, either 211 or 221, plus four additional term-course equivalents in Economics.

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**English**

**General Program**
To fulfill the requirements for a General degree in English, a student must complete a total of thirty term courses, of which at least twelve must be English Major credits, as follows:

1. 102 or 105A/B (or equivalent) (See Note 1)
2. 251A/B (Practice and Theory of Criticism) (See Note 2)
3. 200A/B (Survey of British Literature) (See Notes 2 and 6)
5. One term course from 313, 314, 315, 316, 343, 344, 345, 346, 347, 415 (North American Literature)
6. Three other English Major term courses (See Note 4)

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

**Honours Program: Regular**
An English Honours student must complete a minimum of forty term courses before graduation, and these must include at least twenty English Major term courses. These twenty term courses, usually divided 2-6-6-6 among the four years, are as follows:

1. 102 or 105A/B (or equivalent) (See Note 1)
2. 251A/B (Practice and Theory of Criticism) (See Note 2)
3. 200A/B (Survey of British Literature) (See Notes 2 and 6)
4. Two term courses from 305, 373A/B, 375A/B, (Language and Early Literature)
5. Four term courses from 310A/B, 330A/B, 350A/B, 362, 363, 410A/B (British Literature to 1800)
6. Two term courses from 430A/B, 451A/B, 460A/B (British Literature since 1800)
7. Two term courses from 313, 314, 315, 316, 343, 344, 345, 346, 347, 415 (North American Literature)
8. Four other English Major term courses (See Notes 3, 4, and 5)

**Honours Program (Co-operative)**
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 communication media. Qualified students will ordinarily be admitted to the program after completion of their first two academic terms at the University of Waterloo and will
proceed through the Honours English BA program consisting of six further terms of study on campus and five paid work terms with participating employers in the media, business, government, and industry.

The academic requirements of the Co-operative program are essentially those of the regular Waterloo Honours BA in English.

Students who complete the program will have had a total of twenty 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 in areas relevant to their careers. Finally, they will have qualified for a University of Waterloo Honours BA Degree in English.

Honours English (Applied Studies Co-op)
A student may combine an Honours English 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 94.

Joint Honours Program
An English Joint Honours student must earn at least forty-four term courses in all, of which at least sixteen must be English Major term courses as follows:

1. 102 or 105A/B (or equivalent) (See Note 1)
2. 251A/B (Practice and Theory of Criticism) (See Note 2)
3. 200A/B (Survey of British Literature) (See Notes 2 and 6)
4. 305, 373A/B, 375A/Ei (Language and Early Literature)
5. 310A/B, 330A/B, 350A/B, 362, 363, 410A/B (British Literature to 1800)
6. 430A/B, 451A/B, 460A/B (British Literature since 1800)
7. 313, 314, 315, 316, 343, 344, 345, 346, 347, 415 (North American Literature)
8. Two other English Major term courses (See Notes 3, 4 and 5)

Minor Program for Students in Other Disciplines
Ten term courses in English are required, as follows:

1. 251A/B (Practice and Theory of Criticism)
2. 200A/B (Survey of British Literature) (See Notes 2 and 6)
3. Two English Major term courses, numbered 300 or above
4. Four other English Major term courses

Note 1
Although 102 and 105A/B are recommended for the first year, a student may gain English Major credit from the following English courses without formal permission from the Department: 103A/B, 108, 190. A student may use only two 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).

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

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

Note 4
All students in Arts must earn a) the equivalent of two term courses either in a language other than English or in a foreign culture, and b) four term courses from Group B (see Degree Requirements, p. 87). The Department of English also recommends Classical Civilization 265 and 266.

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

Note 5
English Honours students should confer with their advisors in order to draw up programs that fulfill official requirements and satisfy the students' own needs and interests as well.

1. Students planning to go on to graduate work are advised to choose the following English courses:
   a) 102, 200A/B, 251A/B, 362/363, 373A/B
   b) 305 or 310A/B
   c) 330A/B or 350A/B
   d) four term courses from 410A/B, 430A/B, 451A/B, 460A/R
   e) two term courses from 211/212, 232/233
   f) 343
g) one term course from 313/314/315/316
h) either four more term courses from 305, 310A/B, 330A/B, 350A/B, 410A/B, 430A/B, 451A/B, 460A/B
or
two term courses from the above and two from 344/345/346/347.

2. Students planning to teach high school are advised to choose the following English courses:
   a) 102, 200A/B, 251A/B, 362/363
   b) 373A/B or 375A/B
c) two term courses from 330A/B, 350A/B, 410A/B, 430A/B, 451A/B
d) two term courses from 211/212, 232/233, 343/344
e) two term courses from 313/314/315/316/317

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

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**Fine Arts**

**General Program (Studio Option)**
Thirty term courses.
A and B requirements - eight term courses
FINE 120/121, 220/221, 222/223, 224/225
FINE 110/111, and additional two term Art History courses
Electives - ten term courses.

**General Program (Art History Option)**
Thirty term courses.
A and B requirements - eight term courses
FINE 110/111, 210/211, 212/213, 316/317
FINE 120/121 and additional two term studio courses
Electives - ten term courses.

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

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

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**Arts**

**English**

**Fine Arts**

**Four Year General Program (Studio Option)**
Forty term courses.
A and B requirements - eight term courses
FINE 120/121, 220/221, 222/223, 224/225
FINE 110/111, and additional two term Art History courses
Four term courses in Fine Arts on the 3rd of 4th year level, one of which must be 490A
Electives - sixteen term courses.

**Four Year General Program (Art History Option)**
Forty term courses.
A and B requirements - eight term courses
FINE 110/111, 210/211, 212/213, 316/317
FINE 120/121, and additional two term studio courses
Four term courses in Fine Arts on the 3rd or 4th year level, one of which must be 490A
Electives - sixteen term courses.

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

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

**Honours Program (Studio Option)**
Forty term courses.
A and B requirements - eight term courses
FINE 120/121, 220/221, 222/223, 224/225
FINE 110/111, and additional four term Art History courses
Four term studio courses on the 3rd year level chosen from the following list:
FINE 324, 325, 320, 321, 322, 323
FINE 490/491
Electives - twelve term courses.

**Honours Program (Art History Option)**
Forty term courses.
A and B requirements - eight term courses
FINE 110/111, 210/211, 212/213, 316/317
FINE 120/121, and additional two term studio courses
Six term Art History courses on the 2nd or 3rd year level
FINE 490/491
Electives - twelve term courses.

**Honours Program (Film Studies Option)**
Forty term courses.
A and B requirements - eight term courses
FINE 110/111
FINE 120/121
In addition to these courses, at least five term courses in Film to be selected in consultation with the Fine Arts Film Advisor. These may include FINE 246, 248R, 233W and 242W.

Electives - twelve term courses.

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

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

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

Honours Fine Arts (Applied Studies Co-op)
A student may combine an Honours Fine Arts 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 94.

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 Program (Studio or Art History Option)
Ten term Fine Arts courses, in addition to your major program, including:
FINE 110/111, 120/121

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

French

General Program in French
Students in the three year General program in French must complete twelve term courses in French of which at least six term courses are on the 300 or 400 levels.

Honours Program in French
Students in the Honours program in French must complete before graduation the equivalent of twenty term courses in French of which at least twelve term courses are on the 300 or 400 levels.

Recommended Program

Year 1
French 192 or French 195/196
Eight additional term courses.

Note: Students who wish to major or honour in French are strongly urged to enrol in both French 192 and French 195/196.

Year 2
A minimum of French 251 plus one of French 207, French 208, French 252 or French 255; French 231, French 253, French 275 plus one other term course chosen in accordance with the area requirements listed on p. (314 b).
Four additional term courses.

Year 3
A minimum of French 300 or its equivalent, French 303, French 342, French 363, plus one other term course chosen in accordance with the area requirements listed on p. (314 b).
Four additional term courses.

Year 4
A minimum of French 401/402 or their equivalent; French 421 or French 422, French 409 or French 410 plus two additional term courses in French chosen in accordance with the area requirements listed on p. (314 b).
Four additional term courses.

Note 1
To establish a Minor in a sister discipline, the student must complete ten term courses (or equivalent) in that discipline.

Note 2
With the permission of the department, the student may spend the third year enrolled in an acceptable university in France or in the Province of Quebec.
A total of forty term courses must be successfully completed before graduation.

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

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

A minor program in French will consist of ten term courses in French Language and/or Literature. Students must demonstrate written and oral ability in French equal to that expected in French 300.

A minor program in Business French will consist of a minimum of ten term courses in French. Students must demonstrate written and oral ability in French equal to that expected in French 300.

Recommended Program

Year 1
FR 192

Eight additional term courses.

Students taking this course who wish to major or honour in French are strongly urged to enrol in both French 192 and French 195/196.

A minimum of French 251 plus one of French 207, French 208, French 252 or French 255, French 231, French 253, French 275 plus one other term course chosen in accordance with the area requirements listed on p. 314.

A minimum of French 300 or its equivalent, plus two of French 303, French 342 or French 363.

A minimum of French 401/402 or their equivalent plus two additional term courses in French.
Geography

Admission to the Geography programs in the Faculty of Arts is gained in second year. Those interested should ensure that they take the appropriate Geography courses in first year. Geography courses have credit weights ranging from 0.5 to 1.5. Accordingly, the Geography Department expresses its degree requirements in terms of credits rather than term courses. Credit requirements for Geography are here referred to as term course equivalents. Thus, for example, the sixteen credits, or, thirty-two term course equivalents required for the three year General Degree will constitute approximately thirty term courses.

General Geography

A) Three Year General Program
Recommended Program

Year 1
GEOG 101 Introduction to Human Geography
GEOG 102 Introduction to Physical Geography
GEOG 110 Introduction to the Field of Geography
and one but not more than two of:
GEOG 125R Introduction to the Third World
GEOG 126R Development in the Third World
GEOG 127 Regional Problems of Europe
ENV S 195A Introduction to Environmental Studies,
or:
ENV S 195B Introduction to Environmental Problems
GEOG 125R Introduction to the Third World
GEOG 126R Development in the Third World
GEOG 127 Regional Problems of Europe
and additional courses.

Year 2
ENV S 200 Field Ecology
GEOG 201 Some Basic Topics of Physical Geography
GEOG 202 Some Basic Topics of Economic and Urban Geography
and one of:
GEOG 203 Some Basic Topics of Cultural and Regional Geography
GEOG 204 Soviet Union
GEOG 205 Africa
GEOG 220 World Regional Geography
GEOG 221 The United States
and additional courses so that a student should have completed by the end of the second year twenty-two term course equivalents.

Year 3
GEOG 381 The Nature of Geography
Additional courses so that a student will have completed at least thirty-two term course equivalents of which at least twelve are in Geography.

B) Four Year General Program
Recommended Program

Year 1
GEOG 101 Introduction to Human Geography
GEOG 102 Introduction to Physical Geography
GEOG 110 Introduction to the Field of Geography
and one but not more than two of:
ENV S 195A Introduction to Environmental Studies
or:
ENV S 195B Introduction to Environmental Problems
GEOG 125R Introduction to the Third World
GEOG 126R Development in the Third World
GEOG 127 Regional Problems of Europe
and additional courses.

Year 2
ENV S 200 Field Ecology
GEOG 201 Some Basic Topics of Physical Geography
GEOG 202 Some Basic Topics of Economic and Urban Geography
and one of:
GEOG 203 Some Basic Topics of Cultural and Regional Geography
GEOG 204 Soviet Union
GEOG 205 Africa
GEOG 220 World Regional Geography
GEOG 221 The United States
and additional courses.

Years 3 and 4
GEOG 260 Introduction to Cartography and Map Analysis
GEOG 275 Introductory Air Photo Analysis and Remote Sensing
ENV S 271 Introduction to Quantitative Research Methods
and four term courses in Geography at the 300 level or above.

Additional courses so that a student will have completed at least forty-two term course equivalents of which at least eighteen are in Geography.
Notes on General Program (3 Year and 4 Year)

Note 1
Thirty-two term course equivalents is the minimum requirement for the three year General degree of Bachelor of Arts; forty-two term course equivalents is the minimum for the four year General degree.

Note 2
In the three year program a minimum of twelve term course equivalents in Geography constitutes a Geography major. Two of these twelve term course equivalents may be designated as Environmental Studies. In the four year program a minimum of eighteen term course equivalents in Geography constitutes a Geography major. Three of these term courses may be designated Environmental Studies. Students in both programs may choose additional Geography electives, and are encouraged to do so.

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

Honours Geography
Recommended Program

Year 1
GEOG 101 Introduction to Human Geography
GEOG 102 Introduction to Physical Geography
GEOG 110 Introduction to the Field of Geography
and one of, but not more than two of:
ENV S 195A Introduction to Environmental Studies
or:
ENV S 195B Introduction to Environmental Problems
GEOG 125R Introduction to the Third World
GEOG 126R Development in the Third World
GEOG 127 Regional Problems of Europe

Additional courses.

Note that, among elective credits, MATH 105, Math for Environmental Studies, is recommended, though not required, for students who have no Grade 13 Math.

Year 2
ENV S 200 Field Ecology
GEOG 201 Some Basic Topics of Physical Geography
GEOG 202 Some Basic Topics of Economic and Urban Geography

two of:
GEOG 260 Introduction to Cartography and Map Analysis
GEOG 275 Introductory Air Photo Analysis and Remote Sensing
ENV S 271 Introduction to Quantitative Research Methods

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

and additional courses.

Year 3
GEOG 381 The Nature of Geography
GEOG 390 Senior Honours Research Essay Proposal
GEOG 391 Field Research

one of:
GEOG 260 Introduction to Cartography and Map Analysis
GEOG 275 Introductory Air Photo Analysis and Remote Sensing
ENV S 271 Introduction to Quantitative Research Methods

and one of:
GEOG 316 Multivariate Statistics
GEOG 317 Nonparametric Statistics
GEOG 318 Spatial Analysis

and additional courses.

One credit of Geography electives.

Three credits chosen after consultation with the Department

Year 4
GEOG 490A and B Senior Honours Research Essay and additional courses so that a student should have a minimum of forty-eight term course equivalents of which at least twenty-two are in Geography and Environmental Studies.

Notes on Honours Program

Note 1
Forty-eight term course equivalents is the minimum requirement for the degree Bachelor of Arts (Honours Geography). Honours Geography students must therefore ensure that, in addition to the courses required for the degree as outlined above, they take additional courses as electives to average at least twelve term course equivalents per academic year.

Note 2
Students are required to take a minimum of twenty-two term course equivalents in Geography. Four of these may be courses designated as Environmental Studies (p. 308).

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

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

Note 5
Since many departments offering graduate work in Geography demand proficiency in a foreign language: students intent on graduate work should consider taking at least two term courses in a foreign language.

Note 6
Students intending to teach in Secondary Schools are advised to take at least four term courses of Regional Geography.

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

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

Note 9
For some courses, participating students may be expected to make a financial contribution to defray heavy equipment/travel costs, e.g. GEOG 397 (Field Research), which is mandatory for all third year regular honours students. Statements on fees, where required, will be found with the course description (p. 320).

Note 10
No more than three term course equivalents may be taken as reading courses in Geography.

Honours Geography Options
(See p. 169-171.)

Geography Joint Honours and Minor Programs
(See p. 171-172.)

German

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

Honours Program in German
Joint Honours Program with German
General Program in German
Minor Program in German
German and Russian/Scientific Translation Program

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

Stream A
Students with little or no knowledge of German
First Year
GER 101/102 or GER 111/112
Second Year
GER 201/202 or GER 211/212

Stream B
Students with at least two years of High School German
First Year
GER 121/122 or GER 105/106 or GER 111/112
Second Year
GER 291/292

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

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

Note 3
GER 271/272, GER 355, and GER 391/392 are open to all students. However, these courses will normally count toward the Major or Honours requirement for Stream A students only.

Honours German
Eligibility for graduation in the Honours German Program includes fulfillment of the following requirements:

1. Successful completion of a minimum of forty term courses of which at least twenty term courses must be in German.
2. An overall cumulative average of 60% and a cumulative average of 75% in the German courses.
3. Completion of the Faculty of Arts Group requirements.
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 Honours requirements listed above. The Applied Studies requirements are listed on page 94.

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.

Joint Honours Program with German
Eligibility for graduation in a Joint Honours Program with German includes fulfillment of the following requirements:
1. Successful completion of a minimum of forty-four term courses of which at least sixteen term courses must be in German.
2. An overall cumulative average of 60% and a cumulative average of 75% in each of the two Honours disciplines.
3. Completion of the Faculty of Arts Group Requirements.

A Joint Honours 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. Some representative Joint Honours Programs are:
- German and Economics
- German and English
- German and French
- German and Geography
- German and History
- German and Russian

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 forty term courses, of which:
   a) Fourteen term courses must be approved courses in German,
   b) Eight term courses must be approved courses in Russian,
   c) Twelve term courses must be in the sciences and/or mathematics.
2. An overall cumulative average of 60% and a cumulative average of 65% in the primary and secondary languages.
3. Completion of the Faculty of Arts Group Requirements.

General Programs in German
Eligibility for graduation in the General Program in German includes fulfillment of the following requirements:
1. Successful completion of a minimum of thirty term courses, of which at least twelve term courses must be in German.
2. An overall cumulative average of 60% and a cumulative average of 65% in the German courses.

Greek

See Classical Studies
History

The Department of History offers the following programs:

- Three-Year General Program
- Four-Year General Program
- Honours Program
- Honours History Applied Studies Co-op Program
- History Joint Honours Programs
- Minor Program

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

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

Three-Year General Program
Students must complete ten term courses in History, with at least two at the 250 level and no more than two at the 100 level.

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

Honours Program
Students must complete sixteen term courses and two Senior Seminars in History with a B average (75.0%). No more than two term courses may be at the 100 level and no more than four may be in the 200-249 range. The Department of History’s Undergraduate Officer is responsible for ensuring that individual programs are not too narrowly specialized.

Recommended Program

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

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

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

Year 3
Six term courses in History.
Four other term courses.

Year 4
Two Senior Seminars (2.0 course credits).
Two term courses in History.
Two other term courses.

The Department encourages History majors to include in their programs introductory courses from the other Faculties at the University of Waterloo. These courses need not be taken during the student’s first year.

Note:
C CIV 251 and C CIV 252 will be accepted for credit as term courses in history provided that the student does not have credit for HIST 237 or HIST 238. Either C CIV 480 or C CIV 490 (but not both) will be accepted for credit as a year course in History, but will not be accepted as a Senior Seminar in History.

Honours History (Applied Studies Co-op)
A student may combine an Honours History 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 94.

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

Students in these programs must complete twenty-two course credits (the equivalent of forty-four term courses), including ten term courses and two Senior Seminars in History.

Minor Program
To qualify for a Minor in History, students must complete ten term courses in History, with at least two at the 300 level and no more than two at the 100 level. Students from other departments and faculties who are interested in taking a Minor in History should consult with the Department of History’s Undergraduate Officer.

Italian

Minor Program
A minor program in Italian is available. Interested students should see the Advisor for Italian at St. Jerome’s College.
Legal Studies Option

Legal Studies is an interdisciplinary program that focuses on law primarily from a liberal arts perspective. Given the centrality of law to most human institutions and values, a great deal of attention has been paid to law by scholars working in a wide variety of disciplines including History, Philosophy, Political Science, Sociology, Economics, and Environmental Studies. Students are invited to join in these scholarly investigations. The liberal arts orientation of this 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 three sections. The first consists of broadly based courses that are concerned with the nature and character of legal systems, reasoning and concepts; these include courses in the history of law, philosophy of law, sociology of law, and Canadian law. Students are required to take all the courses (four term courses) in this section. In the second section the courses are in general more advanced and concerned with particular aspects of the law. Students must select four term courses from this section. In the third section the courses are less central to the area of legal studies, but serve to bridge the gap between legal studies and particular disciplines. Students will choose two term courses from courses in this section that fit their General or Honours program. It is strongly urged that students consult the Legal Studies Undergraduate Advisor in making their course selections from Sections Two and Three.

The Legal Studies option is open to students in General or Honours programs. Students must complete five year course equivalents of designated Legal Studies courses from the appropriate sections. An overall average of 65% in these courses is necessary to graduate with the Legal Studies Option. See the Legal Studies Course Descriptions in Chapter 16 for further details of the requirements.

Medieval Studies

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

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

The General Program
For the core of a Medieval Studies program each student must take fourteen term courses from a list of approved courses, including at least two term courses from each of four of the eight subject fields specified.

The Honours Program
For the core of a Medieval Studies program each student must take fourteen term courses from a list of approved courses, including at least two term courses from each of five of the eight subject fields specified.


Honours Medieval Studies (Applied Studies Co-op)
A student may combine an Honours Medieval Studies 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 94.
Music

General Program
Thirty-two term course equivalents.
In addition, students must demonstrate competence on one instrument (or voice) equal to Grade 10 standing at the Royal Conservatory of Music of Toronto. Normally this is attained through taking Music Studio courses - MUSIC 266G/267G, 366G/367G.

Honours Program
Forty-three term course equivalents.
In addition, students must demonstrate competence on one instrument (or voice) equal to Grade 10 standing at the Royal Conservatory of Music of Toronto. Normally this is attained through taking Music Studio courses - MUSIC 266G/267G, 366G/367G.

Joint Honours Program
Forty-seven term course equivalents.
Nineteen term course equivalents in Music.
Joint honours programs may be arranged between music and most other departments. Students must complete 47 term course equivalents, including 19 in music as follows: MUSIC 101G/102G, 201G/202G, 301G/302G, 150G/151G, at least three of 253G, 254G, 353G, 354G; at least three of 250G, 251G, 370G, 371G; plus eight additional term courses of which at least six must be above the 100 level. These eight 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 266G/267G, 366G/367G.

Minor Program

Peace and Conflict Studies

Peace and Conflict Studies ("PACS") is an interdisciplinary program of study which may be chosen by students in conjunction with a major in some other department. It provides a course of study for those who have a special interest in the causes and conditions of international, intergroup, or interpersonal conflict, and in approaches to conflict resolution or management. The PACS Option is especially appropriate for those considering careers in conflict resolution occupations (e.g. social work, community development, public administration, law and corrections, education, or politics). The program is administered by Conrad Grebel College in cooperation with participating departments in the University of Waterloo. The participating departments presently include History, Man-Environment Studies, Philosophy, Political Science, Psychology, Religious Studies, Social Development Studies, and Sociology.

Program Options
There are three different Options open to students participating in the PACS program: 1) General Program, 2) Honours, and 3) Minor. Successful completion of either of the first two permits the student to add the subtitle (Peace and Conflict Studies) to the name of the degree earned.
All students in the PACS program will take the PACS Core Courses as well as a specified number of "PACS Content Courses" offered by their own and other departments. In every case students must fulfill all the requirements for the major in their own department.

1. The General Arts Degree (Peace and Conflict Studies)
In addition to fulfilling the requirements for the major (normally including at least ten term courses in the major field), the general arts student must meet the following PACS requirements:
a) PACS 201, 202, 301, and 302.
b) Six term courses chosen from the PACS Content Courses offered by either the department in which the student majors, or any other departments (see Note).
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 B.A. or B.E.S. 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) Six term courses chosen from among the PACS Content Courses offered by the student’s department (eight term courses if joint honours). These courses may also be used to meet the department’s honours requirements if approved as such by the department. (See Note).

c) Three term courses chosen from among the PACS Content Courses offered in any department (Students should use their first year to take lower-level prerequisites for PACS Content Courses in those Departments where they have special interests).

3. Honours Minor in Peace and Conflict Studies

A Minor in PACS is available to students pursuing an Honours degree in any faculty (including non-arts faculties). The Minor consists of ten term courses chosen from among the courses approved for PACS credit in any department, and must include PACS 201, 202, 301, and 302.

Note

Each of the participating Departments has designated certain course offerings as Peace and Conflict Studies Content Courses. These courses are listed in Chapter 16 of the Calendar. Many of the 300 and 400 level courses have specific prerequisites. Students planning to pursue study in these upper level courses should use their electives wisely to ensure that the prerequisites for these courses are met.

Philosophy

Three Year General Degree in Philosophy

Thirty term courses of which ten term courses must be in Philosophy including:

a) one of 140, 145, 241, 242, 243, or 440A/B
b) 221
c) any two of 380 - 386

Students registered at St. Jerome’s in General Philosophy must take thirty term courses of which ten term courses must be in Philosophy including:

a) one of 200J, 140, 145, 241, 242, 243, or 440A/B
b) 218J or 221
c) any two of 380 - 386

Four Year General Degree in Philosophy

Students must satisfy the Three Year General Degree in Philosophy requirements (see above) and complete ten more term courses (four of which must be in Philosophy. An overall average of 68% is required.

Students registered at St. Jerome’s in Philosophy must meet the same requirements to earn a Four Year General Degree. See the second paragraph under the above section for the appropriate list of required Philosophy courses.

Minor

Ten term courses in Philosophy approved by the Department.

Honours Degree in Philosophy

Forty term courses are required of which twenty term courses must be in Philosophy including:

a) one of 241, 242, 243, or 440A/B
b) 221/322
c) any four of 380 - 386
d) 499

e) College students are 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 94.
Philosophy Joint Honours Programs
These usually consist of fourteen term courses in Philosophy and fourteen term courses in the other subject. A total of forty-four term courses is required. The Philosophy courses ordinarily include:

a) one or two of 140, 241, 242, 243, or 440A/B (depending on the program)
b) 221/322
c) any four 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 is written in either Philosophy 499 or in the other subject.

There are currently joint honours programs in Philosophy and the following: Economics, English, History, Latin, Literature (French, German, or Russian), Mathematics, Political Science, Psychology, Religious Studies, Social Development Studies, and Sociology.

The Undergraduate Advisor in Philosophy should be consulted for details of these and other Philosophy programs.

Options
The following options are available to students majoring in Philosophy: Legal Studies, Peace and Conflict Studies, and Studies in Personality and Religion. Check the appropriate Calendar entry for further details.

Political Science

While students in Arts do not choose a major until the end of the first year, many have some idea of the area in which they wish to study. Those students who intend to major in Political Science may wish some guidance in the selection of the first year courses. The Department would recommend the following program for such students:

- Political Science 101/102
- Economics 101/102 or Economics 100a/100b
- Sociology 102/205
- History - two term courses
- Two other term courses chosen from Group A

By no means should the above recommendations be considered mandatory: while these courses constitute, on the whole, the best overall background for the study of politics, students who wish to pursue interests in other disciplines are free to do so.

The Department of Political Science offers a series of undergraduate programs designed to meet the needs of students with varying interest. 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. 115).

1. Three Year General Program
Students choosing a three-year General program in Political Science will normally complete, before graduation, ten term courses in Political Science beyond the 100 level, of which there must be at least one term course from each of four different fields of the discipline as defined above. At least four term courses must be taken at the 300 level or higher.

2. Four Year General Program
Students choosing a four-year General program in Political Science must complete, before graduation, sixteen term courses in Political Science beyond the 100 level and maintain a cumulative average in these courses of 70%. Remaining program requirements are the same as those for the four-year Honours program.

3. Honours Program
Students choosing an Honours program in Political Science must complete, before graduation, eighteen term courses in Political Science beyond the 100 level, of which there must be at least two term courses from each of four different fields of the discipline as defined above. At least four term courses must be taken at the 400 level.

Honours Political Science

Recommended Program

Year 1
P SCI 101/102
Eight other term courses.
Arts
Political Science

Year 2
Six term courses in Political Science (see note)
Four other term courses.

Year 3
Six term courses in Political Science (see note)
Four other term courses.

Year 4
Six term courses in Political Science at least four of which must be at the 400 level (see note)
Four other term courses.

Note
Among the eighteen Political Science term courses above the 100 level, students must select two term courses from each of four different fields of the discipline and four term courses must be taken at the 400 level.

4. Honours Political Science (Administrative Studies Option)
This program consists of courses which would ordinarily lead to an Honours degree in Political Science, together with the following core courses:

1. ECON 101/102 or ECON 100a/100b
2. ACC 191 or ACC 121 or ACC 131
3. ACC 192 or ACC 122 or ACC 132
4. PSYCH 333 or M SCI 44 or SOC 242
5. ENGL 210

An Honours Program with the Administrative Studies Option, in addition to the core courses, must include:

1. At least six term courses in Political Science beyond the 100 level, selected from courses which have been designated as Administrative Studies courses by the Department; and
2. At least four term courses beyond the 100 level not in Political Science, selected from courses which have been designated as Administrative Studies courses by the Department.

Honours Political Science (Administrative Studies Option) after Year 1

Recommended Program

Year 2
One term course
ACC 191 or ACC 121 or ACC 131

One term course
ENGL 210

Six term courses from the major subject, two of which must be in designated Administrative Studies courses
Four other term courses.
Total twelve term courses.

Year 3
One term course
ACC 192 or ACC 122 or ACC 132

One term course
PSYCH 333 or SOC 242 (unless M SCI 44 is to be taken in Year 4)

Six term courses from the major subject, two of which must be in designated Administrative Studies courses
Four other term courses, two chosen from designated Administrative Studies courses not in the major subject
Total twelve term courses.

Year 4
One term course
M SCI 44 (unless PSYCH 333 or SOC 242 was taken in Year 3)

Six term courses from the major subject, two of which must be in designated Administrative Studies courses
Three other term courses, two chosen from designated Administrative Studies courses not in the major subject
Total ten term courses.

Total term courses in the program: 44

Note
Students in Honours Political Science (Administrative Studies Option) must achieve an overall cumulative average of 75% in all core and designated Administrative Studies courses.

5. Co-operative 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 two academic terms. The program consists of six further academic terms and a minimum of four paid work terms with participating employers.

The academic requirements of the Co-operative program are identical with those of the Regular Honours program in Political Science. The program is open to students enrolled in either the Regular Honours Political Science program or Honours Political Science (Administrative Studies Option).

The first work term of the Co-operative program occurs after the successful completion of Year 2 courses. At the beginning of the fourth year students may have the option of either continuing the pattern of alternating work terms or working for a full year before returning to campus for the last two academic terms.
6. Honours Political Science (Applied Studies Co-op)
A student may combine an Honours Political Science 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 94. Students planning to enrol in Honours Political Science (Applied Studies Co-op) should consult the Department's Co-op Officer.

7. 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.

It is possible to combine the Political Science Joint Honours requirements with the requirements made by Anthropology, Economics, English, French, Geography, History, Man-Environment, Philosophy, Psychology or Sociology. In a Joint Honours program involving a Department in another Faculty, as in the Political Science and Man-Environment program, students will fulfill the degree requirements of the Faculty in which they are registered. For a Joint Honours program in any other discipline, please consult the Political Science Department and the other department concerned.

Students choosing a Joint Honours program involving Political Science must complete, before graduation, twelve term courses in Political Science beyond the 100 level of which there must be at least one term course from each of four different fields of the discipline as defined above.

Political Science Joint Honours Program

Recommended Program

Year 1
P SCI 101/102
Two introductory term courses in the other discipline
Six other term courses.

Year 2
Four term courses in P SCI (see note)
Four term courses in the other discipline.
Four other term courses.

Year 3
Four term courses in P SCI (see note)
Four term courses in the other discipline.
Four other term courses.

Year 4
Four term courses in P SCI, at least two of which must be at the 400 level (see note)
Four term courses in the other discipline
Two other term courses.

Note
Among the twelve Political Science term courses above the 100 level, students must select at least one term course in each of four different fields of the discipline. For further information on this please consult the Department.

8. Joint Honours Political Science
(Administrative Studies Option)
The program consists of the successful completion of courses which would ordinarily lead to a Joint Honours degree in Political Science and another discipline and the following core courses:

1. ECON 101/102 or ECON 100a/100b
2. ACC 191 or ACC 121 or ACC 131
3. ACC 192 or ACC 122 or ACC 132
4. PSYCH 333 or M SCI 44 or SOC 242
5. ENGL 210

In addition a Joint Honours Program with the Administrative Studies Option must include:

1. Six terms courses beyond the 100 level in each of the student's major subjects selected from courses in those subjects which have been designated as Administrative Studies courses by the Department; and
2. Four term courses beyond the 100 level not in either of the student's major subjects selected from courses which have been designated as Administrative Studies courses by the Department.

Joint Honours Political Science
(Administrative Studies Option) after Year 1

Recommended Program

Year 2
One term course
ACC 191 or ACC 121 or ACC 131
One term course
ENGL 210
Eight term courses
Four in each of the major subjects; two in each major subject must be in designated Administrative Studies courses.
Two other term courses.
Total twelve term courses.

Year 3
One term course
ACC 192 or ACC 122 or ACC 132
One term course
PSYCH 333 or SOC 242 (unless M SCI 44 is to be taken in Year 4)
Eight term courses
Four in each of the major subjects; two in each major subject must be in designated Administrative Studies courses.
Two other term courses
Chosen from designated Administrative Studies
courses, not in the major subjects.
Total twelve term courses.

### Year 4
One term course
M SCI 44 (unless PSYCH 333 or SOC 242 was
taken in Year 3).

Eight term courses.
Four in each of the major subjects; two in each
major subject must be in designated Administrative
Studies courses.
Three other term courses.
Two chosen from designated Administrative
Studies courses not in the major subjects.
Total twelve term courses.

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**9. Minor Program**

Any student in an Honours program may qualify for a
Minor in Political Science by completing ten term
courses in Political Science before graduation with a
cumulative average of 65 (C) or better. Courses must
be selected to meet the following requirements:

a) at least one term course in each of three different
   fields of the discipline;

b) the equivalent of at least two term courses above
   the 200 level.

Students interested in a Minor in Political Science are
advised to consult with the Department's
Undergraduate Officer. In addition, it is now possible
for students in Co-op studies in Arts, Mathematics,
Science, Engineering, or Recreation to add a wide
range of Political Science courses to their programs.

### Note

*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.*

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**Graduate Program**

The Department of Political Science offers a program
leading to the degree of Master of Arts. For more
information, please consult the Graduate Calendar or
the Political Science Department.

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### Psychology

**General Program**

Students choosing a three-year program in
Psychology must complete thirty term courses of
which ten must be in Psychology including:

- PSYCH 101
- PSYCH 200

At least one of PSYCH 203, 206, 207, 261, 271
At least one of PSYCH 211, 253, 355, 357
At least one of PSYCH 212, 213, 333, 334, 335, 341
plus five additional term courses in Psychology.

**Honours Program**

Students choosing the Honours program in
Psychology must complete, before graduation,
eighteen term courses in Psychology. Before entering
the fourth year of the program, all students must
complete PSYCH 201, 202, 301 and one course from
each of the following groups:

- Group 1: 293, 295, 297
- Group 2: 393, 395, 397

In the fourth year, all students must complete
Psychology 498 or 499. A recommended program is
outlined below.

### Recommended Program

**Year 1**
PSYCH 101/102
Eight additional term courses.

**Year 2**
PSYCH 201/202
Two additional term courses in Psychology (see
note 1)
Six additional term courses.

**Year 3**
PSYCH 301
Five additional term courses in Psychology (see
note 1)
Four additional term courses.

**Year 4**
PSYCH 498 or 499
Four additional term courses in Psychology (see
note 2)
Four additional term courses.

### Note 1

*Honours students are required to complete one
course from each of the following groups before
entering the fourth year of the program:*

- Group 1: 293, 295, 297
- Group 2: 393, 395, 397
Note 2
It is recommended that honours students include at least two fourth-year seminars in their program.

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 94.

Honours Psychology Cooperative Program
The Department of Psychology offers a Co-operative Honours program in Psychology, in which academic studies are combined with relevant work experience. Generally, students are placed as research or program assistants in such work settings as government and private research organizations, personnel departments, management training programs, correctional institutions, and other educational and/or treatment institutions.

The Co-op program consists of six academic terms beyond the first year, and four paid work terms. Each work term is of four months duration. 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.

Early Childhood Education and Care Programs
The Department of Psychology offers both a Four Year General and an Honours program with Early Childhood Education and Care Option. At the end of both programs, students will have completed all of the formal university training required by the Association of Early Childhood Education (Ontario), and the Ministry of Community and Social Services for working in a preschool and day care setting. The other principal requirement for the Early Childhood Education Certificate is one year of full-time teaching experience in the Ontario preschool setting. Interested persons are encouraged to request a brochure from the Department of Psychology which outlines in detail the recommended programs.

Four Year General Program with Early Childhood Education and Care Option
Students must complete a minimum of twenty term courses with letter grades in Psychology (two required courses, PSYCH 325 and 425, are graded pass-fail). The required courses include PSYCH 101, 200, 203, 207, 211, 212, 213, 253, 311, 312, 322, 325, 341, 422, 425, and DANCE 364. The major admission requirement is a 65% average in first year courses and 65% grade in PSYCH 101. In addition, students must have had some previous work experience with children.

It is recommended that students take at least two undergraduate seminars or special topic courses (300 or 400 level) in child psychology.

Students must maintain a 65% average in Psychology, and 75% in Early Childhood Education courses (PSYCH 322, 341, 422).

Honours Psychology with Early Childhood Education and Care Option
Students must be accepted into the option at the beginning of the third year, and must complete a minimum of twenty term courses with letter grades in Psychology (two required courses, PSYCH 323 and 423, are offered on a pass-fail basis only). The required courses include PSYCH 101, 201, 202, 203 or 207, 211, 212, 213, 293 or 295, 301, 311, 312, 322, 323, 341, 393, 422, 423, 453, 498 or 499, HLTH 140, and DANCE 364. In addition, it is recommended that students take at least one additional seminar or special topics course (300 or 400 level) in child psychology.

Psychology Joint Honours Programs
Students choosing a Joint Honours program involving Psychology must complete fourteen term courses in Psychology and an Honours Thesis course. Unless other arrangements are approved by the Department, all students in Joint Honours programs must complete the following courses before entering the fourth year.

PSYCH 201, 202, 301 and one course from each of the following groups:

- Group 1: 293, 295, 297
- Group 2: 393, 395, 397

In the fourth year, all students must complete PSYCH 498 or 499, or the Honours Thesis course in the related discipline.

Joint Honours programs other than those already approved may be arranged by consultation with the Psychology Department and the Department concerned.

Approved Joint Honours programs presently exist with Anthropology, Classical Studies, Drama, Economics, English, Fine Arts, French, Geography, German, History, Man-Environment, Mathematics, Philosophy, Political Science, Religious Studies, Russian, Social Development Studies, Sociology, Spanish, and Statistics. 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.
Honours Psychology with a BSc Degree

An Honours Psychology degree program is also available in the Faculty of Science. See Chapter 15.

Minor Program

Students choosing a Minor program in Psychology must complete ten term courses in Psychology including:

- PSYCH 101
- PSYCH 200
- At least one of PSYCH 203, 206, 207, 261, 271
- At least one of PSYCH 211, 253, 355, 357
- At least one of PSYCH 212, 213, 333, 334, 335, 341
- Plus five additional term courses in Psychology.

Religious Studies

Purpose of the Program in Religious Studies:

a) to expose the student to the issues and problems involved in, and to the nature of the questions raised by, the study of religious phenomena and ideas;

b) to enable him to approach, in a methodical way, the study of the major religious traditions living today for the purpose of encountering and understanding the life and the expression of religion through the various religions of the world.

c) to introduce him to the distinctive features of one or more religious traditions and to the methods for their systematic study.

The course offerings of the Religious Studies Department fall into the following five areas:

1. World Religions
2. History of the Christian tradition
3. Biblical studies
4. Theology - Philosophy - Ethics
5. Religion, Society and Culture.

Note:

Areas of Religious Studies to which courses belong are indicated by the number below the course description.

The following programs are available in Religious Studies.

A) General degree in Religious Studies

Requirements:

Successful completion (65% average) of a minimum of ten term courses in Religious Studies, including:

- RS 100A and one other course from the Religious Studies 100A-K sequence
- RS 200, 230 and 231
- two term courses at the 300 or 400 level
- electives

Thirty term courses are required for the General degree.

B) Four-Year General degree in Religious Studies

Requirements:

Successful completion (65% average) of a minimum of fourteen term courses in Religious Studies, including:

- a) and b) as in the General degree above and
- c) four term courses at the 300 or 400 level
- d) electives

Forty term courses are required for the Four-Year General degree.

C) Honours BA Minor in Religious Studies

Requirements:

Successful completion (65% average) of a minimum of ten term courses from at least four of the five areas of Religious Studies. The sequence of courses to be determined in consultation with the Undergraduate Advisor of the Department.

D) Honours degree in Religious Studies

Requirements:

Successful completion (75% average) of a minimum of twenty term courses in Religious Studies, including:

1. in particular:
   - RS 100A and one other course from the RS 100A-K sequence
   - RS 200, 230 and 231
   - RS 490A and 490B

2. in general:
   - one term course from each of the five RS areas
   - at least five term courses at or above the 300 level, not including RS 490A and 490B

Forty term courses are required for the Honours degree.

D) 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 94.

F) Joint Honours Program in Religious Studies

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 and Sociology. The total number of year course equivalents for the degree, twenty-two.

The requirements in Joint Honours programs are the same as the Honours program, except the overall number of Religious Studies courses is 7, instead of 10 year course equivalents. The RS 490 requirement
may be waived for students who choose to do their senior honours essay in the other Department. There will be consultation between the Undergraduate Officers of the two Departments.

Note: Students at the University of Waterloo and Wilfrid Laurier University may, with the permission of their advisor, take courses in Religious Studies at either University. For details regarding registration procedures and courses available at Wilfrid Laurier University, consult the Undergraduate Officer, Religious Studies.

Russian and Slavic Studies
The Department of Germanic and Slavic Languages and Literatures offers the following programs in Russian and Slavic Studies:
- Honours Program in Russian
- Honours Program in Slavic Studies
- Joint Honours Program with Russian
- General Program in Russian
- Minor Program in Russian
- Russian and German/Scientific Translation Program

Honours Russian
Eligibility for graduation in the Honours Russian program includes fulfillment of the following requirements:
1. Successful completion of a minimum of forty term courses, of which at least twenty term courses must be in Russian.
2. An overall cumulative average of 60% and a cumulative average of 75% in the Russian courses.
3. Completion of the Faculty of Arts Group Requirements.

Honours Slavic Studies
Eligibility for graduation in the Honours Slavic Studies program includes fulfillment of the following requirements:
1. Successful completion of a minimum of forty term courses, of which at least twenty term courses must be in Slavic Studies. Of these twenty term courses, twelve will normally be in Russian and the remaining eight in Ukrainian and Polish.
2. An overall cumulative average of 60% and a cumulative average of 75% in the Slavic courses.
3. Completion of Faculty of Arts Group Requirements.

Honours Russian (Applied Studies Co-op)
A student may combine an Honours Russian program with Applied Studies Co-op. The requirements in Slavic Studies are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 94.

Russian Joint Honours Programs
Eligibility for graduation in a Russian Joint Honours program includes fulfillment of the following requirements:
1. Successful completion of a minimum of forty-four term courses, of which at least sixteen term courses must be in Russian.
2. An overall cumulative average of 60% and a cumulative average of 75% in each of the two Honours disciplines.
3. Completion of Faculty of Arts Group Requirements.

A Joint Honours 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. Some representative Joint Honours programs are:
- Russian and Drama
- Russian and Economics
- Russian and English
- Russian and French
- Russian and German
- Russian and History
- Russian and Mathematics
- Russian and Political Science

General Program in Russian
Eligibility for graduation in the General program in Russian includes fulfillment of the following requirements:
1. Successful completion of a minimum of thirty term courses, of which at least twelve term courses must be in Russian.
2. An overall cumulative average of 60% and a cumulative average of 65% in the Russian courses.
3. Completion of Faculty of Arts Group Requirements.

Minor Program in Russian
Students of all departments may elect Russian as a minor field of studies in consultation with the Department of Germanic and Slavic Languages and Literatures. A minor requires the completion of a minimum of ten term courses in Russian with an overall cumulative average of at least 65% in those courses, of which:
1. not more than four term courses may be chosen from courses on the 100 level, and
2. at least two term courses must be chosen from courses above the 200 level.
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 forty term courses of which
   a) Fourteen term courses must be approved courses in Russian
   b) Eight term courses must be approved courses in German
   c) Twelve term courses must be in the sciences and/or mathematics.
2. An overall cumulative average of 60% and a cumulative average of 65% in the primary and secondary languages.
3. Completion of the Faculty of Arts Group Requirements.

Social Development Studies

Social Development Studies are integrated multi-disciplinary programs providing a liberal education with concentration in certain pure and applied social sciences. The inter-related courses of the programs are used to help the student develop an appreciation of the interdependence of the social sciences and a facility in applying material and perspectives from one discipline to questions in other areas of study. As part of the programs, the College offers its own courses in Interdisciplinary Social Science, Psychology, Social Work and Sociology. Students select other courses from the Departments of the University or the other Colleges to serve particular needs and interests. In the programs particular attention is given to the development of human personality in the context of the major social institutions and our major traditions and to the study of the development of certain contemporary social problems. Courses in Social Work provide an opportunity to study various types of social intervention. The College assists students to find places as volunteers in a number of local agencies. Through this volunteer work students are given an opportunity to increase the experience which they can bring to their studies and to test and apply their theoretical understanding in practical settings.

These programs stand as a sound liberal and general education. However, they also provide an excellent background for further study in professions such as Social Work, Education, Religion, the Ministry, Journalism, and for work in various helping professions, community organizations, communications and international service organizations.

The General Program

The General Program normally extends over six academic terms of full-time study but may also be completed by part-time students. Students registered in the program must complete:

1. The equivalent of 30 term courses in total with an overall average of at least 60%.
2. The normal Group A and B requirements of the Faculty of Arts;
3. The equivalent of at least 14 term courses from the core area courses listed below with the following stipulations:
   a) In the first year 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. In the second year all students are required to take a full credit in social research (i.e., ISS 250R, 251R). Students are required to complete a minimum of 4 term course equivalents from the list in each year of registration in the three-year program.
   b) The 14 term course equivalents must be distributed over at least 3 of the 4 core areas with a maximum of 6 term course equivalents within a single area counting towards the requirement.
4. After meeting these minimum requirements, students may elect their remaining courses from the general arts offerings of Renison or any Department of the University.
5. Transfer students from other programs, faculties or universities must comply with all requirements as set out above. In special cases they may petition for equivalent credit for courses taken elsewhere which are similar to core area courses. Petitions should be directed in writing to the Registrar of the College.
6. For further information consult the Registrar, Renison College, Waterloo, Ontario N2L 3G4.
Core Area Courses

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The Social Work Stream

Within the program of studies for the Bachelor of Arts degree with a Major in Social Development Studies, the College has developed a stream to meet the particular needs of students who plan to pursue graduate studies in Social Work or to follow vocations in Social Work or the related helping professions. The courses in this stream meet the Faculty of Arts requirements for the BA, the College’s requirements for the Major and in addition include a range of courses particularly appropriate to the needs of such students. It is recommended that the courses taken to satisfy program requirements in this stream include PSYCH 322R, PSYCH 323R, SOCWK 220R, ISS 221R or 222R. 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 awarded 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.

The Honours Program

The Honors program normally extends over eight academic terms of full-time study.

Requirements for the Honours program are:

1. a minimum of 42 term course equivalents in total while maintaining an overall average of at least 60% and a cumulative average of 75% in the core area courses of the program;

2. the normal "Group A and B" requirements of the Faculty of Arts, University of Waterloo;

3. a minimum of 18 term course equivalents within the core area of the program;

4. a minimum of 8 term course equivalents related to one of the multidisciplinary theme areas (see note 1).

Recommended Program

Year 1
Fall: ISS 150R, PSYCH 120R, SOCWK 120R
Winter: SOC 120R, PSYCH 121R, ISS 131R
The equivalent of 4 additional term courses.

Year 2
ISS 250R, 251R
At least two term courses from among:
- ISS 220R, 221R, 231R
- SOCWK 220R, 221R, 222R
- SOC 220R, 221R, 102(R)
The equivalent of 4 term courses from chosen theme area.
The equivalent of 3 additional term courses.

Year 3
ISS 320R, SOCWK 326R
At least two term courses from among:
- PSYCH 322R, 323R, 334(R), 369R
The equivalent of 4 term courses from chosen theme area.
The equivalent of 3 additional term courses.

Year 4
ISS 469R, 499R
The equivalent of 6 additional term courses.

Note 1
Students in the Honours Social Development Studies Program are required to complete the equivalent of 8 term courses from a theme area of study which has been selected in consideration of the students’ own needs and plans. The suggested theme areas are: “Home and School”, “Work”, “Community”, “Mental Health”.

In consultation with Renison’s Undergraduate Officer, courses are chosen in such a manner as to explore the theme area in depth, looking at the historical, institutional, and cross-cultural aspects, and examining value systems and patterns of change.

Social Development Studies Joint Honours Program

Social Development Studies Requirements

1. Four introductory term courses from the following:
   - ISS 131R, ISS 150R, PSYCH 120R, SOC 120R, SOCWK 120R;
2. Methodology: ISS 250R, 251R;
3. ISS 320R, plus 5 term course equivalents at the 200 level or above;
4. A Senior Seminar, ISS 469R or a Senior Honours Essay, ISS 499R.

Note:
The student will be expected to develop an elective theme area of 6 term course equivalents. There are Joint Honours programs with Religious Studies, Sociology, Psychology and Philosophy.

The requirements for the Joint Honours program with Psychology vary in that PSYCH 101 and PSYCH 102 may be substituted for PSYCH 120R and PSYCH 121R; ISS 250R for PSYCH 201; ISS 251R for one of PSYCH 393, 395 or 397. In 4th year ISS 469R is required plus one of ISS 499R, PSYCH 498 or PSYCH 499.

Minor Program
A minor in Social Development Studies consists of 10 term course equivalents taken from among the courses approved for the program. Courses may be selected to fill the needs of the individual student, but course selection should only be made after consultation with the Undergraduate Officer for Social Development Studies. The following requirements apply to all minors in Social Development Studies:
a) ISS 131R, ISS 150R, SOC WK 120R;
b) 7 term course equivalents beyond the first year level including at least 2 term course equivalents in each of two different disciplines.

Of the 10 term course equivalents for the minor, no more than six may be taken in any one discipline.

Note:
For students who do not have at least one term course in statistics and one term course in research, and especially those considering graduate studies in Social Work, ISS 250R and ISS 251R are strongly recommended.

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Sociology

General Sociology
Students who take the three year general program with a major in Sociology must successfully complete the following ten term courses in Sociology:

A term course introduction to Sociology
(SOC 101)
A term course in sociological methods (one of SOC 281, 380, 381)
A term course in sociological theory (one of SOC 271, 405, 406)
At least seven additional term courses in Sociology

Students are strongly encouraged to elect Sociology 280, Social Statistics and Social Indicators, although this is not required.

Honours Sociology

Recommended Programs

Year 1
SOC 101
One other term course in Sociology
Eight term course equivalent electives.

Year 2
SOC 280
Four term courses in Sociology
Five term course equivalent electives.

Year 3
SOC 281/282
Four term courses in Sociology
Four term course equivalent electives.

Year 4
SOC 405/406
SOC 499
Two term courses in Sociology
Six term course equivalent electives.

Note:
Students may elect Honours Sociology (Canadian Studies) or Honours Sociology (Peace and Conflict Studies) by fulfilling the Honours requirements in Sociology and the requirements listed under Canadian Studies or Peace and Conflict Studies in this Calendar.

Honours Sociology-Co-operative 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 94.

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

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The usual recommended program in Sociology for Joint Honours is fifteen term course equivalents distributed as follows:

- A term course in introductory Sociology (101);
- A term course in statistics (280);
- Two term courses in research methods (281/282);
- Two term courses in sociological theory to be chosen from 271, 405, 406;
- The equivalent of seven term courses of electives in Sociology;
- and an Honours Thesis course (499) or the equivalent in the related department.

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

Note 2
In the Joint Honours 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 from students choosing the minor program.

Spanish

*(Jointly mounted with Wilfrid Laurier University)*

**Note:**
By agreement, students at the University of Waterloo and Wilfrid Laurier University can be expected to take courses in Spanish at either university. While most language courses are taught concurrently every year at both universities, most other courses are taught either at one university or the other, and a few courses may rotate from year to year. Please check with the Undergraduate Officer in Spanish and note cross-registration procedures on page 17 of the Calendar.

**Arts**
Sociology
Spanish

General Spanish
Students in the three year General Program must complete twelve term courses in Spanish of which six term courses are language and two term courses are Survey of Spanish Literature.

**Four-Year General Spanish**
Students must satisfy the requirements of the Three-Year General program in Spanish and one term course each in Golden Age and Spanish American Literature. An average of 70% in Spanish courses is required.

Honours Spanish
Students in the Honours Program must complete twenty term courses in Spanish, of which at least six term courses are language, two term courses are Survey of Spanish Literature, one term course in Golden Age, and one term course is Spanish American Literature.

**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.)
  - Eight additional term courses.
- **Year 2**
  - A minimum of six term courses in Spanish, including SPAN 251A/251B. (or 201A/201B), and 205/206
  - Four additional term courses.
- **Year 3**
  - A minimum of six term courses in Spanish, including SPAN 351A/351B. (or 251A/251B), and 326 or 327
  - Four additional term courses.
- **Year 4**
  - A minimum of six term courses in Spanish, including one term course in Spanish American Literature
  - Four additional term courses.

Honours Spanish (Applied Studies Co-op)
A student may combine an Honours Spanish program with Applied Studies Co-op. The requirements in Spanish are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 94.

**Joint Honours in Spanish**
The Department of Spanish recognizes combined Honours Programs in Spanish and the following disciplines: Classical Studies, English, French, German, History, Latin, Sociology.
Arts
Spanish Studies in Personality and Religion

Other combinations may be arranged by consultation between the student and the Departments concerned.

Students in the Spanish Joint Honours Program must complete sixteen term courses in Spanish, of which at least six term courses are language, two term courses are Survey of Spanish Literature, one term course is Golden Age, and one term course is Spanish American Literature.

Recommended 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.)
Eight additional term courses.

Year 2
A minimum of four term courses in SPAN 251A/251B, (or 201A/201B, and 205/206.
Six additional term courses.

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

Year 4
A minimum of four term courses in Spanish, including one term course in Spanish American Literature.
Six additional term courses.

Notes for Honours and Joint Honours Spanish

Note 1
Before graduation students must complete the requirements of their home university and faculty.

Note 2
For Honours Spanish, a minimum of forty term courses must be successfully completed before graduation, of which twenty term courses must be in Spanish.

For Joint Honours, a minimum of forty-four term courses of which sixteen term courses must be in Spanish.

Note 3
With the permission of the Department, students may spend the third year enrolled in an acceptable university in Spain or in Spanish America.

Note 4
Students in Years 3 and 4 must have the permission of the home Department to enrol in Spanish courses on the lower levels.

Minor in Spanish
Students in an Honours Program interested in Spanish as a complement to the major field of study will be expected to complete ten term courses in Spanish. Please consult the Undergraduate Officer in Spanish for Minor in Spanish.

Studies in Personality and Religion

Studies in Personality and Religion (SIPAR) is an inter-disciplinary 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 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 cooperation with an advisory committee representing four departments in the University of Waterloo. The participating departments presently include Philosophy, Psychology, Religious Studies and Sociology.

The Core Course Curriculum

The core course curriculum provides an introduction to the field of Studies in Personality and Religion. The goals of the core course program are to give the student a base of knowledge, a familiarity with the subject and an understanding of the concepts involved.

There are four term courses in the core program:
Psychology of Religion in Historical Perspective (ARTS 202P) provides an historical survey of theories on the relationship between personality and religion; Psychology of Religion (RS 270) examines the variety of religious experience from a psychological point of view; Personality and Religion (RS 271) examines personality theory and its relationship to religious development and growth; Seminar on Selected Topics in Personality and Religion (ARTS 302P) involves the study of how the disciplines of philosophy, sociology, and religious studies have come to know and understand human behaviour.

Program Options

There are two different options open to students participating in the SIPAR program. The first is open to students in a general program; the second, to students in an honors program only.

1. General Program
A SIPAR option consisting of six term courses may be earned by students in a General program. The subtitle "Studies in Personality and Religion" would be
designated on the degree. In every case, students must fulfill all the requirements for the major in their own departments.

2. Honours Minor in Personality and Religion
A minor in SIPAR is available to students pursuing an honours degree in any faculty (including non-Arts faculties). This minor consists of ten term courses chosen from among the courses approved for SIPAR credit in any participating department, and must include the SIPAR Core Courses, ARTS 202P, RS 270, RS 271, ARTS 302P.

For details of core courses and content courses, please consult Course Descriptions section of this calendar.

Note:
Each of the participating departments has designated certain course offerings as Studies in Personality and Religion content courses. Many of the 300- and 400-level courses have specific prerequisites. Students planning to pursue studies in these upper-level courses should use their elective courses wisely to ensure that the prerequisites for these courses are met.
Field trips across Canada
The Option in Canadian Studies

The Canadian Studies option allows students to gain a broad insight into the nature of Canadian culture and society in three areas. Students take courses about Canada in their selected discipline. They take courses about Canada in other departments outside of their discipline, and take core, interdisciplinary courses offered by the Canadian Studies 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 I

At Waterloo, students declare their area of study in the second year and therefore there are no Canadian Studies requirements in the first year. However, it is recommended that students who intend to take the Canadian Studies option, take a course in French language in the first year. Otherwise, students should proceed with the usual first year program set out by their Faculty.

Once students have declared their home discipline among one of the ten listed above, then they can also choose the option in Canadian Studies. Those taking a three-year General degree can do the General option in Canadian Studies. Those taking the Honours degree should declare an Honours option in Canadian Studies. Both options are identical except that Honours students do the fourth year.

Year II

Canadian Studies 201/202 given at the Canadian Studies Program Centre at St. Paul’s College.

One full or two half-courses in the home discipline chosen from courses dealing specifically with Canada.

One full or two half-courses chosen from outside your home discipline. These courses deal specifically with Canada and are to be selected from the list of approved courses provided in the Canadian Studies section of Chapter 16 of the Calendar (See Note 1).

The equivalent of two full courses chosen to meet the Honours requirement in the home discipline.

Year III

Canadian Studies 301/302 given at the Canadian Studies Program Centre at St. Paul’s College.

One full or two half-courses in the home discipline chosen from courses dealing specifically with Canada.

One full or two 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 provided in the Canadian Studies section of Chapter 16 of the Calendar.

General degree students will graduate at the end of this third year with a degree in their home discipline with the Canadian Studies option shown on their diploma.

Year IV

Canadian Studies 400 given at the Canadian Studies Program Centre at St. Paul’s College.

One full or two 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 provided in the Canadian Studies section of Chapter 16 of the Calendar.

The equivalent of two full courses chosen to meet the Honours requirements in the home discipline.

Note 1

It is possible to do a double Honours Program and also take the Canadian Studies option. In this case, students take a full course or two half-courses in each of the Honours areas and take the core Canadian Studies courses. They do not need to take the courses listed outside of their Honours areas in other departments.

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 five full courses. Students take the Canadian Studies core courses, 201/202 and 301/302. They also take the equivalent of three full courses from the approved list of courses listed in the Canadian Studies section of Chapter 16.
Faculty of Engineering

Electrical Engineering
The Co-operative Engineering Program

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

The engineering curricula at the University of Waterloo provide a sound basis in Mathematics and Pure Science and in Engineering Science and Design. The first year of the program is essentially common for all programs except Chemical and Systems Design Engineering. A substantial part of the work of the first and second years is common to all programs. Starting with the second year, students elect one of the six principal divisions of engineering. The curriculum for each of the six 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

All programs entail 4-2/3 calendar years of undergraduate study on the Co-operative system.

Engineering Examinations and Promotions

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

Admission

All Year 1 students enrol in September. These Year 1 students spend the Fall term together at the University, after which they are divided into two groups. They also complete the last term of the program and graduate together. Both groups, of course, have the same total time on campus and in industry, one group having a double academic term at the start of the 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 5-8.

The program in Systems Design Engineering is not divided into two groups. All students in this program start with four months of school before going out on the first work term in the Winter.

The program in Geological Engineering has only one group. Students in Geological Engineering start with eight 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; five 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 five specific Grade 13 requirements must contact the Admissions Officer no later than January (for September admission).

Applicants will be evaluated and advised on possible courses of action required to meet our specific requirements.

Admission as an Adult Student

It is recommended that applicants attempt to obtain standing in Ontario Grade 13 Mathematics and Science courses or their equivalent. The university has developed special pre-university mathematics and science courses which can be taken by correspondence and which are recommended for adult students. To discuss admissibility and appropriate qualifying work applicants are advised to contact the Admissions Officer for the Faculty of Engineering.
Admission to Advanced Standing
Because of the co-operative nature of the Engineering 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 three satisfactory work terms. The level of advanced admission is determined by an examination of the applicant's academic and work experience.

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

Examinations and Promotions

Note
The Faculty of Engineering has revised its examinations and promotions procedures and the following regulations went into effect beginning with those students entering Year 1 Engineering in the Fall 1978 term. Students who entered the Engineering program prior to September 1978 will be governed by the regulations as laid out in the 1977-78 calendar.

The faculty constitutes the examining body for all examinations and is responsible for all decisions on grades, promotions, failures, deferred examinations, appeals and recommendations for the granting of degrees. Students are examined and grades are set for individual courses upon 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 are as follows:

- Promoted - proceed to next term
- Promoted (Aegrotat) - proceed to next term
- *Proceed on Probation - proceed to next term
- Required to Repeat Term - No Penalty - may repeat in next available term
- **Required to Repeat Term - must stay out 2 terms before repeating
- Voluntary Withdrawal - 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

The procedures through which promotion decisions are made are as follows:

At the end of each term, examining faculty members submit grades for that term's courses. Each department then reviews the performance of students registered in that department and makes promotion recommendations to the Examinations and Promotions Committee. The Engineering Examinations and Promotions Committee considers the evidence on which the departments have based their promotions recommendations and assigns the official academic decision which may be reviewed by the Engineering Faculty Council. All academic decisions and grades are reported to the students through the Registrar's Office. All recommendations to award degrees must be approved by Senate.

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

1. To continue in the degree 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 two months to allow the student an opportunity to bring forward evidence of extenuating circumstances which affected the term performance.

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

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

4. A student with a term average of over 60% and two or more course grades below 50 will have the academic decision deferred for two months to allow the student an opportunity to bring forward evidence of extenuating circumstances which affected the term performance.

5. A student with a term average of over 60% and two or more course grades below 50 will be required to repeat the term except in 1A when the student is allowed to proceed on probation. Probationary status will be cleared by achieving an unconditional promotion at the end of the probationary term. A student on probation who receives an average over 60% and two or more course grades below 50 will be required to repeat the term.

6. A student with a term average of 50-59% will be required to repeat the term except in 1A when the student is allowed to proceed on probation.

7. A student with a term average of 50-59% will be required to repeat the term except in 1A when the student is allowed to proceed on probation.

8. A student on a repeat term who does not achieve an unconditional promotion will be required to withdraw from the program.

9. A student with a term average of 50-59% who has never before in the program had an average below 60% may be repeated more than once.

10. A student with a term average of 50-59% may be repeated more than once.

11. A student with a term average of over 60% and two or more course grades below 50 will be required to repeat the term except in 1A when the student is allowed to proceed on probation.

12. A student on a repeat term who does not achieve an unconditional promotion will be required to withdraw from the program.

13. A student may withdraw voluntarily from the program at any time prior to four weeks before the commencement of the final exam period in the term by giving written notification of the withdrawal. Students in 1A may withdraw at any time in that term.
8. A student may be required to withdraw from the 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.

9. 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 students will be expected to register for the minimum number of courses specified by the calendar for the appropriate term.

12. There are no supplemental examinations except in the last term of the 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 - Aegrotat - Student was ill according to medical evidence but has satisfactory understanding of the course.
   
   CR - Credit Granted - Performance was satisfactory.
   
   NCR - No Credit Granted - Performance was unsatisfactory.
   
   INC - Incomplete - The course work is incomplete and the student has permission to extend the work beyond the term. If six months have elapsed since the end of the term, a grade must be submitted.
   
   DNW - Did Not Write - The student did not withdraw from the course and was not eligible for an Incomplete grade. The student did not complete a sufficient proportion of the assignments, tests and examinations for an evaluation to be made.

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

<table>
<thead>
<tr>
<th>Grade</th>
<th>Numerical Grade</th>
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<tbody>
<tr>
<td>A+</td>
<td>95</td>
</tr>
<tr>
<td>B+</td>
<td>78</td>
</tr>
<tr>
<td>C+</td>
<td>68</td>
</tr>
<tr>
<td>D+</td>
<td>58</td>
</tr>
<tr>
<td>F+</td>
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<td>65</td>
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<td>D</td>
<td>55</td>
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<td>F</td>
<td>38</td>
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<tr>
<td>A-</td>
<td>83</td>
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<td>B-</td>
<td>72</td>
</tr>
<tr>
<td>C-</td>
<td>62</td>
</tr>
<tr>
<td>D-</td>
<td>52</td>
</tr>
<tr>
<td>F-</td>
<td>32</td>
</tr>
</tbody>
</table>

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

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

17. Students must demonstrate consistent satisfactory performance during their work-term employment. They must also submit the required number of acceptable work term reports (See booklet 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 four satisfactory work reports which must be related to the work of the term reported and must have identifiable analytic content. For those students admitted to advanced standing into 2B or 3A with only 3 work terms remaining, only 3 satisfactory work reports would be required.

2. Work reports are due seven days after the first official day of lectures of the academic term directly following the work term on which the report is based. Reports submitted after the deadline are considered unacceptable.
3. Work reports shall be compulsory for all students in their first work term. The reports and evaluation forms shall be returned to the students and copies of the evaluation forms shall be placed in the students' files in the Department of Co-ordination.

4. Three additional work reports shall be submitted for the remaining five work terms. Students are encouraged to reserve a report for their final work term. If students wish, they may submit the additional reports and the evaluations of these reports will be added to their work term record.

5. Work reports, other than those completed by first year students, shall be evaluated by the Engineering Faculty following the same procedure suggested in Item 3. This shall include reports marked by employers.

6. Work reports rated as unsatisfactory may be 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.)

The 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 education at Waterloo, is intended to provide some understanding of the wider humanistic and societal context within which an Engineering career must grow and interact.

Students in the Faculty of Engineering, beginning with the class entering in Fall, 1977, must complete, as a part of the BASc requirements, a program consisting of six courses in humanities and social sciences, to be selected from course lists published by the Faculty, such that at least two of the courses are advanced level courses in the same, or closely related, subject area.

The course lists, published each year, will be divided into: List A - Introductory, Non-prerequisite Courses; List B Options - recommended sequences in a range of coherent options, containing at least two advanced level courses; List B Other Courses - other advanced level courses from among which students may devise their own appropriate sequence. Any choices other than those from the published lists require the approval of the student's departmental advisor.

Combined Bachelor's - Master's 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 whole, while at the same time satisfying the requirements for both degrees. This stands in contradistinction to treatment of the Bachelor's and Master's degree programs each as terminal activities. Such structured programs, starting at the undergraduate level and terminating with MASc degree in the Faculty of Engineering provide an alternative means, complementary to the existing undergraduate and graduate programs, for the attainment of the MASc degree.

The following are some general conditions that all such combined Bachelor's-Master's degree programs should satisfy:

A) Students who elect to enter and pursue the combined Bachelor's-Master's programs will fulfill the degree requirements of both the BASc program and the MASc program. This implies that:

1. eight terms of full-time registration at the undergraduate level and at least two terms of full-time registration (or equivalent) at the graduate level are mandatory;
2. the graduate program must include at least four (graduate) courses and a thesis, or eight courses and a MASc project.
3. the Co-operative work-term requirements of the BASc program must be met.

B) There must be complete freedom of transferability from the combined programs to the regular programs.
Combined Bachelor's - Master's Program

If a student is proceeding to an MASc with a research thesis, the balance of courses (two courses numbered 500 or above) will normally be taken in the 5A (fall) term. There will be no course requirement for the 5B (winter) term.

A student who is proceeding to an MASc with a Master's degree project, would normally select three courses in each of the 5A and 5B terms (with the advice of the Supervisor and approval of the Associate Chairman).

C) Co-operative Work Terms

The combined Bachelor's-Master's program includes two work terms. These may take two forms:

1. "Special" Off-Campus Work Terms
   It is expected that most of the students proceeding to the MASc degree by course work and project will be involved in off-campus work terms. Because of the calibre of these students it should be possible to make special arrangements for significant projects to be completed in these terms, so that they form a coherent pair, and that the students have special supervision in industry. The "work reports" generated on the "special" work terms will form the basis for the MASc project report. The Faculty Supervisor will be expected to maintain liaison with the off-campus organization in which the student works during these terms.

2. "Special" On-Campus Work Terms
   It is expected that most of the students proceeding to the MASc degree with a research thesis will be involved in on-campus work terms. During these work terms they will not be registered students; they may be hired as associate researchers for the purposes of various research grants, without the restriction of student salaries. They may also work as teaching assistants during these terms. This combination can be attractive from the various points of view of available research time, income generation for the student, total research cost from a grant and effective teaching assistantships.

D) Fourth-Year Projects

All Departments have some requirement or opportunity for projects in the 4A/4B terms. For students in the combined Bachelor's-Master's program these projects may be integrated with their special work term projects as well as their work in 5A and 5B.

E) Granting of Degrees

The BASc degree will be granted at the normal time, i.e., at the Spring Convocation following the 4B 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 six 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 128
- 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.

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.

Students enrolling in Systems Design should refer to page 414 for the Systems Design course listings.
Transfer between programs is possible (see booklet entitled Admission '82 for conditions of transfer and make-up requirements).

Note
Detailed course descriptions commence in Chapter 16. Courses beginning with GEN E (General Engineering) can be found on page 316.

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 six options.

Biochemical and Food Engineering
This option deals with the application of chemical engineering principles to biotechnology, with emphasis on bioprocesses. Examples are fermentation operations, biofuels, food processing, and waste treatment and utilization, using either microbicell 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 polymers (plastics, elastomers, synthetic fibres).

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

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

Guide to Undergraduate Chemical Engineering Course Numbers

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

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

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

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

A) Core Courses (Beyond Year 1)

CH E 210 Transport Processes 1 (Equilibrium Stage Operations)
CH E 213 Transport Processes 2 (Fluid Mechanics)
CH E 220 Applied Mathematics 1
CH E 230 Physical Chemistry 1
CH E 231 Physical Chemistry 2
CH E 232 Inorganic Chemistry 1
CH E 233 Physical Chemistry Laboratory
CHEM 026 Organic Chemistry 1
CHEM 036 Organic Chemistry 2
MATH 210 Calculus 2
MATH 216 Differential Equations
CH E 314 Transport Processes 3 (Heat Transfer)
CH E 317 Transport Processes 4 (Mass Transfer)
CH E 320 Applied Mathematics 2
CH E 321 Process Dynamics and Control 1
CH E 330 Chemical Engineering Thermodynamics
CH E 331 Chemical Reaction Engineering
CH E 332 Inorganic Chemistry 2
CH E 333 Instrumental Methods of Chemical Analysis
CH E 382 Engineering Economics and Process Design 1
CH E 410 Chemical Engineering Laboratory
CH E 484 Engineering Economics and Process Design 2
CH E 486 Technical Seminar
CH E 007 General Awareness Seminar

Note:
Students whose registration in first year was prior to September 1979 follow a program described in the 1980/81 Calendar.

B) Elective Courses
In addition to the core courses listed above, a minimum of 12 elective courses must be taken beyond Year 1. The usual sequence of technical (T) and General Studies (GS) electives is as follows.

<table>
<thead>
<tr>
<th>Term</th>
<th>GS</th>
<th>T</th>
<th>Free (GS or T)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2B</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3A</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3B</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4A</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>4B</td>
<td>0</td>
<td>4*</td>
<td>1</td>
</tr>
</tbody>
</table>

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

Note:
One of the two free electives in 4th year must normally be a General Studies elective.

Four or five of these courses may be chosen from social sciences, humanities, languages and other non-technical subjects. Four of the courses together with the general studies course in the 1B term must satisfy the General Studies program requirements described on page 131.

The remaining seven or eight courses must be technical electives which must include either the seventh option group listed below or one of the first six option groups listed plus one of CH E 583 or CH E 585. The other technical electives may be chosen from other Chemical Engineering courses or from other science or engineering courses according to interest, but the choice must be approved by the Associate Chairman (Undergraduate Studies).

The three technical electives for each of the seven Chemical Engineering option groups are identified below. Within each option group, the first course is normally taken in the 3B or 4A term and the other two courses are normally taken in the 4B term.

1) Transport Process
CH E 510 Prediction of Physico-Chemical Properties
CH E 515 Two-Phase Flow Operations
CH E 517 Performance of Separation Processes

2) Mathematical Analysis and Control
CH E 520 Chemical Engineering Analysis
CH E 521 Process Dynamics and Control 2
CH E 523 Process Control Laboratory

3) Polymer Science and Engineering
CH E 540 Introduction to Polymer Science
CH E 541 Physical Chemistry of Polymers
CH E 543 Polymer Laboratory

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

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

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

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

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

A student may acquire a BASc in Chemical Engineering with an option in Management Sciences by taking eight specific M SCI courses as electives (see listing under equivalent with M SCI 21 and M SCI 23, respectively).

The six other courses use 6 of the minimum 12 elective course choices (3 GS and 3 T). The student must achieve a grade of at least 50% in each of the 8 courses and must obtain an average of 60% or more in these courses in order to receive recognition for satisfactorily completing the Option.
Academic Program for Each Term

Note:
Students whose registration in first year was prior to September 1979 follow a program described in the 1980/81 Calendar.

Term 2A, Fall and Winter
MATH 210, CHEM 026, CH E 220, CH E 230, CH E 232, CH E 007

Term 2B, Spring and Fall
MATH 216, CHEM 036, CH E 231, CH E 233, CH E 007, General Studies Elective

Term 3A, Winter and Spring
CH E 314, CH E 320, CH E 330, CH E 332, CH E 382, CH E 007, General Studies Elective

Term 3B, Fall and Winter
CH E 317, CH E 321, CH E 331, CH E 333, CH E 007, Technical Elective, (CH E 550 or CH E 570), General Studies Elective

Term 4A, Spring and Fall
CH E 410, CH E 484, CH E 486, CH E 007, 2 Technical Electives, Free Elective

Term 4B, Winter
Either:
CH E 581, CH E 007, 2 Technical Electives, Free Elective
or:
CH E 583, CH E 007, 3 Technical Electives, Free Elective
or:
CH E 585, CH E 007, 3 Technical Electives, Free Elective

Note:
One of the 4A and 4B Free Electives must normally be a General Studies Elective, the other may be a Technical or General Studies Elective. General Studies Electives must be chosen from the list of courses approved for this purpose, and published in the Engineering Society Handbook.

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

Detailed course descriptions are given in Chapter 16.
geotechnical data and fundamentals to the design of foundation elements, earth-retaining structures, excavations, earth embankments and highway pavements.

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

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

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

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

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

It is difficult to give a simple definition of what a Civil Engineer is and does. Essentially the profession is principally involved with the creation, operation and maintenance of structures associated with water resources, transportation, power generation, and a wide range of industrial, commercial and institutional buildings and complexes including whole urban structures. The activities include investigation, planning, design, construction and evaluation. Vocationally a Civil Engineer may specialize in any of the foregoing. He or she may also specialize in biomechanics, solid mechanics, fracture mechanics, elasticity, building structures, bridges, hydrology, hydraulics, sanitation (public health), industrial wastes, water resource structures, irrigation and drainage, inland waterways, harbours, aerospace, highways (roads and streets), railroads, pipelines, geology, meteorology, soil mechanics, foundations, tunnelling (rock mechanics), surveying and cartography, urban and regional planning and overall project planning. The list is by no means complete.

For example, some of our graduates are involved in aquaculture. Civil Engineering may also be combined with another discipline or profession. 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

CIV E 116 Engineering Concept 2
CIV E 200 Civil Engineering Project 1
CIV E 203 Statics
CIV E 204 Dynamics
CIV E 205 Mechanics of Deformable Solids 1
CIV E 221 Calculus
CIV E 222 Differential Equations
CIV E 224 Probability and Statistics
CIV E 265 Structure and Properties of Materials
CIV E 280 Fluid Mechanics
CIV E 291 Survey Camp
CIV E 292 Engineering Economics
CIV E 294 Thermal Sciences
CIV E 300 Civil Engineering Project 2
CIV E 303 Structural Analysis 1
CIV E 304 Structural Analysis 2
CIV E 313 Structural Concrete Design 1
CIV E 342 Transport Engineering 1
CIV E 343 Transport Engineering 2
CIV E 353 Soil Mechanics
CIV E 354 Foundation Engineering
CIV E 381 Hydraulics
CIV E 400 Civil Engineering Project 3
CIV E 413 Structural Steel Design
CIV E 453 Engineering Geology
CIV E 486 Hydrology
CIV E 491 Engineering Law

b) Non Credit Courses

CIV E 298 Civil Engineering Seminars
CIV E 299 Civil Engineering Seminars
CIV E 398 Civil Engineering Seminars
CIV E 399 Civil Engineering Seminars
CIV E 498 Civil Engineering Seminars
CIV E 499 Civil Engineering Seminars

The above represent seminars and discussions arranged by the department on topics of general interest to civil engineers.
**B) Electives**

*a) Technical Electives†*

Elective courses may be selected from the following list, in accordance with the academic program for the term, and in consultation with the Civil Engineering Faculty advisor.

- CIV E 306 Mechanics of Deformable Solids 2
- CIV E 344 Urban and Regional Engineering
- CIV E 383 Water Distribution and Collection Systems
- CIV E 403 Structural Analysis 3
- CIV E 404 Structural Analysis 4
- CIV E 405 Structural Dynamics and Stability
- CIV E 414 Structural Concrete Design 2
- CIV E 415 Structural Systems
- CIV E 430 Experimental Mechanics
- CIV E 440 Urban Traffic Management
- CIV E 442 Pavement Structural Design
- CIV E 444 Urban Transport Planning
- CIV E 454 Geotechnical Engineering
- CIV E 472 Wastewater Treatment
- CIV E 473 Pollution in the Aquatic Environment
- CIV E 480 Basic Principles of Water Resources
- CIV E 493 Engineering in the Canadian North
- CIV E 496 Project Management
- CIV E 497 Engineering Optimization and Analysis

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

*b) General Studies Electives*

Four courses, together with the general studies course in the 1B term must satisfy the General Studies Program requirements described on p. 131.

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

**C) Other Courses**

- CIV E 110†, Urban Transport Problems and Prospects
  †CIV E 110 is not intended for Civil Engineering students at any level. The offering of this course is contingent upon sufficient demand and/or teaching resources.

---

**Academic Program for Each Term**

| Year 1B (Winter and Spring Terms) | CIV E 116, plus other Year courses |
| Year 2A (Fall and Winter Terms) | CIV E 203, CIV E 204, CIV E 221, CIV E 224, CIV E 265, CIV E 292, CIV E 298, CIV E 291† |
| Year 2B (Spring and Fall Terms) | CIV E 200, CIV E 205, CIV E 280, CIV E 294, CIV E 299; one general studies elective, CIV E 291† |
| Year 3A (Winter and Spring Terms) | CIV E 303, CIV E 313, CIV E 342, CIV E 353, CIV E 381, CIV E 398; one general studies elective. |
| Year 3B (Fall and Winter Terms) | CIV E 300, CIV E 304, CIV E 343, CIV E 354, CIV E 375, CIV E 399; one elective chosen from CIV E 306, CIV E 344 or CIV E 383. |
| Year 4A (Spring and Fall Terms) | CIV E 413, CIV E 453, CIV E 486, CIV E 498; two electives chosen from CIV E 403, CIV E 414, CIV E 440, CIV E 472 or CIV E 496; one general studies elective. |
| Year 4B (Winter Term) | CIV E 400, CIV E 491, CIV E 499; three electives chosen from CIV E 404, CIV E 405, CIV E 415, CIV E 430, CIV E 442, CIV E 444, CIV E 454, CIV E 473, CIV E 480, CIV E 493 or CIV E 497; one general studies elective. |

†CIV E 291 Survey Camp is taken at the commencement of the Fall Term, preceding either 2A or 2B

**Civil Engineering with an Option in Management Sciences†**

A student may acquire a BASc in Civil Engineering with an Option in Management Sciences by taking 8 M SCI courses (see p. 341) as electives. Note that M SCI 21 and M SCI 23 are equivalent to CIV E 224 and CIV E 292, respectively, for the purposes of this Option. The student must achieve a grade of at least 50% in each of the 8 courses and must obtain an average of 60% or more in these courses.

†A student who wishes to follow the Management Science Option, must declare his or her intent before embarking on his 2B term and must obtain the approval of the Civil Engineering Department.
Electrical Engineering

The curriculum in Electrical Engineering is designed to teach those fundamental physical and engineering sciences which form the basis of the work of electrical engineers. After the common Year 1 program in Engineering, the program in Electrical Engineering consists of prescribed core courses and a minimum of nine technical electives (taken during the last two terms); these technical electives include the possibility of working on a design or research project. In addition, students must satisfy Faculty of Engineering general studies requirements by choosing suitable elective courses.

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

The normal rules of the co-operative program will apply. By special permission the number of co-operative work terms may be reduced, but a student must complete at least five work terms (including that done in Year 1), unless admitted to advanced standing, as defined in the Calendar (see page 129).

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 129).

Options in Electrical Engineering

There are two options available to students in the department, one in Computer Engineering and one in Management Sciences. Students may take one or the other, but not both.

Computer Engineering Option:

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:

- CS 240 Principles of Programming Languages and Data Structures 2B
- CS 340 Data Structures 3B
- CS 454 Principles of Operating Systems 4A
- EL E 407 Numerical Analysis 4B
- EL E 427 Digital Hardware Engineering 4A

In addition to these courses, two other computer science courses, chosen from a list, will be taken in the fourth year in either the A or B term.

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 eight courses 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 1982/83

Note 1

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

Note 2

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

Term 2A, Fall and Winter

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Name</th>
<th>C</th>
<th>T</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL E 201</td>
<td>Seminar</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EL E 205</td>
<td>Advanced Calculus for Electrical Engineers 1</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>(MATH 211)</td>
<td>Introduction to Digital Computers</td>
<td>2</td>
<td>1</td>
<td>2*</td>
</tr>
<tr>
<td>EL E 233</td>
<td>Physical Electronics</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EL E 241</td>
<td>Electric Networks 1</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>EL E 293</td>
<td>Instrumentation &amp; Measurement 1</td>
<td>1</td>
<td></td>
<td>4*</td>
</tr>
<tr>
<td>M SCI 23</td>
<td>Managerial &amp; Engineering Economics 1</td>
<td>3</td>
<td>1</td>
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</table>

Term 2B, Fall and Spring

<table>
<thead>
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<th>Course No.</th>
<th>Name</th>
<th>C</th>
<th>T</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL E 202</td>
<td>Seminar</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EL E 206</td>
<td>Advanced Calculus for Electrical Engineers 2</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>(MATH 212)</td>
<td>Energy Processing &amp; Conversion</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EL E 271</td>
<td>Electric &amp; Magnetic Fields</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EL E 294</td>
<td>Instrumentation &amp; Measurement 2</td>
<td>1</td>
<td>1</td>
<td>3*</td>
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<tr>
<td>M E 250</td>
<td>Thermodynamics</td>
<td>3</td>
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</table>

General Studies Elective.
### Term 3A, Winter and Spring

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Name</th>
<th>C</th>
<th>T</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL E 301</td>
<td>Seminar</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EL E 316</td>
<td>Probability &amp; Statistics</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>EL E 323</td>
<td>Principles of Digital Circuits and Systems</td>
<td>2</td>
<td>1</td>
<td>2*</td>
</tr>
<tr>
<td>EL E 342</td>
<td>Electric Networks 2</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>EL E 351</td>
<td>Electronic Devices</td>
<td>2</td>
<td>1</td>
<td>3*</td>
</tr>
<tr>
<td>EL E 362</td>
<td>Energy Conversion</td>
<td>2</td>
<td>1</td>
<td>3*</td>
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</tbody>
</table>

General Studies Elective.

### Term 3B, Fall and Winter

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Name</th>
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<th>T</th>
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</thead>
<tbody>
<tr>
<td>EL E 302</td>
<td>Seminar</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EL E 317</td>
<td>Signal Analysis Methods</td>
<td>3</td>
<td>1</td>
<td>1*</td>
</tr>
<tr>
<td>EL E 352</td>
<td>Electronic Circuits</td>
<td>2</td>
<td>1</td>
<td>3*</td>
</tr>
<tr>
<td>EL E 372</td>
<td>Transmission Lines &amp; Electromagnetic Fields</td>
<td>2</td>
<td>1</td>
<td>3*</td>
</tr>
<tr>
<td>EL E 380</td>
<td>Introduction to Systems &amp; Control</td>
<td>2</td>
<td>2</td>
<td>3*</td>
</tr>
</tbody>
</table>

General Studies Elective.

### Term 4A, Fall and Spring

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Name</th>
<th>C</th>
<th>T</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL E 401</td>
<td>Seminar</td>
<td></td>
<td>1</td>
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</tr>
</tbody>
</table>

Five Technical Electives from the following:

- EL E 418 Communication Systems: 2 1 1*
- EL E 425 Systems Simulation: 2 1 1*
- EL E 427 Digital Hardware: 2 1 1*
- EL E 435 Semiconductor Devices 1: 2 2
- EL E 446 Linear Systems: 2 2
- EL E 454 Nonlinear Electronic Circuits: 2 1 1*
- EL E 463 Power Electronics: 2 1 1*
- EL E 474 Antenna & Propagation Engineering: 2 1 1*
- EL E 481 Control Systems 1: 2 1 1*
- EL E 499A Project: 2 1 1*

### Term 4B, Winter

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Name</th>
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<th>T</th>
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<tbody>
<tr>
<td>EL E 402</td>
<td>Seminar</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Four Technical Electives from the following:

- EL E 407 Numerical Methods: 2 2
- EL E 419 Digital Communications: 3 1
- EL E 426 Software Engineering: 3 1 1*
- EL E 434 Quantum Electronics and Magnetics: 2 2
- EL E 436 Semiconductor Devices 2: 3 1
- EL E 443 Electric Networks 3: 2 1 1
- EL E 453 Linear Electronic Circuits: 2 1 3*
- EL E 459 Sound, Noise and Electroacoustics: 2 1 3*

### Engineering

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Name</th>
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<th>T</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL E 464</td>
<td>High Voltage &amp; Insulation Engineering</td>
<td>3</td>
<td>3*</td>
<td></td>
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<tr>
<td>EL E 465</td>
<td>Power Systems</td>
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<td>EL E 473</td>
<td>Microwave Engineering</td>
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<td>1</td>
<td>3*</td>
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<td>EL E 482</td>
<td>Control Systems 2</td>
<td>2</td>
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<tr>
<td>EL E 499B</td>
<td>Project</td>
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</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 Courses

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<tr>
<th>Course No.</th>
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<tr>
<td>ME 2A</td>
<td>EL E 14 Electrical Engineering</td>
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<td>ME 3A</td>
<td>EL E 32 Electrical Engineering</td>
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</table>

*Indicates laboratory every second, every third week, or open lab. See Course Descriptions.
†The general elective can be any course that is approved by the undergraduate officer.
**Indicates 3 hours per 3 weeks; average open consultative tutorial.

### 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 four areas of specialization within Geological Engineering:

1. geotechnical engineering and geohydrology
2. petroleum exploration and exploitation
3. mineral exploration
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 insitu 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 2A, Fall
- EARTH 121 Introductory Geology
- EARTH 231 Mineralogy
- EARTH 235 Stratigraphy
- CIV E 203 Statics
- CIV E 221 Calculus

General Studies Elective (1).

Term 2B, Spring
- CIV E 205 Mechanics of Deformable Solids
- CIV E 222 Differential Equations
- EARTH 221 Geochemistry 1
- EARTH 232 Petrography
- EARTH 260 Structural Geology

General Studies Elective.

Term 3A, Winter
- CIV E 353 Geology & Soil Mechanics
- CIV E 392 Engineering Economics
- EARTH 338 Rock Mechanics
- EARTH 332 Metamorphic Petrology
- EARTH 333 Sedimentology
- EARTH 370 Economic Geology
- EARTH 390 Field Methods

Term 3B, Fall
- CIV E 200 Civil Engineering Project I
- CIV E 354 Foundation Engineering
- EARTH 331 Igneous Petrology
- EARTH 360 Applied Geophysics
- EARTH 438 Engineering Geology
- CIV E 291 Survey Camp

General Studies Elective.

Term 4A, Fall
- EARTH 439 Groundwater Geology
- EARTH 440 Quaternary Geology
- CIV E 280 Fluid Mechanics
- CIV E 224 Probability & Statistics
- CIV E 400 Geotechnical Project
- EARTH 490 Field Trip

General Studies Elective.

Term 4B, Winter
- CIV E 400 Project (2)
- EARTH 435 Advanced Structural Geology
- EARTH 345 Historical Geology or
- EARTH 427 Crustal Evolution

2 Electives From:
- EARTH 461 Applied Geophysics 2
- EARTH 433 Applied Sedimentology
- EARTH 370 Economic Geology
- CIV E 430 Experimental Mechanics
- CIV E 493 Engineering in the Canadian North
- CIV E 473 Pollution in the Aquatic Environment
- CIV E 491 Engineering Law
- CIV E 454 Geotechnical Engineering
- CIV E 497 Engineering Analysis and Modelling

(1) This program satisfies the General Studies program of the Engineering Faculty. Students will not be able to take the Management Sciences Option.

(2) Civil Engineering 400 Project
The Geological Engineering students will identify and resolve a problem related to geological engineering.

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 two major categories: operations research, and organizational behaviour. A major aim of the Department is to strengthen and develop these fields of study.

**Degrees Conferred**
The department confers degrees only at the graduate level (the MASc and PhD). At the undergraduate level it provides, for a student progressing to a BASc in any other department of the Faculty of Engineering, the opportunity to complete an Option in Management Sciences.

**Undergraduate Academic Program**
As mentioned above, arrangements have been made, in terms of scheduling flexibilities (providing adequate positions for electives), for any student in the following departments to complete an Option in Management Sciences:
- Chemical Engineering
- Civil Engineering
- Electrical Engineering
- Mechanical Engineering
- Systems Design

*The Option in Management Sciences* is structured to provide an understanding of the issues, concepts and techniques related to managerial problems, particularly those concerned with the management of technology. It aims to impart a training that will be useful for problem-solving capability in the long run; also, it lets students acquire certain skills which should help widen the scope of their immediate employment. Students taking the Option may advance to the MASc in Management Sciences within three academic terms following the completion of the BASc.

The Option consists of eight courses (see course descriptions in Chapter 16), two in each of the following areas:

**a) Probability and Statistics**
- M SCI 21 Probability and Statistics 1
- M SCI 31 Probability and Statistics 2

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

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

**d) Decision Analysis and 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 eight courses (see above) or their equivalents as specified by the department of Management Sciences, and obtains an average of 60% or more in these courses.

A student may take any number of courses in the Option as electives, provided that the appropriate prerequisites* are satisfied. However, the designation of an Option in Management Sciences will not be shown on the transcript of a student who does not take all the eight courses specified above.

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

In order to facilitate the taking of all eight courses in the Option the student should proceed according to the following schedule beginning in the 2A term:

*Prerequisites are listed under course descriptions in Chapter 16.*
### Option in Management Sciences

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<td>CHE A</td>
<td>CHE 220*</td>
<td>MSCI 44</td>
<td>CHE 382†</td>
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<td>SYDE B²</td>
<td>SYDE 213*</td>
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<td>MSCI 43</td>
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*Equivalent with MSCI 21
†Equivalent with MSCI 23
²Equivalent with MSCI 31
²SYDE 131 (equivalent with MSCI 23) is taken in 1A
Mechanical Engineering

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

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 four 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, coating, 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
Engineering with an option in Management Sciences by taking eight specific Management Science courses as electives (see elective course listing under Department of Management Sciences).

A) Core 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 719 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 SCI 21 Probability and Statistics (Equivalent to M E 202)
M SCI 23 Managerial and Engineering Economics 1
EL E 14 Electrical Engineering 1
EL E 32 Electrical Engineering 2

b) Non Credit Courses
M E 200 Introduction to Mechanical Engineering 1
M E 300 Introduction to Mechanical Engineering 2
M E 400 Introduction to Mechanical Engineering 3

B) Elective Courses

a) General Studies Electives
Students entering the program will take five 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 five option areas available from within the department of Mechanical Engineering are given below:

a) Fluid Mechanics and Thermodynamics Option;
M E 452 Energy Transfer in Buildings
M E 456 Heat Transfer 2
M E 459 Energy Conversion
M E 463 Tribology 1
M E 557 Combustion 1
M E 563 Turbomachines
M E 565 Gas Dynamics
M E 566 Fluid Mechanics 3
M E 568 Noise Analysis and Control
M E 569 Fluid Mechanics-Design Topics

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

c) Machine Design and Solid Mechanics Option
M E 423 Mechanical Design 2
M E 435 Industrial Metallurgy
M E 463 Tribology 1
M E 524 Advanced Dynamics and Stress Analysis in Design
M E 525 Mechanical Vibrations in Machines
M 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 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 A - The Mechanical Engineering Undergraduate Program for Students Entering 1A on or after Fall 1982

<table>
<thead>
<tr>
<th>Term</th>
<th>Courses</th>
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<tbody>
<tr>
<td>2B (S, F)</td>
<td>M E 203</td>
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</table>

*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.
Curriculum in 1982 - 83

2A (Fall 1982, Winter 1983)
- ME 201
- ME 202 (M SCI 21)
- ME 212
- ME 215
- ME 219
- EL E 14

2B (Spring 1982, Fall 1982)
- ME 203
- ME 204 (M E 304)
- ME 220
- ME 230
- ME 250
- M SCI 23

2B (Spring 1983 - See Table A)

3A (Spring 1982 - Winter 1983, Spring 1983)
- ME 305
- ME 321
- ME 340
- ME 351
- ME 354
- 1 Non-technical Elective

3B (Fall 1982, Winter 1983)
- ME 322
- ME 353
- ME 360
- ME 362
- EL E 32
- 1 Non-technical Elective

4A and 4B - see Table A

Systems Design Engineering

Introduction
Effective solutions to problems involving both society and technology must be based on a broad systems point-of-view. Not only must the overall technical factors of these problems be carefully considered, but the economic, social, human and political parameters must be given equally careful attention. When large scale problems are under study, few people can be knowledgeable in the complete span of factors and parameters which must be considered. For these cases, solutions must be arrived at by interdisciplinary teams where each member contributes his or her own special expertise. In order to work effectively on this team, each member must 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, 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. 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 for solving the problems of complex systems. Moreover, these tools are becoming more and more sophisticated. Thus, the average student in Systems Design is expected to work at least 50 hours per week as he or she increases in awareness of the theories of human communication, makes progress in the areas of Systems Theory, Human Systems Engineering, and Socio-Economic Systems, and absorbs the implications of the tremendous growth of electronic computing systems.

Further information is available from:

Professor M. E. Jernigan  
Associate Chairman for Undergraduate Studies  
Department of Systems Design  
University of Waterloo  
Waterloo, Ontario, N2L 3G1  
(519) 885-1211 Ext. 2897

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

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

Employment Opportunities

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

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

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

Undergraduate Curriculum in Systems Design

The Undergraduate program in Systems Design Engineering encompasses a study of the basic skills required for systems analysis, simulation, optimization and design. In particular the first three years of the program are intended to provide each student with a broad background and capability in the areas of:

- applied mathematics
- engineering sciences and systems theory
- socio-economic systems
- human systems engineering
- computer systems and applications

Throughout these three years the student’s ability to grasp real engineering problems is enhanced by courses in Systems Design Methodology and Systems Behaviour followed by a series of challenging problem solving experiences in the Systems Design Workshop. It is here that a focus is given to the whole curriculum and the student learns to apply his lecture material, to develop skills in solving problems that cut across the traditional disciplines, and to develop design, planning and organizational abilities.

These first three years of the program are followed by one year in which the problem solving capabilities of the student are applied with emphasis in one particular area of technology. This provides the required background for a future year of advanced study to the MASc degree, or for a rewarding career in industry or government with the Bachelor’s degree (BASc).

System Design Undergraduate Core Curriculum

Listing by Terms

1A (Fall Term)
SY DE 101Tutorial
SY DE 111Calculus 1
SY DE 113Linear Algebra
SY DE 121Digital Computation
SY DE 131Engineering Economics
SY DE 161Introduction to Systems Design 1
SY DE 181Statics

1B (Spring Term)
SY DE 102Tutorial
SY DE 112Calculus 2
SY DE 114Theory and Application of Probability
SY DE 122: Introduction to Computer Systems
SY DE 142: Introduction to Ergonomics
SY DE 162: Introduction to Systems Design 2
SY DE 182: Dynamics

2A (Winter Term)
SY DE 201: Tutorial
SY DE 211: Applicable Mathematics for Systems Design 1
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 252: Physical Systems 1
SY DE 262: Systems Design Workshop 2
SY DE 282: Thermodynamics
SY DE 284: Fluid Mechanics
SY DE 292: Systems Design Laboratory 1
1 General Studies Program elective.

3A (Spring Term)
SY DE 301: Tutorial
SY DE 311: Systems Operations 1
SY DE 361: Systems Design Workshop 3
SY DE 381: Materials Engineering
SY DE 383: Introduction to Chemical Systems
SY DE 391: Systems Design Laboratory 2
1 Technical elective
1 General Studies Program elective.

3B (Winter Term)
SY DE 302: Tutorial
SY DE 322: Computer Simulation of Systems
SY DE 354: Introduction to Linear Control Systems
SY DE 362: Systems Design Workshop 4
SY DE 392: Systems Design Laboratory 3
2 Technical electives

4A (Fall Term)
SY DE 401: Tutorial
SY DE 421: Computer-Aided Design 1
SY DE 461: Systems Design Workshop 5
3 Technical electives
1 General Studies Program elective.

4B (Winter Term)
SY DE 402: Tutorial
SY DE 458: Large Scale Engineering Systems
SY DE 462: Systems Design Workshop 6
2 Technical electives
2 General Studies Program electives.

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
6 mandatory courses
1 technical elective course
1 General Studies Program elective

3B
5 mandatory courses
2 technical elective courses

4A
3 mandatory courses
3 technical elective courses
1 General Studies Program elective

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

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 super-
vision, to provide the knowledge and expertise required to define and solve problems arising at the interface between man and machine (artifact), or man and environment.

Problem areas chosen might include:
- design for extreme human environments
- design where anthropometric aspects are dominant
- design of instrumentation for human operators
- design problems associated with occupational health and safety in industry, transportation, etc.
- medical design problems involving engineering technology
- design of consumer products used in recreation and normal living
- design involving human engineering
- human aspects of engineering ecology
- design of human "micro-environments"
- problems of ergonomics and industrial hygiene

Socio-Economic Systems Option
When planning, designing and operating a large-scale engineering project the various interactions between the project and its social environment must be considered. For example, the James Bay hydroelectric project in Northern Quebec has had important economic, social and political consequences upon the population affected by the undertaking. The purpose of the socio-economic option is to equip the students with a specific set of tools and also a general philosophical approach for tackling socio-economic problems that Systems Design Engineers are often confronted with.

To familiarize the students as quickly as possible with socio-economics, an engineering economics course is given during the first term of classes. Fundamental mathematics courses such as probability and statistics are taken during the first two years and they form the foundation stones for socio-economic courses which are available in later terms. Techniques are taught for analyzing socio-economic situations by use of operations research, optimization, game theory, time series analysis and the social sciences. By selecting additional elective courses, students may pursue further topics in the social sciences and operations research. Furthermore, illustrative application problems are presented within each course so that the students may fully appreciate how these methods work in practice. Additional experience in studying the socio-economic aspects of engineering design may be obtained by doing workshop projects in this area.

Physical and Computer Systems Option
In this option the student is provided an opportunity to study in some depth a unified approach of Physical Systems Theory to mathematical modelling, analysis, simulation and design of a variety of engineering systems such as electrical, mechanical, hydraulic, structural systems and their combinations. Essential concepts and tools from linear systems theory, transform methods, frequency and time domain modelling and analysis, control systems, graph theory and computer simulation techniques are given in the earlier years followed by technical electives dealing with such topics as large-scale systems, algorithms for computer-aided-analysis and design in the final years. Students may also take technical courses in specific areas in other departments.

The Department recognizes the tremendous growth and impact of electronic computing systems on technology and society. For those students concerned with the application of computers this option provides several courses and opportunities to learn about computer hardware (structure of digital and analog computers, microcomputers and micro-processors), computer software (algorithmic, simulation and problem-oriented software), and principles of computer-aided design.

Option in Management Sciences
The Management Sciences 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:

<table>
<thead>
<tr>
<th>Academic Term</th>
<th>Option in Management Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A F</td>
<td>Experimental Design</td>
</tr>
<tr>
<td>1B S</td>
<td>Managerial &amp; Engineering</td>
</tr>
<tr>
<td>2A W</td>
<td>Economics 2</td>
</tr>
<tr>
<td>2B F</td>
<td>other Technical elective</td>
</tr>
<tr>
<td>3A S</td>
<td>Systems</td>
</tr>
<tr>
<td>3B W</td>
<td>Operations 2</td>
</tr>
<tr>
<td></td>
<td>other technical elective</td>
</tr>
<tr>
<td>4A F</td>
<td>Organizational Behaviour 1</td>
</tr>
<tr>
<td></td>
<td>other technical elective</td>
</tr>
<tr>
<td>4B W</td>
<td>Organizational Behaviour 2</td>
</tr>
<tr>
<td></td>
<td>other technical elective</td>
</tr>
</tbody>
</table>

In order to successfully complete this option, students must obtain at least 50% in each of the option courses and an overall average in them of at least 60%.
Option in Computer Engineering
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.

<table>
<thead>
<tr>
<th>Academic Term</th>
<th>Option in Computer Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>F</td>
</tr>
<tr>
<td>1B</td>
<td>S</td>
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<tr>
<td>2A</td>
<td>W</td>
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<tr>
<td>2B</td>
<td>F</td>
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<tr>
<td>3A</td>
<td>S</td>
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<tr>
<td>3D</td>
<td>W</td>
</tr>
<tr>
<td>4A</td>
<td>F</td>
</tr>
<tr>
<td>4B</td>
<td>W</td>
</tr>
</tbody>
</table>

- CS 240 Programming Principles and Languages
- SY DE 352 Algorithms for Computer-Aided Systems Analysis
- EL E 352 Electronic Circuits
- EL E 427 Digital Hardware Engineering
- CS 340 Data Structures
- 1 other Technical elective
- CS 454 Principles of Operating Systems
- 1 other Technical elective

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.
Faculty of Environmental Studies
Faculty of Environmental Studies

Introduction
The Faculty of Environmental Studies is equivalent in organization to any regular faculty, such as Arts, Science, and Engineering but is unique in its outlook. It concentrates on using diverse sources of knowledge from different disciplines needed to understand one particular problem area: man and his environment. Since many of the issues are contemporary, the faculty has attempted to utilize the best of traditional teaching approaches combined with newer and innovative techniques derived from a broad range of disciplines.

The Faculty of Environmental Studies has within it two types of academic groups - the professional Schools, and the academic Departments.

Schools and Departments
- School of Architecture
- Department of Geography
- Department of Man-Environment Studies
- School of Urban and Regional Planning

The professional schools are specialized, vocation oriented but they are not narrow. Through the Faculty of Environmental Studies, they are integrated into the mainstream of the University's concern with man and his environment, through the two main thrusts of research and practical applications.

The academic Departments represent a grouping of studies which have the interaction of man with his environment as their core. Both the Man-Environment Studies and Geography Departments are interdisciplinary in nature and interact with many fields of study and research from the Arts, Science, Social Sciences, Mathematics, and Engineering.

One of the innovative aspects of the Faculty of Environmental Studies is the high degree of interaction among its four units. Faculty members in each School or Department participate in the 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.

Environmental Studies
Faculty of Environmental Studies

Degrees

The Faculty of Environmental Studies offers two undergraduate degrees: a Bachelor of Environmental Studies (BES), and a Bachelor of Architecture (BArch). At the graduate level a Master of Arts (MA) and a PhD Degree may be obtained in both Geography, and Regional Planning and Resource Development. In addition, the Geography and Man-Environment Studies Departments offer joint honours 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: Major in 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 one, depending upon the student's academic record and program. Ease of transferring between the units of the Faculty of Environmental Studies varies. Transfer to the School of Urban and Regional Planning is not normally permitted above Year 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, Gold Medal, monetary prizes. Further information on this can be obtained from the office of the Associate Dean, Undergraduate Affairs.
Admission

The admission requirements and procedures for all 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 for admission to programs in Environmental Studies; Grade 13 Geography is similarly recommended for those applying to the Geography Department. For applicants to the School of Architecture, Functions and Relations, Calculus, Physics and English (Francais) 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, page 18.

A maximum of eight 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 system” in which student progress is measured by courses successfully completed rather than by years. Students who passed fewer than five courses will be considered Year 1 students; those who have passed at least five courses but fewer than ten will be considered Year 2 students; those with at least ten but fewer than sixteen, Year 3, and those with sixteen or more, Year 4.

1. Final Examinations

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

b) Failure to write an examination is ordinarily considered a failure to pass. A student who defaults a final examination, except for a properly certified reason, shall have no make-up examination privileges and may be required to repeat the work in class. If a student fails to write, for medical reasons, a Doctor’s certificate covering the precise period of absence must be filed in the Registrar’s Office within one week of the set examination date.

c) A student will be eligible for make-up examinations.
only when failure to pass is attributable to extraordinary circumstances. In addition, students:

1. must have attended a reasonable number of lectures in the course in which they propose to write, and must have satisfied all term work requirements;
2. must have secured the permission of the professor concerned.

2. Appeals
Appeals against departments/schools decisions are handled at three progressive levels:

1. Disputes between students and instructors should be fully discussed at that level,
2. Problems not resolved to either party's satisfaction should be referred to the department/school Undergraduate Affairs Committee,
3. Lack of mutual satisfaction at that level would involve the dispute being forwarded to the Associate Dean, Undergraduate 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 have 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 courses will be allowed 4 months from the completion date of the course to clear such standings. Any such standings not cleared within this period will automatically be converted to a grade of F-. In the School of Urban and Regional Planning, this grade cannot be changed without a student appeal to the School.
d) To be considered in good standing in the Honours programs, a student must maintain a cumulative overall average of at least B- (70.0) and an average in the chosen field of specialization as specified in the regulations of the relevant department/school. If an Honours 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 C- (60.0) as well as an average of at least C (65) in Geography. If at any time a student's average falls below C- (60.0) or the average in Geography below C (65), the individual may be granted conditional status for one year, during which period he/she must make reasonable progress toward obtaining good standing or he/she will be asked to withdraw. A student whose cumulative overall average falls below D (55) 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 in each academic year enrol in at least five courses, but in not more than six. A regular student in the Honours programs must each year enrol in at least six courses (unless otherwise specified in a departmental Honours program), but in not more than seven. 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 two course credits or the equivalent over the academic year or who, in the opinion of the School or Departmental Promotions Committee, is deemed not to be profiting from University studies may be required to withdraw regardless of his/her cumulative average.
h) If a student receives a "Required to Withdraw" decision, he/she must withdraw from that program for a year; that student is entitled to apply to any
5. Additional Regulations, School of Architecture
Examinations and Promotions
In order to proceed unconditionally from one term to the next in the BES and BArch programs, the student must satisfy each of the following requirements:

a) Maintain a minimum cumulative overall average of C- (60.0) calculated at the end of each term of study.
b) Pass the studio course.
c) Not fail** more than one half course or equivalent (excluding studio) in any single term.

*A term of study refers to a particular four month (13 week) period of registration including the 1N Fall and Winter terms and all 'A' and 'B' terms.

**A minimum passing grade in any course is D- (50.0).

While the School reserves the right to make exceptional academic decisions for students who require exceptional consideration, the Promotions Committee will be guided by the following:

- Students who satisfy at least two of the above requirements in a given term may be permitted to continue conditionally in the program as outlined in notes 1, 2, 3, 4 and 5.
- Promotions decisions for students who satisfy only one of these requirements in any given term will be made on an individual basis by the Promotions Committee.
- Students who satisfy one or none of the above requirements in a given term will normally receive the decision “Required to Withdraw”.

Note 1
Students who fail to maintain the minimum cumulative overall average requirement but who satisfy the other two requirements will receive the academic decision “May not Proceed”. At the discretion of the Promotions Committee such students must raise their cumulative average to a minimum of C- (60.0) by repeating the term or by repeating courses which are detrimental to their average and/or by taking approved elective courses before enrolling in the next higher level core or studio courses. The minimum cumulative average must be attained within the next calendar year. Failing this, the student will be required to withdraw. Failure to maintain the minimum cumulative average of C- (60.0) by the end of the next higher level term will result in the academic decision “Required to Withdraw”.

Note 2
Students who fail a studio course (ARCH 192, 193, 292, 293, 392, 393, 492, 493, 592, 593) but who satisfy the other requirements will receive the academic decision “May not proceed”. Such students must repeat and pass the studio course. Failure to pass the studio in question on the second attempt will result in the academic decision “Required to Withdraw.” Students may not register in any higher level studio course or core courses until the failed studio course is passed. Credit will be retained for courses passed in a term in which a studio course is failed.

Note 3
Students who fail more than one half elective course or equivalent in any single term (but who pass studio and maintain the minimum cumulative overall average) will receive the academic decision “Proceed on probation”. Failed elective courses or their equivalents must be repeated and passed by the end of the next term of study (which includes the higher level studio and core course(s)). Should the student fail more than one half course or equivalent in the next term, the student will receive the academic decision “Required to Withdraw”.

Note 4
Students who fail two or more one term core courses or equivalent in any single term (but who pass studio and maintain the minimum cumulative overall average) will receive the academic decision “May not proceed”. The failed core courses or equivalent must be repeated and passed before the student may register in any higher level studio or core courses. Should the student fail two or more one term courses or equivalent in the next term, the student will receive the academic decision “Required to Withdraw”.

Note 5
Notwithstanding the provisions of Notes 1-4, students who have been granted conditional status in a previous term during the course of the BES (Pre-professional) program will be required to withdraw if at any subsequent time they fail to meet any one or more of the three basic requirements for unconditional promotion as stated in 3. a, b, c, above. Similarly, students who have been granted conditional status on one previous occasion during the course of the BArch program will be required to withdraw if at any subsequent time they fail to meet any one or more of the three basic requirements for unconditional promotion stated in 3. a, b, c, above.

Note 6
Normally students of the School are permitted to take only one more or one fewer half-courses than that prescribed for the particular year and term in which they are registered. Any further addition or reduction to the student's program must be approved by the Undergraduate Officer of the School of Architecture.

The following procedures have been set out for those students who have not met the above conditions.
Supplemental Examinations
A student failing any Architecture course with an F+ standing has supplemental examination privileges and may take such an examination as arranged in accordance with University policy.

Appeals
See Faculty procedures, p. 156.

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 freely add and drop term and year courses before and during the first two weeks of classes in the term in which the courses begin.
b) After the two week periods, students may add and drop courses only with the written permission (signatures) of the course instructor and of the appropriate undergraduate officer on the schedule.
c) All schedule changes at any time must be submitted to the designated department office.
d) After the first two weeks of classes but before November 1 (Fall), March 1 (Winter), and July 1 (Spring), students enrolled in more courses than their programs require may drop courses. This requires the signature of the appropriate undergraduate officer on the schedule.
e) Students may reduce their programs below the specified minimum only upon the recommendation of the undergraduate officer of the major department.

Environmental Studies
Examinations and Standings
Academic Programs

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

Correspondence Courses
Only in exceptional cases would correspondence courses be taken by a student during a term in which he or she was a full-time student.

Faculty Options
The Faculty of Environmental Studies offers two 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 transcript.

Environmental and Resources Management Option

1. Required Courses
ENV S 195A 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
PLAN 265 Planning Surveys and Analysis
PLAN 307 Social Survey Techniques
PLAN 319 Economic and Social Techniques for Regional Planning
GEOG 260 Introduction to Cartography and Analysis
GEOG 275 Introductory Air Photo Analysis and Remote Sensing
M ENV 250 Environmental Issues: Methods & Techniques

b) Content Courses
ENV S 358 Environmental Pollution and its Control
ENV S 401 Environmental Law
ENV S 417 Land Use History and Landscape Change 1
ENV S 418 Land Use History and Landscape Change 2
GEOG 102 Introduction to Physical Geography
GEOG 201 Some Basic Topics of Physical Geography
GEOG 300 Geomorphology and the Southern Ontario Environment
GEOG 315 Agricultural Geography
GEOG 408 Special Topics in Climatology and Natural Hazards

GEOG 410 Recreation Geography

GEOG 411 Resource Studies

GEOG 414 Resources Management Workshop

GEOG 461 Land Dereliction & Rehabilitation 1

PLAN 156 Introduction to Urban and Regional Planning Concepts

PLAN 256 Principles of Environmental Design

PLAN 370 Land Development Planning

M ENV 375E Land and Leisure: Concepts and Methods in Recreation Land Use

ARCH 223 Human Ecology

ARCH 244 History of Gardens of Europe and Western Asia

ARCH 245 Survey of Contemporary Architecture

c) Other substitute courses can be taken with permission of the co-ordinator or Associate Dean of Undergraduate Studies.

i) Students must take courses in the three categories outlined above.

ii) A minimum of ten half course credits must be completed and students must achieve an average of "B" in these courses.

d) Many students will normally be required to take the majority of these courses as core requirements, and are advised to take additional electives. It should also be noted that certain prerequisites will be necessary for the required courses listed above.

Regional Development Option

Required Courses (7 half-course credits)

PLAN 156 Introduction to Urban and Regional Planning Concepts

GEOG 101 Introduction to Human Geography

GEOG 202 Some Basic Topics of Economic and Urban Geography

GEOG 311 Regional Industrial Development

GEOG 350 Regional Urban Systems 1

PLAN 319 Economic and Social Techniques for Regional Planning

one of

PLAN 358* Regional Planning and Development

PLAN 222 Canadian Regional Issues

or

GEOG 322 Geographical Study of Canada

Elective Courses (3 half-course credits minimum)

GEOG 203 Some Basic Topics of Cultural and Regional Geography

GEOG 315 Agricultural Geography

GEOG 349 The City as a System 1

GEOG 352 The Rural-Urban Fringe of Canadian Cities

GEOG 450 Regional Urban Systems 2

GEOG 452 Problems of Rural Land Use

M ENV 320 Environmental Economics

M ENV 247 Urban Anthropology

M ENV 445 Technology Assessment and Policy Analysis

HIST 201X Canadian Urban History

PLAN 332 The Sociology of Regions

PLAN 333 The Sociology of Regional Planning

PLAN 360 Technology in Urban and Regional Planning

PLAN 430 Social Policy Planning

PLAN 456* Political and Administrative Processes in Urban and Regional Planning

SOC 242 Industrial Sociology

ECON 333 Inter-regional Economics

ECON 335 Economic Development

ECON 343 Urban Economics

*Available to Planning Students only.

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.

Ecology-Biology

ENV S 200 Field Ecology

ENV S 201 Introduction to Environmental and Planning Law

GEOG/

PLAN 357 Conservation and Resource Management

BIOL 111 Introductory Biology 1

BIOL 112 Introductory Biology 2

BIOL 250 Ecology

ENV S 401 Environmental Law

ENV S 417 Land Use History and Landscape Change 1

EN S 418 Land Use History and Landscape Change 2

Physical

GEOG 102 Physical Geography

GEOG 201 Physical Geography

GEOG 300 Geomorphology and the Southern Ontario Environment

GEOG 301 Climatology

GEOG 302 Geomorphology

GEOG 303 Water

M ENV 356 Canadian Non-Renewable Resources

GEOG 408 Hazards

GEOG 461/462 Land Dereliction and Rehabilitation

EARTH 121 Introductory Geology 1

EARTH 122 Introductory Geology 2
Human
(Economic, Social, Policy)
M ENV 357 Resource Use
M ENV 331 International Environment
GEOG 356 Resource Management
GEOG 410 Recreation
GEOG 411 Investment & Resources
M ENV 445 Technology and Policy
ENVS 310 Behavioural Studies
GEOG 414 Resource Management
M ENV 410 Environmental Assessment
ENVS 417 Land Use History and Landscape
Change 1
ENVS 418 Land Use History and Landscape
Change 2

In addition are some basic techniques - Surveying and mapping, cartography, statistical analysis, air photo interpretation, computer science, field methods, cost benefit (resources-economics).

Applied Environmental Methods
The Environmental Studies Methods Committee coordinates and develops courses, 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 copies are located in a research room, graphics lab, tutorial/lecture room and student work room. Computer access and associated consulting support is available to students.

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

Interested persons should contact any of the following committee members: R. Newkirk (Chairman), D. Dudycha, E. Farkas, L. Martin, D. McIntyre, L. Russwurm, 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 four 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.

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 four programs in the Faculty of the Environmental Studies.

School of Architecture
Nature of the Program
Architects decide how spaces within and about buildings shall be organized. It is they who determine the shape the total building will take and how it is to be built. They design at major scale with awareness of
the demands of society. They design in detail with attention to the needs and aspirations of individuals and groups. They show understanding of structural technique, construction detail and the sound use of materials. They determine the way in which the building shall be built and supervise the construction process.

Architecture is a vast spread of concerns about people and their surroundings, their history, cultures, resources, disciplines and contradictions. The School's primary concern is the development of design skills in architecture, and it stresses awareness of cultural background and existing environment.

The five-year 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 society it serves.

The five years of architectural studies are made up of: a pre-professional, 3 year Bachelor of Environmental Studies program leading to a 2 year professional program of study for the Bachelor of Architecture degree. Both programs are on the co-operative system which consists of alternating periods of academic study and practical work experience.

Degrees
The pre-professional architecture program comprises six academic terms of study and three four-month co-operative work terms leading to the degree, Bachelor of Environmental Studies (BES Pre-Professional Architecture). This degree, combined with a cumulative average of "C-" in design studio theme courses, indicates appropriate preparation for four subsequent academic terms of study and two co-operative work terms, each of four 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.

Non-Architecture Students
Students not enrolled in the School of Architecture may take any architectural course listed in the recommended core program 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 up knowledge and expertise in various aspects of building and architectural design:

1. The design studio, theories and methods, and practice of architectural design.
2. Studies of systems and measures including computer, physical and material sciences.
3. Cultural history in the human environment.
4. Environmental studies, including natural and human ecology.

See Recommended Core Program for course arrangement, page 162. See Chapter 16 for course descriptions.

Bachelor of Architecture Program
The Bachelor of Architecture program increases the emphasis on architectural design and professional aspects of architecture. There are opportunities for students to develop their own areas of interest, and the final two terms of the program are normally devoted to a design thesis.

Note
Students are expected to defray costs of materials in connection with studio projects.

See Recommended Core Program for course arrangement. See Chapter 16 for course descriptions.
# 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 175 Mathematics</td>
<td>ENV S 195A Introduction to Environmental Studies</td>
<td>ARCH 142 Iconography 1 (1 credit)</td>
<td>ARCH 192 Design Fundamentals (1-1½ credits)</td>
</tr>
<tr>
<td>Fall</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sept-Dec</td>
<td>ARCH 172 Building Science</td>
<td></td>
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<tr>
<td>TOTAL 4 cr.</td>
<td></td>
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</tr>
<tr>
<td>1B</td>
<td>CS 116 Introduction to Computing</td>
<td></td>
<td>ARCH 143 Iconography 2 (1 credit)</td>
<td>ARCH 193 Design Fundamentals and Studio (1-1½ credits)</td>
</tr>
<tr>
<td>Winter</td>
<td></td>
<td></td>
<td></td>
<td>ARCH 194 or FE</td>
</tr>
<tr>
<td>Jan-Apr</td>
<td>ARCH 163 Statics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL 4 cr.</td>
<td></td>
<td></td>
<td></td>
<td></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>
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<td></td>
</tr>
<tr>
<td>Spring</td>
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<tr>
<td>May-Aug</td>
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<td></td>
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</tr>
<tr>
<td>2-A</td>
<td>ARCH 212* Computer Science</td>
<td>ARCH 224 An Introduction to Landscape Design</td>
<td>ARCH 246 Foundations of Europe (1 credit)</td>
<td>ARCH 292 Design Concepts and Studio (1-1½ credits)</td>
</tr>
<tr>
<td>Fall</td>
<td></td>
<td>ARCH 272 Simulation or FE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sept-Dec</td>
<td>ARCH 262 Surveying and Soils</td>
<td></td>
<td></td>
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<tr>
<td>TOTAL 4 cr.</td>
<td>Strength of Materials</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, etc.</td>
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</tr>
<tr>
<td>Winter</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Jan-Apr</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2-B</td>
<td>ARCH 213* Computer Generated Human Ecology Design or FE</td>
<td>ARCH 247 Renaissance to Revolution (1 credit)</td>
<td>ARCH 293 Design Concepts and Studio (1-1½ credits)</td>
<td></td>
</tr>
<tr>
<td>Spring</td>
<td></td>
<td>ARCH 263</td>
<td></td>
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</tr>
<tr>
<td>May-Aug</td>
<td>Theory of Structures 1</td>
<td></td>
<td></td>
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<tr>
<td>TOTAL 4 cr.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Co-op Work Term 2</td>
<td>The type of experience a student may obtain in this term includes assisting in design presentation and model buildings; assisting in preparation and corrections to site plans, floor plans, and elevations, and on-site measurements; etc.</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 Mechanical Systems 1</td>
<td>ARCH 346* Romanticism and 20th Century or FE</td>
<td>ARCH 392 Design Concepts and Studio (2 credits)</td>
<td></td>
</tr>
<tr>
<td>Winter</td>
<td>F.E.*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jan-Apr</td>
<td>ARCH 362 Structural Synthesis 1</td>
<td></td>
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</tr>
<tr>
<td>TOTAL 3½ cr.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Co-op Work Term 3</td>
<td>The type of experience a student may obtain in this term includes design research; detailed design developments, design presentation; assisting in preparation of site plans, floor plans elevations, building cross-sections; etc.</td>
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<tr>
<td>Spring</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>May-Aug</td>
<td></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>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>ARCH 313*</td>
<td>Computer Generated</td>
</tr>
<tr>
<td></td>
<td>ARCH 373</td>
<td>Design or FE</td>
</tr>
<tr>
<td></td>
<td>ARCH 393</td>
<td>Design Concepts and Studio</td>
</tr>
<tr>
<td></td>
<td>ARCH 363</td>
<td>Mech. Systems 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total 3% cr. Structural Synthesis 2</td>
</tr>
</tbody>
</table>

TOTAL 23 credits

### Program for the Degree of Bachelor of Architecture

<table>
<thead>
<tr>
<th>Year/Term</th>
<th>Systems and Measures</th>
<th>Ecology</th>
<th>Design</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theme Area</td>
<td>Theme Area</td>
<td>Theme Area</td>
</tr>
<tr>
<td>Co-op Work Terms</td>
<td>This period of 8 months may serve many objectives. A student after the first degree program has time in which he may travel and decide about his future goals before returning to the School for the second degree program.</td>
<td>design research; in assisting in the development of conceptual designs and schematics, preparation of site plans and details, floor plans, elevations, cross-sections and standard details; in assisting the site architect or construction superintendent; etc.</td>
<td></td>
</tr>
<tr>
<td>4&amp;5 Winter and Spring</td>
<td>During that time a student may continue the Co-op terms wherein he obtains experience in</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jan-Aug</td>
<td>Co-op terms wherein he obtains experience in</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TOTAL 3½ credits.

<table>
<thead>
<tr>
<th>Year/Term</th>
<th>Systems and Measures</th>
<th>Ecology</th>
<th>Design</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theme Area</td>
<td>Theme Area</td>
<td>Theme Area</td>
</tr>
<tr>
<td>4-A Fall</td>
<td>ARCH 452</td>
<td>Design Studio</td>
<td>(2 credits)</td>
</tr>
<tr>
<td></td>
<td>Specifications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sept-Dec</td>
<td>Total 3½ credits.</td>
<td></td>
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<table>
<thead>
<tr>
<th>Year/Term</th>
<th>Systems and Measures</th>
<th>Ecology</th>
<th>Design</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theme Area</td>
<td>Theme Area</td>
<td>Theme Area</td>
</tr>
<tr>
<td>4-B Winter</td>
<td>ARCH 455*</td>
<td>ARCH 423**</td>
<td>ARCH 493</td>
</tr>
<tr>
<td></td>
<td>Management and</td>
<td>Urban Planning</td>
<td>Design Studio</td>
</tr>
<tr>
<td></td>
<td>Estimating or FE</td>
<td>or TE</td>
<td>(2 credits)</td>
</tr>
<tr>
<td>Jan-Apr</td>
<td>Total 3½ credits.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year/Term</th>
<th>Systems and Measures</th>
<th>Ecology</th>
<th>Design</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theme Area</td>
<td>Theme Area</td>
<td>Theme Area</td>
</tr>
<tr>
<td>Co-op Work Terms</td>
<td>This is the last Co-op term of 8 months before the final year of study. On the basis of previous experience in a variety of jobs, a student is capable of handling somewhat advanced work in professional offices such as: design research; preparation of design schematics and small</td>
<td>project design; preparation of site plans and details; development of special details; co-ordination of consultants work and architect on small projects, and assisting construction superintendent on large projects; etc.</td>
<td></td>
</tr>
<tr>
<td>6 &amp; 7 Spring and Fall</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>May-Dec</td>
<td></td>
<td></td>
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</tbody>
</table>

TOTAL 3½ cr.

<table>
<thead>
<tr>
<th>Year/Term</th>
<th>Systems and Measures</th>
<th>Ecology</th>
<th>Design</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theme Area</td>
<td>Theme Area</td>
<td>Theme Area</td>
</tr>
<tr>
<td>5-A Winter</td>
<td>ARCH 554*</td>
<td>ARCH 592</td>
<td>Design Studio</td>
</tr>
<tr>
<td></td>
<td>Development and Financing</td>
<td></td>
<td>(3 credits)</td>
</tr>
<tr>
<td>Jan-Apr</td>
<td>or FE</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total 3½ cr.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year/Term</th>
<th>Systems and Measures</th>
<th>Ecology</th>
<th>Design</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theme Area</td>
<td>Theme Area</td>
<td>Theme Area</td>
</tr>
<tr>
<td>5-B Spring</td>
<td>ARCH 555</td>
<td>ARCH 593</td>
<td>Design Studio</td>
</tr>
<tr>
<td></td>
<td>Architectural Practice</td>
<td></td>
<td>(3 credits)</td>
</tr>
<tr>
<td>May-Aug</td>
<td>Total 3½ credits.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TOTAL 14 credits.

* The course may be replaced by a 'free elective'.
** The course may be replaced by a 'theme elective'.

FE (Free Elective) constitutes any course in any Faculty at the University of Waterloo.
TE (Theme Elective) constitutes a recommended course in the Faculty of Environmental Studies.

NOTE Department approval of electives is mandatory.
Co-operative Programs
The Bachelor of Environmental Studies program includes six terms of study, three four-month co-operative work terms and one "off-term". The subsequent Bachelor of Architecture program consists of four terms of academic study and two co-operative work terms, of eight months each. The work terms must be approved by the Department of Coordination and Placement.

Note
The "off-term" in the Bachelor of Environment Studies pre-professional program follows the first two terms of study (from September to April) in Year 1. Students may use the "off-term" as a vacation period or they may seek temporary employment. Any employment arrangements made for the "off-term" are the student's own responsibility.

The terms are arranged as indicated on the 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 judgement to assume responsibility for any medium-sized building project.

English Language Proficiency Program
The Faculty of Environmental Studies expect 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.

Environmental Studies
Architecture
Geography

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) program in Honours Geography provides students with almost unlimited freedom to choose supporting electives from across the whole University. Thus, in consultation with professors, students will be able to have a tailor-made 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 may be designated on a student's transcript; these are specified on p. 169. The Department has Joint Honours programs with a number of other departments on campus (see page 171).

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

Although the Honours program is broad in scope, six major aspects of the discipline have been formalized into Options. The Honours student may take one of these Options, as specified on p. 169 though this is not in any way required. Further concentration is possible by careful selection of courses from related fields in other parts of the University. However, should students wish to design their programs along other lines of specialization, or to pursue non-specialized programs the Department will be pleased to assist.

The Department of Geography also offers an Honours Co-operative program. Students are admitted to the Co-operative program 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.
Entry into the Honours Co-operative program requires specific courses in the first year (see page 167). 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 four of these must be evaluated as successful for the Co-op degree. Co-op Geography students are required to specialize in one of the theme areas outlined for the Co-op program (p. 169). 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.

The General Geography programs offer a fundamental education in Geography balanced with a variety of elective courses to complement the student’s area of interest. These programs are designed for students seeking some specialization in Geography while maintaining flexibility in their educational pursuits outside the discipline. The Department of Geography offers General programs at both the three and four-year level.

A program of correspondence courses is being developed which will allow a student to complete a General BES or BA in Geography. Upon successful completion, students taking the Geography 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 is concentrated on a specific subfield of Geography. Areas of research specialization include applied physical geography, air photo interpretation and remote sensing, urban and economic geography, agricultural geography and rural development, regional planning and development, resources management, and Europe.

### Bachelor of Environmental Studies

#### Undergraduate Geography Courses

**Note 1**
All courses are open to any student from any Faculty or School of this University whenever prerequisites are met and space permits.

**Note 2**
The division suffix R designates courses given through Renison College.

**Note 3**
GEOG 101 and GEOG 102 are given in both fall and winter terms. It is immaterial which of these courses is taken first as neither is sequential to the other.

**Note 4**
Courses designated “Environmental Studies” (p. 308) are included with Geography courses in the calculation of the major average.

**Note 5**
Most term courses with a laboratory component of 2 hours or more are given a credit weight of 0.75.

### BACHELOR OF ENVIRONMENTAL STUDIES

#### GENERAL GEOGRAPHY

##### A) Three Year Program

**Year 1**
GEOG 101 Introduction to Human Geography
GEOG 102 Introduction to Physical Geography
GEOG 110 Introduction to the Field of Geography
GEOG 125R Introduction to the Third World
GEOG 126R Development in the Third World
GEOG 127 Regional Problems of Europe
and additional credits.

**Year 2**
ENV S 195A Introduction to Environmental Studies
ENV S 195B Introduction to Environmental Problems
GEOG 125R Introduction to the Third World
GEOG 126R Development in the Third World
GEOG 127 Regional Problems of Europe
and additional credits.

**Year 3**
ENVS 200 Field Ecology
GEOG 201 Some Basic Topics of Physical Geography
GEOG 202 Some Basic Topics of Economic and Urban Geography
GEOG 203 Some Basic Topics of Cultural and Regional Geography
GEOG 204 Soviet Union
GEOG 205 Africa
GEOG 220 World Regional Geography
GEOG 221 The United States
and additional credits so that a student should have completed by the end of the second year 77 credits.
Environmental Studies
Geography

Notes on General Program (3 Year and 4 Year)

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

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

Note 3
Students must take a minimum of four course credits in Faculties other than the Faculty of Environmental Studies.

Note 4
Students must maintain an overall average of C- (60.0) with a major average of C (65.0).

Note 5
Students in the four year program may take Minors and Options (as outlined for Environmental Studies, p. 158 and for Geography, p. 169) in a manner analogous to Honours students.

HONOURS GEOGRAPHY
A) Regular Program

Year 1
GEOG 101 Introduction to Human Geography
GEOG 102 Introduction to Physical Geography
GEOG 110 Introduction to the Field of Geography
and one but not more than two of:
ENV S 195A Introduction to Environmental Studies
or:
ENV S 195B Introduction to Environmental Problems
GEOG 125R Introduction to the Third World
GEOG 126R Development in the Third World
GEOG 127 Regional Problems of Europe
and additional credits.

Year 2
ENV S 200 Field Ecology
GEOG 201 Some Basic Topics of Physical Geography
GEOG 202 Some Basic Topics of Economic and Urban Geography
one of:
GEOG 203 Some Basic Topics of Cultural and Regional Geography
GEOG 204 Soviet Union
GEOG 205 Africa
GEOG 220 World Regional Geography
GEOG 221 The United States
one of:
GEOG 260 Introduction to Cartography and Map Analysis
GEOG 275 Introductory Air Photo Analysis and Remote Sensing
ENV S 271 Introduction to Quantitative Research Methods
and additional credits so that a student should have completed by the end of second year 11 credits.

Years 3 and 4
GEOG 381 The Nature of Geography
one of:
GEOG 260 Introduction to Cartography and Map Analysis
GEOG 275 Introductory Air Photo Analysis and Remote Sensing
ENV S 271 Introduction to Quantitative Research Methods
and two full credits in Geography at the 300 level or above.
Additional credits so that a student will have completed at least 21 credits.
Environmental Studies
Geography

Year 2
ENV S 200 Field Ecology
GEOG 201 Some Basic Topics of Physical Geography
GEOG 202 Some Basic Topics of Economic and Urban Geography
two of:
GEOG 260 Introduction to Cartography and Map Analysis
GEOG 275 Introductory Air Photo Analysis and Remote Sensing
ENV S 271 Introduction to Quantitative Research Methods
and one of:
GEOG 203 Some Basic Topics of Cultural and Regional Geography
GEOG 204 Soviet Union
GEOG 205 Africa
GEOG 220 World Regional Geography
GEOG 221 The United States
Electives: see below.

Year 3
GEOG 381 The Nature of Geography
GEOG 390 Senior Honours Research Essay Proposal
GEOG 391 Field Research
one of:
GEOG 260 Introduction to Cartography and Map Analysis
GEOG 275 Introductory Air Photo Analysis and Remote Sensing
ENV S 271 Introduction to Quantitative Research Methods
and one of:
GEOG 316 Multivariate Statistics
GEOG 317 Nonparametric Statistics
GEOG 318 Spatial Analysis
Electives: see below.

Year 4
GEOG 490A and B Senior Honours Research Essay
Electives: see below.

B) Co-operative Program

Year 1
GEOG 101 Introduction to Human Geography
GEOG 102 Introduction to Physical Geography
GEOG 110 Introduction to the Field of Geography
PLAN 156 Introduction to Urban and Regional Planning Concepts
and one but not more than two of:
GEOG 125R Introduction to the Third World
GEOG 126R Development in the Third World
GEOG 127 Regional Problems of Europe
ENV S 195A Introduction to Environmental Studies or:
ENV S 195B Introduction to Environmental Problems and two of:
GEOG 260 Introduction to Cartography and Map Analysis
GEOG 275 Introductory Air Photo Analysis and Remote Sensing
ENV S 271 Introduction to Quantitative Research Methods

Theme Courses
One credit in areas outside the Faculty of Environmental Studies, e.g. Business, Economics, Languages, Earth Sciences, Biology. Note that in Year 2 students must identify a continuing theme (see note 12 below).

Electives:
MATH 105 Math for Environmental Studies (It is recommended, though not required, that students who have no Grade 13 Math take this course as a Year 1 elective.) See also below.

Year 2
Fall Term 2A Core Courses
ENV S 200 Field Ecology
one of:
GEOG 260 Introduction to Cartography and Map Analysis
GEOG 275 Introductory Air Photo Analysis and Remote Sensing
ENV S 271 Introduction to Quantitative Research Methods

Theme Courses
See Note 12

Electives: see below

Winter Term
Work Term 1

Spring Term 2B Core Courses
GEOG 201 Some Basic Topics of Physical Geography
GEOG 202 Some Basic Topics of Economic and Urban Geography
ENGL 210 Report Writing
one of:
GEOG 203 Some Basic Topics of Cultural and Regional Geography
GEOG 204 Soviet Union
GEOG 205 Africa
GEOG 220 World Regional Geography
GEOG 221 The United States
one of:
GEOG 316  Multivariate Statistics
GEOG 317  Nonparametric Statistics
GEOG 318  Spatial Analysis

Theme Courses
See Note 12.

Electives: see below.

Fall Term
Work Term 2

Year 3
Winter Term 3A Core Courses
GEOG 381  The Nature of Geography
ENV S 272  Computer Programming in Environmental Studies

Theme Courses
See Note 12.

Electives: see below.

Spring Term
Work Term 3

Fall Term 3B Core Course
GEOG 390  Senior Honour Research Essay Proposal

Theme Courses
See Note 12.

Electives: see below.

Year 4
Winter Term
Work Term 4

Spring Term 4A Core Course
GEOG 490A  Senior Honours Research Essay

Theme Courses
See Note 12.

Electives: see below.

Fall Term
Work Term 5

Winter Term 4B Core Course
GEOG 490B  Senior Honours Research Essay

Theme Courses
See Note 12.

Electives: see below.

Electives
Such additional credits as are necessary to ensure that by the time of graduation a student has a minimum of 24 credits.

Environmental Studies
Geography

Notes on Honours Program (Regular and Co-op)

Note 1
Twenty-four full credits is the minimum requirement for the degree Bachelor of Environmental Studies (Honours Geography - Regular and Co-op).

Note 2
Students are required to take a minimum of eleven credits in Geography. Two of these credits may be courses designated as Environmental Studies (p. 308).

Note 3
Students must take a minimum of five credits in Faculties other than the Faculty of Environmental Studies.

Note 4
To enter Year 2 of the Honours Geography program, a student must achieve in Year 1 a minimum overall average of B- (70.0) and an average of B (75.0) in Geography and Environmental Studies courses. In subsequent years, a student must continue to achieve an overall average of B- (70.0) and an average of B (75.0) in Geography and Environmental Studies courses.

Note 5
For students wishing to specialize, the Department offers a series of Options as detailed below. Students meeting the requirements of an Option (which are additional to the core requirements identified above), will have that Option designated on their official university transcript.

Note 6
Since many departments doing graduate work in Geography demand proficiency in a foreign language, students intent on graduate work should consider taking at least one credit in a foreign language.

Note 7
Students intending to teach in Secondary Schools are advised to take at least two credits of Regional Geography.

Note 8
This program prepares students for graduate study in Geography or in Planning, for entry to Secondary School teaching, or for research positions in industry, commerce and government.

Note 9
All Geography students in the regular program are encouraged to take summer employment which will provide experience useful to a geographer. Where possible, the Environmental Studies Placement Office will provide information and assistance in securing
such summer employment. Co-op Geography students will gain appropriate employment experience as part of their degree requirements.

**Note 10**
For some courses, participating students may be expected to make a financial contribution to defray heavy equipment/travel costs, e.g. GEOG 301 (Field Research), which is mandatory for all third year Regular Honours students. Statements on fees, where required, will be found with the course description (p. 320).

**Note 11**
No more than one and one-half credits may be taken as reading courses in Geography.

**Note 12**
Co-op students are expected to focus on one or more of the Department's broad areas of specialization which are designated as themes for the Co-op program. There are five themes: resource management, economic geography, urban geography, applied physical geography, and techniques. Theme course selections are based on advanced courses offered in the Geography Department and throughout the University. Students must select one of the five themes as a continuing theme of specialization in their own program of study. Detailed outlines of theme course selections are provided by the Co-op Advisors at the end of Year 7. By graduation, a student must acquire six and one-half credits in theme courses beyond Year 1, of which three and one-half credits must be in the chosen continuing theme.

**HONOURS GEOGRAPHY OPTIONS**
The following Options represent recognized fields of specialization within the Honours program. Students may elect one option, which will be designated on their transcript upon satisfactory completion of the requirements.

All students must fulfill their regular requirements for the Honours degree and are responsible for meeting prerequisite courses. Students electing to graduate with a recognized Geography Option will be required to fill out a Geography Options Schedule at the time they file an Intent to Graduate. Inquiries about any of these Options programs should be directed to the office of the Undergraduate Officer.

**Applied Physical Geography Option**
EARTH 121 Introductory Geology 1
EARTH 122 Introductory Geology 2
BIOL 250 Ecology
GEOG 301 Climatology
GEOG 302 Geomorphical Processes
GEOG 303 Physical Basis and the Geography of Water
GEOG 375 Air Photo Interpretation

**Environmental Studies**
GEOG 376 Environmental Remote Sensing
GEOG/
PLAN 357 Conservation and Resource Management
GEOG 407 Field and Lab Techniques in Geomorphology
GEOG 451 Soils Geography

**Urban Geography Option**
PLAN 156 Introduction to Urban and Regional Planning Concepts
GEOG 311 Regional Industrial Development
GEOG 349 The City as a System
GEOG 350 Regional Urban Systems
GEOG 450 City and Regional Systems
3 of:
GEOG/
PLAN 307 Social Survey Techniques
GEOG/
PLAN 316 Multivariate Statistics
GEOG/
PLAN 317 Nonparametric Statistics
GEOG/
PLAN 318 Spatial Analysis
GEOG/
PLAN 319 Economic and Social Techniques for Regional Planning
2 of:
PLAN 370 Land Development Planning
ENV S 201 Introduction to Environmental and Planning Law
CIV E 543 Land Use Models

**Regional Geography Option**
Students are expected to take one course from the list below in their first year, and 2 courses in each subsequent year. A further 3 courses of selected electives must be selected in consultation with an advisor. These will normally represent either themes and techniques from within Geography relevant to the individual's particular interests, or related studies in disciplines other than geography. Students concentrating on Canada should consider doing the joint program Geography with Canadian Studies (see page 171).

**Applied Physical Geography Option**
EARTH 121 Introductory Geology 1
EARTH 122 Introductory Geology 2
BIOL 250 Ecology
GEOG 301 Climatology
GEOG 302 Geomorphical Processes
GEOG 303 Physical Basis and the Geography of Water
GEOG 375 Air Photo Interpretation

or:

GEOG 376 Environmental Remote Sensing
GEOG/
PLAN 357 Conservation and Resource Management
GEOG 407 Field and Lab Techniques in Geomorphology
GEOG 451 Soils Geography

**Urban Geography Option**
PLAN 156 Introduction to Urban and Regional Planning Concepts
GEOG 311 Regional Industrial Development
GEOG 349 The City as a System
GEOG 350 Regional Urban Systems
GEOG 450 City and Regional Systems
3 of:
GEOG/
PLAN 307 Social Survey Techniques
GEOG/
PLAN 316 Multivariate Statistics
GEOG/
PLAN 317 Nonparametric Statistics
GEOG/
PLAN 318 Spatial Analysis
GEOG/
PLAN 319 Economic and Social Techniques for Regional Planning
2 of:
PLAN 370 Land Development Planning
ENV S 201 Introduction to Environmental and Planning Law
CIV E 543 Land Use Models

**Regional Geography Option**
Students are expected to take one course from the list below in their first year, and 2 courses in each subsequent year. A further 3 courses of selected electives must be selected in consultation with an advisor. These will normally represent either themes and techniques from within Geography relevant to the individual's particular interests, or related studies in disciplines other than geography. Students concentrating on Canada should consider doing the joint program Geography with Canadian Studies (see page 171).
The regional courses will be selected from the following list:

- GEOG 127 Regional Problems of Europe
- GEOG 125R Introduction to the Third World
- GEOG 126R Development in the Third World
- GEOG 225R Urbanization in the Third World
- GEOG 226R Food and Agriculture, and Integrated Rural Development in the Third World
- GEOG 204 Soviet Union
- GEOG 205 Africa
- GEOG 220 World Regional Geography
- GEOG 221 The United States
- GEOG 322 Geographical Study of Canada
- GEOG 323 Comparative Regional Problems
- GEOG 325R Special Topics in Development of the Third World
- GEOG 341 Historical Geography of Canada 1
- GEOG 342 Historical Geography of Canada 2
- GEOG 421 Europe and the Mediterranean
- GEOG 422 Canada
- GEOG 423 Central and Eastern Europe
- GEOG 424 Soviet Union
- GEOG 425 Africa
- GEOG 430 Field Research in Regional Geography

Environmental and Resources Management Option

ENVS 195A Introduction to Environmental Studies
ENVS 195B Introduction to Environmental Problems
ENVS 401 Environmental Law
ENVS 444 Land Evaluation and Resources Management
MENV 320 Environmental Economics
GEOG 316 Multivariate Statistics
GEOG 317 Nonparametric Statistics
GEOG 356 Resources Management
GEOG/
PLAN 357 Conservation and Resources Management
GEOG 375 Air Photo Interpretation
GEOG 376 Environmental Remote Sensing

3 of:

- GEOG 358 Water Planning and Management: Strategies and Experiences
- GEOG 359 Geography of Energy
- GEOG 410 Recreation Geography
- GEOG 411 Resource Studies
- GEOG 414 Energy Resources Management
- GEOG 461 Land Dereliction and Rehabilitation 1

Environmental Studies
Geography

Urban and Regional Development Option

PLAN 156 Introduction to Urban and Regional Planning Concepts
GEOG 311 Regional Industrial Development
GEOG 315 Agricultural Geography
GEOG/
PLAN 319 Economic and Social Techniques for Regional Planning
PLAN 332 The Sociology of Regions
GEOG 350 Regional Urban Systems
PLAN 358 Regional Planning and Development
PLAN 370 Land Development Planning

2 of:

- GEOG/
PLAN 317 Nonparametric Statistics
GEOG/
PLAN 318 Spatial Analysis
GEOG/
PLAN 316 Multivariate Statistics

Geographical Techniques Option

ENVS 272 Computer Programming in Environmental Studies
GEOG 360 Preparation of Maps and Illustrations
GEOG 375 Air Photo Interpretation

GEOG 376 Environmental Remote Sensing

3 of:

- GEOG/
PLAN 307 Social Survey Techniques
GEOG/
PLAN 316 Multivariate Statistics
GEOG/
PLAN 317 Nonparametric Statistics
GEOG/
PLAN 318 Spatial Analysis
GEOG/
PLAN 319 Economic and Social Techniques for Regional Planning

2 of:

- GEOG 403 Advanced Cartography 1
GEOG 404 Advanced Cartography 2
GEOG 470 Applied Air Photo Interpretation
GEOG 471 Advanced Remote Sensing

3 of:

Any options not taken from courses listed above or any of:

- PLAN 159 Graphics for Planning
- ARCH 212 Computer Science Simulation
- ARCH 224 An Introduction to Landscape Design
- PLAN 255 Planning Surveys and Analysis
- ENVS 252 Media Tools for Environmental Studies
- ENVS 253 Media Tools for Environmental Studies (Advanced Level)
PLAN 256 Principles of Environmental Design  
M ENV 361 Contemporary Media of Communication and Human Environments  
GEOG 407 Field and Lab Techniques in Geomorphology  
M ENV 445 Technology Assessment and Policy Analysis

Note: Honours Geography Options
On occasion, certain courses required for an Option program may not be available to students in their final year. On such occasions, students should consult with the Undergraduate Officer to inquire about permissible modifications to their programs.

Joint Honours
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. 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, depending on the faculty in which the student is registered, the following degrees may be awarded:

BES or BA Joint Geography with:
Anthropology
Canadian Studies (see Note 5)
Economics, English, French
German, History
Man-Environment Studies
Management Studies
Music
Political Science
Recreation
Russian
Sociology

BES or BA
or BMath
Mathematics

BES or BSc
Earth Sciences
Biology

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, with the exception that where both Departments participating in the program require specific courses of similar content, a student shall meet that requirement in one Department only. This might be expected to apply in the cases of technique courses, field research and the Senior Honours Essay. Further information concerning Joint Honours programs may be obtained from the Undergraduate Officer of the Department.

Geography Course Requirements for Joint Honours Students Registered In Other Departments

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>GEOG 101 Introduction to Human Geography</td>
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<td>GEOG 102 Introduction to Physical Geography</td>
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<td>GEOG 110 Introduction to the Field of Geography</td>
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<tr>
<td>and one of:</td>
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<tr>
<td>GEOG 125R Introduction to the Third World</td>
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<tr>
<td>GEOG 126R Development in the Third World</td>
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<tr>
<td>GEOG 127 Regional Problems of Europe</td>
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<tr>
<td>ENV S 195A Introduction to Environmental Studies or:</td>
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<tr>
<td>ENV S 195B Introduction to Environmental Problems</td>
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<tr>
<td>ENV S 200 Field Ecology</td>
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<tr>
<td>GEOG 201 Some Basic Topics of Physical Geography</td>
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<tr>
<td>GEOG 202 Some Basic Topics of Economic and Urban Geography</td>
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<tr>
<td>GEOG 260 Introduction to Cartography and Map Analysis</td>
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<tr>
<td>GEOG 275 Introductory Air Photo Analysis and Remote Sensing</td>
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<tr>
<td>ENV S 271 Introduction to Quantitative Research Methods*</td>
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<tr>
<td>and one of:</td>
</tr>
<tr>
<td>GEOG 203 Some Basic Topics of Cultural and Regional Geography</td>
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<tr>
<td>GEOG 204 Soviet Union</td>
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<td>GEOG 220 World Regional Geography</td>
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<td>GEOG 221 The United States</td>
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<tr>
<td>GEOG 381 The Nature of Geography</td>
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<tr>
<td>GEOG 390 Senior Honours Research Essay Proposal*</td>
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<tr>
<td>GEOG 490A Senior Honours Research Essay*</td>
</tr>
<tr>
<td>GEOG 490B Senior Honours Research Essay*</td>
</tr>
</tbody>
</table>

*Students taking courses comparable to these in their home departments are not expected to take these courses in Geography.
Notes on Joint Honours Programs

Note 1
The minimum number of credits in Geography for students registered in another department as Joint Honours is 7.5.

Note 2
Geography students taking Joint Honours with another department must achieve Honours standing as required by the Geography Department (70% overall, 75% in Geography). The average required in the second major is the minimum Honours standing set by that Department. Students in other Departments taking Joint Honours with Geography must achieve a minimum of 75% in Geography and Environmental Studies courses.

Note 3
Students will not normally be accepted into a Joint Honours program in Geography before second year.

Note 4
The total number of courses required for a Joint Honours degree is determined by the student's home Department. Students doing Joint Honours in Geography are encouraged to take credits beyond the minimal degree requirements.

Note 5
Students choosing the program Geography with Canadian Studies are referred to the regulations of that program (p. 126). In addition, the Department of Geography recommends that course selections include the following:

At least three of:
- GEOG 251 Cities in Canada
- GEOG 322 Geographical Study of Canada
- GEOG 341 Historical Geography of Canada 1
- GEOG 342 Historical Geography of Canada 2
- GEOG 411 Resource Studies
- GEOG 422 Canada

At least three of:
- ANTH 203 Prehistoric Man in North America
- ANTH 205 Anthropology of Race and Racism in Canada
- ECON 363 Contemporary Canadian Problems 1
- 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

Environmental Studies
Geography
Man-Environment Studies

M ENV 356 Canadian Non-Renewable Resources
or:
SCI 350 Canadian Non-Renewable Natural Resources

Geography Minor for Honours Students in Other Departments
The requirements are the same as those noted for the 3 year General Geography program, i.e., core requirements plus electives to make 6 credits in Geography.

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

Department of Man-Environment Studies

Nature of the Program
The Department of Man-Environment Studies offers both an Honours Regular program and an Honour Co-operative program.

These two honours degree programs are oriented towards study of the many dimensions of human inter-relationships with various environments, including natural and managed landscapes, buildings and cities, small groups, communities, and whole societies. Through problem- and issue-oriented inquiry into such complex relationships, along with related study in contributing academic disciplines, ample scope is provided for acquiring a broad-based education, as well as technical knowledge and skills.

Much of the work in the Department falls into one or more of the following major thematic areas:

1. management of resources and environmental impacts
2. evaluation of government and private sector programs and policies
3. interaction of science, technology, environment and society
4. environmental and occupational health

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.

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 unique 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 fields such as anthropology, agriculture, biology, chemistry, chemical engineering, communications science, earth sciences, economics, fine arts, geography, mathematics, physics, planning, political science, psychology, sociology and social work, as well as a variety of experience in such diverse areas as the planning of education systems, ecological research, geological investigations, economic studies, urban affairs, technology assessment, and work with various international organizations.

For the approach used in Man-Environment Studies, considerable academic innovation has been necessary. Besides lectures and labs, the program uses modular instruction units; student-selected projects and community work; field trips to environments other than lecture halls; team teaching; a regular flow of visitors from outside the University; and workshop instruction to help develop techniques and skills relevant to environmental studies. Students in both the Regular and Co-operative Man-Environment Studies programs are encouraged to relate aspects of their academic program to summer or work-term employment. This employment may include involvement with community organizations, and self-generated activity, and students incorporate this experiential learning into the university-based educational process.

For many students a "theme" oriented program of this kind offers a more satisfying undergraduate education than traditional alternatives. Man-Environment Studies started at Waterloo in 1969 and as an undergraduate degree program it is unique in Canada although similar ones have become established in the United States, Europe and Australia.

It is recommended that persons desiring more explicit information concerning the program contact the Undergraduate Officer, Department of Man-Environment Studies, directly.

Bachelor of Environment Studies (Honours Man-Environment Studies)

The formal admission requirements of the program are listed beginning on page 26 of this calendar. No specific Grade 13 courses are required, but some science or mathematics would be helpful.

The Faculty of Environment 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 and travel experiences as well as their past academic record.
About one half of the 22 courses required for the BES degree are designated as a core of required courses. The remainder are free electives chosen by each student to develop the mix of subjects and skills best suited for achieving individual educational or career preparation objectives.

Most required courses are taken in the first two years. The first year introductory courses examine major environmental themes from the viewpoints of the natural and social sciences. They also introduce techniques for investigating environmental questions and provide experience in conducting a systematic enquiry through the device of small group projects. In the second year, further work in natural ecology and social sciences helps to introduce other perspectives and themes running through man-environment studies. Additional course work on research design, methodology, and information or data handling is required and each student also conducts an individual or group project selected from a wide range of possible topics and problem areas.

The core requirements for years three and four are also project-oriented, comprising a “seminar-workshop” and senior honors assignment respectively. Arrangements to receive extra credit for project work have been provided for those who learn most effectively through undertaking self-directed work under the guidance of faculty and other advisors. The fourth year also requires participation in a senior honors seminar course which provides the occasion for students to draw together what they have learned and direct it to one of the broad sub-areas within man-environment studies.

The stress given to project-oriented learning within the program reflects the importance attached to having students develop increasingly sophisticated abilities for coping with situations that are inherently complex, value-laden, ambiguous and uncertain. Project-oriented learning provides the occasion to practise skills in problem definition, information and data gathering, analysis and synthesis of material, and presentation of results in a suitable format using the most appropriate communications media. Skills of this nature can be refined, adapted and applied in whatever context or situations students choose during and after their university years. An increasing number of students incorporate work with governmental agencies, community organizations and other groups into projects they select for their third and fourth year project assignments and, in a few cases, well conceived and executed projects have led to employment in a variety of organizations.

Effective 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 four broad options as follows:

a) Students may combine Man-Environment Studies with another academic discipline to the extent that a joint honours degree can be awarded.

Arrangements to do this have been approved with 13 other departments and more are being considered. Students interested in Joint Honours should consult with the Undergraduate Officer.

b) Students may concentrate study in an associated field to the extent it becomes a “minor” (typically five credits; consult the “minor” department) within Honours Man-Environment Studies. A “minor” can be in any area such as Anthropology, Canadian Studies, Chemistry, Management Studies, Personnel and Administrative Studies, Psychology, etc.

c) Students may develop a coherent sequence of courses from electives offered by the Department in combination with courses offered elsewhere to concentrate on one of several possible sub-areas emerging within man-environment studies, i.e. human and community studies, resource and environmental management, or policy and decision-making at the interface of technology and society. See also pages 158-160.

d) Students may choose instead to explore whatever range of subjects interests them in addition to Environmental Studies.

In each case students should give careful consideration to their choices in terms of the educational goals and possible careers they may wish to pursue after obtaining a BES degree. They would also do well to seek information and advice on the kind of undergraduate courses favoured by graduate programs in which they may be interested.

The recommended course load is 6 credits in each of the first two years, and 5 credits in each of the last two years. Each student must have completed twenty-two full credits or the equivalent before graduation with a cumulative average of B- (70.0); an average of B (75.0) must be maintained in M ENV/ENV S courses. There are several evaluation techniques used to determine grades.

The programs are as follows:

The Honours Regular Program

<table>
<thead>
<tr>
<th>Year 1</th>
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</thead>
<tbody>
<tr>
<td>ENV S 195A</td>
<td>Introduction to Environmental Studies</td>
</tr>
<tr>
<td>M ENV 130(F)</td>
<td>Environmental Issues 1</td>
</tr>
<tr>
<td>M ENV 131(W)</td>
<td>Environmental Issues 2</td>
</tr>
<tr>
<td>M ENV 150(F)</td>
<td>Environmental Methods &amp; Techniques 1</td>
</tr>
<tr>
<td>M ENV 151(W)</td>
<td>Environmental Methods &amp; Techniques 2</td>
</tr>
<tr>
<td>M ENV 190(F)</td>
<td>Seminar-Workshop</td>
</tr>
<tr>
<td>M ENV 191(W)</td>
<td>Seminar-Workshop</td>
</tr>
<tr>
<td>plus electives for a total of 3 credits for the Fall term and 3 credits for the Winter term.</td>
<td></td>
</tr>
</tbody>
</table>
### Year 2
- **ENV S 200**: Field Ecology
- **M ENV 241**: Social Change, or other half-credit 200 level or above course in one of the social sciences
- **ENV S 271**: Introduction to Quantitative Research Methods
- **M ENV 290, 291**: Seminar-Workshop
- **M ENV 295, 296**: 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 295/296 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.

### Year 4
- **M ENV 400(Y)**: Senior Honours Seminar
- **M ENV 490A(Y)**: Senior Honours Assignment (with consent of faculty, 490B or 490C may be taken in place of 490A.)

plus electives for a total of 5 credits for the Fall/Winter Session.

### The Honours Co-operative Program
Terms 1A, 1B, and 4A, 4B are the same as Years 1 and 4 respectively of the Regular program. During Fall term of Year 1, those interested may apply to enter the Co-operative program effective with the beginning of Term 1B. The remainder of the Co-operative program is as follows:

#### Term 2A
- **ENV S 200**: Field Ecology
- **ENV S 271**: Introduction to Quantitative Research Methods
- **M ENV 290**: Seminar-Workshop
- **M ENV 295**: Development of Environmental Thought 1

**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**: Social Change or other half-credit 200 level or above course in one of the social sciences
- **M ENV 296**: Development of Environmental Thought 2
- **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
The arrangement of academic and work terms, and further information on Co-operative study generally, are given in Chapter 5 of the Calendar.

### Joint Honours
Joint Honours Programs have been approved between Man-Environment Studies and Anthropology, Biology, Economics, Fine Arts, French, Geography, Germanic and Slavic Languages (for Russian), Management Studies, Mathematics, Philosophy, Political Science, Psychology, Recreation, Religious Studies, and Sociology. Man-Environment students may also add a Biology Option to their programs. The Biology Option consists of 7 credits of Biology coursework and is slightly less demanding than the joint honours program with Biology. Contact the Undergraduate Officer for details.

These programs lead to degrees from the Faculty in which the student is registered. Students from other departments choosing one of these joint programs must complete 7 credits of M ENV course work. ENV S 195A or ENV S 195B, ENV S 200, and ENV S 271 are the only non-M ENV courses that will be counted toward this total. The Department of Man-Environment Studies is prepared to work out other programs for interested students who meet honours standing.

The Department of Man-Environment Studies is a participating department in the Canadian Studies program and in the Peace and Conflict Studies program. Concentration in one of these areas can be officially recognized via an “option” designation attached to the BES degree. See the Undergraduate Officer of the Department and the Directors of the programs for details.
School of Urban and Regional Planning

Bachelor of Environmental Studies (Honours Urban and Regional Planning Program)

Nature of the Program
The emphasis of the program is on planning as a process, conceived in broad terms to include policy making, research and decision making. The subject focus is regional; that is, the integrated planning of regions, large and small, includes urban-centred or core regions and rural components in which the policy emphasis is on environmental issues and other contexts typical of the Canadian scene, in which resource potentials are not yet realized, and where development issues and problems of human adjustment are in the forefront.

To implement this approach, the School of Urban and Regional Planning has gathered a team of faculty with diverse academic and practical planning experience.

The broad aim of the School is to prepare the student for active participation in the planning process. This approach gives equal emphasis to the 'why' and 'how' of planning and requires that a style be adopted that strives for a continuum between classroom and field experience, between planning studies and related disciplines, and between academic studies and future professional practice. Realizing this concept requires integration within the program of selected elements from Geography, social sciences and pure and applied sciences. For this purpose, the School of Urban and Regional Planning has been located in a Faculty with an interdisciplinary approach to a wide range of environmental issues.

The program gives a well-rounded preparation for a wide variety of professional or graduate work in urban planning, regional planning and resource development. Courses on the theory, methods and philosophy of planning provide an integrating framework. The student is also given an opportunity to pursue a special interest in economic, social, and ecological issues in planning, or in planning methodology. This is done through the selection of elective courses. Students are also encouraged to select Senior Honours Essay Topics from these special fields of interest.

The integration of practical 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 maths 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 four 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.

Note 1
Students in the Planning School are normally expected to carry a minimum load of six credits in each of the 4 years of the program. However, students interested in taking extra courses are free to take a seven credit load in any given year without approval from the School; preregistration for more than seven credits may only be done with the undergraduate officer's approval. 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.

Note 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 B- (70.0) and a B (73.0) in Planning and Environmental Studies courses and must obtain credit standing in 6 full courses. In subsequent years, a student must maintain a cumulative, overall average of B- (70.0) as well as an average of B (73.0) in Planning and Environmental Studies courses.

Should the student be permitted to continue on the basis of "Conditional due to Average"; and, subsequently, if the required averages are not met this second time, withdrawal from the program is automatic.
Note 3
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.

Note 4
No more than 8 first year level credits will be allowed toward the 24% required to graduate.

Note 5
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.

Note 6
PLAN 307 may be taken in Year 2 or Year 3 provided that the ENV S 271 prerequisite has been met.

Note 7
The School reserves the right to make changes to the curriculum as necessary. Please consult the School prior to registration.

Note 8
For some courses, participating students may be expected to make a small financial contribution to defray materials/travel costs, e.g. PLAN 159 (Graphics for Planning). PLAN 300 (Seminar/Workshop Project in Urban and Regional Planning), PLAN 357 (Conservation and Resource Management), PLAN 391 (Field Research Methods and Projects).

Note 9
Where a student in 2nd year selects 2 of: 258, 270 and 275A and then picks up the third option - that third course will be considered a second year theme elective.

Note 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 theme elective planning courses required in Year 3.

Note 11
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.

Note 12
A variety of items are covered in the Undergraduate Studies Policy Manual available from the undergraduate officer. Policy areas covered include: Admission, Courses, Examination, 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.

Note 13
Arts 000 is not a credit course. This course registers students in the English Language Proficiency Examination (ELPE) which must be taken by all students entering the program, whether as first year students or by transfer from another program. Transfer students from the University of Waterloo who have already achieved an ELPE score of 50% need not register for the test.
Honours Urban and Regional Planning Recommended Program

**YEAR 1 Required Planning Courses**
- PLAN 100 Introduction to Urban Planning Concepts and Techniques, PLAN 159 Graphics for Planning, ARTS 000 Y (see Note 13)

**Theme Elective Courses**
One-half credit from each of the eight 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. 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.

### Year 1 Theme Elective Courses

**Theme Areas**

1. **BIOPHYSICAL**
   - BIOL 111 Introductory Biology 1
   - BIOL 112 Introductory Biology 2
   - EARTH 121 Introductory Geology 1
   - EARTH 122 Introductory Geology 2
   - GEOG 102 Introduction to Physical Geography

2. **PHYCHO-SOCIAL**
   - SOC 101 Introduction to Sociology

3. **ECONOMIC**
   - ECON 100A, B Introduction to Modern Economics
   - ECON 101 Introduction to Microeconomics
   - ECON 102 Introduction to Macroeconomics
   - ECON 103 Introduction to Economic Concepts and Current Problems

4. **POLITICS**
   - P SCI 101 Introduction to Politics I
   - P SCI 102C Politics in Action
   - P SCI 102U The Political Process in the Modern Democracies
   - P SCI 102H Citizen Participation in Canada
   - P SCI 102M Contemporary Issues in Canadian Public Policy

5. **PHILOSOPHY**
   - ENGL 108B Utopia and Anti-Utopia
   - HIST 105 The Meaning of Civilization
   - HIST 120 An Introduction to Western Intellectual History
   - PHIL 125 Introduction to Social and Political Philosophy
   - PHIL 150 Introduction: Knowledge and Reality
   - PHIL 130J Philosophy of Discontent
   - P SCI 102F Political Rights and Obligations
   - RS 110 Religions of Mankind I
   - RS 111 Religions of Mankind II

6. **METHODS**
   - CS 116 Introduction to Computing
   - ENGL 109 Introduction to Essay Writing
   - ENGL 129R Introduction to Written English
   - ENGL 140R The Use of English I
   - ENGL 150 English as an Instrument of Thought and Communication
   - FR 151 Basic French
   - FR 198 Reading French
   - MATH 105 Mathematics
   - PHIL 145 Critical Thinking

7. **THE ARTS**
   - ANTH 102B Anthropology Through Science Fiction
   - ARCH 194 Visual Interdisciplinary Language
   - ENGL 101 The Living Tradition
   - ENGL 102 Poem, Play and Story
   - ENGL 108 Themes of Literature (any one)
   - FINE 110 Introduction to World Art I
   - FINE 111 Introduction to World Art II
   - FINE 120 Fundamentals of Visual Art I
   - FR 191 French Language and Literature
   - DANCE 110 Introduction to Dance

8. **OTHER THEMES**
   - ECON 193/194 Economics and the Administrator I and II
   - ENV S 111 Introduction to the Study of the Future
   - ENV S 195A Introduction to Environmental Studies
   - GEOG 101 Introduction to Human Geography
   - GEG 126R Development in the Third World
   - HLTH 141 Introduction to Health Sciences II
   - HIST 123A Canada: Unity in Diversity I
   - HIST 123B Canada: Unity in Diversity II
   - PHIL 120 Science, Technology, and Society
   - REC 100 Introduction to the Study of Leisure and Recreation
   - SOC 161 Population and Society
   - PSYCH 101 Introductory Psychology
### Environmental Studies
#### Urban and Regional Planning

**YEAR 2 Required Planning Courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENV S 200</td>
<td>Field Ecology</td>
</tr>
<tr>
<td>PLAN 256</td>
<td>Principles of Environmental Design, Quantitative Research Methods</td>
</tr>
<tr>
<td>ENV S 271</td>
<td>Introduction to Environmental Design, Quantitative Research Methods</td>
</tr>
<tr>
<td>PLAN 231</td>
<td>Citizen Involvement Planning and Social Change</td>
</tr>
<tr>
<td>PLAN 255</td>
<td>Planning Surveys and Analyses</td>
</tr>
</tbody>
</table>

*and at least two of: PLAN 259 Regional Planning and Development, PLAN 270 Concepts and Ideas in Contemporary Urban Planning, PLAN 275A Rural Planning*

**Theme Elective Courses**

<table>
<thead>
<tr>
<th>Year 2 Theme Elective Courses</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. URBAN THEME</strong></td>
<td>One full credit from list of Second Year Theme Elective Courses (see below).</td>
</tr>
<tr>
<td>ARCH 212</td>
<td>Computer Science Simulation</td>
</tr>
<tr>
<td>ARCH 213</td>
<td>Computer Generated Design I</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>ARCH 282</td>
<td>Preservation Practice - Background</td>
</tr>
<tr>
<td>ARCH 283</td>
<td>Preservation Practice - Technology and Technique</td>
</tr>
<tr>
<td>GEOG 225R</td>
<td>Urbanization in the Third World</td>
</tr>
<tr>
<td>GEOG 251</td>
<td>Cities in Canada</td>
</tr>
<tr>
<td>HIST 201X</td>
<td>Canadian Urban History</td>
</tr>
<tr>
<td>M ENV 247</td>
<td>Urban Anthropology</td>
</tr>
<tr>
<td>PLAN 270</td>
<td>Concepts &amp; Ideas in Contemporary Urban Planning</td>
</tr>
</tbody>
</table>

**2. REGIONAL THEME**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDN ST 201</td>
<td>Social Regionalism</td>
</tr>
<tr>
<td>GEOG 225R</td>
<td>Urbanization in the Third World</td>
</tr>
<tr>
<td>PLAN 222</td>
<td>Canadian Regional Issues</td>
</tr>
<tr>
<td>PLAN 230</td>
<td>The Small Group in the Planning Process</td>
</tr>
<tr>
<td>PLAN 259</td>
<td>Regional Planning and Development</td>
</tr>
</tbody>
</table>

**3. RURAL/RESOURCE THEME**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLAN 357</td>
<td>Conservation and Resource Management (see Note 10)</td>
</tr>
<tr>
<td>GEOG 226R</td>
<td>Food and Agriculture and Integrated Rural Development in the Third World</td>
</tr>
<tr>
<td>SCI 250</td>
<td>Environmental Geology</td>
</tr>
</tbody>
</table>

**ALL THEMES**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENV S 201</td>
<td>Introduction to Environmental and Planning Law</td>
</tr>
<tr>
<td>ENV S 202</td>
<td>Social Science Approaches to Environmental Problems</td>
</tr>
<tr>
<td>ENV S 252</td>
<td>Media Tools for Environmental Studies</td>
</tr>
<tr>
<td>ENV S 253</td>
<td>Media Tools for Environmental Studies - Advanced Level</td>
</tr>
<tr>
<td>ENV S 272</td>
<td>Computer Programming in Environmental Studies</td>
</tr>
<tr>
<td>ECON 241</td>
<td>Cost-benefit and Project Evaluation</td>
</tr>
<tr>
<td>ECON 282</td>
<td>Understanding and Using Managerial Accounting Information</td>
</tr>
<tr>
<td>GEOG 201</td>
<td>Some Basic Topics of Physical Geography</td>
</tr>
<tr>
<td>GEOG 202</td>
<td>Some Basic Topics of Economic and Urban Geography</td>
</tr>
<tr>
<td>GEOG 260</td>
<td>Introduction to Cartography and Map Analysis</td>
</tr>
<tr>
<td>GEOG 275</td>
<td>Introductory Air Photo Analysis and Remote Sensing</td>
</tr>
<tr>
<td>HLTH 245</td>
<td>Community Health</td>
</tr>
<tr>
<td>M ENV 241</td>
<td>Social Change</td>
</tr>
<tr>
<td>PLAN 230</td>
<td>The Small Group in the Planning Process</td>
</tr>
<tr>
<td>PLAN 275</td>
<td>Readings and Research in Planning</td>
</tr>
<tr>
<td>PHIL 216</td>
<td>Rational Behaviour and Decision-making</td>
</tr>
<tr>
<td>PLAN 231</td>
<td>Citizen Involvement, Planning and Social Change</td>
</tr>
<tr>
<td>P SCI 260</td>
<td>Canadian Government and Politics</td>
</tr>
<tr>
<td>HEC 210</td>
<td>Organization and Administration of Recreation Services</td>
</tr>
<tr>
<td>Year 3 Required Planning Courses</td>
<td>Theme Elective Courses</td>
</tr>
<tr>
<td>---------------------------------</td>
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</tr>
<tr>
<td>PLAN 300 Seminar/Workshop</td>
<td>Two full credits from list of</td>
</tr>
<tr>
<td>Project in Urban and Regional</td>
<td>Third Year Theme Elective</td>
</tr>
<tr>
<td>Planning, PLAN 307 Social</td>
<td>Courses (see below).</td>
</tr>
<tr>
<td>Survey Techniques, PLAN 391</td>
<td></td>
</tr>
<tr>
<td>Field Research Methods and</td>
<td></td>
</tr>
<tr>
<td>Projects</td>
<td></td>
</tr>
<tr>
<td>and at least two of: PLAN 301</td>
<td></td>
</tr>
<tr>
<td>Planning Design, PLAN 357</td>
<td></td>
</tr>
<tr>
<td>Conservation and Resource</td>
<td></td>
</tr>
<tr>
<td>Management, PLAN 330 Urban</td>
<td></td>
</tr>
<tr>
<td>Social Planning</td>
<td></td>
</tr>
</tbody>
</table>

**Year 3 Theme Elective Courses**

1. **URBAN THEME**
   - ARCH 313 Computer Generated Design 2
   - ARCH 345 Architectural Theory 1850-1940
   - CIV E 342 Transport Engineering I
   - CIV E 375 Sanitary Engineering
   - CIV E 383 Water Distribution and Collection Systems
   - ECON 343 Urban Economics
   - GEOG 349 The City as a System
   - PLAN 344 Recreation 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
   - SOC 366 Urban Sociology

2. **REGIONAL THEME**
   - CDN ST 301 Regionalism: West
   - CDN ST 302 Regionalism: East
   - GEOG 311 Regional Industrial Development
   - GEOG 350 Regional Urban Systems
   - PLAN 319 Economic and Social Techniques for Regional Planning
   - PLAN 332 The Sociology of Rural Development
   - PLAN 333 The Sociology of Regional Planning
   - PLAN 360 Technology in Urban and Regional Planning
   - P SCI 343 Canadian Municipal Government

3. **RURAL/RESOURCE THEME**
   - CIV E 375 Sanitary Engineering
   - CIV E 383 Water Distribution and Collection Systems

4. **ALL THEMES**
   - ANTH 333 Canadian Communities and Planned Change
   - ANTH 334 Ethnicity and Diversity in Canada
   - CIV E 343 Transport Engineering II
   - CS 316 Introduction to Statistical Problem Solving by Computer
   - CS 330 Computer Application to Business: Introduction
   - CS 338 Computer Application in Business: Data Bases and Data Communications

**Note:**
- **ECON 355** Economics of Energy and Natural Resources
- **ECON 357** Environmental Economics
- **ENV S 333** Parkland Management
- **ENV S 358** Environmental Pollution and Its Control
- **ENV S 380** Environmental Workshop
- **ENV S 381** Environmental Workshop
- **GEOG 300** Geomorphology and the Southern Ontario Environment
- **GEOG 301** Climatology
- **GEOG 303** Physical Basis and the Geography of Water
- **GEOG 315** Agricultural Geography
- **GEOG 356** Resources Management
- **GEOG 358** Water Planning and Management
- **GEOG 376** Environmental Remote Sensing
- **M ENV 320** Environmental Economics
- **M ENV 351** Organizations and Environmental Management
- **M ENV 356** Canadian Non-Renewable Resources
- **SCI 350** Canadian Non-Renewable Resources
- **SCI 349** Introductory Pedology
- **PLAN 332** The Sociology of Rural Development
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECON 335</td>
<td>Economic Development</td>
</tr>
<tr>
<td>GEOG 352</td>
<td>The Rural-Urban Fringe of Canadian Cities</td>
</tr>
<tr>
<td>GEOG 360</td>
<td>Preparation of Maps and Illustrations</td>
</tr>
<tr>
<td>GEOG 375</td>
<td>Air Photo Interpretation</td>
</tr>
<tr>
<td>HLTH 344</td>
<td>Program Evaluation</td>
</tr>
<tr>
<td>M ENV 338</td>
<td>Social Impact Assessment</td>
</tr>
<tr>
<td>M ENV 350</td>
<td>Community Action on Environmental Problems</td>
</tr>
<tr>
<td>PHIL 327A</td>
<td>Philosophy of Law - Part 1</td>
</tr>
<tr>
<td>PHIL 327B</td>
<td>Philosophy of Law - Part 2</td>
</tr>
<tr>
<td>PLAN 316</td>
<td>Multivariate Statistics</td>
</tr>
<tr>
<td>PLAN 317</td>
<td>Nonparametric Statistics</td>
</tr>
<tr>
<td>PLAN 318</td>
<td>Spatial Analysis</td>
</tr>
<tr>
<td>PSCI 331</td>
<td>Public Administration 1</td>
</tr>
<tr>
<td>PSCI 332</td>
<td>Public Administration 2</td>
</tr>
<tr>
<td>PSCI 333</td>
<td>Administrative Law</td>
</tr>
<tr>
<td>PSCI 341</td>
<td>Provincial Politics</td>
</tr>
<tr>
<td>REC 302</td>
<td>Travel and Tourism</td>
</tr>
<tr>
<td>REC 316</td>
<td>Principles of Recreation Planning</td>
</tr>
<tr>
<td>REC 334</td>
<td>Park Management</td>
</tr>
<tr>
<td>SOC 340</td>
<td>Complex Organizations</td>
</tr>
<tr>
<td>SOC 364</td>
<td>Social Change</td>
</tr>
<tr>
<td>STAT 300</td>
<td>Introduction to the Theory of Statistics</td>
</tr>
</tbody>
</table>

**YEAR 4 Required Planning Courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLAN 456</td>
<td>Political and Administrative Processes in Urban and Regional Planning</td>
</tr>
<tr>
<td>PLAN 480</td>
<td>The Philosophy and Methodology of Urban and Regional Planning</td>
</tr>
<tr>
<td>PLAN 490</td>
<td>Senior Honours Essay (2 full course credits)</td>
</tr>
</tbody>
</table>

**One full credit from list of Fourth Year Theme Elective Courses (see list below).**

**Note:** Required and Elective Courses together to total 6 full credits.

**Year 4 Theme Elective Courses**

1. **URBAN THEME**
   - ARCH 455 Management and Estimating
   - CIV E 440 Urban Traffic Management
   - CIV E 444 Urban Transport Planning
   - GEOG 448 Urban Historical Geography
   - PLAN 414 Housing Policies
   - PLAN 420 Health, Environment and Planning
   - PLAN 449 Canadian Urban and Regional Planning: Part 1
   - PLAN 450 Canadian Urban and Regional Planning: Part 2
   - REC 410 Planning of Recreation Facilities

2. **REGIONAL THEME**
   - GEOG 410 Recreation Geography
   - GEOG 412 Alternative Future Environments 2
   - GEOG 450 City and Regional Systems
   - PLAN 420 Health, Environment and Planning
   - PLAN 449 Canadian Urban and Regional Planning: Part 1
   - PLAN 450 Canadian Urban and Regional Planning: Part 2

3. **RURAL/RESOURCE THEME**
   - CIV E 473 Pollution in the Aquatic Environment
   - CIV E 480 Basic Principles of Water Resources
   - CIV E 493 Engineering in the Canadian North
   - ECON 451 Advanced Topics in Resource Economics
   - ENV S 401 Environmental Law
   - ENV S 411 Alternative Future Environments 1
   - ENV S 417 Land Use History and Landscape - Change 1
   - ENV S 418 Land Use History and Landscape - Change 2
   - ENV S 444 Land Evaluation and Resource Management
   - GEOG 408 Special Topics in Climatology and Natural Hazards
   - GEOG 410 Recreation Geography
   - GEOG 414 Resources Management Workshop
   - GEOG 451 Soils Geography
   - GEOG 452 Problems of Rural Land Use
   - GEOG 461 Land Dereliction and Rehabilitation 1
   - GEOG 462 Land Dereliction and Rehabilitation 2
   - GEOG 470 Applied Air Photo Interpretation
   - GEOG 471 Advanced Remote Sensing
   - PSCI 435 The Politics of Canadian Resource Development
   - REC 434 Advanced Park Management
   - SCI 453 The Seas and Man's Effects Upon Them
   - SCI 454 The Inland Waters and Man's Effects Upon Them
   - SCI 462 Biology of Food Production

4. **ALL THEMES**
   - CIV E 496 Project Management
   - CS 437 Simulation by Computer
   - CS 492 The Social Implications of Computers
   - ECON 403 Economic Analysis, Forecasting and Public Policy
   - ENV S 500 Professional Development in Environmental Management
ENV S 402  Planning Law
ENV S 411  Alternative Future Environments 1
ENV S 412  Alternative Future Environments 2
FNV S 403  Advanced Cartography 1
ENV S 404  Advanced Cartography 2
P SCI 431  Canadian Public Policy
P SCI 436  Comparative Public Policy
PLAN 430  Social Policy Planning
PLAN 454  Professional Practice in Planning
PLAN 475  Projects, Problems and Readings in Planning
PLAN 476  Projects, Problems, and Readings in Planning
REC 435  Recreation Resource Policy
REC 580  The Dynamics of Tourism
SY DE 433  Conflict Analysis
SY DE 434  Planning of Facilities
SY DE 535  Selected Topics for Socio-Economic Systems Design
Faculty of
Human Kinetics
and Leisure Studies

Dance
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. Nine years ago a Regular stream was added to the Co-operative program to enable students who wanted the programs, but not the Co-operative aspects, to attend the University of Waterloo. At the same time elective courses were introduced into each Department making it possible for students to pursue in some depth an area of Kinesiology, Dance, Health Studies or Recreation in which they had a special interest. The future promises even greater opportunities for specialized study by the individual students.

Dance 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

Health Studies is a four-year University Honours program leading to the Bachelor of Science (BSc) degree. Students in the program study important health problems and their causes. Of primary interest are diseases in which behaviour is an important contributing cause, such as lung cancer and smoking or heart disease and diet. Also of interest are health problems which occur because people do not use 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.

Human Kinetics and Leisure Studies

Programs

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 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. Graduates of all Kinesiology programs will receive either an Honours or General Bachelor of Science degree in Kinesiology. Recreation program graduates are awarded an Honours Bachelor of Arts degree in Recreation. Those students who graduate from the Dance program will receive an Honours Bachelor of Science degree in Dance, an Honours Bachelor of Arts Degree or a General Bachelor of Arts Degree.

Graduates who have pursued their studies in a Co-operative 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 eight-month academic year the student alternates four-month terms in academic study and related work experiences.

Arrangements for work assignments are made through the Department of Co-ordination and Placement of the University which provides the liaison between the campus and the field situation. Students should refer to Chapter 5 of the Calendar for further details concerning the Co-operative program.

Regular System
In Regular programs students attend school during the Fall and Winter terms each year for three or four years.

Admission
The admission 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 any of the Kinesiology programs are required to select a Grade 13 program which includes four or more of the following courses: Biology, Chemistry, Physics, Functions and Relations, Algebra, Calculus.

Applicants to the Health Studies program should include Grade 13 Biology and Chemistry in their program.

Applicants to the Recreation program are required to include a Grade 13 Mathematics course in their program.

Advanced Standing
It is not unusual for students transferring to HKLS programs to be granted credit for courses taken elsewhere in which they have received a grade of C-or better. All transfer students will be required to complete at least the equivalent of two years of study at Waterloo (i.e. at least 22 term courses) regardless of the number of courses that are presented for transfer.

One term of advanced work experience standing may be granted to students transferring into the third year of Co-operative programs in HKLS. Details are available from the Department of Co-ordination and Placement.

English Language Proficiency Program
The Faculty of Human Kinetics and Leisure Studies feels that a student in any of their programs should be able to demonstrate competency in writing before qualifying for a degree. Therefore, all students entering an H.K.L.S. program must write the English Language Proficiency Examination (scheduled during registration week). Achieving a grade of 50% or better on the examination will satisfy the requirement. If a student fails the examination, the requirement can be satisfied by one of the following:

1. Sitting for the examination again and achieving a mark of 50%.
2. Successfully completing the assignments of the UW Writing Clinic.
3. Achieving a passing grade in one of English 109, 140R, 150.

This requirement normally must be met by the end of Year 2.

Examinations and Standings
The Faculty of Human Kinetics and Leisure Studies currently operates under a "course system" in which student progress is measured by courses successfully completed. Students who have passed fewer than 10 term courses will be considered Year 1; those who have passed at least 10 term courses but fewer than 21 will be considered Year 2; those with at least 21 but fewer than 32, Year 3; and those with 32 or more, Year 4.

1. Final Examinations
a) In all courses each student is required to submit in such form and at such time as may be determined by the instructor, evidence of satisfactory participation in term work. The marks obtained for work during the term are used, in part, in determining standing. The ratio in which marks for term work and written examinations are combined is at the discretion of the individual departments. To pass a course, a student must obtain a minimum of D- in the combined term and examination marks. At the discretion of the chairman of the department concerned and of the Dean, a student may be barred from the final examination if the course requirements are not completed to the satisfaction of the instructor. Some courses and/or instructors may not require final examinations; in such cases term work only will be used in determining a final grade.
b) Students absent from examinations, except for properly certified reasons, do not have make up privileges, and must repeat the entire course. If a student has a Doctor's certificate covering the precise period of absence, with legitimate medical grounds, it must be submitted to the Associate Dean for Undergraduate Affairs within one week of the scheduled examination.
c) All examinations which receive a failing grade are automatically re-read.
d) Examination results are issued to individual students by the Registrar. Appeals against faculty decisions made under these regulations should be made in writing to the Associate Dean for
Undergraduate Affairs within one month of publication of the official mark reports. Additional regulations concerning examinations may be found in Chapter 1.

2. Standing

a) The Faculty has endorsed the letter grade system outlined in Chapter 1 of this Calendar.

b) Overall standing will be determined at the end of each year for regular 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).

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>C</td>
<td>C+</td>
</tr>
<tr>
<td>Health Studies Honours</td>
<td>C</td>
<td>C+</td>
</tr>
<tr>
<td>Kinesiology General</td>
<td>D</td>
<td>C-</td>
</tr>
<tr>
<td>Recreation Honours</td>
<td>C</td>
<td>B-</td>
</tr>
<tr>
<td>Dance Honours</td>
<td>C-</td>
<td>C+</td>
</tr>
<tr>
<td>Dance General</td>
<td>C-</td>
<td>C</td>
</tr>
</tbody>
</table>

Kinesiology, Health Studies and Dance students who receive a grade report with one of F, INC, DNW or NMR in any one academic year are placed on probation for the following academic year. Students who receive a grade report with two or more of any combination of the following: F, INC, DNW or NMR in any one academic year are designated as "May not proceed in the program". (The designation F takes into account all failing grades, i.e. F-, F, and F+). If a student clears his/her F, INC and DNW grades prior to his/her next registration, the decision on his/her grade report may be changed.

Students who are required to withdraw may be eligible to apply for readmission only after one year absence. It is recommended that during this absence students do some academic work (extension, correspondence, or community college study) in order to demonstrate that they should be readmitted.

3. Submission of Course Material

In situations where a student wishes to submit a body of material to satisfy the requirement of more than one course, the student must notify the instructors of both courses of his/her intention where the courses are concurrent so that they may each decide what is appropriate for their own course.

When one of the courses has been taken in a previous term, the current course instructor must be informed by the student of his/her intention of submitting the same course material. The current instructor has the final decision on the extent to which the material is allowed.

Failure of a student to comply with the above regulations constitutes an academic offence.

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 one 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 two 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.

Course and Program Changes

a) Up to the end of the first three weeks of lectures, the student may drop or add any course without approval, provided he or she does not predetermine a section.

b) After the first three weeks of classes any course may be dropped provided the course instructor initials the drop, and either the Associate Chairman or the Associate Dean for Undergraduate Affairs signs the registration form. This policy will permit course drops only up to the date which is 8 weeks from the beginning of lectures.
Academic 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 two 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, three 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 four years of study with the opportunity to specialize in a particular area of Dance in the fourth year through a major research project, special seminars and workshops. The General degree program comprises three years of study and is designed for students who are interested in acquiring an overall knowledge of the subject of Dance.

Upon entrance, students are required to enrol in a particular degree program. However, after participating in an introductory First Year which is designed to familiarize them with the various capacities and applications of the discipline of Dance, students may alter their course of study accordingly.

Course Requirements

To be eligible for the Honours BSc degree or the Honours BA degree in Dance, students must successfully complete 44 term courses, and maintain an overall cumulative average of 60% and a cumulative average of 67% in their dance courses. To be eligible for the General BA degree, students must successfully complete 30 term courses and maintain a minimum overall cumulative average of 60% and a minimum cumulative average of 63% in their dance courses.

Honours Bachelor of Science Degree Program

A) Required Dance Courses (14)
   DANCE 110, 111, 346, 347, 364, 410, 411, 412,
   Two of DANCE 220, 221, 225
   Two of DANCE 230, 231, 233
   Two of DANCE 241, 242, 341, 342

B) Required Outside Courses (9)
   BIOL 230, 233; CS 118; MATH 106; PHYS 103;
   MUSIC 150G, 151G; PSYCH 101, ANTH 102A

C) Required Kinesiology Courses (10)
   KIN 102, 200, 222, 255, 300, 321, 330; plus 3
   additional courses in the bio-physical area of
   Kinesiology.

D) Dance Electives (4)
   Four term courses in Dance.

E) Other Electives (7)
   At least three of the seven term course electives
   must be selected from the offerings of the Faculty
   of Science.

Suggested Course Sequences

<table>
<thead>
<tr>
<th>Year</th>
<th>Course 1</th>
<th>Course 2</th>
<th>Course 3</th>
<th>Course 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DANCE 110</td>
<td>DANCE 111</td>
<td>MUSIC 150G</td>
<td>MUSIC 151G</td>
</tr>
<tr>
<td></td>
<td>MATH 106</td>
<td>CS 118</td>
<td>KIN 102</td>
<td>ANTH 102A</td>
</tr>
<tr>
<td></td>
<td>PSYCH 101</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
</tr>
<tr>
<td>2</td>
<td>BIOL 230</td>
<td>BIOL 233</td>
<td>KIN 200</td>
<td>PHYS 103</td>
</tr>
<tr>
<td></td>
<td>KIN 222</td>
<td>KIN 255</td>
<td>DANCE 241 or 242</td>
<td>DANCE 341 or 342</td>
</tr>
<tr>
<td></td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
<td>one of DANCE 220, 221, 225</td>
</tr>
<tr>
<td>3</td>
<td>KIN 300</td>
<td>KIN 321</td>
<td>Elective</td>
<td>KIN 330</td>
</tr>
<tr>
<td></td>
<td>DANCE 364</td>
<td>one of DANCE 220, 221, 225</td>
<td>Elective</td>
<td>Elective</td>
</tr>
<tr>
<td>4</td>
<td>DANCE 410</td>
<td>DANCE 411</td>
<td>Elective</td>
<td>Elective</td>
</tr>
</tbody>
</table>

Honours Bachelor of Arts Degree Program

A) Required Dance Courses (10)
   DANCE 110, 111, 336, 410, 411, 412
   Two of DANCE 220, 221, 225
   Two of DANCE 230, 231, 233

B) Required Outside Courses (9)
   MUSIC 150G, 151G; PSYCH 101; ANTH 102A; KIN
   200; two term courses from Drama and/or Fine
   Arts and the equivalent of one full language course
   or two of DANCE 241, 242, 341, 342.

C) Dance Electives (8)
   Eight term courses in Dance

D) Other Electives (17)
   At least eight of the 17 term course electives must
   be taken within the Faculty of Arts.
### Suggested Course Sequences

#### Year 1
<table>
<thead>
<tr>
<th>Semester</th>
<th>Course 1</th>
<th>Course 2</th>
<th>Course 3</th>
<th>Course 4</th>
<th>Course 5</th>
<th>Course 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>DANCE 110</td>
<td>DANCE 111</td>
<td>MUSIC 150G</td>
<td>MUSIC 151G</td>
<td>PSYCH 101</td>
<td>DRAMA 101 or Fine Arts</td>
</tr>
<tr>
<td>Fall</td>
<td>Dance Elective</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
</tr>
<tr>
<td>Winter</td>
<td>DANCE Elective</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
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#### Year 2
<table>
<thead>
<tr>
<th>Semester</th>
<th>Course 1</th>
<th>Course 2</th>
<th>Course 3</th>
<th>Course 4</th>
<th>Course 5</th>
<th>Course 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>DANCE 230</td>
<td>DANCE 231 or 233</td>
<td>KIN 200</td>
<td>one of DANCE 220, 221, 225</td>
<td>DANCE 241 or 242</td>
<td>DANCE Elective</td>
</tr>
<tr>
<td>Fall</td>
<td>Dance Elective</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
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#### Year 3
<table>
<thead>
<tr>
<th>Semester</th>
<th>Course 1</th>
<th>Course 2</th>
<th>Course 3</th>
<th>Course 4</th>
<th>Course 5</th>
<th>Course 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>DANCE 336</td>
<td>one of DANCE 220, 221, 225</td>
<td>Elective</td>
<td>Dance Elective</td>
<td>Elective</td>
<td>Elective</td>
</tr>
<tr>
<td>Fall</td>
<td>Dance Elective</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
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</tbody>
</table>

#### Year 4
<table>
<thead>
<tr>
<th>Semester</th>
<th>Course 1</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>DANCE 410</td>
<td>DANCE 411</td>
<td>Elective</td>
<td>DANCE 412</td>
<td>Dance Elective</td>
<td>Elective</td>
</tr>
<tr>
<td>Fall</td>
<td>Dance Elective</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
</tr>
</tbody>
</table>

### General Bachelor of Arts Degree Program

**A) Required Dance Courses (7)**
- DANCE 110, 111, 336
- Two of DANCE 220, 221, 225
- Two of DANCE 230, 231, 233

**B) Required Outside Courses (8)**
- MUSIC 150G, 151G; PSYCH 101; ANTH 102A; two term courses from Drama and/or Fine Arts and the equivalent of one full language course or two of DANCE 241, 242, 341, 342.

**C) Dance Electives (6)**
- Six term courses in Dance

**D) Other Electives (9)**
- Of the nine term course electives at least 4 must be taken within the Faculty of Arts.

### 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 are granted .25 credit. Students may apply technique credits to the “Other Electives” section of their degree.

### Note

Students should plan their program with a faculty advisor so that courses are elected 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 four core areas:

1. **Health Sciences** - the scientific facts and principles pertinent to personal and community health. Specific subject areas include: (a) introduction to health sciences, (b) determinants of disease (epidemiology), (c) environmental health, (d) nutrition, and others.

2. **Behavioural Sciences** - introductions to psychology and sociology, determinants of health behaviour, and health behaviour modification.

3. **Biological Sciences** - the basic principles of biology, anatomy, physiology and biochemistry.

4. **Evaluation and Research** - the principles of statistics and research design aimed at developing sufficient competencies to enable students to evaluate and interpret the findings of health-related research.

Students may apply for admission directly into the Honours Health Studies Program, Co-op or Regular.
In order to receive the honours BSc degree the student must successfully complete 44 term courses including the following requirements:

### Degree Requirements

#### a) Required Health Studies Courses: (14)

#### b) Required Kinesiology Courses: (4)
- KIN 200, 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: (4)
- One of: HLTH 407, 410
- One of: PHIL 226, 258 (recommended for Year 4)
- Two of: BIOL 211, 240, 241, 340, 451, HLTH 302, 303

#### e) Free electives: Thirteen (13) term courses selected in consultation with the student's advisor.

### Course Sequence

**Year 1 (Co-op and Regular)**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>HLTH 140 or 141</td>
<td>HLTH 141 or 140</td>
</tr>
<tr>
<td>PSYCH 101</td>
<td>SOCP 101</td>
</tr>
<tr>
<td>BIOL 230</td>
<td>BIOL 233</td>
</tr>
<tr>
<td>CHEM 123</td>
<td>CHEM 124</td>
</tr>
<tr>
<td>CHEM 123L</td>
<td>CHEM 124L</td>
</tr>
<tr>
<td>1 Elective</td>
<td>KIN 116</td>
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<td>1 Elective</td>
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#### Regular Program

**Year 2**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
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</thead>
<tbody>
<tr>
<td>HLTH 245</td>
<td>HLTH 241</td>
</tr>
<tr>
<td>KIN 200, 222, 317</td>
<td>HLTH 346</td>
</tr>
<tr>
<td>1 Elective</td>
<td>KIN 330</td>
</tr>
<tr>
<td></td>
<td>BIOL 239</td>
</tr>
<tr>
<td></td>
<td>2 Electives</td>
</tr>
</tbody>
</table>

**Year 3**

| HLTH 340   | HLTH 344           |
| HLTH 349   | HLTH 348           |
| 4 Electives| CS 316             |
|            | 3 Electives        |

**Year 4**

| HLTH 431   | HLTH 432           |
| HLTH 442   | HLTH 443           |
| 3 Electives| HLTH 445           |
|            | 2 Electives        |

### Co-operative Programs

<table>
<thead>
<tr>
<th>Year 2</th>
<th></th>
</tr>
</thead>
<tbody>
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</tr>
<tr>
<td>HLTH 245</td>
<td>HLTH 346</td>
</tr>
<tr>
<td>KIN 200, 222, 317</td>
<td>HLTH 348</td>
</tr>
<tr>
<td>1 Elective</td>
<td>HLTH 349</td>
</tr>
<tr>
<td></td>
<td>KIN 330</td>
</tr>
<tr>
<td></td>
<td>BIOL 239</td>
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</table>

<table>
<thead>
<tr>
<th>Year 3</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3A (Winter)</td>
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</tr>
<tr>
<td>HLTH 344</td>
<td>HLTH 340</td>
</tr>
<tr>
<td>HLTH 241</td>
<td>HLTH 442</td>
</tr>
<tr>
<td>CS 316</td>
<td>4 Electives</td>
</tr>
<tr>
<td>3 Electives</td>
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<table>
<thead>
<tr>
<th>Year 4</th>
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<tbody>
<tr>
<td>4A (Spring)</td>
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<tr>
<td>HLTH 431</td>
<td>HLTH 432</td>
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<tr>
<td>5 Electives</td>
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</tr>
<tr>
<td>HLTH 443</td>
<td>HLTH 445</td>
</tr>
<tr>
<td>2 Electives</td>
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</tbody>
</table>

### Health Studies/Kinesiology

#### Kinesiology/Health Studies Joint Honours Degree Programs

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 in Health.

### Degree Requirements for Joint Honours include:

#### A. 44 term courses including -

- **Kinesiology required courses (15):**
- **Health Studies required courses (8):**
  - HLTH 140, 141, 241, 245, 348, 349, 442, 445
- **Outside Required (8):**
  - BIOL 230/233, CS 118 or 316, MATH 106 or 107, PHYS 103, PHYS 105, PSYCH 101, SOC 101

- **Electives (13):**
  - a) Kinesiology - 4 term courses chosen from those electives available in Kinesiology.
  - b) Health Studies - 3 of HLTH 340, 344, 346, 410, 443, 1 of PHIL 226, 258.
  - c) Free* - 5 term courses chosen from any department within the University.

* (*If KIN 116 is taken, it counts as a free elective.)

#### B. An overall average and major average of 70% is required in the Joint Honours program.
### Department of Kinesiology

Listed below are the course combinations leading to the Honours and General degrees in Kinesiology. Students are encouraged to make full use of the advisory system of the Department in planning their programs.

#### Degree Requirements

##### Honours Program

Successful completion of 44 term courses is necessary in order to obtain the Honours BSc degree in Kinesiology. The program must be completed in 8 years.

- **a)** Required Kinesiology courses: (14)
  
  KIN 102, 103, 200, 222, 252, 255, 300, 317, 321, 330, 335, 354, 431 or 433, 470.

- **b)** Required courses from other departments: (8)
  
  PHYS 103, PHYS 105, BIOL 230, BIOL 233, MATH 106 or 107 (see note), CS 116 or 118 or 316, PSYCH 101, and SOC 101.

**Note**

In the case of PHYS 103 and MATH 106 or MATH 107, students may elect to take full year courses in either subject in the appropriate department. MATH 106 is for students not presenting Grade 13 Calculus. MATH 107 is for students who have taken Grade 13 Calculus.

- **c)** Kinesiology Electives: (10) Ten courses from those offered in the Department in addition to the required courses. As part of their Kinesiology elective package, those students who wish to do so may specialize in one of the streams designated by the Department.

(KIN 116 is required for all students not presenting Grade 13 Chemistry for admission. When taken, KIN 116 is counted as a Kinesiology elective.)

- **d)** Electives: Of the remaining twelve (12) term courses, six (6) must be chosen from outside the Department of Kinesiology.

  Students should choose electives in consultation with their Faculty advisor.

##### General Program

The General degree is offered on a regular basis only and may be taken by part-time study.

In order to receive the general BSc degree a student must successfully complete 40 term courses including the following requirements:

- **a)** Required Kinesiology Courses (11) KIN 102, 103, 200, 222, 252, 255, 300, 317, 321, 335, 354.

- **b)** Required Courses from other departments (8)
  
  PHYS 103, PHYS 105, BIOL 230, BIOL 233, MATH 106 or 107, CS 116 or 118 or 316, PSYCH 101, SOC 101.

**c)** Kinesiology Electives (9)

Nine elective courses in Kinesiology.

**d)** Electives (12): Of the remaining twelve (12) term courses six (6) must be chosen from outside the Department of Kinesiology.

#### Course Sequence

##### Honours and General Programs

<table>
<thead>
<tr>
<th>Year 1</th>
<th>(Common to Regular and Co-operative programs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>Winter</td>
</tr>
<tr>
<td>KIN 102</td>
<td>KIN 116 (if necessary)</td>
</tr>
<tr>
<td>KIN 103</td>
<td>KIN 255</td>
</tr>
<tr>
<td>BIOL 230</td>
<td>BIOL 233</td>
</tr>
<tr>
<td>MATH 106 or 107</td>
<td>PHYS 103</td>
</tr>
<tr>
<td>PSYCH 101</td>
<td>Elective*</td>
</tr>
</tbody>
</table>

*Students may choose a computer science course in place of an Elective in Year 1. If a computer science course is not chosen in Year 1 it must be completed by the end of 3A or 3N.

**Regular Program**

<table>
<thead>
<tr>
<th>Year 2</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Fall</td>
<td>Winter</td>
</tr>
<tr>
<td>KIN 200</td>
<td>KIN 252</td>
</tr>
<tr>
<td>KIN 222</td>
<td>KIN 321</td>
</tr>
<tr>
<td>SOC 101</td>
<td>KIN 335</td>
</tr>
<tr>
<td>PHYS 105</td>
<td>KIN 354</td>
</tr>
<tr>
<td>Elective</td>
<td>Elective</td>
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<table>
<thead>
<tr>
<th>Year 3</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>Winter</td>
</tr>
<tr>
<td>KIN 300</td>
<td>KIN 330†</td>
</tr>
<tr>
<td>KIN 317</td>
<td>5 Electives</td>
</tr>
<tr>
<td>4 Electives</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 4</th>
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</thead>
<tbody>
<tr>
<td>Fall</td>
<td>Winter</td>
</tr>
<tr>
<td>KIN 431 or 433†</td>
<td>KIN 470†</td>
</tr>
<tr>
<td>5 Electives</td>
<td>5 Electives</td>
</tr>
</tbody>
</table>

**Co-operative Programs**

<table>
<thead>
<tr>
<th>2A Fall</th>
<th>2B Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>KIN 200</td>
<td>KIN 252</td>
</tr>
<tr>
<td>KIN 222</td>
<td>KIN 300</td>
</tr>
<tr>
<td>SOC 101</td>
<td>KIN 321</td>
</tr>
<tr>
<td>PHYS 105</td>
<td>5 Electives</td>
</tr>
<tr>
<td>Elective</td>
<td>KIN 330†</td>
</tr>
<tr>
<td></td>
<td>KIN 354</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>3A Winter</th>
<th>3B Fall</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>6 Electives</td>
<td>KIN 300</td>
<td></td>
</tr>
<tr>
<td></td>
<td>KIN 317</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 Electives</td>
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</table>

<table>
<thead>
<tr>
<th>4A Spring</th>
<th>4B Winter</th>
<th></th>
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<tbody>
<tr>
<td>KIN 431 or 433†</td>
<td>KIN 470†</td>
<td></td>
</tr>
<tr>
<td>5 Electives</td>
<td>5 Electives</td>
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</tbody>
</table>

*Note

All students in Year 1 are Honours students.

†for Honours students only.
Department of Recreation

Forty-four term courses are required for the Honours degree in Recreation. The student begins study in one of the four areas of concentration available in the second year of the program. Joint Honours programs with Geography, Man-Environment Studies, Sociology and Kinesiology have been developed. A Business Option with Wilfrid Laurier is also offered.

Degree Requirements
A) Recreation courses (22):

1. Required:
   a) REC 100, 101, 201, 210, 230, 250, 270, 371, 399, 470, 471.
   b) Each student normally must include in his program the five (5) courses listed in one of the following areas of concentration (see note):
      Leisure Studies: REC 200, 300, 301, 302, 306.
      Therapeutic Recreation: REC 200, 252, 253, 254, 361.
      Recreation Administration: REC 312, 316, 320, 334, 410.
      Outdoor Recreation: REC 316, 332, 334, 432, 434.

2. Recreation Electives:
   Each student must complete additional recreation electives to meet the required total of 22.

B) Courses outside the Department of Recreation:

1. Required: (8)
   - PSYCH 101 and SOC 101
   - Two English Courses
   - Select one course from four of the following six 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 (Co-operative and Regular)

Year 1
REC 100, 101, 230, 250
PSYCH 101
SOC 101
Electives:
   Two English courses
   One course from four of the following six 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

Year 2
REC 201, 210, 270
3 Recreation Electives
6 Electives

Year 3
REC 371, 399
5 Recreation Electives
4 Electives

Year 4
REC 470, 471
3 Recreation Electives
4 Electives

Joint Honours Degrees
Joint Honours degrees with Geography, Man-Environment Studies, Management Studies, 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 following Recreation core requirements: REC 100, 101, 201, 210, 230, 250, 270, 371, 399, 470, and 471. Further information concerning Joint Honours programs may be obtained from the Undergraduate Officer and the student undergraduate handbook.

Options
An Option is a specified combination or grouping of courses which provides the student with another emphasis in a particular program.

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.
I.S. graduate David Harrison teaching a computer music system
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 inter-disciplinary study, they are able to identify connections among areas of knowledge. From their experience in the University and the community they direct students to specialized areas of expertise or particular facilities to further their study and expand their interests.

The current Resource Persons are: Carol Brooks, Madeleine Byrnes, Anne Dagg, Mac Jamieson, Larry Kendall, Hugh Miller.

Approach to Resources
In designing their own studies, the students have access, not only to the 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, on change, the psychology of adolescence, women in literature, and evolution), ongoing meetings such as the women’s and men’s groups, and the writers’ workshop, and a recent symposium on learning.

Year-End Reviews
Students are encouraged to document the structure and pursuit of their studies as their 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.

Degree Process
While students may take and receive grades for regular University courses, the degree awarded through this Program is not based on the accumulation of course credits but on the evidence of competence achieved. The Bachelor of Independent Studies (BIS) degree is at least equivalent to a regular general baccalaureate degree. However, it is neither a three year nor a four year degree. Each degree program is evaluated on its own merits.

Students who desire the degree and are ready for senior undergraduate work, present a written application to the Academic Board for Integrated Studies documenting their level of achievement and their plans for their final degree period. The Board, consisting of faculty members of the University appointed by Senate, interviews the applicants to determine their preparedness for degree candidacy.
Accepted degree candidates then work under appointed supervisors (two of whom must be members of this University's faculty) for a minimum of two academic terms. During this time the candidates are required to present tangible evidence of their educational development to assist the supervisors with the evaluation of their total baccalaureate programs. At the end of this process the supervisors present letters of recommendation which serve as the basis for the Board's degree recommendation and form part of the student's academic transcript.

The responsibility 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 educational development. These capabilities have prepared them well for further endeavours and have proven advantageous in their search for employment. Moreover, graduates have been remarkably successful in gaining admission to colleges of education, law, business, medicine, and other professional and graduate programs.

Current members of the Academic Board are: P. Bowers (Psychology), G.R. Francis (Man-Environment Studies), R.H. Holmes (Philosophy), M.L. Hutchison (Recreation), F. Mavaddat (Computer Science), S.M. Smith (Biology), D.M.R. Taplin (Mechanical Engineering).

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 further information, including a copy of the current handbook, contact Bill Smyth, Co-ordinator, at extension 3437 in room 1054 in the Psychology (PAS) building.

Examples of Individual Studies

Brian’s program has included courses in science and psychology at this University, directed studies in preventive health at the University of Toronto’s Medical School and studies in pain at the Rosedale Pain Clinic (Toronto), and independent study in statistics, chemistry, physiology, anatomy, neurophysiology and psychoneuroendocrinology. In addition, he has served as a research assistant at Hamilton Psychiatric Hospital/McMaster University and in the Zoology Department at the University of Toronto. His degree studies, which will involve faculty from McMaster University and this University, are focused on biological psychiatric research, biomedical problem-solving and psychopharmacology. They will involve research, literature searches, working with a group of arthritic patients, and the preparation of a series of papers.

Beth’s initial intentions were to work with Program Resource Persons and with small groups of students. When she entered Integrated Studies, however, she felt overwhelmed by the University’s resources and her own inexperience, and immediately registered for ‘as many courses as possible’. As it turned out, her courses in human sexuality, counselling and problems in third world development proved a good introduction for her. They helped define the direction of her studies and established contacts with faculty and teaching assistants for independent study. In addition to her courses, she trained as a volunteer for the Canadian Mental Health Institute—a practical experience which served as a fine complement to her academic studies. Further, she served on the executive of the Peace Society. Her participation in this group served to tie her two main study interests together as the members met to discuss issues of international and interpersonal conflict.

After graduating from high school Randy spent a year at McGill University, travelled throughout North America, Europe and North Africa for a couple of years and then entered and completed a manpower retraining course in marine engine mechanics and small powered equipment. After working for seven years as a small-engine mechanic he pursued the technological studies program at the University of Toronto’s Faculty of Education. After graduating with an honours diploma in technical education he applied to Integrated Studies to examine the physiology, sociology and psychology of learning and to continue his studies in various fields of special education. He chose to undertake these studies before assuming a
teaching position, partially for their influence on his
teaching and also from concern that once he was
immersed in teaching it would be more difficult to
devote the time the study warranted. He chose
Integrated Studies because it afforded him the
opportunity to study in depth exactly what he wanted,
in a manner suited to his personal needs.

Caroline studied for two years in a regular science
program at the University of Guelph but found that for
her it became a system of studying for marks, not
knowledge, in an atmosphere of tension and stress.
Armed with some experience of independent study
and with her background at Guelph she entered
Integrated Studies to pursue her primary interests in
biology and chemistry. She took some courses to
provide her with ideas for in depth study and
participated in Program tutorial groups for the study
of women and literature, and physiology. Further she
undertook readings in philosophy with assistance
from a Program Resource Person.

Kate had been interested in horses for a number of
years. She began by cleaning stalls in exchange for
riding lessons, worked for a major show stable in
Toronto and then was a groom for the Canadian
equestrian team. Recognizing her need for more
formal education, she entered Integrated Studies
where she undertook independent study in organic
chemistry, environmental biochemistry, ecology and
statistics under the direction of a Resource Person
and also took some courses. She spent a term at the
Ontario Veterinary College (Guelph) attending
courses in plant adaptation and soil science, and
studying independently in anatomy and physiology
with assistance from two of the College's professors.
She did readings in locomotion and biomechanics
under the direction of a Resource Person and
reviewed introductory calculus. Prior to beginning her
degree candidacy she served as a research assistant
at the Western School of Veterinary Medicine in
Saskatoon on a study of equine locomotion. This led
directly to two major degree projects on the timing
and placement of the equine forelimbs on approach to
a jump and a quantitative description of the movement
of the fore and hind limbs of a horse, based on force
analysis of stick diagrams for a complete stride of the
trot.

Adrienne’s involvement in the correctional field began
with her participation in a grass root's program
designed to further communication between men
incarcerated in federal institutions and their families.
She then taught courses on the effects of
incarceration on the family unit, and young offenders
and the family. She served as a caseworker for a
halfway house accommodating men on a work release
program from a provincial correctional institution. She
also served as a volunteer with Youth in Conflict with
the Law, interviewing for bail supervision. She entered
Integrated Studies to balance her first-hand
experience with a study of the research that is being
done regarding correctional inmates and their families
and to develop a life studies curriculum to assist
inmates in their return to life outside prison.

Lynn’s major area of interest was in social theory,
particularly as it relates to health care and social
services in western industrialized societies. When she
entered the Program her primary task was to discover
a coherent method of study which would address the
kinds of questions she had about health care. She was
quickly drawn to the sociological literature, much of
which spoke to her personal experiences as a health
care worker. As she began to distinguish between the
use of sociology as part of the knowledge base of the
health and social welfare fields and the sociological
study of those fields in themselves, she gradually
identified herself more as a student of society than as
a student of health and social welfare. More
specifically, a good portion of her work was
concerned with the ways in which the ‘human
services’ are conceptualized by those actively working
in the field. This included an examination of the
relationship between social-scientific knowledge and
its application in the human services. The area of
health and social welfare was thus used as a
framework for an understanding of larger social
processes and issues.

Within the framework of Canadian labour history,
Cheryl studied immigration, political theory and
agrarian reform and delved into such related areas as
Marxism, political economy and the Canadian Left.
While the available literature served as her primary
resource, she also took a course on Marxist political
theory, undertook a Marxist analysis of the history of
Canada with an Economics professor, and worked
intermittently with Resource People and other
students. To complement her historical viewpoint, she
organized a seminar in which a representative from
CUPW presented the union’s stand on the significance
of automation for the postal worker. Finally she
learned to use the computer text editor to facilitate the
writing of papers.

Although writing had been a hobby for George for a
number of years, it was only when two of his poems
were published in a northern anthology that he was
encouraged to conceive of himself as a writer. Further
publications enhanced his reputation but also led him
to enter university to seek assistance with his writing.
Upon admission to Integrated Studies he designed
and undertook a program including: writing a non-
novel narrative examining, under a History
professor’s guidance, the histories of Canadian
Indians in city, small town and remote village
environments; preparing a series of essays on the
structure and goals of an elementary alternative
Examples of Individual Studies

Nancy entered Integrated Studies after graduating from the Law and Security Administration Program at Mohawk College. After an initial full course load she eventually approached her studies through study groups within the Program, individual work with a Resource Person and a student, readings and journal writing. As these changes occurred, her study priorities also altered. Her original interest in women and the law was maintained but increasingly her studies focused on women's creativity - initially in the gifted adolescent but eventually in the accomplished adult. Her studies, involving anthropology, history, music and literature, examined how women have articulated the creative process, and the nature of women's language.

Glen's involvement with the music of the pipe organ included performance, choir direction, organ assembly and studying the history of Canadian pipe organ building. For the concluding part of his program he is documenting the pioneer efforts of the Gabriel Kney Pipe Organ company's development of mechanical action pipe organs and video taping the company's installation of Canada's largest 4 manual mechanical action pipe organ in the new Massey Hall in Toronto. He attended a number of conferences and conventions; took courses, studied under faculty at Wilfrid Laurier University and the University of Western Ontario, restored several organs, and read extensively on the development of pipe organs in North America, Europe and England.

As with many other applicants, Dwayne first heard of the Program through a former student. In his case, the setting was the Yukon and he was searching for an opportunity to expand his study of acupuncture. The more he learned about Integrated Studies, the more he recognized its possibilities for him. The University, while not having specific resources in acupuncture, appeared to have related expertise which would assist his studies. At the same time the independence afforded by the Program would allow him to continue his studies and to seek out suitable resources in the general community. Once resident in Waterloo he developed, with the help of experienced Resource People, a program of study which included some courses in anatomy, physiology and Chinese philosophy while he maintained his focus on acupuncture theory and practice through independent work.

Describing his study as the business application of microcomputers, Ian began by assessing the capabilities of micros to determine what business procedures could and could not be implemented on them, and by experimenting with his own microcomputer. For background, he took courses in such areas as computer science, accounting, economics, business management and ergonomics. In addition he learned CMS and SCRIPT and computer languages such as COBOL, Fortran and BASIC. He developed an extensive bibliography and kept abreast of current developments through data processing journals. Eventually he plans to develop business software.
Faculty of Mathematics

Computer Science
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 and Statistics, (including Actuarial Science). The degree Bachelor of Mathematics (BMath) is awarded upon successful completion of three-year Pass, four-year General and four-year Honours programs.

Honours and General 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 program is not available on the Co-operative system. Students may also register in Regular 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 individual pamphlets describing the Faculty's 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 two years and who does not possess the minimum requirements for admission may apply as an adult student. The applicant should have covered the material of the Ontario Grade 13 mathematics courses (Calculus, Functions and Relations, Algebra), either through a local high school or through the Correspondence Branch of the Ontario Ministry of Education, and should provide evidence of being able to profit from a mathematics program. Each application will be considered on its own merits by the Admissions Committee (See also Part-time Studies).

Advanced Standing

1. Transfer Credits
Students transferring into the Faculty of Mathematics, either from outside or from within the University of Waterloo, will normally be given transfer credit for relevant courses previously taken if (i) a mark of at least 60% or equivalent has been obtained, (ii) a mark of at least 50% has been obtained in a non-mathematics University of Waterloo mathematics course 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 twelve transfer half-credits per academic year previously taken will normally be given. Students admitted with a previous Bachelor's degree will normally be given a maximum of twelve elective (non-math) half-credits, with a possibility of exemptions in certain math courses.

Note
Students transferring from other post-secondary institutions or other University of Waterloo faculties require at least twelve University of Waterloo mathematics half-credits that may be taken for credit by a student in the Faculty of Mathematics.

2. Cumulative Averages
Grades in courses taken at the University of Waterloo prior to a student's admission to the Faculty of Mathematics will normally be included in overall and mathematics cumulative averages if the courses are ones that a student registered in the Math Faculty might take for credit toward a BMath degree. Otherwise, the grades are 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. The BMath Pass degree may be obtained entirely by part-time studies; the BMath General degree requires at least two complete terms on campus; the BMath Honours degree requires at least four complete terms on campus.

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.

Applicants who do not meet the regular admission requirements may be admitted as non-degree (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.

Applicants who do not meet the regular admission requirements may be admitted as non-degree, part-time students at the discretion of the Admissions Committee. Admission as a NON-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 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 as a non-degree student, usually first-year Calculus and Algebra (MATH 124a/b, 130a/b in the UW Correspondence Program), a non-degree student may re-apply for admission as a BMath degree candidate. No special application form is required; simply write to the Secretary of the Mathematics Admissions Committee (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 basis, to make its decision. If the admission decision is favourable, any relevant courses taken on a non-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.

Fees, Financial Assistance
See Chapters 3 and 4.

Academic Programs/Degree Requirements

General Remarks
The Faculty of Mathematics offers undergraduate programs leading to the following Bachelor of Mathematics degrees: BMath Honours, BMath General, BMath Pass. The Honours program is designed for students who wish a heavy concentration of study in some area of the Mathematical Sciences. The General program, on the other hand, is more suitable for students with a definite interest in mathematics but who wish to avoid the intense specialization of the Honours program. The Pass program is available only to students in the Regular system of study. It 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 three years.

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 normal course load for an Honours student beyond first year is six compared to five for General and Pass students. Further, the BMath Honours program requires a higher graduating average and a greater degree of specialization than the BMath General and Pass programs.

The commonality of curriculum (particularly in the first two years) 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.

The following tables and accompanying descriptions outline in detail the degree requirements and typical course load for each year (i.e. two four-month academic terms) of all undergraduate programs in the Faculty of Mathematics. Except where noted, Honours and General programs may be taken in either the Regular or Co-operative system of study. The Pass program is 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, the onus is on the student to be aware of all regulations pertaining to his/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 Credits Required</td>
<td>thirty math half-credits; twelve elective half-credits; six elective or math half-credits.</td>
<td>twenty-four math half-credits; twelve elective half-credits; six elective or math half-credits.</td>
<td>twelve math half-credits; twelve elective half-credits; eight elective or math half-credits.</td>
</tr>
<tr>
<td>Minimum Math Graduating Average</td>
<td>70% on thirty math half-credits</td>
<td>60% on twenty-four math half-credits</td>
<td>60% on twelve math half-credits</td>
</tr>
<tr>
<td>Maximum Course Attempts (or equivalent)</td>
<td>sixty half-credits</td>
<td>fifty-four half-credits</td>
<td>forty-four half credits</td>
</tr>
<tr>
<td>Maximum Failures (or equivalent)</td>
<td>eight half-credits</td>
<td>ten half-credits</td>
<td>ten half-credits</td>
</tr>
<tr>
<td>Minimum Complete Terms Required</td>
<td>four</td>
<td>two</td>
<td>none</td>
</tr>
</tbody>
</table>

Footnotes to Table 1(a):

1. The term 'math half-credit' includes courses with abbreviations ACTSC (Actuarial Science), AM (Applied Mathematics), C&O (Combinatorics and Optimization), CS (Computer Science), MATH (non-departmental faculty courses), PMATH (Pure Mathematics), and STAT (Statistics). The term 'elective half-credit' refers to courses offered by other faculties as well as those with the abbreviation MTHEL. A two-term (i.e. eight-month) course is equivalent to two one-term (i.e. four-month) courses.

2. Some Honours programs require fewer than thirty math half-credits (e.g. Joint Programs with other faculties, Math/Business Administration, Chartered Accountancy and Management Accountancy options). All Honours programs, however, require a minimum total of forty-eight half-credits. See detailed program descriptions on the following pages.

3. All Faculty and Departmental courses required for a particular degree will be included in the Math Graduating Average; that is, for Honours programs requiring more than 30 math half-credits (e.g. Double Honours), all such credits will be included while for Honours programs which require fewer than 30 math half-credits, only those required credits will be included. Also see item 3.1 on page 214 and 'Cumulative Averages' on page 200.

4. There are two deadline dates each term, one for adding courses (this includes changing sections) and a second for dropping courses. The last day to ADD a course is 2 weeks after the official beginning of lectures. The last day to DROP a course is 6 weeks after the official beginning of lectures in the term the course terminates. (These deadline dates apply only to Math Faculty students.) A course attempt refers to a course registration not formally cancelled with the Registrar's Office before the drop deadline in the term in which the course is taken. Further, if a two-term course registration is cancelled after the drop deadline in the first term of the course but before the drop deadline in the second term of the course, the course will be recorded as a half-credit course attempt.

5. A course attempt not successfully completed constitutes a course failure. Further, if a two-term course registration is cancelled between drop deadlines (see 4 above) constitutes an unsuccessfully completed half-credit course attempt, hence a half-credit failure.

6. A complete term (i.e. 4 months) is normally one in which a student successfully completes at least five half-credits on campus, at least two of which must be mathematics courses. For purposes of satisfying the requirements for a complete term, each term of a two-term course will be regarded as a successfully completed half-credit, provided the student successfully completes the two-term course.

### English Writing Skills

All BMath degree candidates with an initial registration in the Faculty of Mathematics of Fall/80 or later must satisfy a Writing Skills Requirement, namely:

"A grade of 65 or better on the UW English Language Proficiency Exam, OR a half-credit with a mark of C- or better in a term-course chosen from a list, approved by the Curriculum Committee, to be maintained in the Math Undergraduate Office, OR four satisfactory Work Reports."
## Table 1 - (b) Required Year 1 & 2 Faculty Core Courses/Typical Course Loads

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Honours Program</th>
<th>General Program</th>
<th>Pass Program</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MATH 130a/b; MATH 134a/b;</td>
<td>MATH 120a/b; MATH 124a/b;</td>
<td>MATH 120a/b; MATH 124a/b;</td>
</tr>
<tr>
<td></td>
<td>six elective half-credits.</td>
<td>six elective half-credits.</td>
<td>six elective half-credits.</td>
</tr>
<tr>
<td>Year 2</td>
<td>MATH 230a/b; MATH 234a/b;</td>
<td>MATH 220a/b; MATH 224a/b;</td>
<td>four math half-credits;</td>
</tr>
<tr>
<td></td>
<td>STAT 230, 231;</td>
<td>STAT 220/221;</td>
<td>three elective half-credits;</td>
</tr>
<tr>
<td></td>
<td>two math half-credits;</td>
<td>two elective half-credits;</td>
<td>three elective or math half-credits.</td>
</tr>
<tr>
<td></td>
<td>two elective half-credits;</td>
<td>two elective half-credits;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>two elective or math half-credits.</td>
<td>two elective or math half-credits.</td>
<td></td>
</tr>
<tr>
<td>Year 3</td>
<td>eight math half-credits;</td>
<td>six math half-credits;</td>
<td>four math half-credits.</td>
</tr>
<tr>
<td></td>
<td>two elective half-credits;</td>
<td>two elective half-credits;</td>
<td>three elective half-credits;</td>
</tr>
<tr>
<td></td>
<td>two elective or math half-credits.</td>
<td>two elective or math half-credits.</td>
<td>three elective or math half-credits.</td>
</tr>
<tr>
<td>Year 4</td>
<td>eight math half-credits;</td>
<td>six math half-credits;</td>
<td>not applicable.</td>
</tr>
<tr>
<td></td>
<td>two elective half-credits;</td>
<td>two elective half-credits;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>two elective or math half-credits.</td>
<td>two elective or math half-credits.</td>
<td></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. Degree requirements and recommendations which are program dependent 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. eight-month) course is equivalent to two one-term (i.e. four-month) courses.

3. All Honours programs require a minimum total of forty-eight half-credits. Some, however, require fewer than thirty math half-credits (e.g. Joint Programs with other faculties, Math/Business Administration, Chartered Accountancy and Management Accountancy options require 24 math half-credits.) This would typically be accomplished by taking 6 math and 6 non-math half-credits each year (3 and 3 each term). See detailed program descriptions on the following pages.

4. The Faculty of Mathematics has completed the implementation (begun in 1980/1981) of curriculum changes in its Linear and Abstract Algebra core courses. MATH 221a/b, 231a/b, 241a/b, 321a/b, 331a/b, PMATH 341a/b have been phased out and replaced by MATH 224a/b, 234a/b, 244a/b, 324, 334, PMATH 344. Degree requirements involving Algebra courses in this and subsequent calendars will be described in terms of the new courses. Students who have completed the old Algebra sequence will obviously not be expected to retake courses from the new sequence. Students with at least one half-credit in the old sequence who have not completed the entire sequence should seek clarification of their position by contacting the Mathematics Undergraduate Office. Under no circumstances, without written Faculty approval, should students mix courses from the old and new Algebra sequences.

5. Some flexibility exists to permit the scheduling of courses in a different manner than that shown in Table 1 (b), provided that course pre-requisites have been met. In certain cases, substitutions among corresponding Advanced Honours, Honours, and General level courses may be made in the Faculty core. More details are given on pages 215 and 345.
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 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.

Students can also gain valuable background knowledge in economics, finance, administration, and law by carefully selecting their electives.

Honours Actuarial Science

Faculty core requirements as outlined in Table 1(b) and:

ACTSC 231, 232, 331, 332, 431, 432;
MTHEL 305a;
STAT 333;
Four of MATH 332a, 332b, 334, STAT 330, 331, AM 381, CS 370, 371, C&O 370;
Four additional fourth year math half-credits including at least two 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 or Mathematics" which begins on page 206.

Applied Mathematics

Traditionally, Applied Mathematics has been almost synonymous with Mathematical Physics but times change and today Applied Mathematics, while retaining its interest in the physical sciences, is broadening its scope and is becoming concerned with the applications of mathematics to the social and biological sciences. To handle the types of problems that arise in these areas, the Applied Mathematician requires two things: a firm background in mathematics with a mastery of techniques and an ability to understand a problem when that problem is stated in the language of biology, economics, engineering, chemistry, physics or business.

With these considerations in mind, the Honours Applied Mathematics program has been developed as follows. In the first two years the student takes essentially the same program as every other Mathematics student and acquires a basic mathematical background. In year three he/she studies the mathematics needed by an applied mathematician. In the fourth year, in addition to broadening his/her mathematical background, the student can apply his/her acquired mathematical skills to problems in various fields such as: Fluid Mechanics, Differential Equations, Quantum Mechanics and General Relativity.

It is our belief that a graduate from this 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 Minor".

Honours Applied Mathematics (Regular)

Faculty core requirements as outlined in Table 1 (b) and:

One of MATH 332a, CS 370, 371, PMATH 351a;
MATH 332B or PMATH 352a;
A minimum of eight Applied Math half-credits at the 300 or 400 level, at least two of which must be at the 400 level.
AM 260, 270 recommended.
MATH 334 or PMATH 344 recommended.

Recommended elective courses for Honours Applied Mathematics with Physics minor are: PHYS 121/122 or 162/163, 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) and:

AM 371, 381, 391;
CS 240, 250, 340, 360, 370, 371;
Three of CS 350, 369, 472, 473, 474, 476, 478, 487;
MATH 332b or PMATH 352a;
Five additional Applied Math half-credits at the 300 or 400 level, at least two of which must be at the 400 level.
PHYS 121/122 or 162/163 in Year 1 recommended.
AM 260 and 270 recommended.
MATH 334 or PMATH 344 recommended.

Honours Applied Mathematics with electives in Engineering (Co-operative only)
Faculty core requirements as outlined in Table 1 (b) (with CS 140, 250 required in Year 1) and:

AM 260, 270, 371, 381, 391, MATH 332b;
A minimum of eight Applied Math half-credits at the 300 or 400 level with at least two at the 400 level.

Electives required include PHYS 121/122 or 162/163 in Year 1 and two half-credits each year (one each term) beyond Year 1 from groups A, B, C, D, E or F.

Group A ME 219, 220, CE 303, 304, ME 527
and/or ME 525:
One or more of CE 518, 522, 526, ME 626.

Group B SY DE 282, 555, SY DE 281 and/or 543;
Three or more of SY DE 352, 372, 434, 442, 468, 535, 544, 565, 567.

Group C ME 219, 250, 351;
Three or more of ME 353, 354, 452, 456, 459, 469, 557, 563.

Group D EL E 271, 233, and/or 241:
Four or more of EL E 342, 351, 352, 372, 418, 419, 434, 435, 436, 453, 454.

Group E EL E 241, 261, 362, 380;
Two or more of EL E 342, 372, 463, 464, 465, 481, 482.

Optional courses: CH E 232, 330, 332.
CHEM 26, 36.

Honours students in another department in the Faculty of Mathematics wishing a "double major" or a "minor" in Applied Mathematics should consult the section "Combination Honours Programs within the Faculty of Mathematics" which begins on page 208.

Combinatorics and Optimization
Combinatorics is the mathematics of discretely structured problems. Although its boundaries are not easily defined, Combinatorics includes the theories of graphs, enumeration, designs, and polyhedra. It is a very old subject which in the past was studied principally for its aesthetic appeal. Today's modern technology with its vital concern for the discrete has given Combinatorics new challenges and a new seriousness of purpose. In particular, since computers require discrete formulations of problems, Combinatorics has become indispensable to modern Computer Science.

Optimization, or mathematical programming, is the study of maximizing and minimizing functions subject to specified boundary conditions, or constraints. The functions to be optimized arise in engineering, the physical and management sciences, and in various branches of mathematics. With the emergence of the computer age, Optimization experienced a dramatic growth as a mathematical theory, enhancing both Combinatorics and classical analysis. In its applications to the management and engineering sciences, Optimization forms an important part of the discipline Operations Research.

Both Combinatorics and Optimization have long been special interests of Canadian Mathematicians. Indeed, Waterloo was the first university in the world to have a Department of Combinatorics and Optimization, and it continues to be a leading centre for teaching and research in the theories and applications of these disciplines.

Honours Combinatorics and Optimization
Faculty core requirements as outlined in Table 1 (b) and:

One of MATH 332a, CS 370, 371, PMATH 351a;
MATH 332b or PMATH 352a;
MATH 334 or PMATH 344;
At least nine additional 300 or 400 level math half-credits. These must include at least two math half-credits from one or more of the other four departments and at least seven half-credits from the C&O department. The seven C&O half-credits must include:
C&O 230, 350;
One of C&O 330, 342;
One of C&O 351, 367;
Three of C&O 331, 343, 351, 367, 430 through 466.
Honours students in another Department in the Faculty of Mathematics wishing a "double major" or a "minor" in Combinatorics & Optimization should consult the section “Combination Honours programs within the Faculty of Mathematics” which begins on page 208.

Computer Science

Computer Science is the science of information. It is concerned with the nature and properties of information, its structure and classification, its storage and retrieval, and the various types of processing to which it can be subjected. It is also concerned with the physical machines that perform these operations, with the elemental units of which the machines are composed, with the organization of the units into efficient information processing systems, and with the exploration of the limits of the abilities of the machines.

Computer Science is well recognized as an independent discipline with an inherently mathematical nature. Its activity ranges from theoretical areas such as automata theory, formal languages, and computability theory, to applied areas such as numerical analysis, programming languages, software and hardware systems, and logic design. More specialized areas such as computer graphics, data base management, artificial intelligence, and automatic theorem-proving are also studied with hands-on experience playing an important role in most courses.

The advent of the computer has 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 what function these systems will perform, systems analysts to determine how the systems will perform these functions, and programmers to actually implement the systems on computers. The demand for such software specialists should remain robust for many years.

The Computer Science program at Waterloo is designed to prepare the student for the challenges of a career in this rapidly evolving technological environment. Considerable emphasis is placed on learning fundamental principles in the early part of the program. Later, the student has the opportunity to explore the ways in which these principles are exploited in current and future areas of application.

Honours Computer Science

Faculty core requirements as outlined in Table 1 (b) (with CS 140 required in Year 1) and:

- CS 240, 250, 340, 350, 360, 369, 370, 371;
- Four additional CS half-credits from those labelled CS 440 or higher;
- C&O 230;
- At least four half-credits chosen from the following list:

MATH 334 (or PMATH 344), MATH 332a (or PMATH 351a), MATH 332b (or PMATH 352a), STAT 333, 334, AM 381, 391, C&O 330, 342, 350, PMATH 430a (or PMATH 432a).

"Students who entered third year prior to September, 1982, may elect not to complete C&O 230 and instead select five courses from this list.

Honours Computer Science with Electrical Engineering Electives (Co-operative only)

Computer Science requirements with the following modifications:

- exclude CS 250 and CS 369;
- include at least two of CS 450, 452, 454, 456, 457;
- include EL E 222, 241, 323, 352, 427, 454.

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)

Faculty core requirements as outlined in Table 1 (b) (with CS 140 and CS 180 required in Year 1) and:

- CS 240, 250, 340, 350, 360, 370, 448, 482;
- Two additional CS half-credits from those labelled CS 440 or higher;
- C&O 230;
- At least four half-credits chosen from the following list:

CS 369, 371, C&O 342, 350, 370, 371, STAT 331, 332, 333

"Or any 300 or 400 level honours mathematics course outside the Computer Science Department requiring one of this group as a prerequisite.

The following non-math half-credits are also required:


(Courses labelled BUS are offered by Wilfrid Laurier’s Business School. They are described by title on page 211.)

Joint Honours Applied Math with Computer Science

This program is described with Applied Mathematics programs.

Joint Honours Pure Math with Computer Science

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 Computer Science should consult the section “Combination Honours programs within the Faculty of Mathematics” which begins on page 208.
Operations Research

How is a mathematical model of an organizational problem arising in science, industry and government formed? By what techniques is such a model analysed? These questions are answered by Operations Research, a discipline that uses the methods of optimization, statistics, and computer science.

The Honours Program in Operations Research, which is offered by the Department of Combinatorics and Optimization, combines a solid foundation in mathematics with special sequences of elective courses in economics, business and management science. The mathematics portion of the program includes linear programming, modelling, scheduling, game theory, forecasting, decision theory and computer simulation.

In Canada, employers of OR graduates are found in manufacturing, distribution and retail companies, mining, transportation, banking, health services, education, and government agencies. Students proceeding to a Master's of Business Administration (MBA) will find that a degree in mathematics, emphasizing operations research, together with relevant work term experience, is an excellent preparation for a rewarding career.

Honours Operations Research

Faculty core requirements as outlined in Table 1 (b) (with CS 140, 180 required in Year 1) and:

- MATH 332b or PMATH 352a;
- MATH 334 or PMATH 344;
- C&O 350, 351, 370, 371;
- CS 240, 370, 437;
- STAT 331, 333, 466;
- Four of C&O 342, 367, 450 through 466, CS 340, 482, STAT 332, 334, 430, 442.

The thirty math half-credits required by the Faculty must include at least four at the 400 level.

Of the twelve elective half-credits required by the Faculty, students must include the following:
- Two of ECON 101, 102, 181, 182, M SCI 43;
- Two of M SCI 44, 53, PSYCH 101, 333, SOC 101, 242;
- Two of ACC 371, BUS 352W, M SCI 48.

(BUS 352W is offered by Wilfrid Laurier's Business School. It is described by title on page 211.)

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 program is designed also for students who wish ultimately to apply their knowledge, but who would prefer to obtain a thorough understanding of mathematics before committing themselves to some particular area of application. Many of those Pure Mathematics graduates who do not become direct appliers of their mathematics enter the field of education, anywhere from the primary level to the most advanced research institute. Our objectives are based on the conviction that the ability to think clearly and precisely, and to continue educating oneself, are valuable in any field of endeavour.

The special interests of the Department include: Algebra (group theory, representation theory, ring theory, lattice theory, universal algebra, linear and multilinear algebra); Analysis (generalized integrals, real and complex analysis, functional analysis); Geometry (algebraic topology, homotopy theory, differential geometry); Number Theory; Functional Equations and their applications (e.g. to information theory, probability, engineering, science and social science); Logic and Foundations.

Besides the Regular Pure Mathematics Honours program, the Department offers two programs for Regular and Stream 4 Co-operative students, Joint Honours Pure Mathematics with Computer Science and Joint Honours Pure Mathematics with Statistics. These programs give the student an opportunity to obtain skills in an applied area while keeping a strong background in Mathematics.

Honours Pure Mathematics (Regular only)

Faculty core requirements as outlined in Table 1 (b) and:

- PMATH 344, with MATH 244b strongly recommended;
- PMATH 351a/b, 352a/b, 367;
- Eight 400 level math half-credits, at least four of which must be Pure Mathematics.

Joint Honours Pure Mathematics with Computer Science

Faculty core requirements as outlined in Table 1 (b) (with CS 140 required in Year 1) and.
PMATH 344, with MATH 244b strongly recommended; PMATH 351a/b, 352a; CS 240, 250, 340, 350, 360, 369, 370, 371, C&O 230; One half-credit from PMATH 352b, 367, C&O 342, MATH 380a/b; Four half-credits (at least two PMATH) from 400 level PMATH courses or CS courses labelled 440 or higher.

Students will normally delay taking some 300 level required courses until fourth year.

Joint Honours Pure Mathematics with Statistics
Faculty core requirements as outlined in Table 1 (b) and:
- PMATH 344, with MATH 244b strongly recommended;
- PMATH 351a/b, 352a;
- STAT 330, 331, 333, 430, 454;
- STAT 334 or 450;
- Three half-credits from PMATH 352b, 367, 443, 451a/b, MATH 380a/b, one of which must be at the 400 level;
- Three additional 400 level PMATH half-credits.

Students will normally delay taking some 300 level required courses until fourth year.

Honours students in another Department in the Faculty of Mathematics wishing a "double major" or a "minor" in Pure Mathematics should consult the section "Combination Honours Programs within the Faculty of Mathematics" which begins on page 208.

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) and:
- STAT 330, 331, 333, 430, 450, 454;
- Four of AM 371, 381, C&O 330, CS 370, 371, MATH 332a, PMATH 351a, 351b, MATH 332b, PMATH 352a, 352b, MATH 334, PMATH 344;
- Two additional STAT half-credits at the 300 or 400 level;
- At least four additional 300 or 400 level math half-credits.

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.

Combination Honours Programs within the Faculty of Mathematics
In the descriptions below, 'X' and 'Y' refer to any two of Actuarial Science, Applied Mathematics, Combinatorics & Optimization, Computer Science, Pure Mathematics, Statistics.

Double Honours 'X' and 'Y' Programs
All Honours requirements for both areas 'X' and 'Y' must be satisfied.

A student who completes the requirements for one of the Faculty's "Option" programs (i.e. Honours Mathematics/Business Administration, Chartered Accountancy, Management Accountancy or Teaching) and all the requirements for 'X' will satisfy the requirements for a Double Honours program.

Honours 'X' with 'Y' Minor Programs
All Honours requirements for area 'X' and the subset of the normal Honours requirements for area 'Y' designated below must be satisfied.
### Mathematics

#### Combination Honours Programs

**'Y' Minor Requirements**

**Actuarial Science:**
- ACTSC 231, 232, 331, 332, MTHEL 305a;
- One of ACTSC 431, 433;
- ACTSC 337 or one 400 level ACTSC half-credit.

**Applied Mathematics:**
- AM 270, 365, 371, 381, 391;
- Two additional 300 or 400 level AM half-credits.

**Combinatorics & Optimization:**
- Five C&O half-credits to include:
  - C&O 230, 350;
  - One of C&O 330, 342;
  - Two of C&O 330, 331, 342, 343, 351, 367, 430 through 466.

**Computer Science:**
- Four of CS 340, 350, 360, 369, 370, 371;
- Three additional CS half-credits in addition to the Faculty core.
  (Note: two of CS 140, 180, 240, 250 are included in the Faculty core.)

**Pure Mathematics:**
- PMATH 344, 351a, 351b, 352a;
- Three additional 300 or 400 level PMATH half-credits at least two of which are 400 level.

**Statistics:**
- STAT 331, 333;
- One of STAT 332, 454;
- Two additional 300 or 400 level STAT half-credits.

#### Combination Honours Programs with other faculties leading to the BMATH Degree

In the descriptions below, 'X' refers to any one of Actuarial Science, Applied Mathematics, Combinatorics & Optimization, Computer Science, 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 Math Graduating Average requirements of 'X', students in these programs must also satisfy the Honours average requirements specified by 'Z'. Students may take these programs in either faculty in Years 1 and 2. In Year 3, they should register in the Faculty of Mathematics.

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anthropology</strong></td>
<td>Fourteen half-credits in Anthropology, twelve of which must be at the 200-level or above; these include one half-credit in an advanced 200-level or above course in each of the four sub-disciplines within Anthropology, (socio-cultural anthropology, archaeology, linguistics, and physical anthropology), as well as two half-credits in anthropological theory (400-level theory oriented courses). ANTH 103 or ANTH 104 meet the linguistics portion of these requirements.</td>
</tr>
<tr>
<td><strong>Economics</strong></td>
<td>101, 102, 201, 202, 231, 301, 302, 311, 321, 401, 402, 421, 422, one additional Economics half-credit.</td>
</tr>
<tr>
<td><strong>English</strong></td>
<td>Sixteen English Major half-credits as outlined under &quot;Joint Honours Programs&quot; on page 100.</td>
</tr>
<tr>
<td><strong>French</strong></td>
<td>191 or 192; fourteen additional half-credits in French with six at the second-year level, four at the third-year level, and four at the fourth-year level.</td>
</tr>
<tr>
<td><strong>Geography</strong></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, 110, 201, 202, 260, 275, 381; ENV S 200; one of GEOG 203, 204, 205, 220, 221; one of GEOG 125R, 126R, 127, ENV S 195b.</td>
</tr>
<tr>
<td><strong>German</strong></td>
<td>One of the following pairs 101/102, 105/106, 111/112, 121/122, 151/152, and four German half-credits in each of Years 2, 3, 4.</td>
</tr>
<tr>
<td><strong>Philosophy</strong></td>
<td>221, 222, 258, 280, 281, 282, 283, 340, 359; four additional half-credits in Philosophy.</td>
</tr>
</tbody>
</table>
Psychology 101, 102, 499; ten additional half-credits in Psychology chosen in consultation with the Psychology Department to fulfill their research requirements.

Russian 101, 102; four half-credits in Russian in each of Years 2, 3, and 4.

Sociology 101, 320, 321, 322, 425, 426, 481, 499; seven additional half-credits in Sociology.

Honours 'X' with 'Z' Minor
All Honours requirements for area 'X' ('X' as defined above) and a set of 10 half-credits prescribed by discipline 'Z' (where 'Z' can be any departmental area, not necessarily restricted to the disciplines mentioned above) in a faculty other than Mathematics which chooses to make a 'Minor' designation available to Math Faculty students, must be satisfied. The minimum average required in these 10 half-credits is determined by 'Z'.

Note
BMATH transcripts are to include no more than two areas of study.

Combination Honours Programs leading to a degree in another faculty (i.e. not BMATH) are described on page 213.

Non-Departmental Honours, General and Pass Programs: Requirements and Recommendations
Except where noted, Honours and General Programs may be taken on either the Regular or Co-operative system of study.

Faculty General* and Pass Programs:
(*Excluding General Math/Business Administration, Chartered Accountancy, Management Accountancy and Teaching Options. Requirements and recommendations for these programs follow this section.)

As indicated earlier, the General and Pass Programs are intended for students with an interest in the mathematical sciences who do not want the intense specialization required in Honours Programs.

Although there are no formal departmental programs in Pass or General, students in these programs may associate themselves with a department at the beginning of Year 3. This procedure allows Pass or General students to turn to departmental Undergraduate Officers for advice but does not subject them to departmental degree requirements.

General Mathematics
(For all students who entered Year 2 prior to September, 1981)

Faculty core requirements as outlined in Table (b) and:
- MATH 324;
- One of MATH 322a, CS 370, 371;
- MATH 322b

(For all students entering Year 2 in September, 1981 or later, the degree requirements above will be replaced by the requirements outlined below.)

Faculty core requirements as outlined in Table 1 (b) and:
- MATH 322b, 324;
- One of MATH 322a, CS 371;
- One of CS 370, C&O 370, AM 444;
- Eight additional math half-credits to include at most two with the same prefix (ACTSC, AM, CS, C&O, MATH, PMATH, STAT).

Note
Students are advised to select these eight half-credits from the following recommended list:
- ACTSC 221, 222, 337
- AM 260, 270, 340, 444
- C&O 220, 270, 370, 371, 380, 381, 382
- CS 330, 338, 340, 350, 360, 369
- MATH 322a, 380a/b
- PMATH 340, 360, 430a/b
- STAT 320, 321, 322, 430, 440, 442, 443.

Pass Mathematics (Regular only)
Faculty core requirements as outlined in Table 1 (b).

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
School of Business and Economics at Wilfrid Laurier University, the Department of Economics and the Department of Management Sciences at Waterloo, offers three 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 three options are available in both the Regular and Co-operative systems 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 two or three 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 qualifies a student for twelve RIA exemptions and also to write three of the Society's six Uniform National Examinations.

Co-operative work terms are accepted by both the Institute and the Society as part of their respective internship requirements. Thus, Co-op graduates are able to complete all Institute or Society requirements in as little as one year after graduation. Graduates of the Regular program are able to complete all such requirements in as little as two years after graduation.

Note that, in the requirements and recommendations which follow, courses labelled BUS are offered by Wilfrid Laurier's Business School. These courses are:

- **BUS 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 and prerequisites.

### Honours Mathematics/Business Administration, Chartered Accountancy, Management Accountancy Options

Faculty core requirements as outlined in Table 1 (b) for Years 1 and 2 (with CS 140, 180 required in Year 1) and one of the packages listed below:

a) **Information Systems Package**

- CS 240: 330, STAT 331:
- **Four additional 300 or 400 level CS half-credits**

b) **Optimization Package**

- C&O 350, 351, 370, 454, CS 330, 338, STAT 331:
- Two of C&O 367, 456, 459:
- One of STAT 332, 333, 442, 466:
- Two additional math half-credits.

*(CS 250 is strongly recommended as a course which should be taken before CS 240.)*

**(Credit may be granted for only one of CS 338, 448 and only one of CS 432, 434, 482.)*

c) **Statistics Package**

- STAT 330, 331, 332, 442, 466, CS 330, 338:
- Two of C&O 350, 367, 370, 454:
- One additional 300 or 400 level STAT half-credit chosen in consultation with the Statistics Undergraduate Officer:
- Two additional math half-credits.

ACTSC 221 or 231, C&O 270, CS 434 are recommended.

The non-math elective half-credits required (together with the year in which these courses are normally taken) are given in the table below:

<table>
<thead>
<tr>
<th>Year</th>
<th>Math/Bus Admin Option</th>
<th>Math/Accountancy Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ECON 101, 102</td>
<td>ECON 101, 102</td>
</tr>
<tr>
<td></td>
<td>ACC 121, 122</td>
<td>ACC 131, 132 (Note 4)</td>
</tr>
<tr>
<td></td>
<td>BUS 111W, 121W</td>
<td>BUS 191, 192</td>
</tr>
<tr>
<td>2</td>
<td>BUS 362W, 362W</td>
<td>ACC 291, 292</td>
</tr>
<tr>
<td></td>
<td>MTHEL 100</td>
<td>MTHEL 100</td>
</tr>
<tr>
<td>3</td>
<td>ACC 371, 372</td>
<td>ACC 381, 382</td>
</tr>
<tr>
<td></td>
<td>M SCI 44, 53</td>
<td>ACC 251</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M SCI 44 (Note 3)</td>
</tr>
<tr>
<td>4</td>
<td>BUS 454W, 481W, 491W</td>
<td>ACC 371, 372</td>
</tr>
<tr>
<td></td>
<td>M SCI 48</td>
<td>ACC 461, 462</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ACC 491</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(ACC 492 recommended)</td>
</tr>
</tbody>
</table>

Note 1

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).
Note 2
A minimum average of 70% is required, based upon 24 math half-credits (including those specified). As well, a minimum average of 70% is required, based upon these 24 math half-credits and the non-math elective half-credits explicitly specified.

Note 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.

Note 4
ACC 131/132 is open only to Co-op Math/Accountancy students. Regular Math Students in these options should substitute BUS 111W/121W.

General Mathematics/Business Administration, Chartered Accountancy (Regular only) and Management Accountancy Options

Faculty core requirements as outlined in Table 1 (b) for Years 1 and 2 (with CS 140, 180 required in Year 1) and:

Two of CS 250, 330, 338;
Two of ACTSC 221, STAT 320, 321, 332, 333;
Two of C&O 270, 350, 351, 367, 370, 371, 454, 459, 464;

The non-math elective half-credits required (together with the Year in which these courses are normally taken) are stated in the table in the preceding section.

Note 1
These programs require a minimum of 42 half-credits, at least 24 of which must be math half-credits.

Note 2
STAT 321 is required by the Society of Management Accountants but not for the BMATH General degree.

Mathematics
Faculty Option Programs

Mathematics/Teaching Option

The Co-operative Mathematics Teaching Option is a uniquely integrated program involving the Faculty of Mathematics and the Faculty of Education at the University of Western Ontario. This program combines academic work, experience in secondary schools, and professional training, with the graduate fully qualified as a secondary school mathematics teacher.

Students interested in the program enrol in the Regular program in Year 1, and are admitted to the Co-operative Program in year 2 on the basis of good academic work and success in an interview process.

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 components 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) and:

MATH 334;
MATH 332b;
One of MATH 332a, CS 370, 371, PMATH 351a;
At least five of ACTSC 221 or 231, C&O 230, 270, 380, 381, 480, 481;
A total of at least four Computer Science half-credits;
A total of at least fourteen 300 or 400 level math half-credits, at least six of which must be at the 400 level.
Elective half-credits required include MTHEL 206a, PSYCH 212 and PSYCH 312 in Year 2, and SOC 207G, PHIL 311 and PHIL 312 in Year 3.
General Mathematics Teaching Option
(Co-operative only)
Faculty core requirements as outlined in Table 1 (b) and:

MAI H 322b;
MATH 324;
One of MATH 322a, CS 370, 371;
At least five of ACTSC 221, C&O 220, 270, 380, 381, 480, 481;
A total of at least four Computer Science half-credits.
Elective half-credits required include MTHEL 206a,
PSYCH 212 and PSYCH 312 in Year 2, and
SOC 207G, PHIL 311 and PHIL 312 in Year 3.

Note
The Faculty of Education at the University of Western Ontario requires that PSYCH 212, 312 and PHIL 311, 312 be part of the B Ed degree. As a result, four half-credits are required in addition to the requirements for the BMATH degree; that is, Honours students must complete a minimum of 52 half-credits and General students must complete a minimum of 46. To achieve this, Honours students normally take seven half-credits each term in Years 2 and 3; General students normally take six.

Combination Honours 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, Geographicaly, German, Man-Environment Studies, Philosophy, Psychology, Russian, Sociology.
Students may take these programs in either faculty during Years 1 and 2. At the beginning of Year 3 they must register in the appropriate department in Arts or Environmental Studies, and have their programs approved by that Department.

Mathematics
Combination Honours Programs
Centre for Information Theory

The mathematics requirements are: *MATH 120a/b, 124a/b, 220a/b, 224a/b;
At least six additional math half-credits which would be acceptable toward a BMATH degree.
A minimum average of at least 70% on these fourteen math half-credits is required.

*Some substitutions are permitted. See the note following Table 1 (b) on page 203.

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 math half-credits, namely: MATH 120a/b, 124a/b, 2 of CS 140, 180, 240, 250, 4 additional math half-credits which would be valid for BMATH degree credit. A minimum average of 70% is required on these 10 math half-credits.

Centre for Information Theory
The Centre for Information Theory was created by the Senate of the University of Waterloo on September 15, 1980. It consists of members of the Engineering, Mathematics, and Science Faculties who are teaching and doing research in Information Theory.

Members of the Centre work on the algebraic, combinatorial, non-probabilistic, probabilistic and mixed theories of information and their applications to coding, economics, engineering, forecasting, optimization, physics, pattern recognition, picture processing, and system designs. The Centre organizes a Seminar and Lecture Series on Information Theory and 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. STANDINGS & PROMOTIONS COMMITTEE

Membership, Duties, Operating Procedure
The Standings & Promotions Committee consists of the Dean, Associate Deans, Department Chairmen, Director of Undergraduate Affairs, Program Undergraduate Officers, the Senior Mathematics Coordinator, the Assistant Registrar, Faculty of Mathematics (who is the Committee's non-voting secretary), and a representative of the Math Society.

The main purposes of the Committee are to administer the rules and regulations pertaining to undergraduate studies in the faculty, to make recommendations on student performance before end-of-term grade reports are issued to students by the Registrar and to consider all requests for special consideration or appeals in matters within its jurisdiction.

Exceptions to normal faculty policies under the jurisdiction of the Standings & Promotions Committee may be authorized only by that Committee. Requests or appeals of this nature must be made in writing to the Committee's Secretary (the Assistant Registrar, Faculty of Mathematics, in Needles Hall). When the Committee feels that the circumstances outlined in writing justify giving an individual student special treatment that others would not receive, such requests are usually granted. (It is often in a student’s best interest to discuss this type of situation with a Faculty Advisor or the Secretary of the Committee before formally approaching the Standings & Promotions Committee. Committee meetings are normally scheduled every other week.)

2. PROMOTIONAL POLICIES

2.1 Required Withdrawal from Co-op
A student will normally be allowed to remain in a Co-operative math program if he/she has satisfied all of the following conditions:

(i) an overall cumulative average $\geq 60$.
(ii) no more than 2 half-credit failures in any one term.
(iii) no more than 3 half-credit failures in any two consecutive full-time academic terms.
(iv) no more than 8 half-credit failures in total.

Continuation in a Co-operative program is also contingent upon satisfactory performance on work terms and work reports.

2.2 Required Withdrawal from Honours
When an Honours student has exceeded 8 half-credit failures, he/she will be required to withdraw from the Honours program. In those cases where the student has not fallen into one of the categories warranting required withdrawal from the Faculty (see below), he/she will still be eligible to pursue a Pass or General degree. In such instances, however, the student will not normally be permitted to take an Honours level course when there is a corresponding General level course available.

2.3 Required Withdrawal from Mathematics
A student will normally be required to withdraw from the Math Faculty if he/she is in one or more of the following categories:

(i) exceeded 10 half-credit failures (or equivalent).
(ii) failed to satisfy all requirements for the BMATH Pass degree by the end of the first term in which the student has accumulated 44 or more half-course attempts.
(iii) is unlikely to profit from further study in the Math Faculty (in the opinion of the Standings & Promotions Committee).

A student who has been required to withdraw from the Math Faculty will not normally be readmitted to a degree 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 zeroes in overall cumulative average calculations.)
The averages displayed on end-of-term 'Student Examination Reports' (i.e. mark reports that are reviewed each term by the Standings and Promotions Committee and released to individual students by the Registrar's Office) are intended only to give an indication of student progress. They do not correspond exactly to the average requirements for a BMath degree. (For example, the "Math Graduating Average" cannot be calculated until all required math half-credits have been successfully completed.) The overall average includes all marks displayed on the mark report (counting zero for DNW, NMR, INC). Two math averages are displayed. One includes the marks of all 'math' courses taken, whether passed or failed. The other includes only the marks of successfully completed 'math' courses. Only the best mark is used if 'math' courses have been repeated (where 'math' refers to courses with the following subject abbreviations: ACTSC, AM, CS, C&O, MATH, PMATH, STAT).

All Faculty and Departmental courses required for a particular degree will be included in the Math Graduating Average; that is, for Honours programs requiring more than 30 math half-credits (e.g. Double Honours), all such credits will be included while for Honours programs which require fewer than 30 math half-credits, only those required credits will be included. In addition to meeting Math Graduating Average requirements, students in Combination Honours programs with other faculties must also satisfy Honours average requirements specified by the other Department.

3.2 Grade Appeals
Any student wishing to appeal a grade may do so by contacting the Secretary of the Standings and Promotions Committee (the Assistant Registrar, Faculty of Mathematics, in Needles Hall). Such an appeal must (i) be made in writing within one month of the official release of that term's grades, (ii) specify the course(s), instructor(s) and grade(s) involved together with reasons why the appeal is being made, (iii) include $5.00 per grade appealed (which is refunded if the grade is raised). Please note, however, that a grade may be lowered if a re-examination leads to the discovery of an earlier error in the student's favour.

4. POLICIES RE: COURSES

4.1 Corresponding Advanced Honours/General Courses
Certain core subjects are offered at three different levels. The Advanced 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).

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 course and obtained that final mark. Otherwise, the student must formally take the Honours course. (Special provisions apply to MATH 120a/b; 124a/b; a grade of at least 80% in one of these courses will count as satisfying the corresponding Honours level course requirement.)

4.3 Failed Courses
The minimum passing mark in all courses is 50%. If a student fails a course, he/she may either retake the same course (and this will be the case if the course is required for the degree being sought) or replace it by another course. The failed course remains a permanent part of the student's record at the university, regardless of whether he/she passes the same course on a subsequent attempt, and it is included in course-attempt and failure counts. However, the failing grade will not be included in the Math Graduating Average required for the degree in question. Note that supplemental examinations are not available for students in the Math Faculty.

4.4 Repeated Courses
A student may not normally retake a passed course more than once in an attempt to improve the grade. Both attempts will be included in the student's quota of course attempts, but the course will be included only once in credit counts and may be counted at most once in the Math Graduating Average pertaining to degree requirements.
4.5 No Credit/Overlap Courses
Some courses offered within the University may not normally be taken for credit toward a BMath degree. The mathematical content which these courses often contain has usually been designed with the academic needs and background of students in faculties other than Mathematics in mind.

Other courses offered by various departments throughout the University sometimes deal with similar subject matter. In such instances, at most one entry from a group of overlapping courses may count for credit toward a BMath degree.

Lists of such courses are maintained in the Mathematics Undergraduate Office and are published from time to time. 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 towards the beginning of the following February. In this regard the Mathematics Faculty has adopted a policy whereby a student with less than a 70% overall average in his/her most recent complete academic term may not normally take a Correspondence course on a part-time basis during the fall term if he/she will be registered full-time during the winter term. This policy is intended to limit this type of situation to students who should be able to cope with the overlap involved in 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 electives, whether mathematics or non-mathematics courses, may be taken on a part-time basis by Correspondence for Honours degree credit. It should also be noted that this policy applies only to Honours 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 one half-credit course.) Interested students are encouraged to discuss Correspondence course selections with their "on campus" Faculty Advisor, but the actual paperwork to pre-register for Correspondence courses involves completely separate application forms available in the Correspondence Program Office (Physics Building, Room 375).

4.7 Courses at Other Universities (Letters of Permission)
Students in good academic standing (i.e. at least 60% cumulative overall average) are normally permitted to take elective courses at other universities on a part-time basis during terms off campus to count as credits toward a Bachelor of Mathematics degree at Waterloo. However, only under very special circumstances will full-time math students be permitted to take mathematics courses (i.e. MATH, CS, STAT, etc.) at other institutions to count toward their Waterloo degree requirements. Students wishing to take courses at other universities may apply to the Standings 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 will be treated as if they had been taken at Waterloo (for Standings and Promotions purposes). Note that, while on a work-term, Co-op students are normally limited to one half-credit course.

Care should be exercised in the selection of courses to be taken on a letter of permission to eliminate unnecessary duplication in course material covered and to ensure adequate preparation for subsequent courses the student is planning to take in future years at the University of Waterloo.

Once the Faculty has approved a request to take a course on a letter of permission, the student will be held responsible for it. It will be his/her responsibility to ensure that an official transcript from the host institution is sent to the UW Registrar's Office within two months of the completion of the course. Otherwise, a grade of DNW (which counts as a failure) will be automatically submitted. Any changes a student wishes to make to an authorized letter of permission must be approved by the Standings and Promotions Committee.
4.8 Dropping/Adding Courses
There are two deadline dates each term, one for adding courses (this includes changing sections) and a second for dropping courses. The last day to ADD a course is 2 weeks after the official beginning of lectures. The last day to DROP a course is 6 weeks after the official beginning of lectures in the term the course terminates. (These deadline dates apply only to Math Faculty students.)

A course attempt refers to a course registration not formally cancelled with the Registrar’s Office before the drop deadline in the term in which the course is taken. Further, if a two-term course registration is cancelled after the drop deadline in the first term of the course but before the drop deadline in the second term of the course, the course will be recorded as a half-credit course attempt.

A course attempt not successfully completed constitutes a course failure. Further, a two-term course registration cancelled between drop deadlines (see above) constitutes an unsuccessfully completed half-credit course attempt, hence a half-credit failure.

5. MISCELLANEOUS POLICIES

5.1 Special Co-op Regulations
i) Co-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 eight academic terms and six work terms. (For students admitted beyond the 1A level, the normal numbers of academic and work terms will be adjusted accordingly.)

To be eligible for a Co-op degree, a student must have successfully completed all academic degree requirements, written at least four satisfactory work reports, followed an approved academic/work-term sequence and successfully completed at least five satisfactory work terms. (For students admitted beyond the Year 1 level, four 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.

Students who have not completed their academic degree requirements at the termination of their approved academic/work-term sequence must do so within one further calendar year to be eligible for a Co-op degree. Otherwise, they will be considered as candidates for a Regular degree.

ii) Re-arranging Academic/Work-term Sequences
Student requests to re-arrange academic/work-term sequences must be directed to the Faculty Standings and Promotions Committee on special forms available from the Registrar’s Office, Department of Co-ordination, and Mathematics Undergraduate Office.

Such requests will normally be approved if all of criteria 1-6 listed below are met. Students who alter their academic/work-term sequence, without first obtaining written approval from the Standings and Promotions Committee, may be required to withdraw from the Co-op program.

1. The request does not reduce the number of work terms remaining for the student at the time of the request.
2. The request does not involve more than two consecutive academic terms or two consecutive work terms.
3. There is no obvious indication that the new sequence requested will result in serious course selection difficulties for the student.
4. The student’s academic performance to date is of sufficiently high calibre that he/she should not suffer academically from being off campus for any eight-month work terms which might be involved in the request.
5. The student’s employer supports the request in writing (if appropriate).
6. The request is properly documented, as requested on the sequence-change form.

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 one or two term-courses of fulfilling the academic degree requirements for their program. With regard to taking courses during work terms, the Standings and Promotions Committee is not prepared to consider requests to take more than one half-credit course unless the request is supported in writing by the student’s employer.

5.2 Course Load, Part/Full-Time, Complete Term
No student may pre-register for more than 6 courses per term.

Students in year 3 and 4 may add additional courses, to a maximum of 8, during the two-week course-change period at the beginning of term, provided their academic record justifies a heavier course load.

For current students in Years 1 and 2, addition of extra courses will normally be restricted to students with both overall and math averages at least 75% during the student’s most recent complete term. In cases where the student was registered in more than 6 courses in the previous term and had both averages at least 70% in those courses, he/she will be permitted to register in the same number of courses in the subsequent term.

For new students in Year 1, addition of extra courses in the first term will normally be restricted to students with both admission averages at least 80%.

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:

| First Year | 0 ≤ N < 10 |
| Second Year | 10 ≤ N < 20 |
| Third Year | 20 ≤ N < 32 |
| Fourth Year | 32 ≤ N |

A student registering for one or two courses per term is considered to be part-time and fees are assessed exclusively on a per-course basis. A student registering for more than two courses is considered to be full-time and fees include extra provisions for an incidental fee (student federation membership, athletics, etc.) and a Co-op fee (for students in Co-operative programs).

Students in the Regular program normally take courses during the fall and winter terms. However, they may also take courses on a part-time or full-time basis during the Spring (May-August) or Summer (July-August) terms.

A complete term (i.e. 4 months) is normally one in which a student successfully completes at least five half-credits on campus, at least two of which must be math half-credits. For purposes of satisfying the requirements for a complete term, each term of a two-term course will be regarded as a successfully completed half-credit, provided the student successfully completes the two-term course.

5.3 Illness or Incapacity

Normally, failure to write a required final examination in any course in which a student is officially registered, or failure to complete such a course for some other reason, will result in a DNW, NMR or INC grade being recorded for the course. All of these grades are considered as failures for the purpose of course-attempt and failure counts and count zero in 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.

5.4 Voluntary Withdrawal

A student may withdraw from the Faculty of Mathematics within the first six weeks of classes in a term without incurring any academic penalty. (A special ‘Withdrawal Form’, available in the Mathematics Undergraduate Office or the Registrar’s Office, must be completed.) A student who withdraws after this date will normally be held responsible for that term’s courses in the sense that such courses will be permanently recorded with grades of DNW and will subsequently be counted as course attempts and failures. Students in this category may still be eligible for tuition and residence fee rebates, depending of course, upon the date of withdrawal.

5.5 'Inactive' Status/Re-Admission

A BMath degree candidate who has been 'inactive' for more than 4 consecutive academic terms must apply for re-admission by writing to the Secretary of the Mathematics Admissions Committee (the Assistant Registrar, 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 re-admission. No special application form is required. 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 performance 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) ≥ 85%, based on at least 6 half-credits. 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 Honour List" if their cumulative averages (both math and overall) ≥ 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. Last year, Michael Albert won this award on the basis of outstanding academic achievement throughout his undergraduate career.

7. ENGLISH WRITING SKILLS
BMath degree candidates with an initial registration in the Faculty of Mathematics of Fall/80 or later must satisfy a WRITING SKILLS REQUIREMENT, namely:

"A grade of 65% or better on the ELPE, OR a half-credit with a mark of C- or better in a term-course chosen from a list, approved by the Curriculum Committee, to be maintained in the Math Undergraduate Office, OR four satisfactory Work Reports."

NOTE: ELPE = UW English Language Proficiency Exam.

8. "AREAS OF STUDY" ON TRANSCRIPTS
BMath transcripts are to include no more than two areas of study.
Faculty of Science

Optometry
Faculty of Science

Introduction
The first students were enrolled in the Faculty of Science in the autumn of 1959. There are now approximately 1,900 full-time students including 200 graduate students, taking programs within the Faculty. The Faculty of Science has five 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 four 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 four-month work terms in industry, business or government in an area related to their studies.

For those students whose leanings are more towards administration than research or teaching there is a General Science and Business program. 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 General Science Program in either the three or four-year option. 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
A student who has graduated with a 3-year General degree from this University only, may successfully complete the requirements of the 4-year degree with an official major field designation and exchange the old diploma for a new one. Normally a student may not upgrade a General BSc or its equivalent to a Waterloo Honours BSc. However, from time to time such conversion privileges may be allowed in exceptional cases on the recommendation of the Department(s) concerned and with the approval of the Examinations and Standings Committee. Rulings of the Committee in any particular case on the conditions to be met for such conversion may include time limits.

Admission
The admission requirements and procedures for all programs are outlined in Chapter 2 of this Calendar. The following points emphasize some of the admission requirements which relate specifically to programs in the Faculty of Science.

Applicants from Ontario Grade 13
Satisfactory completion of six Grade 13 credits with a 65% overall average as well as 65% overall average in Math (Calculus and one of Relations and Functions or Algebra) and two Sciences (one of which must be Physics or Chemistry). Co-op Physics requires 70% average in Math and Physics. Co-op Chemistry, and Co-op Biology and Chemistry require 70% in Chemistry and in Maths.

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 will 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 one Ontario Grade 13 Mathematics and one Science course or their equivalent in order to have the proper background for first year University courses in these areas. To discuss admissibility and appropriate qualifying works, applicants are advised to contact the Assistant Registrar, Faculty of Science.

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 operates under a "credit system" in which student process is measured by credits successfully completed rather than by years. Students who have passed fewer than five credits successfully will be considered Year 1 students; those with at least five but fewer than ten, Year 2; those with at least ten but fewer than fifteen, Year 3; and those with fifteen or more, Year 4.

1. Final Examinations
   a) The Faculty constitutes the examining body for all examinations. All examination results are considered by the Examinations and Standings Committee and subsequently by the Faculty Council. After the results have been considered by these bodies, they will be issued to individual students by the Registrar. Appeals against faculty decisions made under these regulations should be made in writing to the Registrar's Office within one month of the official announcement of term or year marks.
   b) Final examinations in one-term courses are held in December, April, or August. Final examinations for all full year courses are held in April, and cover all the work taken in each course. The time normally allowed for each examination is three hours.
   c) In all courses each student is required to submit, in such form and at such time as may be determined by the instructor, evidence of satisfactory participation in term work. The marks obtained for work during term are used, in part, in determining standing. The ratio in which marks for term work and written examinations are combined is at the discretion of the individual departments. To pass in a course, a student must 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 examination; 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 one week after the examination should have been written.
   e) In cases where a course (failed or passed) is repeated, both marks will be used in calculating the student's cumulative overall average. If a passing grade is achieved more than once in the same course, it will still only count as one course passed towards the total necessary for graduation. Students in good standing will not normally repeat courses they have passed.
   f) No course or its equivalent may be repeated more than once.
   g) In cases where more than one course or course- sequence contains the same or similar course content, credit will only be given in one.
   h) All examinations which receive a failing grade are automatically re-read.

2. Make-up Examinations
   Make-up examination privileges may be granted to students in good standing:
   a) In a case where failure to pass is attributable to extraordinary circumstances, especially medical or health-related problems.
   b) Only when such failed courses could not be repeated and when a student's progress could be unduly held up by lack of one prerequisite.
   c) If more than one course or course- sequence is failed in a given year (except on medical grounds as in a).

In all cases regarding make-up examinations the student must have satisfied all term work requirements in the course and must have the permission of the Examinations and Standings Committee (who must be satisfied the student has a fair chance to pass the examination - the student's overall University record may be used in making this assessment.) Regardless of standing, no student will be allowed make-up privileges if he or she has failed more than two full courses or their equivalent in a given year (except on medical grounds as in a).

Except in extraordinary circumstances (e.g. a) above), when a make-up examination is passed, the course will count as a course passed toward the degree, but the mark obtained will not be counted in determining cumulative average (i.e. the original mark will normally be the mark which counts).

3. Co-operative 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) Upper year assessment will be made on a term by term basis. Beyond Year 1, the various programs are mostly composed of one-term courses in which all marks are final. Depending on electives chosen there may be some mixture of term and full-year courses. Assessment made in terms of 2A and 3A will be on the basis of marks in all courses taken; for assessments in terms 2B and 3B, marks given for the second half of a full-year course will be the final mark for the course and will replace the A term mark for average purposes. Terms 4A and 4B will normally be assessed as a unit at the end of the 4B term when both terms are taken consecutively from September to April. Students from any co-operative program may be transferred to the General program (non-co-op) if they are deemed to be making unsatisfactory progress towards their Honours degree. Normally a student may take no more than two upper year terms on a part-time or reduced program basis and must have special permission from the Department to do so.

c) A student is expected to follow the work-term sequence from the point of entry, subject to the minimum requirements for graduation within the individual programs.

The minimum number of related work terms required is normally four.

The minimum number of satisfactory work reports is normally four.

4. Standing

Grades
Marks in individual courses will be reported as numerical marks on the scale 0 to 100. A mark of 50 of better is necessary to pass and receive credit for a course. For Science students, the lowest mark to be recorded and averaged will be 32, equivalent to the weighting factor for the F- on the common 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.

Science
Examinations and Standings

Required to Withdraw
Students who have been “required to withdraw” from the Faculty of Science may not apply for readmission for at least two academic terms.

After two terms have elapsed, a formal application may be submitted to the Registrar’s Office. Applicants must include a typewritten statement along with their application outlining why they are now likely to succeed.

Readmission is not automatic. All such applicants will be assessed in competition with new applicants and on the probability of their future success.

Readmission when granted will be with conditional standing.

Terminology
INC (either term work, lab work, examination, etc., are incomplete). AEG (agrotat - signifying the student’s work or examination was incomplete for some acceptable reason (such as illness) and his instructor felt the student should receive credit for the course but a numerical mark could not be set). A course for which the grade designation INC has been given must be completed within two terms of taking the course of the INC automatically becomes a mark of 32. If a graduating student has an INC, it will be recorded as 32 on the transcript. Then, if the required courses and accumulated average are met, the student will be allowed to graduate.

CR (Credit granted where performance was satisfactory but no specific mark is given and AEG is not acceptable).

NCR (Credit is not granted where performance was unsatisfactory but no specific mark is given).

DNW (Final examination not written in a course that has not been dropped officially whether the course has been attended or not).

AEG or CR will count as a course passed towards the total necessary but will not count in the overall average.

Unless there are medical or other extenuating circumstances, a DNW will be weighted for averaging purposes as the lowest possible failing mark (32, equivalent to F- on the common grading system) in determining standing.

“Attempt” is a course completed, whether passed or failed or recorded as INC or DNW. Courses dropped before the official deadline are not considered as attempts and do not appear on the transcript.

Overall standing will be determined at the end of 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
Beginning in 1979, the Faculty of Science introduced a Dean’s Honours List for full-time Honours students who have completed second year studies or higher during the previous twelve months.

The list of nominations will not exceed 10% of the number of such students in each Department. To be eligible for consideration a student must have a cumulative average and an overall average for the completed year of at least 80%.

The award will be noted on the student transcript, and the student will receive a congratulatory letter from the Dean.

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 (see also p. 228)

General Programs - 3 Year General and 4 Year General (Major) Requirements (see p. 248)
The 4 Year General Program begins at the Year 2 level, admission to which requires a 55% overall average as well as 60% or better in the field of specialization. A 60% cumulative average in the major field courses must be maintained in the 4 Year General program.

To continue in the General programs a full-time student carrying the normal 5 lecture course load must maintain a cumulative average of 55% with a minimum of 3.0 lecture credits obtained per academic year and no more than 2.0 failed. Failure to meet these requirements could result in a Conditional Standing or a requirement to withdraw. A Conditional Standing may be allowed the first time depending upon the circumstances.

Of the total 15 credits required in the 3 Year General program at least 14 must be lecture credits. No more than 21 credit attempts will be allowed.

Of the total credits required in the 4 Year General program (20 or greater) at least 18 must be lecture credits the number dependent on the program. No more than 6 credit attempts over and above the number of credits required will be allowed.

Science
Academic Programs

No more than 3 credits offered under the "Science" label may be applied to any general degree.

All 4 year General students must take Year 4 of the program through the University of Waterloo.

Honours Programs

Introduction
Admission to the Co-operative Biology, Biology and Chemistry, Chemistry, Earth Sciences, and Physics programs is at year 1 (see Chapter 2 for Admission Requirements). All other programs begin at the Year 2 level, admission to which requires a 60% overall average as well as 60% or better in the field of specialization.

To be eligible for an Honours degree a student must have been enrolled fulltime in two out of three of years 2, 3 and 4 of an Honours Program one 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. 246)
(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.

A student who fails one of the credits in the field of specialization may be placed on probation in order to clear that requirement. Failure of more than one such course could result in requirement to withdraw from that program.

Not more than 3 credits offered under the "Science" label may be applied to any Honours Program.

No more than 6 credit attempts over and above the number of credits required in a program will be allowed.

b) Honours Major Programs (see also p. 229)
Honours Biology - Regular and Co-operative
Honours Biology and Chemistry - Regular and Co-operative
Honours Biology and Man-Environment - Regular
Honours Chemistry - Regular and Co-operative applied
Honours Earth Sciences - Regular (Geography) and Co-operative applied (Geology, Geophysics or Geotechnical)
Optometry - Regular
Honours Physics - Regular and Co-operative applied
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.

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. In the Honours Earth Sciences (Geography) program a cumulative average of 75% must be maintained in the Geography courses, and a cumulative average of 60% in the other courses.

In the Honours Psychology 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.

A student who fails one of the credits in the field of specialization may be placed on probation in order to clear that requirement. Failure of more than one such course could result in requirement to withdraw from that program. No more than 6 credit attempts over and above the number of credits required in a program will be allowed.

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 and a 60% average in all Biology courses.

**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, Chemistry, Earth Sciences and Physics are labelled as such but all other students are officially in Year 1 General Science. Essentially the same courses are available to all first year students and students may enter most Year 2 programs in Science provided they have taken the necessary courses in Year 1 and have achieved the necessary passing average; the notable exception to this is in the Optometry program where enrolment is limited to 60.

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 two of these must be lecture credits from the Year 1 offerings in two 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).

   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 or General Science-Major programs can be found in the table on page 227.

2. **Course and Program Changes**

   a) Students may "add and drop" half courses during the first two weeks of the Fall, Winter and Spring terms upon having the appropriate change form completed.

   b) Students may "add and drop" full-year courses during the first two weeks of the Fall term upon having the appropriate change form completed.

   c) Courses may be dropped after the normal two weeks change period with adequate cause but not after November 1, March 1 or July 1 for Fall, Winter and Spring one-term courses. The final drop day for full-year courses is March 1. The permission of the instructor and the appropriate undergraduate officer or the Associate Dean must be obtained.

   Courses which have not been dropped officially will receive a DNW grade.

   d) Students may not drop a laboratory course without written clearance from the lab supervisor (faculty member or senior demonstrator). Students not checking out of such courses remain liable for the full value of the locker kit issued to them.

   e) Students may withdraw from the University as late as the official course drop date without penalty on their record. If however, a student chooses to withdraw to avoid a number of failures, he or she will likely be disqualified for readmission.

3. **Correspondence Courses**

   Only in exceptional cases should correspondence courses be taken by a student in a term in which he or she is a full-time student.

4. **Enrolment in a Graduate Course**

   A student may obtain credit toward a graduate degree in the Faculty of Science for normally not more than 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.

5. **Reduced Program**

   Only in exceptional circumstances may an Honours program be taken on a completely part-time or reduced program basis; at least two of the upper three years must be taken on a full-time (full program) basis one of which must be Year 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 Department 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 (B.A. or B.Sc. or equivalent, 3- or 4-year General or Honours).

The Honours Specialist Qualification (HSQ) requires:

- An Honours Bachelor's degree or equivalent; and
- a B average in the subject or subjects in which the HSQ is sought; including
- 9 credits in the subject for one area of specialization, or
- 14 credits in two subjects (no fewer than 6 in each) for two areas of specialization.

In addition, the applicant for the HSQ must have completed a Faculty of Education program and two 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 or Major Programs

#### 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>Biology (see Note 6)</td>
<td>Two 200 level term courses in BIOL, CHEM 123-124 and 123L-124L</td>
<td>PHYS 111-112, AM 101-111, or MATH 113, EARTH 121-122, CS 118</td>
</tr>
<tr>
<td>Biology and Chemistry (see Note 6)</td>
<td>Two 200 level term courses in BIOL, MATH 113, CHEM 123-124 and 123L-124L, a first year PHYS course with labs, CS 118.</td>
<td></td>
</tr>
<tr>
<td>Biology and Man-Environment (see note 6)</td>
<td>Two 200-level term courses in BIOL, ENV S 195a or 195b, M ENV 150-151, and 190-191, CHEM 123-124 and 123L-124L, CS 116 or 118.</td>
<td></td>
</tr>
<tr>
<td>Chemistry (see Note 2)</td>
<td>CHEM 123-124 and 123L-124L, MATH 113, PHYS 121-122 and 121L-122L, CS 118.</td>
<td></td>
</tr>
<tr>
<td>Chemistry (Environmental Studies Option) (See Notes 2 &amp; 6)</td>
<td>CHEM 123-124 and 123L-124L, MATH 113, PHYS 121-122 and 121L-122L, CS 118.</td>
<td>BIOL 111-112, 111L-112L or two 200 level term courses in BIOL, EARTH 121-122, ENV S 195a or 195b.</td>
</tr>
<tr>
<td>Chemistry (Mathematics Option) (see Note 2)</td>
<td>CHEM 123-124 and 123L-124L, MATH 115a-115b, PHYS 121-122 and 121L-122L, or PHYS 162-163 and 162L-163L, MATH 111a-124b, CS 118.</td>
<td></td>
</tr>
<tr>
<td>Chemistry (Physics Option) (see Note 2)</td>
<td>CHEM 123-124 and 123L-124L, MATH 113, PHYS 121-122, and 121L-122L or 162-163 and 162L-163L, CS 118, MATH 111a-124b.</td>
<td></td>
</tr>
<tr>
<td>Earth Sciences (see Note 4)</td>
<td>EARTH 121-122, CHEM 123-124 and 123L-124L, a first year PHYS course with labs, MATH 113.</td>
<td>BIOL 111-112 or two 200 level term courses in BIOL CS 118, or ARTS elective.</td>
</tr>
<tr>
<td>Earth Sciences (Geography Option) (see Note 4)</td>
<td>EARTH 121-122, CI 100-111, CI 101-111, CHEM 123-124 and 123L-124L, GEOG 102 and one of: GEOG 101, 125r, 126r, 127 or ENV S 195.</td>
<td>CS 118</td>
</tr>
</tbody>
</table>
## Year 1 Science Program Selections Leading to Year 2 Honours or Major Programs

### 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 (see Note 3, page 229 and consult page 244 for full list of prerequisites for admission to Optometry.)</td>
<td>MATH 113, BIOL 230 and 211, PHYS 121-122 and 121L-122L, PSYCH 101.</td>
<td>CHEM 123-124 and 123L-124L, PSYCH 102(a-d) or SOC 101.</td>
</tr>
<tr>
<td>Physics (see Note 1)</td>
<td>MATH 115a and MATH 115B or MATH 113; MATH 124a and MATH 124B; PHYS 121-122 or PHYS 162-163; PHYS 121L-122L or PHYS 162L-163L.</td>
<td>A computer course, CHEM 123-124 and 123L-124L.</td>
</tr>
<tr>
<td>Psychology (see Note 6)</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 113. PSYCH 101-102(a-d).</td>
<td></td>
</tr>
<tr>
<td>General Science &amp; Business (see page 251)</td>
<td>2.0 Science lecture credits from the Year 1 departmental courses, MATH 113, ECON 101, 102, CS 118 and 115 (see page 251)</td>
<td></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 5)</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 5)</td>
<td>MATH 115a and MATH 115b; MATH 124a and MATH 124b; PHYS 121-122 or PHYS 162-163; PHYS 121L-122L or PHYS 162L-163L.</td>
<td>A Computing Course, CHEM 123-124 and 123L-124L.</td>
</tr>
<tr>
<td>Applied Physics (Geophysics Option) (see Note 1 and 5)</td>
<td>MATH 114, 115a-115b, PHYS 121-122 and 121L-122L or 102-103 and 102L-103L, CHEM 123-124 and 123L-124L, EARTH 121-122, CS 118 or 140.</td>
<td></td>
</tr>
<tr>
<td>Applied Earth Sciences (Geology Option) (see Note 4)</td>
<td>EARTH 121-122, CHEM 123-124 and 123L-124L, a first year PHYS course with labs, MATH 113.</td>
<td>BIOL 111-112 or two 200 level term courses in BIOL, CS 118, or ARTS elective.</td>
</tr>
<tr>
<td>Applied Earth Sciences (Geotechnical Option) (see Note 4)</td>
<td>EARTH 121-122, MATH 110a-110b, 114, PHYS 115 or PHYS 121-121L and GEN E122 or PHYS 122-122L, CHEM 123-124 and 123L-124L, CS 118, one term ARTS elective.</td>
<td></td>
</tr>
<tr>
<td>Applied Earth Sciences (Geophysics Option) (see Note 4)</td>
<td>MATH 113, PHYS 121-122 and 121L-122L, EARTH 121-122, CHEM 123-124 and 123L-124L, CS 118 (or 140), MATH 114 or 111b, elective.</td>
<td></td>
</tr>
<tr>
<td>Co-operative Biology (see Note 5 and 6)</td>
<td>Two 200 level term courses in BIOL, CHEM 123-124 and 123L-124L.</td>
<td>PHYS 111-112, AM 101-111, EARTH 121-122 and CS 118.</td>
</tr>
<tr>
<td>Co-operative Biology and Chemistry</td>
<td>Two or three 200 level term courses in BIOL, CHEM 123-124 and 123L-124L, MATH 115a-115b, PHYS 121-122 and 121L-122L, 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 133A-133B instead of MATH 113 or 115A-115B, and may select MATH 134 instead of MATH 124 if they have an 80% average in Grade 13 Mathematics and Physics.

Students wishing a Biophysics option of the Honours Physics program are advised to include BIOL 111-112, 111L-112L in their program.

Students wishing a Physics option of the Honours Physics program are advised to include PHYS 123-122 and CHEM 123-124 in Year 1.

Students wishing any of the Business Administration options are advised to select ECON 101-102.

Students wishing an elective program with EL E 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 computer course in Year 1.

Note 2
The Year 2 Honours Chemistry programs (including Co-op Applied Chemistry) are normally limited to the 100 best qualified students. Those who have failed core courses should not expect to proceed in any Honours Chemistry program.

Note 3
Students planning to apply for admission to the B.Sc. degree must have a sound background in Chemistry. CHEM 123-124 and 123L-124L is strongly recommended. PHYS 122 and 123L or 123 may be taken instead of PHYS 121-122 and 122L.

Note 4
By the end of Year 2 students must have completed PHYS 121-122 and 121L-122L, MATH 113, Calculus, and CS 118 or an equivalent course.

The requirements of Physics 122L are limited to approximately 45 students in Year 2 of all Earth Sciences programs.

Note 5
Students in the Co-operative Biology, Chemistry and Physics programs have two methods of taking Year 1. (a) Two terms in a row "3-stream" (September-April) or (b) Fall term on campus "4-stream" (September-December), winter term at work (January-April) and spring term on campus (April-August).

Note 6
The Department of Biology offers ten introductory courses which provide a thorough and broadly based foundation in biology. Areas of biology that are covered include Botany (220-221), Cell Biology (230), Ecology (230), Genetics (239), Microbiology (240-241), Physiology (233) and Zoology (210-211). Physics 121-122 will be offered during the Spring Term in even-numbered years and BIOL 211, 221 and 241 will be offered during the Spring Term in odd-numbered years.

In Year 2, students pursuing 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 (and labs) are available. These courses will emphasize basic principles.

See course descriptions in Chapter 15.

Academic Program Descriptions

1. Honours Majors Programs

Honours Biology

Year 1
(For complete discussion of Year 1, see page 227.)
(Course weight is shown in parenthesis.)

Students entering Year 2 must take the remaining 8 (or 7) Biology courses from the following list of 10.

Year 2†

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 210</td>
<td>Introductory Invertebrate Zoology</td>
<td>0.5</td>
</tr>
<tr>
<td>BIOL 211</td>
<td>Introductory Vertebrate Zoology</td>
<td>0.5</td>
</tr>
<tr>
<td>BIOL 220</td>
<td>Plant Biology 1 - The Living Plant</td>
<td>0.5</td>
</tr>
<tr>
<td>BIOL 221</td>
<td>Plant Biology 2 - The Diversity of Plants</td>
<td>0.5</td>
</tr>
<tr>
<td>BIOL 230</td>
<td>Introductory Cell Biology</td>
<td>0.5</td>
</tr>
<tr>
<td>BIOL 233</td>
<td>Human Physiology</td>
<td>0.5</td>
</tr>
<tr>
<td>BIOL 239</td>
<td>Genetics</td>
<td>0.5</td>
</tr>
<tr>
<td>BIOL 240</td>
<td>Fundamentals of Microbiology</td>
<td>0.5</td>
</tr>
<tr>
<td>BIOL 241</td>
<td>Introduction to the Microbial World</td>
<td>0.5</td>
</tr>
<tr>
<td>BIOL 250</td>
<td>Ecology</td>
<td>0.5</td>
</tr>
<tr>
<td>CHEM 266</td>
<td>Basic Organic Chemistry 2</td>
<td>0.5</td>
</tr>
<tr>
<td>CHEM 266L</td>
<td>Organic Chemistry Laboratory</td>
<td>0.25</td>
</tr>
<tr>
<td>CHEM 267</td>
<td>Basic Organic Chemistry 3</td>
<td>0.5</td>
</tr>
<tr>
<td>CHEM 237</td>
<td>Introductory Biochemistry</td>
<td>0.5</td>
</tr>
<tr>
<td>CHEM 237L</td>
<td>Introductory Biochemistry Laboratory</td>
<td>0.25</td>
</tr>
<tr>
<td>STAT 202</td>
<td>Elementary Statistics for Biologists</td>
<td>0.5</td>
</tr>
</tbody>
</table>

†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.)

††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 249. 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 of 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 two years of work-related experience as well as a degree in Honours Biology. Applicants for Co-op Biology must fulfill the normal admission requirements for the Faculty of Science. The program has academic and work-terms scheduled as shown in Chapter 5.

In-course academic requirements are the same as for Honours Biology. During the work terms, students are assessed on their performance and are also required to write work reports. The program is aimed at making the student competitive in the job market without precluding entry into graduate school.

Note to All 1B Students:
By the end of Year 2B, students must have completed the ten introductory Biology courses at the 200-level. 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 will be offered during the Spring Term in even-numbered years and BIOL 211, 221 and 241 will be offered during the Spring Term in odd-numbered years.
### Stream 4 and Stream 8

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 4A</td>
<td>Year 4B</td>
<td></td>
</tr>
<tr>
<td>BIOL Three 400-level term courses.</td>
<td>BIOL Three 400-level term courses.</td>
<td></td>
</tr>
<tr>
<td>Electives Two term courses.</td>
<td>Electives Two term courses.</td>
<td></td>
</tr>
<tr>
<td>(Biochemistry courses are recommended).</td>
<td>(Biochemistry courses are recommended).</td>
<td></td>
</tr>
</tbody>
</table>

#### Honours Co-operative Biology and Chemistry

Students with an interest in biochemistry have traditionally enrolled in our Honours Biology and Chemistry program, operated jointly by the Departments of Biology and Chemistry. Effective September 1982, first or second year students may take this program in a Co-operative format with academic and work terms scheduled as shown in Chapter 5. In the Co-operative format the curriculum has been revised to provide courses that allow specialization in either biochemistry with a chemical emphasis or biochemistry with a physiological or microbiological emphasis.

The program will also continue to be offered in the regular four-year format.

Program Advisors: Dr. L.J. Brubacher, Chemistry and Dr. J.C. Carlson, Biology.

#### 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 Officers in Biology. Students should be aware that BIOL 233 and 239 will be offered during the Spring Term in even-numbered years and BIOL 241 will be offered during the Spring Term in odd-numbered years.

### Stream 8

(Students who take Year 1B during Winter Term.)

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1A</td>
<td>Year 1B</td>
<td></td>
</tr>
<tr>
<td>BIOL 230</td>
<td>BIOL Two 200-level term courses.</td>
<td></td>
</tr>
<tr>
<td>CHEM 123, 123L</td>
<td>CHEM 124, 124L</td>
<td></td>
</tr>
<tr>
<td>MATH 115a</td>
<td>PHYS 121, 121L</td>
<td>PHYS 122, 122L</td>
</tr>
<tr>
<td>CS 116</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 2A</td>
<td>Work Term</td>
<td>Year 2B</td>
</tr>
<tr>
<td>BIOL 240</td>
<td></td>
<td>BIOL One 200-level term course.</td>
</tr>
<tr>
<td>CHEM 212</td>
<td></td>
<td>CHEM 221, 221L</td>
</tr>
<tr>
<td>CHEM 220, 220L</td>
<td>CHEM 237, 237L</td>
<td></td>
</tr>
<tr>
<td>CHEM 266</td>
<td></td>
<td>CHEM 265, 265L</td>
</tr>
<tr>
<td>STAT 202</td>
<td></td>
<td>Elective</td>
</tr>
<tr>
<td>Work Term</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Stream 4

(Student who take Year 1B in Spring Term)

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 3B</td>
<td>Work Term</td>
<td></td>
</tr>
<tr>
<td>BIOL 331</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOL One 300-level term course.</td>
<td>CHEM 332, 332L</td>
<td></td>
</tr>
<tr>
<td>CHEM 356</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM 356L, 357L</td>
<td>Elective</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Term</td>
<td></td>
</tr>
</tbody>
</table>

| Year 1B     |              |
| BIOL 330    |              |
| BIOL 350    |              |
| CHEM 333, 333L | CHEM 357 |              |
| CHEM 368, 368L | Elective |              |

<table>
<thead>
<tr>
<th>Year 2B</th>
<th>Work Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 240</td>
<td></td>
</tr>
<tr>
<td>CHEM 221, 221L</td>
<td>CHEM 237, 237L</td>
</tr>
<tr>
<td>CHEM 265, 265L</td>
<td>Elective</td>
</tr>
<tr>
<td>STAT 202</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Work Term</th>
<th>Year 3A</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL One 300-level term course.</td>
<td>CHEM 333, 333L</td>
</tr>
<tr>
<td>CHEM 357</td>
<td></td>
</tr>
<tr>
<td>CHEM 356L, 357L</td>
<td>Elective</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3A</th>
<th>Work Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 330</td>
<td></td>
</tr>
<tr>
<td>BIOL 350</td>
<td></td>
</tr>
<tr>
<td>CHEM 333, 333L</td>
<td>CHEM 357</td>
</tr>
<tr>
<td>CHEM 368, 368L</td>
<td>Elective</td>
</tr>
</tbody>
</table>
Streams 4 and 8

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 4A</td>
<td>Year 4B</td>
</tr>
<tr>
<td>CHEM 312</td>
<td>CHEM 464</td>
</tr>
<tr>
<td>CHEM 464</td>
<td>BIOL 431</td>
</tr>
<tr>
<td>Any three of</td>
<td>CHEM 439</td>
</tr>
<tr>
<td>BIOL 331</td>
<td>BIOL 438</td>
</tr>
<tr>
<td>(required if not taken before)</td>
<td>BIOL 439</td>
</tr>
<tr>
<td>BIOL 430</td>
<td>BIOL 442</td>
</tr>
<tr>
<td>BIOL 432</td>
<td>BIOL 444</td>
</tr>
<tr>
<td>BIOL 435</td>
<td>BIOL 447</td>
</tr>
<tr>
<td>BIOL 441</td>
<td>BIOL 449</td>
</tr>
<tr>
<td>BIOL 446</td>
<td>CHEM 419</td>
</tr>
<tr>
<td>BIOL 446</td>
<td>CHEM 433</td>
</tr>
<tr>
<td>BIOL 455</td>
<td>CHEM 434</td>
</tr>
<tr>
<td>CHEM 432</td>
<td>CHEM 492 or</td>
</tr>
<tr>
<td>CHEM 452</td>
<td>BIOL 499</td>
</tr>
<tr>
<td>CHEM 492 or</td>
<td>Elective</td>
</tr>
<tr>
<td>BIOL 498</td>
<td></td>
</tr>
</tbody>
</table>

Honours Biology and Chemistry (Regular Program)

Year 1
Normal Year 1 Science (see page 227) in which CHEM 123-124, 123L-124L, two 200-level term courses in Biology (see Note 6 on page 229), PHYS 121-122 and 121L-122L or 111-112L and 111L-112L, CS 118 and MATH 113 are required; (course weight is shown in parentheses).

Year 2
<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two Biology term courses from:</td>
<td>One Biology term course from:</td>
</tr>
<tr>
<td>BIOL 210 (0.5)</td>
<td>BIOL 211 (0.5)</td>
</tr>
<tr>
<td>BIOL 220 (0.5)</td>
<td>BIOL 221 (0.5)</td>
</tr>
<tr>
<td>BIOL 230 (0.5)</td>
<td>BIOL 233 (0.5)</td>
</tr>
<tr>
<td>BIOL 240 (0.5)</td>
<td>BIOL 239 (0.5)</td>
</tr>
<tr>
<td>BIOL 250 (0.5)</td>
<td>BIOL 241 (0.5)</td>
</tr>
<tr>
<td>plus</td>
<td>plus</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 237L (0.25)</td>
</tr>
<tr>
<td>CHEM 264 (0.5)</td>
<td>CHEM 265 (0.5)</td>
</tr>
<tr>
<td>STAT 202 (0.5)</td>
<td>CHEM 265L (0.5)</td>
</tr>
</tbody>
</table>

Year 3
<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two Biology term courses from:</td>
<td>Two Biology term courses from:</td>
</tr>
<tr>
<td>BIOL 315 (0.5)</td>
<td>BIOL 311 (0.5)</td>
</tr>
<tr>
<td>BIOL 324 (0.5)</td>
<td>BIOL 316 (0.5)</td>
</tr>
<tr>
<td>BIOL 327 (0.5)</td>
<td>BIOL 323 (0.5)</td>
</tr>
<tr>
<td>BIOL 331 (0.5)</td>
<td>BIOL 330 (0.5)</td>
</tr>
<tr>
<td>BIOL 333 (0.5)</td>
<td>BIOL 335 (0.5)</td>
</tr>
<tr>
<td>BIOL 336 (0.5)</td>
<td>BIOL 338 (0.5)</td>
</tr>
<tr>
<td>BIOL 337 (0.5)</td>
<td>BIOL 344 (0.5)</td>
</tr>
</tbody>
</table>

Honours Biology and Man-Environment Studies
Students must maintain a 75% average in all courses taken in the Faculty of Environmental Studies and a 60% average in all Biology courses.

Year 4†
<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three term courses from</td>
<td>Four term courses from</td>
</tr>
<tr>
<td>BIOL 342 (0.5)</td>
<td>BIOL 350 (0.5)</td>
</tr>
<tr>
<td>BIOL 356 (0.5)</td>
<td>plus</td>
</tr>
<tr>
<td>CHEM 332 (0.5)</td>
<td>CHEM 333 (0.5)</td>
</tr>
<tr>
<td>CHEM 332L (0.25)</td>
<td>CHEM 356L (0.25)</td>
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<tr>
<td>CHEM 356 (0.5)</td>
<td>CHEM 357 (0.5)</td>
</tr>
<tr>
<td>CHEM 358 (0.5)</td>
<td>CHEM 357L (0.25)</td>
</tr>
<tr>
<td>CHEM 368L (0.25)</td>
<td>Elective (0.5)</td>
</tr>
</tbody>
</table>

†CHEM 432L and 433L (biochemistry labs) are offered for the last time in 1982-83. These courses are compulsory except for students who elect to do a Biochemistry project in CHEM 492. These students may choose not to do 432L/433L but, if so, they must take an extra 0.5 credit course chosen from upper level Biology or Chemistry courses and approved by an undergraduate officer in the appropriate department.

Honours Biology and Chemistry (Regular Program)

Year 1

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
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</thead>
<tbody>
<tr>
<td>Two Biology term courses from:</td>
<td>One Biology term course from:</td>
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<tr>
<td>BIOL 210 Introductory Invertebrate Zoology (0.5)</td>
<td>BIOL 211 Introductory Vertebrate Zoology (0.5)</td>
</tr>
<tr>
<td>BIOL 211 Introductory Vertebrate Zoology (0.5)</td>
<td>BIOL 221 Introductory Vertebrate Zoology (0.5)</td>
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<td>BIOL 220 Plant Biology 1 - The Living Plant (0.5)</td>
<td>BIOL 221 Plant Biology 1 - The Living Plant (0.5)</td>
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<td>BIOL 221 Plant Biology 2 - The Diversity of Plants (0.5)</td>
<td>BIOL 221 Plant Biology 2 - The Diversity of Plants (0.5)</td>
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<tr>
<td>BIOL 230 Introductory Cell Biology (0.5)</td>
<td>BIOL 233 Human Physiology (0.5)</td>
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<tr>
<td>BIOL 233 Human Physiology (0.5)</td>
<td>BIOL 239 Genetics (0.5)</td>
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<tr>
<td>BIOL 240 Fundamentals of Microbiology (0.5)</td>
<td>BIOL 241 Introduction to the Microbial World (0.5)</td>
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<tr>
<td>BIOL 241 Introduction to the Microbial World (0.5)</td>
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<td>BIOL 250 Ecology (0.5)</td>
<td>ENV S 200 Field Ecology (0.5)</td>
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<tr>
<td>ENV S 200 Field Ecology (0.5)</td>
<td>plus</td>
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</tbody>
</table>
M ENV 290 Seminar Workshop (1.0)
M ENV 295 Development of Environmental Thought (1.0)

plus

ENV S 271 Introduction to Quantitative Research Methods (0.75)
or

STAT 202 Elementary Statistics for Biologists (0.5)

plus

M ENV 241 Social Change (0.5)

plus

CHEM 266 Basic Organic Chemistry 2 (0.5)
CHEM 266L Organic Chemistry Lab (0.25)

CHEM 267 Basic Organic Chemistry 3 (0.5)
or

CHEM 237 Introductory Biochemistry (0.5)
CHEM 237L Introductory Biochemistry Lab (0.25)

Note
Generally students will take the ecology course offered in the Faculty in which they are enrolled. Instead of M ENV 241, students may take any course above the first year level in Anthropology, Economics, Political Science, Psychology or Sociology. All students are required to take CHEM 266 and 266L (Organic Chemistry) and CHEM 237 & 237L (Biochemistry). Students wishing a program with a substantial biochemical component should plan to take Biochemistry in Years 3 and 4. They are advised to take a second Organic Chemistry course, CHEM 267, in their second year, and 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 & 237L along with CHEM 267 in their second year, and then CHEM 332 & 332L and CHEM 333 & 333L in their third year, and other Biochemistry courses in their fourth year).

Year 3

Six term courses from:
BIOL 311 Vertebrate Zoology (0.5)
BIOL 315 Invertebrate Zoology (0.5)
BIOL 316 Arthropod 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 333 Histology & Cytology (0.5)
BIOL 335 Plant Physiology (0.5)
BIOL 336 Embryology (0.5)
BIOL 337 Vertebrate Physiology 1 (0.5)
BIOL 338 Vertebrate Physiology 2 (0.5)
BIOL 342 Microbial Biotechnology (0.5)
BIOL 344 Microorganisms in Foods (0.5)
BIOL 350 Environmental Toxicology 1 (0.5)
BIOL 356 Population Ecology 1 (0.5)

plus

M ENV 390 Seminar-Workshop (1.0)
Electives Four term courses from Biology, Chemistry or the Faculty of Environmental Studies.

Year 4
BIOL Any six term courses from 400-level courses offered in Biology.

M ENV 400 Senior Honours Seminar (1.0)
M ENV 490A Senior Honours Assignment (1.0)

Honours Chemistry Programs

General Information
As well as the Honours Biology and Chemistry program (Regular or Co-operative) previously described, students may take:

Co-operative Applied Chemistry (Honours), Honours Chemistry Honours Chemistry (Physics Option) Honours Chemistry (Mathematics Option) Honours Chemistry (Environmental Studies Option)

(There is also a 4-year Honours Science degree (Program 3) which offers less intensive specialization in chemistry, and a 4-year General Science degree with chemistry major. These are described later in this chapter of the calendar.)

Professional Standing
All five programs listed here fulfill the academic requirements for professional membership in the Chemical Institute of Canada.

Elective Courses for Chemistry 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 will be withdrawn if the specialist lecturer should be unavailable.
### (a) Technical Electives with Chemistry Content

<table>
<thead>
<tr>
<th>COURSE NO.</th>
<th>1982 FALL</th>
<th>1983 WINTER</th>
<th>SPRING</th>
<th>1984 FALL</th>
<th>1984 WINTER</th>
<th>SPRING</th>
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</tr>
</tbody>
</table>

(NOTE - Asterisk (*) indicates strong recommendation for Applied Chemistry students.)

### (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, 205, CH E 220
- **Writing**: SCI 209, ENGL 210
- **Environment**: M ENV 320
- **Law**: P SCI 291, 292, ENV S 201, ACC 231
- **Management Science**: M SCI 44
- **Business (WLU)**: BUS 352, 362, 382, 383
- **Economics**: ECON 101, 102, 201, 202
- **Accounting**: ACC 121, 122
- **Computing**: CS 210, GE 121
- **Microprocessors**: EL E 222, 323, 427
Co-operative Applied Chemistry (Honours)
Program Adviser: Professor H.G. McLeod
This program, which offers the Honours Chemistry courses integrated with six four-month work terms, extends over five years instead of four. Information about the co-operative system and the Coordination Department can be found in Chapter 5. Two streams of students study and work in alternate terms starting at the end of the 1A term, and recombine at the beginning of the 4A term to take Year 4 together and graduate together in the spring.

The same core courses are taken as in the Honours Chemistry program. There may be some variations in the sequence of certain courses between the two streams. The course sequences are set out below.

Co-operative Applied Chemistry

Programs for students whose Year 1 Chemistry was CHEM 121-122 (up to 1979-1980):

Stream 8
(students who took 1B term in the winter).

<table>
<thead>
<tr>
<th>Year 3A</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 10, 312, 315L, 358, 358L, 365</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two electives*</td>
<td></td>
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</tr>
</tbody>
</table>

Stream 4
(students who took 1B term in the spring).

<table>
<thead>
<tr>
<th>Year 3B</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 10, 313, 315L, 358, 358L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Three electives*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Programs for students whose Year 1 Chemistry was CHEM 123-124 (in and after 1980-81):

Stream 8
(students who took 1B term in the winter).

<table>
<thead>
<tr>
<th>Year 2A</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 10, 212, 220, 220L, 254, 264, MATH 215</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Work Term</th>
<th>Year 3A</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 10, 313, 314L, 355, 355L, 368, 368L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two electives*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Regardless of which Year 1 sequence was taken, for all students in both streams:

Programs for students whose Year 1 Chemistry was CHEM 121-122 (up to 1979-1980):

Year 4 (Fall and Winter)
CHEM 10
Eight electives*
CHEM 492

*In Years 3 and 4, at least six of the electives chosen must be from the list of Technical Electives with Chemistry Content, of which at least four must be at 400 level.

Offerings of new courses listed in the revised programs above will begin when the progress of the class which entered in 1980 requires them.

Honours Chemistry
Program Adviser: Professor G.E. Toogood

Year 1
(For a complete discussion of Year 1, see page 227).

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>
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<tr>
<td>CHEM 220 (0.5)</td>
<td>CHEM 221L (0.5)</td>
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<td>PHYS 243L (0.25)</td>
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<td>Elective (0.5)</td>
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</tbody>
</table>
Year 3
Fall Term
CHEM 10
CHEM 312 (0.5)
CHEM 314L (0.25)
CHEM 355 (0.5)
CHEM 355L (0.25)
CHEM 368 (0.5)
CHEM 368L (0.5)
Two Electives* (1.0)

Winter Term
CHEM 10
CHEM 313 (0.5)
CHEM 315L (0.5)
CHEM 358 (0.5)
CHEM 358L (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)


† 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 195b Introduction to Environmental Problems
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 1
PLAN 222 Canadian Regional Issues
PLAN 319 Economic and Social Techniques for Regional Planning

Resource Management
ENV S 200 Field Ecology (0.75)
(antireq: BIOL 250)
ENV S 358 Environmental Pollution and Its Control
M ENV 356 Canadian Non-Renewable Resources (cross-listed as SCI 350)
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 411 Resource Studies
Honours Chemistry (Mathematics Option)

Program Adviser: 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 227.)

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>
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<tr>
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<td>CHEM 221L (0.5)</td>
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<td>CHEM 220L (0.25)</td>
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<td>CHEM 254 (0.5)</td>
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<td>CHEM 264 (0.5)</td>
<td>CHEM 265L (0.25)</td>
</tr>
<tr>
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<td>MATH 230a (0.5)</td>
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Year 3

<table>
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<tbody>
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<td>CHEM 10</td>
<td>CHEM 10</td>
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<tr>
<td>CHEM 264 (0.5)</td>
<td>CHEM 265 (0.5)</td>
</tr>
<tr>
<td>CHEM 312 (0.5)</td>
<td>CHEM 358 (0.5)</td>
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<td>CHEM 355L (0.25)</td>
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Year 4

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<tr>
<td>CHEM 492 (1.5)</td>
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<tr>
<td>Three chemistry electives (1.5)*</td>
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<tr>
<td>Two mathematics electives (1.0)*</td>
</tr>
<tr>
<td>Three other electives (1.5)</td>
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</tbody>
</table>

Suggested electives include CS 210 and 370, AM 465, PHYS 434 and 454.

*Courses other than Chemistry and Mathematics, for example Chemical Engineering, Physics, or Applied Mathematics, may be acceptable. See the Undergraduate Officer for permission.

Honours Chemistry (Physics Option)

Program Adviser: Professor G. Scoles

This program combines the Honours Chemistry core with courses in physics. It is suitable preparation for work in Physical Chemistry or Chemical Physics, or for students whose interests divide between the two disciplines.

Students wishing to follow this program on the Co-operative system of study should first speak to Professor Scoles and to Mr. R.A. Pullin of the Co-ordination Department.

Year 1
(For a complete discussion of Year 1, see page 000.)

Year 2

<table>
<thead>
<tr>
<th>Fall Term</th>
<th>Winter Term</th>
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</thead>
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<td>CHEM 221 (0.5)</td>
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Year 3

<table>
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<td>CHEM 355L (0.25)</td>
<td>PHYS 253 (0.5)</td>
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<td>PHYS 352 (0.5)</td>
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<tr>
<td>PHYS 352L (0.25)</td>
<td>At least one of:</td>
</tr>
<tr>
<td>CHEM 355 (0.5)</td>
<td>CHEM 314L (0.25)</td>
</tr>
<tr>
<td>PHYS 354 (0.5)</td>
<td>Two electives (1.0)</td>
</tr>
<tr>
<td>Elective (0.5)</td>
<td></td>
</tr>
</tbody>
</table>

Year 4

<table>
<thead>
<tr>
<th>Fall and Winter Terms</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 10</td>
</tr>
<tr>
<td>CHEM 492 (1.5)</td>
</tr>
<tr>
<td>PHYS 434 (0.5)</td>
</tr>
<tr>
<td>PHYS 454 (0.5)</td>
</tr>
<tr>
<td>Two chemistry electives (1.0)*</td>
</tr>
<tr>
<td>Two physics electives (1.0)*</td>
</tr>
<tr>
<td>One other elective (0.5)</td>
</tr>
</tbody>
</table>

Suggested electives include PHYS 432, 441 and 445.

*Courses other than Chemistry and Physics, for example Chemical Engineering, Mathematics, or Applied Mathematics, may be acceptable. See the Undergraduate Officer for permission.

Honours Earth Sciences

Completion of this program requires a total of 24.0 credits (including Year 1). Of these at least two elective credits must be from the Faculty of Arts and at least two elective lecture credits must be non-Earth Sciences courses from the faculties of Science and Mathematics. (There are two exceptions. EARTH 355 is considered only as a Science/Mathematics elective; PHYS 368-369 are not considered as Science/Mathematics electives). In addition, attendance at field camp is required (EARTH 390).
(See Undergraduate Course Descriptions, Chapter 16.)

A list of recommended Science and Mathematics electives is given on page 249.

Year 1
(For a complete discussion of Year 1, see page 227.)

EARTH 221 Geochemistry 1 (0.5)
EARTH 231 Mineralogy (0.5)
EARTH 232 Petrography (0.5)
EARTH 235 Stratigraphy (0.5)
EARTH 236 Principles of Paleontology (0.5)
EARTH 260 Introductory Structural Geology (0.5)
Electives Three credits, normally two from courses in Science and/or Mathematics, and one from Arts.

Note
By the end of Year 2, students must have completed PHYS 111-112 and PHYS 111L-112L, General Physics (or an equivalent physics course), MATH 113, Calculus, and an introductory course in computer programming equivalent to CS 118 or GEN E 121.

Year 2

EARTH 331 Igneous Petrology (0.5)
EARTH 332 Metamorphic Petrology (0.5)
EARTH 336 Paleontology (0.5)
EARTH 342 Geomorphology (0.5)
EARTH 345 Historical Geology (0.5)
EARTH 360 Applied Geophysics 1 (0.5)
EARTH 370 Economic Geology (0.5)
EARTH 380 Field Camp
Electives Two credits, normally one from courses in Science and/or Mathematics, and one from Arts.

Year 3

EARTH 427 Crustal Evolution (0.5)
Seven half-credits from:
EARTH 421 Geochemistry 2 (0.5)
EARTH 432 Precambrian Geology (0.5)
EARTH 433 Applied Sedimentology (0.5)
EARTH 434 Biostratigraphy (0.5)
EARTH 435 Advanced Structural Geology (0.5)
EARTH 438 Engineering Geology (0.5)
EARTH 439 Hydrogeology (0.5)
EARTH 440 Quaternary Geology (0.5)
EARTH 456 Numerical Methods in Geoscience (0.5)
EARTH 461 Applied Geophysics 2 (0.5)
EARTH 470 Metallic Mineral Deposits (0.5)
EARTH 490 Field trip (0.5)
EARTH 436 Thesis (1.0)
Electives One credit, not from Earth Sciences.

±Upon program approval by the Undergraduate Officer, a student may take six half-credits from the above list to allow freedom to take courses in the faculties of Engineering, Mathematics or Science.


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.

Honours Earth Sciences (Geography Option)
This program combines the basic courses of Honours Earth Sciences with Geography. Successful completion requires 13.5 credits from the Faculty of Science and 11 one-term courses from the Faculty of Environmental Studies. Students must maintain a 75% average in all Geography courses.

Year 1
(For a complete discussion of Year 1, see page 227.)

EARTH 221 Geochemistry 1 (0.5)
EARTH 231 Mineralogy (0.5)
EARTH 232 Petrography (0.5)
EARTH 235 Stratigraphy (0.5)
EARTH 236 Principles of Paleontology (0.5)
EARTH 260 Introductory Structural Geology (0.5)
ENV S 200 Field Ecology (0.75)
GEOG 201 Some Basic Topics of Physical Geography (0.75)
GEOG 202 Some Basic Topics of Economic and Urban Geography (0.75)
Electives Three one-term equivalents including one of:
GEOG 203 Some Basic Topics of Cultural and Regional Geography (0.75)
GEOG 220 World Regional Geography (1.5)
Note

By the end of Year 2, students must have completed an introductory course in computer programming equivalent to CS 118 or GEN E 121.

Geology Option

Completion of this course requires a total of 24.0 credits (including Year one). Of these at least 2 lecture-credits (excluding required courses) must be non-Earth Sciences courses from the Faculties of Science and Mathematics and 2 credits must be from the Faculty of Arts. (There are two exceptions. EARTH 355 is considered only as a Science/Mathematics elective; PHYS 368-369 are not considered as Science/Mathematics electives.) In addition, attendance is required at field camp (EARTH 390) (see Undergraduate Course Descriptions, Chapter 16). A list of recommended Science and Mathematics electives is given on page 000.

Co-operative Applied Earth Sciences

The 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 227. The Co-operative Earth Sciences programs operate as a single Co-operative stream. The first work term begins in the Spring term following Year 1 and thereafter academic and work terms alternate until the end of term 3B when a double work term commences. Students then take terms 4A and 4B as a full academic year, graduating the following spring. Work term reports must be submitted within three weeks of the first day of lectures of the following academic term. Normally a work term report must be prepared during a student’s first work term. Two satisfactory reports must have been received before the student commences work-term 3B. Four satisfactory reports must have been received by academic term 4A. Transfer to a regular program in Honours Earth Sciences.

Science

Academic Programs

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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 two programs are supervised by a Geophysics Curriculum Committee comprised of Faculty from both departments.

Attendance is required at the field camp (EARTH 390).

Year 1
(For a complete discussion of Year 1, see page 227.)

Year 2A
EARTH 231 Mineralogy (0.5)
EARTH 235 Stratigraphy (0.5)
EARTH 360 Applied Geophysics (0.5)
MATH 213A Calculus 2 (0.5)
PHYS 256 Wave motion and Optics (0.5)

Year 2B
EARTH 221 Geochemistry 1 (0.5)
EARTH 232 Petrography (0.5)
EARTH 260 Introductory Structural Geology (0.5)
MATH 213B Calculus 2 (0.5)
PHYS 243 Electricity and Magnetism (0.5)
Elective (0.5)

Year 3A
EARTH 332 Metamorphic Petrology (0.5)
EARTH 333 Introductory Sedimentology (0.5)
EARTH 345 Historical Geology (0.5)
EARTH 370 Economic Geology (0.5)
EARTH 390 Field Camp
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 342 Geomorphology (0.5)
PHYS 368 Geophysics 1 (0.5)
PHYS 254 Properties of matter (0.5)
Elective (0.5)

Year 4
EARTH 427 Crustal Evolution (0.5)
EARTH 461 Geophysics 2 (0.5)
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 3.5 Earth Sciences credits from 3rd and 4th year courses.

Geotechnical Option
The Co-operative program follows the same timetable as the Geology Option described above. The course selection has been made with both the traditional geology and the geotechnical professions in mind. As such it also provides a good undergraduate background for fields such as engineering geology and hydrogeology. The number of students admitted to this program is limited. Students wishing to enter the Geotechnical Option must have either an average of 70% in Grade 13 Mathematics and Physics and an overall average of 70% at the end of the 1B term or the written permission of the Undergraduate Admissions Committee.

In addition to the prescribed course work, attendance is required at the Earth Sciences field camp (EARTH 390) see Undergraduate Course Description, Chapter 16) and in CIV E 291, a non-credit field course in surveying. CIV E 291 may be taken immediately prior to either the 2A, 3B or 4A terms.

Year 1
(For a complete discussion of Year 1, see page 227.)

Year 2A
GEN E 115 Engineering Concepts 1 (0.75)
EARTH 231 Mineralogy (0.5)
EARTH 235 Stratigraphy (0.5)
CIV E 203 Statics (0.5)
CIV E 221 Calculus (0.5)
One-half credit Arts elective (0.5)

Year 2B
CIV E 205 Mechanics of Deformable Solids (0.5)
CIV E 222 Differential Equations (0.5)
EARTH 221 Geochemistry 1 (0.5)
EARTH 232 Petrography (0.5)
EARTH 260 Introductory Structural Geology (0.5)
One-half credit Arts elective (0.5)
(Recommended — A course in report writing.)

Year 3A
CIV E 353 Geology and Soil Mechanics (0.5)
CIV E 292 Engineering Economics (0.5)
EARTH 338 Rock Mechanics (0.5)
EARTH 332 Metamorphic Petrology (0.5)
EARTH 333 Sedimentology (0.5)
EARTH 370 Economic Geology (0.5)
EARTH 390 Field Camp

Year 3B
CIV E 200 Civil Engineering Project (0.5)
CIV E 354 Foundation Engineering (0.5)
EARTH 331 Igneous Petrology (0.5)
CIV E 360 Applied Geophysics (0.5)
CIV E 438 Engineering Geology (0.5)
CIV E 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)
Year 1
(For a complete discussion of Year 1, see page 227.)

Year 2

Fall Term

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 10</td>
<td>Physics Seminar</td>
<td>0.0</td>
</tr>
<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>Calculus 2</td>
<td>0.5</td>
</tr>
<tr>
<td>MATH 216</td>
<td>Differential Equations</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Winter Term

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</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>Calculus 2</td>
<td>0.5</td>
</tr>
<tr>
<td>Elective</td>
<td>Mathematics</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Year 3

Fall Term

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 10</td>
<td>Physics Seminar</td>
<td>0.0</td>
</tr>
<tr>
<td>PHYS 354</td>
<td>Atomic and Molecular Physics</td>
<td>0.5</td>
</tr>
<tr>
<td>PHYS 358</td>
<td>Thermodynamics</td>
<td>0.5</td>
</tr>
<tr>
<td>PHYS 360A</td>
<td>Intermediate Lab</td>
<td>0.25</td>
</tr>
<tr>
<td>PHYS 364</td>
<td>Mathematical Physics 1</td>
<td>0.5</td>
</tr>
<tr>
<td>Elective</td>
<td></td>
<td>0.5</td>
</tr>
<tr>
<td>Elective</td>
<td>Lab</td>
<td>0.25</td>
</tr>
</tbody>
</table>

Winter Term

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 10</td>
<td>Physics Seminar</td>
<td>0.0</td>
</tr>
<tr>
<td>PHYS 359</td>
<td>Statistical Mechanics</td>
<td>0.5</td>
</tr>
<tr>
<td>PHYS 360B</td>
<td>Intermediate Lab</td>
<td>0.25</td>
</tr>
<tr>
<td>PHYS 363</td>
<td>Classical Mechanics</td>
<td>0.5</td>
</tr>
<tr>
<td>PHYS 365</td>
<td>Mathematical Physics 2</td>
<td>0.5</td>
</tr>
<tr>
<td>Elective</td>
<td></td>
<td>0.5</td>
</tr>
<tr>
<td>Elective</td>
<td>Lab</td>
<td>0.25</td>
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</tbody>
</table>

Note
(Both PHYS 360A and 360B may be taken in the same term.)

Year 4

Fall Term

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 10</td>
<td>Physics Seminar</td>
<td>0.0</td>
</tr>
<tr>
<td>PHYS 434</td>
<td>Introductory Quantum Mechanics</td>
<td>0.5</td>
</tr>
<tr>
<td>PHYS 441</td>
<td>Electromagnetic Theory (Year Course)</td>
<td>1.0</td>
</tr>
<tr>
<td>PHYS 455</td>
<td>Nuclear and Particle Physics</td>
<td>0.5</td>
</tr>
<tr>
<td>PHYS 433</td>
<td>Experimental Research Project (Year Course)</td>
<td>1.0</td>
</tr>
<tr>
<td>PHYS 437A</td>
<td>Theoretical Physics Project</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Winter Term

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 10</td>
<td>Physics Seminar</td>
<td>0.0</td>
</tr>
<tr>
<td>Elective</td>
<td>Physics</td>
<td>0.5</td>
</tr>
<tr>
<td>Elective</td>
<td>Electives to make up total of five credits in Year 4 (1.5 or 2.0)</td>
<td></td>
</tr>
</tbody>
</table>

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 co-ordinated to complement the student's course work and interest where possible. Many work term experiences, especially in the upper years, provide the student with a deeper insight into the meaning and methods of research as well as an incentive to develop course work. Such experience provides a contribution to the development of a scientist which cannot be earned in lecture courses, and helps prepare an individual to apply a fundamental physics background to the solution of practical problems.

Further information about the Co-operative work terms and the Coordination Department can be found in Chapter 5.

Options
There are two main options in the Co-op Physics program. The first option is Honours Co-op Applied Physics with emphasis on such topics as Solid State, Biophysics, Chemistry and Physics, Physics with Computing, Physics with Business Administration, Physics with Electrical Engineering, etc. All are based on the common core of courses as outlined below. Typical examples of several combinations of courses, which supplement the core, are kept on file in the office of the undergraduate advisor, from whom copies are available. The second option is in Geophysics. It is offered as a combination of Physics and Earth Science courses with work terms following the scheme of the Co-op Earth Science program, and is detailed separately below.

A detailed description of the courses starts in Chapter 16.

Honours Co-op Applied Physics

<table>
<thead>
<tr>
<th>Year 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>(For a complete discussion of Year 1, see page 227.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>A term for Stream 8</td>
</tr>
<tr>
<td>B term for Stream 4</td>
</tr>
<tr>
<td>PHYS 10 Physics Seminar (0.0)</td>
</tr>
<tr>
<td>PHYS 254 Thermal Physics and Properties of Matter (0.5)</td>
</tr>
<tr>
<td>PHYS 256 Wave Motion and Optics (0.5)</td>
</tr>
<tr>
<td>PHYS 256L Physical Optics Lab (0.25)</td>
</tr>
<tr>
<td>MATH 213A (or B) Calculus 2 (0.5)</td>
</tr>
<tr>
<td>MATH 216 Differential Equations (0.5)</td>
</tr>
<tr>
<td>Elective (0.5)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3A</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 10 Physics Seminar (0.0)</td>
</tr>
<tr>
<td>PHYS 354 Atomic and Molecular Physics (0.5)</td>
</tr>
<tr>
<td>PHYS 358 Thermodynamics (0.5)</td>
</tr>
<tr>
<td>PHYS 360A Intermediate Lab (0.25)</td>
</tr>
<tr>
<td>PHYS 364 Mathematical Physics 1 (0.5)</td>
</tr>
<tr>
<td>Elective (0.5)</td>
</tr>
<tr>
<td>Elective Lab (0.25)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3B</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 10 Physics Seminar (0.0)</td>
</tr>
<tr>
<td>PHYS 359 Statistical Mechanics (0.5)</td>
</tr>
<tr>
<td>PHYS 360B Intermediate Lab (0.25)</td>
</tr>
<tr>
<td>PHYS 363 Classical Mechanics (0.5)</td>
</tr>
<tr>
<td>PHYS 365 Mathematical Physics 2 (0.5)</td>
</tr>
<tr>
<td>Elective (0.5)</td>
</tr>
<tr>
<td>Elective Lab (0.25)</td>
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</tbody>
</table>

Note
†Both PHYS 360A and 360B may be taken in the same term.

<table>
<thead>
<tr>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term A</td>
</tr>
<tr>
<td>PHYS 10 Physics Seminar (0.0)</td>
</tr>
<tr>
<td>PHYS 434 Introductory Quantum Mechanics (0.5)</td>
</tr>
<tr>
<td>PHYS 441 Electromagnetic Theory (1.0)</td>
</tr>
<tr>
<td>(Year Course)</td>
</tr>
<tr>
<td>PHYS 455 Nuclear and Particle Physics (0.5)</td>
</tr>
<tr>
<td>PHYS 433 Experimental Research Project (1.0)</td>
</tr>
<tr>
<td>(Year Course)</td>
</tr>
<tr>
<td>PHYS 437A Theoretical Physics Project (0.5)</td>
</tr>
<tr>
<td>Elective (0.5)</td>
</tr>
</tbody>
</table>
**Science
Academic Programs**

*Term B*

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 10</td>
<td>Physics Seminar</td>
<td>0.0</td>
</tr>
<tr>
<td>Elective</td>
<td>Physics</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Electives to make up total of five credits in Year 4

(1.5 or 2.0)

**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 1**

*A Term*

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 121</td>
<td>Introductory Physics 1 or Enriched</td>
<td>0.5</td>
</tr>
<tr>
<td>or 162</td>
<td>Introductory Physics (0.5)</td>
<td></td>
</tr>
<tr>
<td>PHYS 121L</td>
<td>Introductory Physics 1 Lab or Enriched</td>
<td>0.5</td>
</tr>
<tr>
<td>or 162L</td>
<td>Introductory 1 Lab (0.25)</td>
<td></td>
</tr>
<tr>
<td>CHEM 123</td>
<td>Chemical Reactions, Equilibria and Kinetics</td>
<td>0.25</td>
</tr>
<tr>
<td>CHEM 123L</td>
<td>Chemical Reaction Lab 1 (0.25)</td>
<td></td>
</tr>
<tr>
<td>EARTH 121</td>
<td>Introductory Geology 1 (0.5)</td>
<td></td>
</tr>
<tr>
<td>MATH 114</td>
<td>Algebra and Vector Geometry (0.625)</td>
<td></td>
</tr>
<tr>
<td>MATH 115A</td>
<td>Calculus (0.5)</td>
<td></td>
</tr>
</tbody>
</table>

*B Term*

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 122</td>
<td>Introductory Physics 2 or Enriched</td>
<td>0.5</td>
</tr>
<tr>
<td>or 163</td>
<td>Introductory Physics 2 (0.5)</td>
<td></td>
</tr>
<tr>
<td>PHYS 122L</td>
<td>Introductory Physics 2 Lab or Enriched</td>
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</tr>
<tr>
<td>or 163L</td>
<td>Introductory 2 Lab (0.25)</td>
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</tr>
<tr>
<td>CHEM 124</td>
<td>Organic Chemistry 1 (0.5)</td>
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</tr>
<tr>
<td>CHEM 124L</td>
<td>Chemical Reaction Lab 2 (0.25)</td>
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</tr>
<tr>
<td>EARTH 122</td>
<td>Introductory Geology 2 (0.5)</td>
<td></td>
</tr>
<tr>
<td>CS 118</td>
<td>Introduction to Scientific Problem</td>
<td></td>
</tr>
<tr>
<td>or CS 140</td>
<td>Solving by Computer; or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Introduction to Mathematical</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Problem Solving by Computer (0.5)</td>
<td></td>
</tr>
<tr>
<td>MATH 115B</td>
<td>Calculus (0.5)</td>
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**Year 2A (Fall)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>PHYS 10</td>
<td>Physics Seminar</td>
<td>0.0</td>
</tr>
<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 (0.5)</td>
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</tr>
<tr>
<td>PHYS 256L</td>
<td>Physical Optics Lab (0.25)</td>
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</tr>
<tr>
<td>MATH 213A</td>
<td>Advanced Calculus (0.5)</td>
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</tr>
<tr>
<td>MATH 216</td>
<td>Differential Equations (0.5)</td>
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</tr>
<tr>
<td>EARTH 231</td>
<td>Mineralogy and Crystallography (0.5)</td>
<td></td>
</tr>
<tr>
<td>EARTH 360</td>
<td>Applied Geophysics 1 (0.5)</td>
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**Year 2B (Spring)**

<table>
<thead>
<tr>
<th>Course</th>
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</tr>
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<tbody>
<tr>
<td>PHYS 10</td>
<td>Physics Seminar</td>
<td>0.0</td>
</tr>
<tr>
<td>PHYS 253</td>
<td>Electricity and Magnetism (0.5)</td>
<td></td>
</tr>
<tr>
<td>PHYS 253L</td>
<td>Electricity and Magnetism Lab (0.25)</td>
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</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 (0.5)</td>
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</tr>
<tr>
<td>EARTH 232</td>
<td>Petrography (0.5)</td>
<td></td>
</tr>
<tr>
<td>EARTH 260</td>
<td>Introductory Structural Geology (0.5)</td>
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**Year 3A (Winter)**

<table>
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<tr>
<th>Course</th>
<th>Title</th>
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<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>
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<tr>
<td>PHYS 363</td>
<td>Classical Mechanics (0.5)</td>
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</tr>
<tr>
<td>PHYS 365</td>
<td>Mathematical Physics 2 (0.5)</td>
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</tr>
<tr>
<td>PHYS 365B</td>
<td>Intermediate Lab (0.25)</td>
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<tr>
<td>EARTH 370</td>
<td>Economic Geology (0.5)</td>
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<tr>
<td>EARTH 369</td>
<td>Geophysics 2 (0.5)</td>
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**Year 3B (Fall)**

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<tr>
<th>Course</th>
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<th>Credits</th>
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<tbody>
<tr>
<td>PHYS 10</td>
<td>Physics Seminar</td>
<td>0.0</td>
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<tr>
<td>PHYS 354</td>
<td>Atomic and Molecular Physics (0.5)</td>
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</tr>
<tr>
<td>PHYS 358</td>
<td>Thermodynamics (0.5)</td>
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<tr>
<td>PHYS 364</td>
<td>Mathematical Physics 1 (0.5)</td>
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<tr>
<td>EARTH 235</td>
<td>Stratigraphy (0.5)</td>
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</tr>
<tr>
<td>EARTH 368</td>
<td>Geophysics 1 (0.5)</td>
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</tr>
</tbody>
</table>

**Year 4A-4B (Fall and Winter)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>PHYS 10</td>
<td>Physics Seminar</td>
<td>0.0</td>
</tr>
<tr>
<td>PHYS 352</td>
<td>Electronics 1 (0.5)</td>
<td></td>
</tr>
<tr>
<td>PHYS 352L</td>
<td>Electronics 1 Lab (0.25)</td>
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</tr>
<tr>
<td>PHYS 441</td>
<td>Electromagnetic Theory (1.0)</td>
<td></td>
</tr>
<tr>
<td>PHYS 433</td>
<td>Experimental Research Project (1.0)</td>
<td></td>
</tr>
<tr>
<td>PHYS 443</td>
<td>Continuum Mechanics (0.5)</td>
<td></td>
</tr>
<tr>
<td>PHYS 455</td>
<td>Nuclear and Particle Physics (0.5)</td>
<td></td>
</tr>
<tr>
<td>PHYS 353</td>
<td>Electronics 2 (0.5)</td>
<td></td>
</tr>
<tr>
<td>PHYS 353L</td>
<td>Electronics 2 Lab (0.25)</td>
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<tr>
<td>EARTH 427</td>
<td>Crustal Evolution (0.5)</td>
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</tr>
<tr>
<td>EARTH 461</td>
<td>Applied Geophysics 2 (0.5)</td>
<td></td>
</tr>
</tbody>
</table>

**Note**

PHYS 464, 465 may replace PHYS 352, 352L, 353, 353L.

**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.
Academic Programs
Optometry Admission

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 twelve 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, Cell Biology; BIOL 211, Vertebrate Zoology; BIOL 201, Human Anatomy, Histology, Embryology; BIOL 240, Fundamentals of Microbiology; CHEM 123, Chemical Reaction, Equilibria and Kinetics; CHEM 124 and 266, Organic Chemistry; CHEM 237, Biochemistry; PHYS 121, 122, General Physics; PHYS 246, Physical Optics; PSYCH 101, Introductory Psychology; PSYCH 201, Statistics; MATH 113, Calculus. Laboratory courses must be completed where given with the above course. To complete the pre-professional program, additional courses in the behavioural sciences, social sciences and the humanities are recommended.

Optometry Program
The School of Optometry of the Faculty of Science offers a four year professional program leading to the degree of Doctor of Optometry. It is the only School of Optometry in Canada offering a program with English as the language of instruction. The immediate purpose of the program is to qualify men and women for the practice of optometry. Graduates are eligible to apply for registration as optometrists in the province of their choice. The program provides students with a background in general science and specialized knowledge in visual science so that they may follow a career in optometric research and teaching if they so desire. A two year Diploma of Residency program, designed for persons with the O.D. degree who wish to improve and extend their clinical skills is available. Graduate programs in Physiological Optics leading to the Master of Science degree and the Doctor of Philosophy degree are also available.

†As with other health care professions, graduates in optometry must hold the certificate of the licensing body of the province in which they choose to practise.
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 seven from Alberta, three from Manitoba, one from New Brunswick, one every three years from P.E.I. and three 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 five provinces must meet the same admission criteria as other applicants. The location of the university where studies have been undertaken is not a criterion in the selection of these applicants. Additional information may be obtained from the Admissions Office of the School of Optometry.

Application Procedures
Students enrolled at the University of Waterloo make application to the optometry program by pre-registering for the first professional year during the spring pre-registration in March. Graduates of the University of Waterloo or persons who were at one time registered at the University of Waterloo in any type of program also apply by pre-registering in March. In the Winter term an interview with the admissions committee will be arranged for the student. Students who have completed the pre-professional 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, 1982. The completed OUAC form should reach the Centre in Guelph no later than February 1. If the copy is to reach the Registrar at Waterloo by the deadline of March 1. After the OUAC form has been processed by the Centre the applicant will receive a supplementary application package from the Registrar of the University of Waterloo. This will contain details on required transcripts, letters of reference and the curriculum vitae. The deadline for receipt of academic transcripts is June 15.

Students granted admission to the first professional year who have taken courses equivalent to those required in the professional 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 practice 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. These 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 Optometrical Optics (0.5)
BIOL 301 Vertebrate Physiology (second term) (0.5)
Note

Students with a particular interest in and an aptitude for research in physiological optics may substitute OPTOM 501-511 for PSYCH 357 and OPTOM 513. A student is required to complete one or the other of these alternatives.

2. The Honours Science Programs

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 in all Faculty of Science courses is required in Program (1) outlined below; a 60% cumulative average in the field of specialization for all other 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 five 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)

Year 1
Five lecture credits, exclusive of laboratory credits. At least two of these must be Science courses chosen from: BIOL 111-112 or two 200 level term courses; CHEM 123-124 + labs; EARTH 121-122; PHYS 111-112 or PHYS 121-122 + labs or PHYS 162-163 + labs.

Years 2, 3 & 4
Normally 4 Science credits per year plus 2 other course-credits per year in Years 2 and 3, 1 other credit...
in Year 4. Of the total required 14 Faculty of Science credits, at least 10 must be at the 200-level or higher and at least 4 of them other than any Science labelled credits must be at the 300 or 400-level.

Program (2)
Honours Science (with specialization in Biology)

Year 1
(For a complete discussion of Year 1, see page 227.)

Year 2
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.)

Year 3
1 other Science credit†
2 other credits.

Year 4
4 Science credits at least 2 of which are Biology credits from the 400-level or the list of 300-level courses above.
1 other credit.

†In order to graduate in Honours Science 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. 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 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).

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 113 must be included.

Year 2
3 Chemistry lecture credits, at least 2 of which must be chosen from CHEM 212, 220, 221, 254, 255, 264, 265.
1 lecture credit to be chosen from Physics, Biology or Earth Sciences. (Not Science-labelled courses.)
Elective credits to give a total of at least 6 credits in the year.
CHEM 10, Chemistry Seminar (0.0) is also required.

Program (4)
Honours Science (with specialization in Earth Sciences)

In total, at least 23.0 credits of which 10 are Earth Sciences credits, selected as indicated below. In addition at least four other Science credits and eight other course-credits must be chosen. Science-labelled courses may not be used for Science course-credits. (CHEM 123-124 and 123L-124L, a Year 1 Physics course, MATH 113, CS 118 or equivalent must be among these choices). A suggested year by year breakdown is as follows:

Year 1
(For a complete discussion of Year 1, see page 227.)

Year 2
EARTH 221, 231, 232, 235, 236, 260
1 other Science credit
2 other credits.

Year 3
3 or 4 EARTH credits at the 300-level (chosen from EARTH 331, 332, 333, 336, 342, 345, 360, 370)
At least 1 other Science credit
At least 1 other credit (for a total of 6 credits in Year 3)

Year 4
4 Science credits of which at least 2 are Earth Sciences credits at the 300-level shown above or from the 400-level.
1 other credit.
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 227.)

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 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 four 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
The General Science Program is available as a three- or four-year option. Students may specialize in a particular subject area in the three-year program or may elect to pursue a broad range of Science subjects (especially a "non-major" program). The three-year program is titled "General Science" with no area of specialization designated. The four-year program is the official majoring General science program. It is only available with a selected major field (Biology, Chemistry, Earth Sciences, Physics, or as a General Science and Business program in which a broad range of specified Science courses is required, rather than a majoring area). It is officially titled "General Science, Biology Major", "General Science, Chemistry Major", and so on.

Students who have completed Year 2 or 3 of the three-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.

Graduates of the four-year program who have taken appropriate courses will be eligible for certain categories of industrial and government employment for which the three-year program will not fit them; likewise they can meet the subject requirements for application to courses at a College of Education in Ontario with specialization in a single subject.

Depending on the option chosen, a student may graduate with the General BSc after either three or four years; the graduation diploma will indicate whether the three- or four-year program has been completed. A student who has graduated from the three-year program may apply to register for the four-year program; upon successful completion of the latter, a new graduation diploma will be issued in exchange for the original. Students may transfer from one of these options to the other; for transfer from the three- or the four-year program, the student must have the necessary course selection and standing required for a major field.

General Science - Three-year Program
The three-year program BSc requires the successful completion of 15 credits at least 14 of which must be lecture credits. At least half of the 15 credits must be in Science and at least 2 of these must be lecture credits from the Year 1 offerings in two different disciplines. Normally no more than 7 are allowed from the same subject area (i.e. no more than 7 Biology credits or 7 Mathematics credits or 7 English credits, etc.). At least 6 of the 15 credits must be at the 200-level or higher. Normal progress is 5 lecture credits per year.

If students wish to specialize in a particular subject area in Science they are advised to follow the recommendations of Year 1-3 of the four-year program.

Students are encouraged to take at least 4 courses (an average of better than one per year) from non-Science areas such as Arts or Mathematics.

The minimum standard for graduation from the three-year program will be a cumulative (overall) average of 55% calculated for all courses taken (in any year - whether passed or failed).

Recommended Program

Year 1
5 lecture credits, exclusive of laboratory credits. At least two of these must be Science courses chosen from: BIOL 111-112 or two 200-level term courses; CHEM 123-124 + labs; EARTH 121-122; PHYS 111-112 or PHYS 121-122 + labs or PHYS 162-163 + labs.

A mathematics course is strongly recommended.

Year 2
5 credits of which 2 or 3 should normally be in Science.

Year 3
5 credits of which 2 or 3 should normally be in Science.

The following list, while not complete, indicates some of the courses from which a choice should be made. Since some Departments offer Honours or General equivalents of the same course area, or Co-operative
or regular versions of the same course area, duplication of subject matter is not allowed. It is usually obvious from the course descriptions where such duplication is possible and care should be taken to avoid it as credit for only one such overlapping course will be allowed (e.g. credit for one of CHEM 220-221, 226-227; one of PHYS 111-112, 121-122, 162-163; etc.). In addition, where Departmental course listings clearly indicate an elective is available only to Arts students, or Engineering students, or Human Kinetics and Leisure Studies students, etc.; such courses may not be selected in the General Science program. Students must also have any necessary prerequisites listed before attempting upper year courses: these are listed in the Departmental descriptions.

**Science courses recommended**

(Other than Year 1 courses)


(No more than 3 credits may be selected from the courses under the "Science" label).


**Mathematics courses recommended**

MATH 113, 111a, 111b, 215 or 216, CS 118, 180, 210; AM 101, 111, STAT 204, 205.

**Arts courses recommended**

It is impossible to list all 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 is available.

**General Science - Four-year Major Programs**

The four-year programs require the successful completion of at least 20.0 or more credits for the BSc, the number depending on the respective program. Of this total at least 18.0 must be lecture credits. At least half of the 20.0 credits presented must be in Science. Students are encouraged to take at least 4 courses (an average of one per year) from non-Science areas such as Arts or Mathematics. No more than 3 credits may be selected under the "Science" label. An official major field (from Biology, Chemistry, Earth Sciences and Physics) must be selected; the credits from this major field must be completed as specified and normally not more than 10 from the major field area will be allowed.

The only exception to the requirement of a major field is in the General Science and Business program where a selection of both Business and Science courses are required.

While considerable flexibility to take electives exists in this program, students must take the courses required by their Major Departments. There are at least 8 free credits available in each program. Departments may have published recommendations regarding electives which should be strongly considered although they are not compulsory.

The minimum standard for graduation from the four-year majoring 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. Students who do not maintain their major field average in the four-year program will be transferred to the three-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 1**

(For a complete discussion of Year 1, see page 227.)

**Year 2**

Three credits from BIOL 210, 211, 220, 221, 230, 233, 239, 240, 241, 250.

CHEM 266-266L and either 267 or 237-237L

One other credit.
Science
General Science Programs

Earth Science Major

Year 1
Including EARTH 121-122 and CHEM 123-124 and 123L-124L and
At least 1.5 credits from courses discussed in Note 4 (see page 229).

Year 2
EARTH 221, 231, 232, 235, 236, 260
Two elective credits.

Note
Students should note that PHYS 111-112 is a prerequisite for the Applied Geophysics course EARTH 360 given in the third year. MATH 113 and an introductory course in computer programming are prerequisites for EARTH 355, 356 and 461 given in the third and fourth years.

Year 3
Two or three credits from:
EARTH 331, 332, 333, 342, 345, 360, 370
Two or one course-credits from Science or Mathematics
Arts elective: One credit.

Year 4
Two or three credits from:
EARTH 421, 427, 432, 433, 434, 435, 439, 440, 456, 461, 470
Three or two credits from non-Earth Sciences courses.

Physics Major (a minimum of 20.0 credits required.)

Year 1
(Including PHYS 121-122 or 162-163 and their labs and MATH 113 (see page 229).

Year 2
PHYS 222-223 and 222L-223L, 226-227 and 226L-227L
One of: MATH 216, 220a,b or a course in computing
One of: CHEM 218-219, 266-267, SCI 251-252, EARTH 121-122 or 231-232.
Elective.

Year 3
PHYS 324-325
Two or one of: MATH 224a,b or STAT 204-205.
CHEM 218-219 or 356-357.
Arts or Mathematics Elective

Year 4
Two or three of: PHYS 250-251, 352 and 352L, 353 and 353L, 358-359, 362-363, 364-365, 368-369, 480-481, 441
Two or one non-Physics Science credits
Arts or Mathematics Elective.

Chemistry Major

Year 1
Including CHEM 123-124 and 123L-124L and MATH 113 and a full-year Physics course.

Year 2
CHEM 10, 226-227 and 226L-227L, 266-267, 266L, 218, 219
2 Elective credits†

Year 3
CHEM 10, 316-316L, 356-357, 356L-357L, 366-366L
2 Elective credits.

Year 4
Five elective credits to complete the requirements for the degree†

†Electives can be freely chosen provided that before graduation at least two Chemistry credits are obtained at the 300- or 400-level, in addition to the required courses listed above. At least 19.0 lecture-credits must be obtained before graduation.

Note
Some possible electives are shown in the list under the three-year program. These courses would be suitable choices here. (PHYS 301-302 are especially recommended.)

Earth Science Major

Year 3
Two or three credits from:
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.

††Students wishing to apply for the Ontario Department of Education Honour Specialist Qualification must choose three credits in Biology in Year 3 or take a third Biology credit as an extra course. In Year 4, three Biology credits should be selected.

Physics Major (a minimum of 20.0 credits required.)

Year 1
(Including PHYS 121-122 or 162-163 and their labs and MATH 113 (see page 229).

Year 2
PHYS 222-223 and 222L-223L, 226-227 and 226L-227L
One of: MATH 216, 220a,b or a course in computing
One of: CHEM 218-219, 266-267, SCI 251-252, EARTH 121-122 or 231-232.
Elective.

Year 3
PHYS 324-325
Two or one of: MATH 224a,b or STAT 204-205.
CHEM 218-219 or 356-357.
Arts or Mathematics Elective

Year 4
Two or three of: PHYS 250-251, 352 and 352L, 353 and 353L, 358-359, 362-363, 364-365, 368-369, 480-481, 441
Two or one non-Physics Science credits
Arts or Mathematics Elective.
General Science and Business

There is a growing need for graduates who have competence in the combined disciplines of science and business administration. For those students whose leanings are towards administration in industry, marketing, analysis, the following program is recommended. The business and economic courses normally provide the prerequisite background for a Master of Business Administration course. Normally a B average is required in these courses. Admission requirements for postgraduate studies in Business Administration depend on the admitting university. In some instances, an entrance examination may be required. It is the student’s responsibility to obtain information regarding admission from the university of their choice.

The 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.

Year 1
5 lecture credits:
- At least 2.0 lecture credits must be from BIOL 111-112 + labs or any two term courses from the 200-level.
- CHEM 123-124 + labs, EARTH 121-122 and PHYS 111-112 or 121-122 + labs.

plus
- MATH 113
- ECON 101-102
- CS 118 and CS 115

Year 2, 3 and 4
Students must take during Years 2 through 4, at least 5 lecture-credits from one of the 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 2
- ACC 101-102 or ACC 121-122
- ECON 201-202

Plus at Year 3
- STAT 204-205
- ACC 381-382
- M SCI 44
- M SCI 46

plus at Year 4
- 3 credits from:
  - ACC 371-372, 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 a Joint Honours program between Science and Management Studies, or an Honours program in Science with a Management Studies Minor. See the Course Descriptions section of the calendar, Chapter 16 under Management Studies.
Undergraduate Course Descriptions
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.

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

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

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

Sample Course Description

<table>
<thead>
<tr>
<th>Course</th>
<th>Term(s) Offered</th>
<th>Type of instruction and Number of hours/wk</th>
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<td>STAT 444</td>
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Course Name — Statistical Methods with Socio-Economic Applications 1


Extra information: Prereq: STAT 331

Terminology

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### Course Abbreviations

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### Course Descriptions

#### Accounting

**Course Descriptions**

**ACC 101 F.W. 0.5**  
(Formerly ECON 191)  
**Introductory Accounting I**  
An introduction to the principles and practices underlying the historical-cost income determination model.  

**Note:**  
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 F.W.S 0.5**  
(Formerly ECON 192)  
**Introductory Accounting II**  
A continuation of Accounting 101, with an introduction to concepts of cost and managerial accounting.  
**Prereq:** ACC 101

**ACC 121 F.W. 0.5**  
(Formerly ECON 181, 281)  
**Understanding and Using Financial Accounting Information**  
This course is designed for non-accounting majors to help them understand and analyze financial statements.  
**Prereq:** ACC 101

**ACC 122 W. 0.5**  
(Formerly ECON 182, 282)  
**Understanding and Using Managerial Accounting Information**  
This course is designed for non-accounting majors. The use of accounting information to assist in planning, control and managerial decision-making will be examined.  
**Prereq:** ACC 121

**ACC 131/132 F.W. 0.5/0.5**  
(Formerly ECON 193/194)  
**Management I/II**  
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 and should be taken prior to P SCI 331.

**ACC 231 F.W. 0.5**  
(Formerly ECON 294)  
**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. 0.5**  
(Formerly ECON 293)  
**Auditing I**  
An examination of the standards developed by the auditing 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 291 F.W.S 0.5**  
(Formerly ECON 291)  
**Financial Accounting I**  
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 102

**ACC 292 F.W.S 0.5**  
(Formerly ECON 292)  
**Financial Accounting II**  
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
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 371 and 491

Managerial Finance I

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, 103, 221 and ACC 291

Managerial Finance II

The theoretical concepts examined in Accounting 371 will be applied within the context of the Canadian economy. Topics examined will include interest rate determination, capital markets, and risk/return characteristics of financing alternatives.
Prereq: ACC 371

Managerial Accounting I

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.

Managerial Accounting II

Consideration of more complex topics in management planning and control. Emphasis is on cost accumulation systems, transfer pricing and applications of quantitative methods to management accounting.
Prereq: ACC 381

Accounting Research

An introduction to research methodology and current research in accounting.
Prereq: Registration in AP 3 and ACC 401

Special Topics

Admission by consent of instructor.

Managerial Decisions

A case course; examines the accountant's participation in decisions drawn from functional areas (marketing, production) in policy and strategy formulation situations, and in evaluation of the impact of government regulation and policy.
Prereq: Registration in AP 3.

Management 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 382

Auditing II

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 AP 3

Auditing III

An examination of current topics affecting public accounting practice. Topics will also include legal, ethical and statutory guidelines.
Prereq: Registration in AP 3 and ACC 451.

Computer Audit and Control

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 AP 3 and ACC 441.

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 AP 3.

Taxation I

A course in the interpretation of the Canadian Income Tax Act, the common law pertaining to taxation, and the pronouncements of Revenue Canada - Taxation on tax topics. The emphasis will be the taxation of individuals.
Prereq: ACC 102

Taxation II

Analysis and interpretation of the Income Tax Act, common law, and departmental practice dealing with estates, trusts, partnerships, and corporations. Topics will include incidence of tax, rollovers, deferrals, distributions, determination of taxable income, and tax payable.
Prereq: ACC 461

Taxation III

A continuation of the introduction to taxation begun in Taxation I and II. Topics covered will include the use of a corporation in planning, corporate rollovers, and an introduction to capital reorganization, corporate distribution and partnerships.
Prereq: ACC 462

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 AP 3 and ACC 463.

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 AP 3 and ACC 463
ACC 466 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 AP 3 and ACC 463

ACC 467 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 AP 3 and ACC 463.

ACC 468 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 AP 3 and ACC 463.

ACC 469 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 AP 3 and ACC 463.

ACC 471 W 0.5
(Formerly ECON 496)
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 0.5
(Formerly ECON 497)
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 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 AP 3 and ACC 382

ACC 491 F,S 0.5
(Formerly ECON 491)
Financial Accounting III
An advanced accounting course considering specific problems of accounting for the corporate entity, such as business combinations, inter-corporate investments, consolidated financial statements, accounting for foreign operations and foreign currency transactions, segment reporting.
Prereq: ACC 292

ACC 494 W 0.5
External Reporting
A case course integrating accounting, taxation, corporate and securities law, and report formulation.
Prereq: Registration in AP 3 and ACC 491

Course Descriptions

Department of Anthropology

Associate Professor, Chairman of the Department
T.S. Abler, BA (Northwestern), MS (Wisconsin-Milwaukee), PhD (Toronto) (on Sabbatical Leave 1982-83)

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. Shimpo2, BA (International Christian, Japan) MA, PhD (Br. Col.) J

Assistant Professor
M.H. Hill, BA (Washington), MA (Washington State), PhD (Southern Illinois)

Adjunct Assistant Professor
M.C. Rodman, BA (Goucher College) MA, PhD (McMaster)

Faculty members holding cross and/or joint appointments as shown.

1Anthropology and Urban Regional Planning
2Sociology and Anthropology (St. Jerome's)

Course Descriptions

Notes
While this calendar is as up-to-date as deadlines permit, students should consult the course offerings list issued at pre-registration.

Anthropology 101 courses introduce physical anthropology and archaeology.
Anthropology 102 courses introduce social-cultural anthropology. The letter designations (A, B) indicate the special approach of the course. A student may take introductory courses in any order. Either 101, 102, or 103 may be taken first and any combination may be taken together.
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.
Required for Anthropology Honours students and Majors.

ANTH 102A F.W 3C 0.5
Introduction to Social and Cultural Anthropology
The dynamic nature of socio-cultural systems is examined. Topics include language, technology, social organization, economics, politics, and religion. Data are drawn from a broad ethnographic base, including both "primitive" cultures and modern, developed societies.
A student may not take both ANTH 102A and ANTH 102B for credit. Anthropology Honours students and Majors must take ANTH 102A or ANTH 102B.

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.
A student may not take both ANTH 102A and ANTH 102B for credit. Anthropology Honours students and Majors must take ANTH 102A or ANTH 102B.

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.
Honours students and Majors in Anthropology are required to take either ANTH 103, ANTH 283, or ANTH 290.

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. Required for Anthropology Honours students and Majors.

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 instructor. Required for Anthropology Honours students and Majors.

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 compared and contrasted with the more revolutionary ideas recently expounded by popular writers.

ANTH 220 W 3C 0.5
Prehistoric Archaeology: Old World I
A survey of the development of culture, from the beginnings of tool making to the transition to agriculture. Areas and periods of emphasis will vary from year to year. Not acceptable for Honours Anthropology credit.

ANTH 221 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 322.

ANTH 222 W 3C 0.5
Peoples of the Pacific
A comparative ethnological survey of selected indigenous societies in the Pacific Region.

ANTH 241 W 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 3C,1L 0.5
Human Evolution
Data, methods, and theory in the study of the origin and evolution of humans are surveyed. Topics will include osteology, growth and development, the fossil record, and genetics. Prereq: ANTH 101 or permission of the instructor. Required for Anthropology Honours students and Majors.

ANTH 270 W 3C,1L 0.5
Archaeological Method and Technique
A survey of the technique used by archaeologists in collecting and analyzing information. Attention to the contributions of other disciplines. Lecture and lab.

ANTH 290 3C 0.5
Language and Culture
An examination of language as it reflects the culture of the speakers. Focus will be on exploring aspects of vocabulary and special usages for their cultural relevance, with illustrations from a variety of languages. Prereq: One half-course from each of linguistics and socio-cultural anthropology.

Honours students or Majors in Anthropology are required to take either ANTH 103, ANTH 283 or ANTH 290.

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. Required for all Anthropology Honours students.
Course Descriptions
Anthropology

ANTH 311 F 3C 0.5
Magic, Witchcraft and Religion
An introduction to the way in which anthropologists study the system of
behaviour and belief known as religion.

ANTH 320 W 3C 0.5
Pleistocene Prehistory in the Old World
Detailed considerations of prehistoric
cultural developments from earliest
toolmaking to the transition to
agriculture. An examination of the
human mode of adaptation and the
increasing complexity of cultural
systems among prehistoric hunters and
gatherers. Areas and periods of
emphasis will vary from year to year.
Prereq: ANTH 201 or permission of the
instructor.

ANTH 322 W 3C 0.5
Prehistoric Man in the Great Lakes Area
An in-depth study of the archaeological
evidence of prehistoric man in the
Great Lakes area from his arrival ca. 11,000
years ago to the coming of Europeans.
Cultural ecology and cultural evolution
will be stressed.
Prereq: ANTH 203 or consent of the
instructor.

ANTH 330 W 3C 0.5
Cultural Ecology
An examination of the relationships
among environment, technology,
society, and culture. The increasing
levels of complexity will be considered
in the context of hunting and foraging
bands, horticultural tribes and
chieftoms, pastoral tribes and
agricultural peasantry.
Prereq: Full credit in Anthropology or
consent of the instructor.
Required for all Anthropology Honours
students and Majors.

ANTH 350 W 3C 0.5
Sex Roles in Anthropology
A seminar to investigate the role of the
sexes in human evolution and the ways
in which gender categories and the
concept of sex roles are considered in
anthropological literature.

ANTH 351 F 3C 0.5
Comparative Policies on Native
Minorities
A comparative survey of government
policies on native minorities with
emphasis on recent attempts to involve
native groups in the policy-making
processes. The course will compare
policy approaches to Canadian Indians
and Metis, Australian Aboriginals, New
Zealand Maoris and Scandinavian
Samis (Lapps).
Prereq: One of ANTH 102A or 102B, or
P SCI 101 or 102M, or SOC 101.
Students may not take for credit both
ANTH 347 offered Fall 1981, and ANTH
351.

ANTH 365 W 3C 0.5
Fossil Man
A detailed examination of the fossil
evidence for human evolution with
particular emphasis on interpretation
and reconstruction.
Prereq: ANTH 260 or permission of the
instructor.

ANTH 370 Ethnographic Field Methods
Supervised research in field or
laboratory studies and analysis in
anthropology.
Prereq: ANTH 270. Primarily for
Honours Anthropology students.
Offered if sufficient demand.

ANTH 390 Y 1.0
Reading in Anthropology
Guided reading in a selected portion of
the anthropological literature.
Prereq: Anthropology Major or Honours
student and permission of the
instructor.

ANTH 391/393 S.F.W 0.5
Reading in Anthropology
Guided reading in a selected portion of
the anthropological literature.
Prereq: Anthropology Major or Honours
student and permission of the
instructor.

ANTH 401 W 3C 0.5
Seminar in the Literature of Social and
Cultural Anthropology
Intensive reading and discussion of
classic studies in ethnography.
Prereq: ANTH 102 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 499 Y 1.0
Honours Essay
Directed reading and research in a
selected area of anthropology inquiry.
Required for all Anthropology Honours
students.

Not Offered 1982-1983
ANTH 204 Language Learning
ANTH 221 Prehistoric Archaeology:
Old World II
ANTH 223 New World Civilizations
ANTH 230 Indians of Canada
ANTH 233 Eskimo Culture
ANTH 250 Regional Studies in
Archaeology
ANTH 261 Primate Behaviour
ANTH 271 Archaeological Field
Methods
ANTH 283 Phonology for Non-Linguists
ANTH 285 Descriptive Grammar 1
ANTH 286 Descriptive Grammar 2
ANTH 321 Recent Prehistory in the
Old World
ANTH 334 Ethnicity and Ethnic
Diversity in Canada
ANTH 345 Special Problems in
Anthropology
ANTH 346 Special Problems in
Anthropology
ANTH 347 Special Problems Topic
ANTH 370 Ethnographic Field Methods
ANTH 373 Archaeological Reporting
ANTH 377 Early Man in the New World
ANTH 388 Applied Anthropology
ANTH 420 Social and Cultural Change
ANTH 449 Honours Seminar
ANTH 451 The Formative Years of
Cultural Theory
ANTH 452 Contemporary Cultural
Theory
School of Architecture

Associate Professor, Director
L.W. Richards, BArch (Miami), MArch (Yale), MRAIC.

Associate Professor, Undergraduate Officer
J.C. Somfay, BArch (N.S.W. Sydney), MArch (Toronto), MRAIC.

Professors
L.A. Cummings, AB (Washington), AM (Missouri), PhD (Washington). Recipient of the OCUPA (Ontario) Teaching Award
C.K. Knapp, BA (Sheffield), PhD (Saskatchewan)
C.B. Nash, BA, MA (UCLA), CE (Grenoble), MCP, MPA, PhD (Harvard), MCIP, AICP
R.H. Sims, AADip, (London), RIBA (on Sabbatical Leave 1982-83)
F.H. Watts, AADip (London), MLA (Harvard), RIBA, MRAIC

Associate Professor
A. Banerji, BArch, (Calcutta), MArch (North Dakota State)
M. Elmitt, National Diploma in Design (High Wycombe)
D.R. Hunt, AADip (London), RIBA, MRAIC
D.B. McIntyre, BArch (Toronto), MRAIC
R.M. Schuster, BS, MS (North Dakota State), PhD (Iowa State), PEng
F. Thompson, BArch, MArch (Toronto), MRAIC (on Sabbatical Leave 1982-83)

Assistant Professors
O. Dutt, BA (Punjab), BSc (London), MS (Wisconsin), PhD (Waterloo), PEng
E.R. Haltenby, BES, BArch (Waterloo), Recipient of the Distinguished Teacher Award
R. Wiljer, BA (Waterloo), MA (Ottawa)

Lecturers:
D. McKay, BArch (Toronto)
G. Consiglio, BArch (Toronto), MRAIC

Adjunct Professor
P.J. Stokes, BArch, LLD (Toronto), FRAIC
J. Zvilna

Adjunct Associate Professor
H. Plumb, BArch, MArch (Toronto), MRAIC

Adjunct Assistant Professor
E. Gustav, BArch, MArch (Toronto), MRAIC

Adjunct Lecturers
S. Arnold, BA (Southern Illinois)
W. Lamb, BArch (McGill) MRAIC

Visiting Professional Critics
Internationally known practitioners and educators augment the program annually.

Faculty members holding cross and/or joint appointments as shown.

1Architecture and English
2Architecture and Civil Engineering
3Environmental Studies and Psychology
4Environmental Studies

Course Descriptions

Courses for Bachelor of Environmental Studies (Pre-Professional Architecture)

For Recommended Program, see page 162.
For Elective Course Requirements, see page 265-266.

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 ensuring studies; to develop an understanding of the qualitative of materials and structural behaviour; to propose alternatives in structural engineering; and to perform independent mathematical checks on simple, statically determinate and indeterminate structures.

Course Descriptions for Environmental Studies courses (ENV S) begin on page 308.

ARCH 175 F 3C, 2L 0.5
Mathematics and Building Science
Review of basic trigonometry, and vector geometry; differential and integral calculus, applications in architecture. Topics in building science, i.e. heat flow, psychometry and air movement and their control in buildings.
Prereq: None

ARCH 176 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.

CS 116
Introduction to Computing
See Computer Science course descriptions.

ARCH 163 W 1C, 2L 0.5
Statics
Basic concepts, forces, moments, systems of forces, resolution of forces, transformation of couples; resultant of force systems; centre of gravity of a system of forces and of composite bodies; equilibrium, free body diagrams; shears, moments, bar forces in simple trusses; friction, moment of inertia.
Prereq: ARCH 175 or MATH 130

ARCH 212 F 2C, 2L 0.5
Computer Science Simulation
Simulation programming is developed in FORTRAN so as to build up meaningful architectural simulation concepts necessary in architectural planning. Specific simulation languages such as G.P.S.S. is introduced.
Prereq: none

ARCH 213 S 4C 0.5
Computer Generated Design 1
Architectural Design 1
An overview of design logic and computer system requirement currently used for architectural design.
Prereq: CS 116 or consent of instructor

ARCH 262 F 2C, 2L 0.5
Strength of Materials
Concept of simple stress and strain; statically indeterminate axially loaded members; thermal stresses, torsion, shear and bending moments in simple beam; shear and moment diagrams, qualitative deflected shapes, flexural and shear stresses, deflection calculations; combined stresses, beams of different materials, compression members, Euler's formula.
Prereq: ARCH 163

ARCH 263 S 2C, 2L 0.5
Theory of Structures 1
Historic review of building structures, live and dead loading, wind, snow, earthquake, reactions, stability, and indeterminacy of structural systems; shears, moments and qualitative deflected shapes, bar forces in pin-
connected frameworks; approximate methods of analysis for high rise building frames; deflection calculations by the moment area method, influence lines, introduction to arches and cables.

**ARCH 256 S 1C,2L 0.5 Structural Morphogenesis**


**Prereq: ARCH 262**

**ARCH 257 S 2C,2L 0.5 Structural Synthesis 1**

Steel and Concrete Design

Design and behaviour of structural steel systems, application of current building specifications, proportioning structural elements based on pertinent design considerations; bolted and welded; criteria for choosing steel systems; introduction to plastic design.

**Prereq: ARCH 263**

**ARCH 362 W 2C,2L 0.5 Structural Synthesis 2**

Concrete and Timber Designs

Design and behaviour of structural concrete systems, application of building specifications; analysis and design of concrete elements using ultimate strength principle; criteria for choosing structural concrete systems; introduction to prestressed concrete. Behaviour and design of modern wood structures fasteners, ring connectors and their significance in timber construction; proportioning and design of sawn and laminated timber members.

**Prereq: ARCH 362**

**ARCH 363 F 2C,2L 0.5 Designing and Building with Solar Energy**

Instruction in the basics of solar technology, including principles of climatic design, solar basics, efficient building layout design, solar systems design, heat loss/gain calculations, and simple computer simulation of the designed systems.

**Prereq: Consent of instructor (ability to figure heat calculations, basic knowledge of solar building).**

**ARCH 372 W 2C,2L 0.5 Mechanical Systems 1**

Plumbing and drainage; heating, ventilating and air-conditioning systems; electrical distribution for power and light; illumination; acoustics, geometrics and materials; vertical transportation systems.

**Prereq: ARCH 293, or consent of instructor**

**ARCH 373 F 2C,2L 0.5 Mechanical Systems 2**

Heating, ventilating and air-conditioning systems for buildings; plumbing and drainage; electrical distribution for power and light in buildings; illumination; acoustics, geometrics and materials; and vertical transportation systems.

**Prereq: ARCH 372**

**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.

**Course Descriptions for Environmental Studies courses (ENV S) begin on page 308.**

**ENV S 111 Introduction to the Study of the Future**

**ENV S 195A Introduction to Environmental Studies**

**ENV S 195B Introduction to Environmental Problems**

**ENV S 200 Field Ecology**

**ENV S 201 Introduction to Environmental and Planning Law**

**ENV S 202 Social Science Approaches to Environmental Problems**

**ARCH 223 S 2C 0.5 Human Ecology**

**Social Behaviour as the Human/Physical Interface**

The biological and psychological basis of perception and cognition of environments; factors affecting percepts, images and meanings, small groups and the social environment; the structure, functioning and change of neighbourhoods and communities.

**Prereq: ENV S 195A**

**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, 282 or consent of instructor.**

**ENV S 252 Media Tools for Environmental Studies**

**ENV S 253 Media Tools for Environmental Studies - Advanced Level**
The courses in design studio combine design fundamentals and design concepts, along with the opportunity to involve analysis and synthesis, professional and scientific insights, application of tools and methods for designing artifacts for man, and an awareness of the inherent physical characteristics and limitations of media and materials. The objectives of the studio are: (1) to guide the student in observing aspects of the physical and social environment; to find, categorize and associate the information into fundamental structures and patterns of relationships; (2) to apply theories generated in the lecture courses to situations in the physical environment, implementing by categorizing the courses into behaviour materials, structures and mechanical systems, behaviour of man, and communications; (3) to provide the student with an opportunity to develop skill in using different "techniques" for analyzing and synthesizing problems in the physical environment; (4) to establish a relationship between faculty and students; (5) to provide a vehicle for persons from faculties of different disciplines and from outside of the university to discuss with students their problems and projects from different points of view.

ARCH 192 F IT,IS,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 to New York City (1 week).
Prereq: Architecture students only.

ARCH 174/175
Experimental Courses
These courses offer a vehicle for introducing additional electives to the program on a short term basis, and for developing future permanent courses.
Prereq: Consent of instructor

ARCH 292 F 3C,11Std 1.5
Design Concepts and Studio
To develop in each student the ability to design on a small, personal scale and explore design as a thinking process. Small space design exercises where the student is required to define and analyze a problem and generate an architectural solution. Solutions are refined through a series of evaluations.
Prereq: Architecture students only.

ARCH 293 S 3C,11Std 1.5
Design Concepts and Studio
Design involving problems of human perception and dimension in complex or large spaces, and to develop in each student the ability to generate solutions to architectural problems on a scale which involves "privacy and community." Emphasis is placed on programming, analysis and solution evaluation. Problems of construction, servicing, and siting will be further explored. Field trip to Chicago (1 week).
Prereq: Architecture students only.

ARCH 374/375
Experimental Courses
These courses offer a vehicle for introducing additional electives to the program on a short term basis, and for developing future permanent courses.
Prereq: Consent of instructor
ARCH 384, 395 F.W. R 0.5
Architectural Research
This offers a student an opportunity for independent research into architectural problems not offered in the regular curriculum. It allows guided exploration of a specific architectural problem area, of appropriate complexity to the particular term.
Prereq: Approval of (in house) UGAC

ARCH 392 W 4C,17 std 2.0
Design Concepts and Studio
Design of complex environments; the effect of legal and administrative controls on the design of process and form; the influence of mechanical, structural and industrial building components on design process and architectural form. Projects will involve co-ordination of the design task with other disciplines involved in such projects.
Prereq: Architecture students only.

ARCH 393 F 3C,18 std 2.0
Design Concepts and Studio
The analysis and exploration of relationships between physical, social, political and economic systems that influence the physical environment; techniques for defining systems that influence the physical environment; techniques for defining patterns of interaction and predicting the influence on physical form involving other disciplines; projects to explore the techniques and design with others at the city or community scale.
Prereq: Architecture students only.

Culture
Courses in cultural history give the student a critical and creative understanding of the basic ingredients of all creative work, recognizing the seemingly unrelated forces for change in the cultural history of man, and comprehending the present as a part of the historical past. Open to any University student upon consent of instructor. No prerequisites are required for these courses except for Architecture students.

ARCH 142 F 4C,2L 1.0
Iconography 1
Conventions
Selected schemes of order, such as fate, providence, natural law, the human will, as expressed in plays, poems, and fiction from various ages; selected conventions in literature, cinema, and the visual arts; the development of one or two archetypal symbols in literature and the visual arts; directed to lead into more detailed studies of symbolic patterns in Iconography 2.
Prereq: Consent of instructor

ARCH 143 W 4C,2L 1.0
Iconography 2
A survey of the symbolic Nature of the Environment
A study centred on ancient life to initiate the student into the stream of cultural history and the complex problems of what the artist is: the quality of human existence, culture, environment, as well as the working of the icon from raw state of perceived image to its function as an expressive symbol in poetry, music, dance, architecture and other works of art: a study of modern work in comparison to an ancient achievement.
Prereq: ARCH 142

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: ARCH 142, 143 and 246 for Architecture students and completion of first year for others or consent of instructor.

ARCH 245 W.S. 1C,2L 0.5
Survey of Contemporary Architecture
Formative years in Europe, early North American scene, study of contemporary works in Architecture, analyses of important buildings of twentieth century. Philosophies of internationally known architects and designers. Study of the development of architectural styles, trends and schools of thought in North America and other countries.
Prereq: Second year standing

ARCH 246 F 4C,2L 1.0
Foundations of Europe
Sense of Periods and Styles
Recognition of patterns of life and concepts of order and conduct, models of the universe and other, moving metaphors and myths by means of study of the thoughts, acts, art, architecture, technology, literature, music and town design of the West from the break-up of the Roman Empire until the Renaissance. Field trips to museums, concerts in Toronto, Detroit or Buffalo.
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 282 F 3C,17 std 0.5
Preservation Practice-Background
An introduction to the field of preservation of older buildings, particularly in Canada; reference will be made to the philosophies and attitudes towards the preservation of older buildings and will be combined with the study, in brief, of historical, social and architectural influences on Canadian building.

ARCH 345 W 2C,1S 0.5
Architectural Theory 1850-1940
An introduction to the development of architectural theory from the mid-19th century to the 2nd World War, through an examination of architectural movement and philosophies of the period and of the architecture, built and imagined, which they generated.
Prereq: Consent of instructor

ARCH 346 W 2C,2L 0.5
Romanticism and 20th Century
Sense of Periods and Styles
Description of "modern" culture as one in which the notion of environmental order as the fulfilling of natural law is replaced by a notion of order as the creation of the autonomous human wills. Selected works in philosophy, literature, art and architecture will be studied.
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 instructors.

ARCH 348 W 2C,2S 0.5
Italian Renaissance Architecture
Architecture and urban design from the early fifteenth to the early seventeenth 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: ARCH 247 for architecture students and consent of instructor for others.

Courses for Bachelor of Architecture

(For Recommended Program, see page 160). 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.

ARCH 445 W 2C,2S 0.5
The Practice of Criticism in Creative Design
The application of critical thought will be exercised regularly through oral and written assignments on a wide range of designed human experiences; secondarily, there will be reading assignments to facilitate the practice of criticism through a broadening knowledge of critical theory and its relationship to culture.
Prereq: Consent of instructor

ARCH 446 F(Rome) 2C,2S 0.5
Italian Urban History
The course provides a survey of the history of settlement and urban form on the Italian peninsula from antiquity to the present day. In it the influences upon the structure of public and private space are outlined for each historical period. These include the constants such as geography and climate, but more especially the factors that induce and manifest change: politics, warfare, economics, social structure, the arts and theory.
Prereq: Registration in ARCH 492 or consent of instructor

ARCH 452 F 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

ARCH 455 W 2C 0.5
Management and Estimating
Exposure of the student to the administrative responsibilities of the practicing architect's work in the building industry, which includes: bidding, bid opening and analysis; contract award; administration of the contract; contractors organization; subcontractors; labour relations, estimating and cost control.

ARCH 474/475
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) UGAG

ARCH 492,493 F,W 3C,18std 2.0 each
Design Studio
The intent of these courses is to develop skills and gain experience in architectural design through the application of design and analysis techniques to complex building types. This is approached through a series of design projects aimed at the exploration of generative factors in the definition of built form. Projects are related to existing contexts and respond to current concerns of architectural theory and practice. Both individual and group work are included. Term held in Rome or Waterloo.
Prereq: Architecture students only.

ARCH 554 W 3C 0.5
Development and Financing
Introduction to the important determinants of the development, growth and re-planning of the various man environments, including development law, land use development, land use planning, appraisal, mortgage lending and accounting.
Prereq: Arch 455

ARCH 555 S 2C 0.5
Architectural Practice
The profession
Discussion of the legal and ethical aspects of architectural practice in Canada and in Ontario in particular, contracts, bonds and insurance, mechanics' liens, by-laws and regulations, architectural partnership. The legal background, client-architect relations, partial services, professional problems.
Prereq: BES standing

ARCH 563 W 3C 0.5
Suspended and Space Structures
State-of-the-art review of cable-suspended construction. Analysis of cable networks, basic equations. Effect of live loads on cables; dynamic considerations. Double cable systems; suspension and anti-suspension surfaces. Cable-stayed systems; analysis of space structures; space frames and roof systems; one and two-way design.
Prereq: 4B architecture standing or equivalent
ARCH 574/575
Experimental Courses
These courses offer a vehicle for introducing additional electives to the program on a short term basis, and for developing future permanent courses. Prereq: Consent of instructor

ARCH 584,585 W.S. 3R 0.5
Architectural Research
This offers a student an opportunity for independent research into architectural problems not offered in the regular curriculum. It allows guided exploration of a specific architectural problem area, of appropriate complexity to the particular term. Prereq: Approval of (in house) UGAG

ARCH 592,593 W.S. 32C 3.0 each
Design Studio
The course provides an opportunity for the student to select an area of concentration for study and design in depth. A thesis topic is to be submitted and approved during term 8 (4b) and all research work completed by the end of the 8 month co-op work term 5. Terms 9 and 10 (5a and 5b) will be spent developing the thesis for presentation during term 10. The thesis is to be a vehicle for thinking and design at an innovative level. Thus considerable emphasis is placed on both theory and development of design solutions. Prereq: Architecture students only.

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

Electives are divided into the following two categories:

(TE)
Theme Elective (BES Degree) courses within the Faculty of Environmental Studies which deal with ecological issues. Theme Elective (BArch Degree) any course within the School of Urban and Regional Planning.
Each student pursuing a BES degree must have accumulated one and a half-course credits in the theme area of Ecology by or before his/her 9th academic term.

Artists
Each student pursuing a BArch degree must have one half course credit in the theme area of Planning by or before his/her 10th academic term.

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

Note
Department approval is mandatory for both TE and FE.

ARTS 200
Issues in Mass Communication 1
Not offered 1982-83.

ARTS 201
Issues in Mass Communication 2
Not offered 1982-83.

ARTS 202P F. 0.5
Psychology of Religion in Historical Perspective
A study of the Psychology of Religion in its historical perspective from the nineteenth century to the present day. Methods, techniques and practices of research that are applicable to the examination of religious experience will also be introduced.

ARTS 211/212 F/F.W 0.5/0.5
Computing Techniques in Language and Literature
An introduction to non-mathematical computer programming, with special emphasis on the manipulation of language data. The programming languages used will be PL/1. Applications will include word indexes, text concordances, methods of computer-aided text comparison. ARTS 212 will stress data management, interactive editors, formatters, and the use of program utilities. No previous knowledge of computing is assumed. 212 presupposes 211 or permission of the instructor.

ARTS 215 Y 3C 1.0
Man in Crisis (Literary Views)
A critical study of such themes as freedom vs. happiness, nihilism, collectivism vs. individualism, old tablets vs. utopias, alienation, earth-bound fragmentation vs. the transcendental in the artistic writings of Kafka, Brecht, Hesse, Nietzsche, Solzhenitsyn, Dostoevsky, Zamyatin, Camus, and others. Taught in English. Prereq: none

ARTS 215A F 3C 0.5
Man in Crisis 1 (Literary Views)
A critical study of Dostoevsky's The Grand Inquisitor, Nietzsche's Thus Spake Zarathustra, Tolstoy's What Men Live By, and works by Aldous Huxley, Zamyatin, Turgenev, and Andres. The two major themes are Utopia, the yearning for and the shape of perfectionibility, and Nihilism, the denial and/or destruction of "Old Tablets" or "God is dead."
ARTS 215B W 3C 0.5
Man in Crisis 2 (Literary Views)
A critical study of Brecht’s The Caucasian Chalk Circle, Kafka’s The Metamorphosis, and works by Ibsen, Hesse, Dostoevsky, Tolstoy, and Solzhenitsyn. The two major themes are Nihilism (see above) and Alienation, the divided self in exile, or the inability to give and to accept love.

ARTS 220R F 3C 0.5
Chinese Thought and Culture 1
An examination of traditional culture, institutions and the modern development of China as the context for the examination of contemporary Chinese society. Offered at Renison College.

ARTS 221R W 3C 0.5
Chinese Thought and Culture 2
An investigation of the dynamics of the new China: education, medicine, the arts, the position of women, foreign policy, the Cultural Revolution and subsequent developments, rural and urban organization, the role of the army, the role of the Chinese Communist Party, and the philosophy of Mao Tse Tung. Prereq: ARTS 220R or consent of instructor. Offered at Renison College.

ARTS 249J J,Y 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 250J 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 302P W 0.5
Seminar on Selected Topics in Personality and Religion.

ARTS 320R/321R
Special Topics in Chinese Thought and Culture
Not offered 1982-83.

ARTS 349J Y,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. Offered at St. Jerome’s College. Prereq: ARTS 249J.

ARTS 350J Y 1.0
Advanced Topics in Family Life Education: Marriage and the Family
An in-depth analysis of select topics in marriage and family life, especially their emotional aspects, including an evaluation of family life education in school and community. Offered at St. Jerome’s College. Prereq: ARTS 250J.

Department of Biology

Professor, Chairman of Department J.E. Thompson, BSA (Toronto), PhD (Alberta)

Professor, Associate Chairman of the Department R.G.H. Downer, MSc (Queen’s Belfast), PhD (Western Ontario)

Professor, Graduate Officer A.D. Harrison, MSc, PhD (Capetown)

Professor, Graduate Officer C.H. Fernando, BSc (Ceylon), D Phil (Oxford)

Associate Professor, Undergraduate Officer J.C. Carlson, MSc, PhD (Massachusetts)

Assistant Professor, Undergraduate Officer W.R. Haworth, MSc (McMaster), PhD (Western Ontario)

Assistant Professor, Undergraduate Officer C.A. Peterson, MSc (Alberta), PhD (California, Davis)

Professors
E.B. Dumbroff, MForestry, PhD (Georgia)
H.B.N. Hynes, PhD, DSc (London), ARC, FRSC
W.E. Inness, MSc (Toronto), PhD (Michigan State)
W.B. Kendrick, BSc, PhD (Liverpool), FRSC
J. Kruuv, MSc (Waterloo), PhD (Western Ontario)
J.K. Morton, BSc, PhD (Durham), FLS
J.J. Pasternak, MA (Toronto), PhD (Indiana)
G. Power, BSc (Durham), PhD (McGill)
J. Swak, LSCO (Montreal), MS (Indiana), PhD (Cornell)

Associate Professors
R.D. Beauchamp, BA (McMaster), MA, PhD (Brown)
J.C.H. Carter, BA (Toronto), MSc, PhD (McGill)
A.M. Charles, MSc, PhD (Manitoba)
H.C. Duthie, BSc, PhD (Wales)
H.R.N. Eydt, MSc, PhD (McMaster)
M. Globus, MSc (McGill), PhD (Toronto)
A.G. Kempton, MSA (Toronto), PhD (Michigan State)
J.R. Lepock, MS (West Virginia), PhD (Penn State)
C.I. Mayfield, BSc, PhD (Liverpool)
P.E. Morrison, MSc (Western Ontario),
PhD (McMaster)
J.C. Semple, BSc (Tufts), MA, PhD
(Washington U, St. Louis)
S.M. Smith, MSc (McMaster), PhD
(Manitoba) Recipient of the
Distinguished Teacher Award
J.B. Theberge+, DSAC (Guelph), MSc
(Toronto), PhD (Br. Col.)
K. Zachariah, BSc (Madras), BA Hons
(Oxford), MA, PhD (Princeton)

Assistant Professors
N. Bolis, BSc (S Fraser), MSc (Br. Col.),
PhD (Toronto)
D.G. Dixon, BSc (Sir George Williams),
MSc (Concordia), PhD (Guelph)
M.E. Haigh+*, MSc, PhD (McMaster)
W.D. Taylor, BSc, PhD (Toronto)

Research Assistant Professors
A. Morgan, BSc (Leicester), MSc
(Saskatchewan), PhD (Birmingham)
J.F. Sutcliffe, BSc (Waterloo),
MSc, PhD (Toronto)
S. Vethamany-Globus, BSc, MA, MSc
(Madras), PhD (Toronto)

Adjunct Faculty
C.R. Barnes, BSc (Birmingham), PhD
(OTTawa) Memorial University
F.F. Mallory, MSc (Laurentian), PhD
(Guelph) Wilfrid Laurier University

Faculty members holding cross
appointments as shown
1Biology and Physics
2Biology and Urban and Regional
Planning
3Biology and Optometry

Course Descriptions
Biology

BIOL 10 F,W,S 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,
ecology and plant biology.
Open to students other than those
intending to major in Biology or to enter
the School of Optometry.

BIOL 111L F 3L 0.25
Introductory Biology 1 Laboratory
A laboratory course only for students
taking Biology 111. Take-home
problems and/or assignments will
alternate with in-house labs.
Open to students other than those
intending to major in Biology or to enter
the School of Optometry.

BIOL 112 W 2C 0.5
Introductory Biology 2
An introduction to the basic principles
of zoology and ecology with reference
to man as a biological organism.
Open to students other than those
intending to major in Biology or to enter
the School of Optometry.

BIOL 112L W 3L 0.25
Introductory Biology 2 Laboratory
A laboratory course only for students
taking Biology 112. Labs. on alternate
weeks.
Open to students other than those
intending to major in Biology or to enter
the School of Optometry.

BIOL 201 Y 2C,3L 1.0
Anatomy, Histology and Embryology
A systematic, anatomical and
histological study of the human body
and an introduction to basic
embryology.
Open to students other than those
intending to major in Biology.

BIOL 210 F 2C,3L 0.5
Introductory Invertebrate Zoology
A study of the functional morphology of
selected invertebrate types with special
emphasis on the various grades of
organization and development in the
different phyla.
BIOL 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 micro-organisms 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/lldlab 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. The 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 F 2C,3L 0.5  
**Invertebrate Zoology**  
A survey of the major invertebrate phyla other than the arthropods, with emphasis on their functional anatomy, classification and ways of life. Prereq: BIOL 210

BIOL 316 W 2C,3L 0.5  
**Arthropod Zoology**  
A survey of the phylum Arthropoda, including the insects, with emphasis on their classification, interrelationships and ways of life. Prereq: BIOL 210

BIOL 323 W 2C,3L 0.5  
**Plant Anatomy and Morphogenesis**  
Plant structure in relation to function and development with particular reference to the vascular plants. Cell, tissue and organ differentiation. Prereq: BIOL 220 and 230

BIOL 324 F 2C,3L 0.5  
**The Flowering Plants**  
A study of floral morphology in relation to classification and evolution. An introduction to taxonomy and nomenclature. History of taxonomy. Systems of classification. Mechanisms of pollination and dispersal. (Students entering this course are required to make a flowering plant collection. Instructions should be obtained from the Herbarium prior to the summer break.)

BIOL 327 F 2S,3L 0.5  
**Mycology 1**  
Fungal taxonomy and ecology; medical mycology; plant pathology; industrial applications; food and food processing; toxins and hallucinogens; biological control. Fungi as coprophiles, predators, and symbionts with plants and animals. Prereq: BIOL 221

BIOL 330 W 2C,3L 0.5  
**Molecular Biology**  
Molecular biological aspects of chromosome replication, expression of genetic information, functional translation of specific eukaryotic proteins, cell division, gamete formation, embryogenesis, hormone action, cellular interactions and cell differentiation.

BIOL 331 F 2C,3L 0.5  
**Cell Physiology**  
The functional organization of cells with particular reference to cell-cell interaction, the structure, function and development of organelles and the biological roles of cellular membranes. Prereq: BIOL 230

BIOL 333 F 2C,3L 0.5  
**Histology and CytoLOGY**  
The structure of mammalian cells, tissues and organs interpreted in functional terms. Cell reproduction and differentiation, with some discussion of the embryological origin of tissues and the regulation of tissue growth. Light and electron microscopy techniques. Prereq: BIOL 211 or 230 or 233

BIOL 335 W 2C,3L 0.5  
**Plant Physiology**  
An integrated study of plant function: the dynamics of nutrient and water movement, photosynthesis, control mechanisms of growth and development.

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 2C,3L 0.5  
**Vertebrate Physiology 1**  
A general study of selected physiological topics in vertebrates including nutrition, digestion, respiration and circulation.

BIOL 338 W 2C,3L 0.5  
**Vertebrate Physiology 2**  
A general study of selected physiological topics in vertebrates including nerve and muscle physiology, endocrinology, osmoregulation and excretion.

BIOL 342 F 2C,3L 0.5  
**Microbial Biotechnology**  
The role of micro-organisms 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 360 W 2C,3L 0.5  
Environmental Toxicology I  
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 F 2C,1T 0.5  
Population Ecology I  
The ecology of populations. Topics include: demographic parameters and their estimation; population growth and regulation; competitive and predator-prey interactions; population genetics and evolution; applied population biology.  
Prereq: BIOL 250 and STAT 202.

BIOL 416 F 2C,3L 0.5  
Entomology  
Introduction to morphology, systematics and biology of insects. (Brief field trips will be made to collect insects from different local habitats.)

BIOL 420 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 Ontario. The phylogeny of the plants will be explored through a study of fossil ancestors in each line of evolution.

Prereq: BIOL 220 and 221 or permission of the instructor.  
(Offered 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 2S,3L 0.5  
Mycology II  
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 or 347

BIOL 430 F 2C,3L 0.5  
Comparative Animal Physiology I  
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.  
(Not offered in 1982-83.)

BIOL 434 W 3C/S 0.5  
Advanced Genetics  
A detailed examination of the recent advances in molecular genetics with emphasis on the regulation of gene action in both prokaryotes and eukaryotes. Current research literature will be reviewed.  
(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/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 or 340  
(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, cyanogenic glycosides and other important compounds in plants and other biological systems.  
Prereq: At least one full-year course or equivalent in organic chemistry plus a one-term course in biochemistry that includes the essentials of carbohydrate and fat metabolism.

BIOL 441 F 2C,3L 0.5  
Immunology  
Physical and biological properties of immunological agents that protect against disease, the procedures for their identification and their practical applications.  
Prereq: BIOL 240-241

BIOL 442 W 2C,3L 0.5  
Virology  
The nature of viruses and their interaction with their plant, microbial and animal hosts.  
Prereq: BIOL 240-241

BIOL 443 F 2C,3L 0.5  
Microorganisms of Industrial Importance  
A study of the role of microorganisms in industrial processes of biosynthesis and degradation.  
Prereq: BIOL 337 or 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 micro-organisms. Aspects of pollution, waste treatment, biodegradation of environmental contaminants, and nutrient cycling will be examined.
Prereq: Biol 240-241, 446 or permission of instructor.

Biol 448 F 2C.3L 0.5
Microbial Physiology 1
A study of the physiology of microorganisms involving multiphasic and synchronous growth, cell permeation, nutrition, physical and chemical environmental factors and metabolic mechanisms as elucidated by radioactively labelled tracers.
Prereq: Biol 240-241, or permission of instructor.

Biol 449 W 2C.3L 0.5
Microbial Physiology 2
A study of the physiology of microorganisms with emphasis on 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; 448 or permission of instructor.

Biol 450 F 2C.3S/4Dlab 0.5
Aquatic Biology
An introduction to the physics, chemistry and biology of the marine and freshwater environments.
Prereq: Biol 315 or 316 or 322 or 333; 497 N.B. Limited to 24; priority will be given to Honours students.

Biol 452 F 2C.3L 0.5
Introduction to Fisheries Biology
The practices of fisheries biology; fish classification, life history, production, harvest and management.

Biol 455 F 2C.3L 0.5
Environmental Toxicology
Cellular, developmental and physiological effects of toxicants on multicellular organisms.
Prereq: Biol 350

Biol 456 W 2C.3Dlab/T 0.5
Population Ecology 2
The analysis of the structure and dynamics of plant and animal populations. Theoretical, mathematical and experimental approaches to the study of population ecology.
Prereq: Biol 346 or 356

Biol 457 F 2C.3Dlab/T 0.5
The Analysis of Communities
Sampling procedures to estimate abundance and distribution of organisms in time and space. Methods to analyze succession. The classification and ordination of ecosystems. The response of ecosystems to exploitation. The role of biological management in conservation programs.
Prereq: Biol 250 and Stat 202

Biol 458 F 2C.3L 0.5
Quaternary Ecology
A consideration of the Quaternary environment. Pollen, plant macrofossil and faunal remains as indicators of past environments. Relationship of fossil assemblages to modern ecosystems. Pollen analysis and the interpretation of fossil deposits.
Prereq: an introductory course in biology or geology, or permission of the instructor.

Biol 473 W 3C/S 0.5
Biosystematics and Evolution
A study of the processes of evolution: the differentiation of populations and the origin of new forms of life. 
Prereq: Biol 239

Biol 474 W 3C 0.5
History of Biology
The development of biological thought from Greek and Roman times to the present; i.e. from classification to the present experimental approach. (Not to be taken in conjunction with SCI 400).
Canadian Studies

S.E. McMullin, BA, MA (Carleton), PhD (Dalhousie)
P. Socken, BA (Toronto), MA (Iowa), PhD (Toronto)

Lecturer
S.D. Burt, BA, MA (Waterloo)

The core courses for each year of the program constitute an inter-disciplinary 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.

Core Courses

CDN ST 201 F 2C1S 0.5
Social Regionalism
Lecturers in Geography, Political Science, Sociology and History discuss the roles which economic disparities, social elites, federal/provincial relations and political parties play in defining Canadian regionalism. Particular attention is paid to Quebec's desire for separate status.

CDN ST 202 W 2C1S 0.5
Cultural Regionalism
Lecturers discuss the contribution made by literature, film, drama, and fine arts in defining distinctive regional identities in Canada. Particular attention is paid to the emergence of a distinctive Ontario culture.

CDN ST 301 F 3S 0.5
Regionalism: West
This course continues the exploration of Canadian regionalism by applying knowledge gained in CDN ST 201/202 to distinctive problems of the Canadian west and northwest. The focus of the seminar will vary according to the interests of the faculty and students. Prereq: CDN ST 201 or 202 or permission of instructor.

CDN ST 302 W 3S 0.5
Regionalism: East
This course continues the exploration of Canadian regionalism by applying knowledge gained in CDN ST 201/202 to distinctive problems of Atlantic Canada. The focus of the seminar will vary according to the interests of the faculty and students. Prereq: CDN ST 201 or 202 or permission of instructor.

Course Descriptions
Canadian Studies

CDN ST 400 Y T 1.0
Research Essay
An extensive senior research essay, supervised by a committee composed of faculty members from two or more of the participating departments, which deals with a specific aspect of Canada utilizing material and methods from several different disciplines. Prereq: CDN ST 301/302

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 333 Canadian Communities and Planned Change
ANTH 334 Ethnicity and Ethnic Diversity in Canada
ANTH 377 Early Man in the New World
ANTH 499 Honours Essay

Economics
ECON 100A Introduction to Modern Economics
ECON 101 Introduction to Micro-economics
ECON 109 Introduction to Macroeconomics
ECON 241 Cost-Benefit Analysis and Project Evaluation
ECON 263 Economic History of Canada
ECON 333 Interregional Economics
ECON 341 Public Finance
ECON 343 Urban Economics
ECON 345 Industrial Organization
ECON 351 Labour Economics
ECON 353 Population Economics
ECON 355 Economics of Energy and National Resources
ECON 363 Contemporary Canadian Problems
ECON 364 Contemporary Canadian Problems

English
ENGL 205R The Canadian Short Story
ENGL 214 Themes in Canadian Literature
ENGL 215 Canadian Regional Literature
ENGL 313 Canadian Literature to 1920

Participating Faculty 1980-81

Professor
J.M. Wilson, BA, MA (Toronto)

Associate Professors
J.R. English, BA (Waterloo), AM, PhD (Harvard)
K.M. McLaughlin, BA (Waterloo), MA (Dalhousie), PhD (Toronto)
W.R. Thirsk, BA, MA (British Columbia), PhD (Yale)
S.M. Weaver, BA, MA, PhD (Toronto)

Assistant Professors
D.J. Horton, BA (Waterloo Lutheran), MA (Waterloo), PhD (McGill)
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<tr>
<th>Code</th>
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<td>ENGL 315</td>
<td>Canadian Prose Since 1920</td>
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<td>ENGL 316</td>
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<td>ENGL 495</td>
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<td>ENV S 195A</td>
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<td>ENV S 333</td>
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<td>ENV S 401</td>
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<td>FRENCH 151</td>
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<td>FR 402</td>
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<td>GEOG 251</td>
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<td>HIST 102E</td>
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<td>HIST 201X</td>
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<td>HIST 204X</td>
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<td>HIST 205X</td>
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<td>HIST 245</td>
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<td>HIST 248</td>
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<td>HIST 253X</td>
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<td>HIST 326</td>
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<td>HIST 326</td>
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**Man-Environment Studies**

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<td>M ENV 351</td>
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<td>M ENV 356</td>
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<td>M ENV 385</td>
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<td>M ENV 400</td>
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**Sociology**

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<td>SOC 200</td>
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<td>SOC 209</td>
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**Political Science**

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<td>Political Power and the Political Process</td>
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<td>SCI 102L</td>
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**French**

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<td>FR 155</td>
<td>Intensive Review of French</td>
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<td>FR 192</td>
<td>French Language</td>
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<td>FR 195</td>
<td>French Literature 1</td>
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<td>FR 196</td>
<td>French Literature 2</td>
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<td>FR 205</td>
<td>Spoken French</td>
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<td>FR 208</td>
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<td>FR 251</td>
<td>Intensive Language Training</td>
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<td>FR 252</td>
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<td>Aspects of Quebec</td>
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<td>FR 275</td>
<td>Contemporary French-Canadian Novel</td>
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<td>FR 300</td>
<td>Advanced Instruction in Written French</td>
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<td>FR 371</td>
<td>French-Canadian Poetry</td>
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<td>FR 372</td>
<td>Contemporary Quebec Theatre</td>
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<td>FR 401</td>
<td>Advanced Language Study</td>
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<td>FR 402</td>
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<td>FR 471</td>
<td>French-Canadian Poetry</td>
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<td>FR 472</td>
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<td>FR 501</td>
<td>Problems of French Language</td>
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<td>FR 502</td>
<td>Problems of French Language</td>
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### Religious Studies

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<tr>
<th>Course Code</th>
<th>Title</th>
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<tr>
<td>R S 220</td>
<td>Evangelical Christianity</td>
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<tr>
<td>R S 221</td>
<td>Minority Religions in North America</td>
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<tr>
<td>R S 264</td>
<td>Religion in the Canadian Experience</td>
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<tr>
<td>R S 265</td>
<td>Unity and Diversity in Canadian Religion</td>
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<tr>
<td>R S 268B</td>
<td>Religious Perspectives in Contemporary Canadian Literature</td>
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</tbody>
</table>

### Department of Chemical Engineering

**Professor, Chairman of Department**

E. Rhodes, BSc Tech, MSc Tech, PhD (Manchester), PEng

**Professor, Associate Chairman (Graduate Studies)**

T.Z. Fahidy, BSc, MSc (Queen's), PhD (Illinois), PEng

**Associate Professor, Associate Chairman (Undergraduate Studies)**

G.S. Mueller, BSc(aWaterloo), MSc, PhD (Manchester), PEng

**Professor, Associate Dean, Graduate Studies**

D.S. Scott, BSc, MSc (Alberta), PhD (Illinois), PEng

**Professor, Director of General Studies Program**

T.L. Batke, BEng, MASc, MSc, PhD (Toronto)

**Professors**

J.J. Byerley, BSc, MASc, MSc, PhD (Toronto), PhD (British Columbia)
K.S. Chang, BS (Hayang Inst. Tech., Seoul), MSc, PhD (Northwestern)
F.A. Dullien, Dipl Ing (Budapest Technical University) MSc, PhD (British Columbia), PEng
R. Y-M. Huang, BSc (National Taiwan University), MSc, PhD (Toronto), PEng
R.R. Hudgins, UE, BSc, Masc (Toronto), MA, PhD (Princeton)
M. Moo Young, BSc (London), Masc (Toronto), PhD (London), PEng
K.F. O'Driscol, BChE (Pratt Inst.), MA, PhD (Princeton)

**D.C.T. Pei, BEng (McGill), MSc (Queen's), PhD (McMaster)**

**P.M. Reilly, AE, BASc (Toronto), DIC, PhD (London), PEng**

**G.L. Rempe, BSc, PhD (British Columbia)**

**C.W. Robinson, BASc (British Columbia), PhD (UC Berkeley)**

**A. Rudin, BSc (Alberta), PhD (Northwestern)**

**P.L. Silvestro, BS, MS (MIT), Dr Ing (Munich), PEng**

**D.R. Spin, BS (Mich), MS (Rochester), PhD (Iowa State), PEng**

**G.A. Turner, BSc (London), PhD (Manchester)**

**B.M.E. van der Hoff, Ing (Amsterdam), ir (Delft)**

**Associate Professors**

L.E. Bodnar, BA, MA (Saskatchewan), PhD (McMaster)

**C.M. Burns, BASc, MASc, PhD (Toronto), PhD (Polytechnic Inst., Brooklyn), PEng**

**K. Enns, BASc, LLB, MASc, PhD (Toronto)**

**J.D. Ford, BEng (McGill), MASc, PhD (Toronto), PEng**

**C.E. Gail, BASc (Toronto), MSc (Queen's), PhD (Memorial), PEng**

**I.F. Macdonald, BEng (NTSC), PhD (Wisconsin)**

**J.R. Wynnynckyj, BEng (McGill), MASc, PhD (Toronto)**

**Assistant Professors**

J.M. Scharer, BSc, PhD (Pennsylvania)

**G.R. Sullivan, BASc (Waterloo), DIC, PhD (London), PEng**

**Faculty members having cross-appointments as shown**

### Fine Arts

- **FINE 316** Canadian Art
- **FINE 317** Canadian Art
- **Inter-Disciplinary Social Science**
  - ISS 221R Community Issues
- **Music**
  - MUSIC 280G 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**

- **R S 220** Evangelical Christianity
- **R S 221** Minority Religions in North America
- **R S 264** Religion in the Canadian Experience
- **R S 265** Unity and Diversity in Canadian Religion
- **R S 268B** Religious Perspectives in Contemporary Canadian Literature

**Course Descriptions**

**Chemical Engineering**

**Department of Chemical Engineering**

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**G.R. Sullivan, BASc (Waterloo), DIC, PhD (London), PEng**

**Faculty members having cross-appointments as shown**

**Chemical Engineering and Philosophy**

**Chemical Engineering and Chemistry**

**Chemical Engineering, Management Science, and Statistics**

**Chemistry and Chemical Engineering**

**Course Descriptions**

**Fine Arts**

- **FINE 316** Canadian Art
- **FINE 317** Canadian Art
- **Inter-Disciplinary Social Science**
  - ISS 221R Community Issues
- **Music**
  - MUSIC 280G Canadian Music
- **Philosophy**
  - PHIL 225 Social and Political Philosophy: Canadian Problems
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- **R S 265** Unity and Diversity in Canadian Religion
- **R S 268B** Religious Perspectives in Contemporary Canadian Literature

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**Note**

Students whose registration in first year was prior to September 1979 follow a program described in the 1980/81 Calendar.

**Prerequisite**

For all courses in the Department of Chemical Engineering, registration in the Department or permission of the Associate Chairman (Undergraduate Studies) is a requirement.
Introductory Engineering Concepts 1
An introduction to the basic methods and principles used by engineers in the analysis and design of physical processes: units, dimensions, and measurements; mass balances; behaviour of fluids. Laboratory on visual communication is included.

CH E 101 W.S 3C,1T,3L 0.5
Introductory Engineering Concepts 2
An extension of the topics covered in CH E 100: energy balances; laboratory experiments illustrate the physical principles discussed.

CH E 112 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 Stage Operations)
Equilibrium between phases; the equilibrium-stage concept. Cascades of stages with and without reflux: examples of their analysis when used to separate components by distillation, extraction, absorption and leaching. Introduction to computer methods for multicomponent mixtures.

CH E 221 S,F 3C,1L 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 222 W,F 3C,1T 0.5
Applied Mathematics 1
Basic concepts of probability and their relevance to engineering decisions. Statistical frequency distributions, tests of significance, correlations, curve fitting, sampling theory, applications: errors, design of experiments.

CH E 230 W,F 3C,1T 0.5
Physical Chemistry 1
Introduction to physical chemistry. Ideal and real gases, the kinetic theory of gases, first law of thermodynamics, thermochemistry, heats of reaction, second law, chemical equilibria in simple systems, phase equilibria in simple systems, third law.

CH E 231 S,F 3C,1T 0.5
Physical Chemistry 2

CH E 232 W,F 3C 0.5
Inorganic Chemistry 1
Wave mechanics, atomic structure and the periodic table, chemical bonding, structural chemistry of elements and compounds, introductory transition metal chemistry, some thermodynamic aspects of inorganic chemistry.

CH E 233 S,F 3L 0.5
Physical Chemistry Laboratory
Experiments on viscosity of gases and liquids, chemical kinetics. Absorption, homogeneous and heterogeneous catalysis, thermochemistry, phase equilibria, diffusion, determination of molecular weight of polymers, training in technical report writing.

CH E 314 W,S 3C,1T 0.5
Transport Processes 3 (Heat Transfer)
Introduction to heat transfer, momentum-heat transfer analogies and dimensional analysis, steady and transient heat conduction, convection and applications to engineering problems, radiant heat transfer and heat transfer with change of phase. Prereq: CH E 231

CH E 317 W,F 3C,1T 0.5
Transport Processes 4 (Mass Transfer)
Mass transfer by molecular and turbulent motion, heat-mass transfer analogies, mass transfer models and application to separations such as: distillation, absorption, adsorption, extraction etc.; simultaneous heat and mass transfer in gas-liquid contacting and solids drying; introduction to mass transfer with chemical reaction. Prereq: CHE 314

CH E 320 W,S 3C 0.5
Applied Mathematics 2
Gamma-Beta- and error-functions; sine-, cosine-, exponential- and elliptic-integrals, linear differential equations.

Wronskian, Green function; initial and boundary value problems; Bessel functions; Fourier series, integrals and transforms; orthogonal functions; Laplace transforms; applications.

CH E 321 W,F 3C 0.5
Process Dynamics and Control 1
Block and signal flow diagrams, proportional-integral-derivative controllers, frequency response techniques, analytical and graphical stability criteria. Introduction to modern control theory. Prereq: MATH 216, CH E 314

CH E 330 W,S 3C 0.5
Chemical Engineering Thermodynamics
Thermodynamics of flow processes, vapour power plants, internal combustion engines, liquefaction of gases, refrigeration and vaporization, chemical equilibria in chemical reactions, thermal pollution, the energy crisis, efficient energy utilization and thermodynamics. Prereq: CH E 231

CH E 331 W,F 3C 0.5
Chemical Reaction Engineering
Homogeneous reactors: batch, CSTR, tubular flow systems, ideal models, residence time distributions in ideal reactors, temperature effects, steady states, semi-batch systems, nonideal behaviour. Heterogeneous catalysis; mass transfer effects; catalytic rate equations, fixed and fluidized bed reactors. Prereq: CH E 231

CH E 332 W,S 3C 0.5
Inorganic Chemistry 2
Introductory electrochemistry, electrolysis, electrolytic conductance and transport, reversible electrode processes, irreversible electrode processes and electrode kinetics, electrochemical measurements and their analytical applications, chemistry of corrosion. Prereq: CHE 232

CH E 333 W,F 3L 0.5
Instrumental Methods of Chemical Analysis
An introduction to modern analysis including optical, electrochemical, radiocal, chromatographic and spectroscopic methods.

CH E 382 W,S 3C 0.5
Engineering Economics and Process Design 1
Mathematics of annuities, mortgages, bonds and small loans; cost accounting, including direct costing, depreciation, taxes and financial statements. Sizing and costing of piping and heat transfer equipment; design of process components.
Course Descriptions
Chemical Engineering

CH E 410 S.F 6L 0.5
Chemical Engineering Laboratory
Experimental applications of physical and chemical principles using pilot scale equipment, experiments illustrating major unit operations (distillation, absorption, extraction, drying, humidification).
Prereq: CH E 314

CH E 484 S.F 3C 0.5
Engineering Economics and Process Design 2
Estimation of sales, and capital and operating costs of a new process or products; study of criteria for the appraisal of capital and expenditures; critical path methods; linear programming. Sizing and costing of mass transfer and other process equipment; design of processes.

CH E 486 S.F 3C 0.5
Technical Seminar
Each student will be expected to prepare and deliver a seminar on material from the recent literature or industrial experience, as well as an impromptu talk on a variety of topics. This course is graded CR or NCR, and CR must be obtained as a requirement for graduation.

CH E 501 W 3C 0.5
The Engineer as Entrepreneur
A survey course covering the place of small business in Canadian manufacturing. The role of innovation in organizing a successful new business. Topics important to business startup: patents, business plans, financing new ventures, bookkeeping, marketing, government assistance, taxation, and bankruptcy.

CH E 502 W 3C 0.5
Fundamentals of Petroleum Production
Background for understanding the physical principles involved and the terminology used in petroleum production. Fundamentals of surface chemistry (capillarity), characterization of and fluid flow through porous media. Principles of production performance, water flooding and enhanced recovery techniques.

CH E 510 S.F 3C 0.5
Prediction of Physico-chemical Properties
Methods of estimating physico-chemical properties of gases and liquids in cases where experimental values are absent. Prediction is usually based on correlations of a form suggested in part by theory, with empirical constants based on experimental data.

CH E 515 W 3C 0.5
Two-Phase Flow Operations
Introductory theory of one-dimensional two-phase flow: conventions, definitions, homogeneous theory, separated flow (Lockhart-Martinelli), particulate characterization and behaviour; applications: two-phase flow in pipes, boiling and evaporation, filtration.

CH E 517 W 3C 0.5
Performance of Separation Processes
Introduction, patterns of change and computation approaches, group methods, limited flows and stage requirements, capacity and efficiency of contacting devices, energy requirements, selection, optimal design and operation, mass transfer with chemical reaction.

CH E 520 S.F 3C 0.5
Chemical Engineering Analysis
Application of advanced mathematical techniques to the analysis of chemical engineering processes.
Prereq: Permission of instructor

CH E 521 W 3C 0.5
Process Dynamics and Control 2
Analog computation, time domain analysis, control of complex chemical systems.
Prereq: CH E 420

CH E 523 W 4L 0.5
Process Control Laboratory
Experiments on process dynamics, control and analog simulation of chemical processes. Time constant, step and frequency response, controller settings, cascade control of thermal, liquid level, and reaction systems.
Prereq: CH E 420

CH E 540 S.F 3C 0.5
Introduction to Polymer Science
Basic concepts of polymer chemistry, classification of polymers, introductory physical chemistry of polymers, organic chemistry of polymerization reactions of polymers, naturally occurring polymers.

CH E 541 W 3C 0.5
Physical Chemistry of Polymers
Polymer solutions, molecular characterization of polymers, molecular weight distributions, morphology and crystallinity in polymers, reaction kinetics and mechanism of addition and condensation polymerization.
Prereq: CH E 540

CH E 543 W 3L 0.5
Polymer Laboratory
Experimental studies of polymerization and physical properties of polymers: condensation and addition polymerization, copolymerization, molecular weight, extrusion rheology.
Coreq: CH E 541

CH E 550 W,F 3C 0.5
Introduction to Extractive Metallurgy
Physical and chemical nature of ores and intermediates, introductory pyrometallurgy, hydrometallurgy and electrometallurgy, survey of extraction processes, application of the principles of thermodynamics and kinetics to metallurgical processes.

CH E 551 W 3C 0.5
Metallurgical Chemistry
Ionic equilibria, thermodynamics and kinetics of reactions in solution, bonding, stability and stereochemistry of co-ordination compounds and mechanisms of their reaction, introductory hydrometallurgy, corrosion and homogeneous catalysis.

CH E 553 W 3C 0.5
Principles of High Temperature Extractive Metallurgy
In-depth discussion of several processes of importance in Canada: blast-furnace smelting (iron, lead, zinc), steel making and other specialized refining processes, pyrometallurgical treatment of sulfide ores, and fused salt electrolysis. The emphasis is on the interplay of the underlying thermodynamic, kinetic, transport, and process-engineering considerations.

CH E 560 S.F 3C 0.5
Introduction to Biochemical Engineering
Aspects of the life sciences of interest to the biochemical industries and to environmental pollution. Classification and growth characteristics of micro-organisms. Physico-chemical properties of biological compounds. Metabolism and biochemical kinetics. Course includes some lab work.

CH E 561 W 3C 0.5
Fermentation Operations
Application of process engineering principles to the design and operation of fermentation reactors which are
widely used in the pharmaceutical, food, brewing, and waste treatment industries. Aspects of mass transfer, heat transfer, mixing, and rheology with biochemical and biological constraints. Course includes some lab work.

**Prerequisite:** CH E 560 or permission of instructor.

**CH E 565 W 3C 0.5**

**Food Processing**

Applications of unsteady and steady state heat and/or mass transfer operations to processing natural and texturized foods. Design and analysis of sterilization, low temperature preservation, concentration, separation and purification processes. Effects of formulation, additives and processing on organoleptic and nutritional quality.

**Prerequisite:** CH E 560 or permission of instructor.

**CH E 570 W F 3C 0.5**

**Air Pollution**

Treatment of gaseous waste products from representative Canadian industries; characterization and toxicity of filtration, scrubbing, cycloning, electrostatic precipitation, and other chemical treatment, legal, socio-political, economic and engineering aspects.

**CH E 571 W 3C 0.5**

**Water Pollution**

Treatment of waste water from metals processing industries; waste characterization; toxicity, recycling; treatment by electro-oxidation/reduction, ion exchange, solvent extraction, absorption, electrodialysis, reverse osmosis, etc.; economics, regulations, moral, legal, social and political implications.

**CH E 580 S F 6L 0.5**

**Research-Design Project 1**

Individualy supervised research or design project on any Chemical Engineering subject chosen by the student-professor group. Written report required.

**CH E 581 W 12L 1.0**

**Research-Design Project 2**

Continuation of CH E 580 Equivalent to two one-term courses. A written report, meeting minimum technical report standards; and a public oral presentation will be required.

**CH E 583 W 2T, 4L 0.5**

**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.

**CH E 585 W 6L 0.5**

**Technical Elective Project**

An individually supervised research or design project, based on one of the technical elective courses taken in the 4A term. A written report, meeting minimum technical report standards, and a public oral presentation will be required.

**CH E 007 W, F 1C 0**

**General Awareness Seminar**

Informal discussions on the Chemical Engineering program.

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**Department of Chemistry**

**Professor, Chairman of Department**

D. E. Irish, BSc (Western Ontario), MSc (McMaster), PhD (Chicago), FCIC

**Professor, Associate Chairman of Department**

R. G. Woolford, MSc (Western Ontario), PhD (Illinois), FCIC

**Associate Professor, Associate Dean of the Faculty of Science**

D. A. Braibin, BSc (Alberta), PhD (Toronto)

**Professor, Associate Dean of the Faculty of Science (Graduate Studies)**

J. G. Smith, MA, PhD (Toronto), FCIC

**Professor, University of Guelph**

Director of the Guelph-Waterloo Centre for Graduate Work in Chemistry

W. R. Fawcett, BA, PhD (Toronto)

**Professors**

A. J. Carty, BSc, PhD (Nottingham)

J. Oizek, RNDr (Charles University, Prague), CSc (Czechoslovak Academy of Sciences, Prague)

T. E. Gough, BSc, PhD (Leicester)

---

F. W. Karasek, BS (Elmhurst), PhD (Oregon State), FCIC

W. A. E. McBayre, MA (Toronto), PhD (Virginia), FCIC

F. R. McCourt, BSc, PhD (British Columbia)

H. G. McLeod, MA, PhD (Toronto)

J. B. Moffat, BA, PhD (Toronto), FCIC

K. F. O’Discoll, BChE (Pratt Inst.), MA, PhD (Princeton), FCIC

J. Paids, RNDr (Charles University, Prague), CSc (Czechoslovak Academy of Sciences, Prague)

W. B. Pearson, DFC, MA, DSc (Oxford), FRSC, FCIC

L. W. Reeves, BSc, PhD, DSc (Bristol), FRSC, FCIC

A. Rudin, BSc (Alberta), PhD (Northwestern)

G. L. Rempel, BSc, PhD (British Columbia), FCIC

G. Socol, Doctorem in Chimica (Genova), LibDCC, FCIC

H. D. Sharma, MSc (Delhi), PhD (California), FCIC

V. A. Snicek, BSc (Alberta), MS (California), PhD (Oregon), FCIC

J. E. Thompson, BSc (Toronto), PhD (Alberta)

T. Viswanatha, MSc, PhD (Mysore), Recipient of the Distinguished Teacher Award

---

**Adjunct Professors**

B. O. Fraser-Reid, MSc (Queen’s), PhD (Alberta), FCIC

R. R. Marchessault, BSc (Montreal-Loyola), PhD (McGill)

R. G. A. Rodrigo, BA (Ceylon), PhD (Virginia), FCIC

---

**Associate Professors**

G. F. Atkinson, MA, PhD (Toronto), CChem, FRSC (UK), FCIC

L. J. Brubacher, BA (Goshen College, Indiana), PhD (Northwestern)

J. B. Capindale, MA, DPhil (Oxford)

P. C. Chieh, BSc (Nat. Taiwan), MSc (Nat. Tsing Hua), PhD (British Columbia)

W. L. Elston, MSc (Western Ontario), PhD (McGill)

R. J. Friesen, BSc, MSc (Manitoba)

R. J. LeRoy, BSc, MSc (Toronto), PhD (Wisconsin)

J. L. Koppel, MSc (McMaster), PhD (Chicago), FCIC

D. Mackay, BSc, PhD (Aberdeen)

A. D. Maynes, MA, PhD (Toronto)

M. F. Tchir, BSc (Alberta), PhD (Western Ontario)

G. E. Toogood, BSc, PhD (Nottingham)

---

**Assistant Professor**

G. I. Dmitrienko, BSc, PhD (Toronto)
Adjunct Assistant Professor
N.J. Taylor, BSc, PhD (Surrey)

Research Assistant Professors
A.J. Thakker, BSc, PhD (Queen's)
M.A. White, BSc (Western Ontario), PhD (McMaster)

Senior Demonstrators
S.O. deSilva, BSc (Ceylon), PhD (Waterloo)
C. Foltzer, BSc (Purdue), MSc, PhD (Rutgers)
S. McBride, BSc (Western Ontario)
T. Rudensky, BSc, PhD (Waterloo)

Faculty Members holding cross appointments as shown
1Chemistry and Physics
2Chemistry and Applied Mathematics
3Chemistry and Chemical Engineering
4Chemistry and Biology

Course Descriptions

General Notes

Prerequisites
Prerequisites must be passed in order to begin any course. A working knowledge of the contents of the prerequisite course will usually be assumed by instructors. Courses equivalent to the named prerequisite may be acceptable. With consent of the instructor, prerequisites may be waived in exceptional cases.

Corequisites
Unless credit has already been obtained for a corequisite or its equivalent, it must be taken in the same term with the course requiring it.

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

Students from non-chemistry programs
In general, it should be assumed that the rules stated apply unless waived by your Undergraduate Officer.

Course Selection
Course selection should be guided by the rules in the Program section of the Calendar, and by these general rules:
Honours Chemistry Students (all programs) may not take General program courses for degree credit.

Honours Science, Program 3 students must take some Honours Core courses but may take General Program courses for the rest of their degree credits.

General Science. Chemistry Major students may not take Honours Core courses but must take the General program equivalents.

General Science (non-Major) students may not take Honours Core courses. Nor may they take 400-level courses, and certain 300-level courses, without the consent of the instructor.

In all cases, it is the student's responsibility to determine eligibility to enter a course. It is advisable to obtain special consents in writing before registration period to avoid delays and complications.

Certain 300- and 400-level courses are listed as 2-lecture-hour courses. An additional hour may be scheduled at the discretion of the lecturer, usually for a tutorial.

Core Courses
The courses listed below are core courses

(a) for Honours Students only:
Inorganic: 212, 312, 313, 314L, 315L
Analytical: 223, 221, 220L, 221L
Physical: 254, 255, 355, 358, 355L, 358L

Organic: 264, 265, 365, 368, 265L, 365L, 368L
Advanced Lab: 492

(b) for General Students (Chemistry Major) or others with prerequisites:
Inorganic: 218, 219, 316, 316L
Analytical: 226, 227, 226L, 227L
Physical: 356, 357, 356L, 357L

Organic: 266, 267, 266L, 266L, 366L

Courses Carrying No University-Credit

CHEM 1001 Pre-University Chemistry
The course covers the material considered essential preparation for first-year chemistry courses. Included are formulae, nomenclature, stoichiometry, an introduction to thermochemistry, solution chemistry, chemical equilibria, acids, bases, oxidation-reduction reactions, kinetics and bonding.

Successful completion of this course fulfills the University Admission requirements where high school chemistry is necessary. No University credit. Offered by correspondence only.

CHEM 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 26 F, W, S 3C, 3L 0.5
Organic Chemistry 1
The basic chemistry of the important classes of aliphatic and aromatic compounds. A laboratory course on preparative organic chemistry and organic techniques accompanies the lectures.

Prereq: Grade 13 Chemistry
Antireq: CHEM 124
(For students in Year 2 Engineering)
Course Descriptions
Chemistry

CHEM 36  F,S  3C  0.5
Organic Chemistry 2
An introduction to the important classes of heterocyclic compounds and natural products.
Prereq: CHEM 26
Antireq: CHEM 264, 266
(For students in Year 2 of heterocyclic compounds and natural products.

CHEM 212  F,W  3C  0.5
Structure and Bonding
Prereq: CHEM 212

CHEM 218  F  2C,1T  0.5
Development of Chemical Bonding and Structure
Prereq: Grade 13 Chemistry, Physics
Antireq: CHEM 218

CHEM 219  W  2C,1T  0.5
Chemistry of Non-Transition Metals
Group trends in main group chemistry. Emphasis will be placed on correlation of structure with physical properties in various groups of compounds.
Prereq: CHEM 212 or 218
Antireq: CHEM 313

CHEM 220  F,W  2C,1T  0.5
Introductory Analytical Chemistry
The principles underlying quantitative measurements.
Prereq: CHEM 123, 123L
Coreq: (for Science students) CHEM 220L
Antireq: CHEM 226

CHEM 220L  F,W  3L  0.25
Analytical Chemistry Laboratory 1
Selected experiments for students taking CHEM 220.

CHEM 221  F,W,S  2C  0.5
Multi-component Analysis
Electrochemical and spectroscopic methods for the quantitative description of multi-component systems.
Prereq: CHEM 220
Coreq: (for Science students) CHEM 221L
Antireq: CHEM 227

CHEM 221L  F,W,S  6L  0.5
Analytical Chemistry Laboratory 2
Selected experiments for students taking CHEM 221.

CHEM 226  F  2C  0.5
Chemical Analysis 1
A variety of classical and modern analytical methods.
Prereq: CHEM 123, 123L
Coreq: (for Science students) CHEM 226L
Antireq: CHEM 220

CHEM 226L  F  3L  0.25
Chemical Analysis Laboratory 1
Selected experiments for students taking Chem 226.

CHEM 227  W  2C  0.5
Chemical Analysis 2
The evolution of some modern analytical methods.
Prereq: CHEM 226 or 220
Coreq: (for Science students) CHEM 227L
Antireq: CHEM 221

CHEM 227L  W  6L  0.5
Chemical Analysis Laboratory 2
Selected experiments for students taking CHEM 227.

CHEM 237  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,G  3L  0.25
Introductory Biochemistry Laboratory
Selected experiments for students taking CHEM 237.

CHEM 254  F,W  2C,1T  0.5
Physical Chemistry 1
This course emphasizes the macroscopic approach. Areas to be studied include properties of gases: the first, second and third laws of thermodynamics applied to ideal systems; chemical equilibrium.
Prereq: CHEM 123, MATH 113 or equivalent.
Antireq: CHEM 356

CHEM 256  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

CHEM 265  F,W  3C  0.5
Organic Chemistry 2
Preparation and reactions of typical organic functional groups examined from the basis of the reaction mechanisms. Introduction to spectroscopic correlations of these functional groups. Stereochmistry of organic molecules.
Prereq: CHEM 124
Antireq: CHEM 36, 266

CHEM 265L  F,W,S  3L  0.25
Organic Chemistry Laboratory 1
Selected experiments for students taking Chem 265.

CHEM 266  F,W  3C  0.5
Basic Organic Chemistry 2
The basic chemistry of the important classes of aliphatic and aromatic compounds including aspects of stereochemistry and 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  0.5
Basic Organic Chemistry 3
A continuation of the concepts of CHEM 266. Introduction to carbohydrates, proteins, steroids, etc. Introduction to NMR and IR spectroscopies.
Prereq: CHEM 266
Antireq: CHEM 36, 265, 264

Note
(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.)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 278</td>
<td>Antireq: CHEM 372</td>
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</tr>
<tr>
<td>CHEM 212</td>
<td>Prereq: CHEM 212 or 212</td>
<td></td>
</tr>
<tr>
<td>CHEM 278</td>
<td>Prereq: CHEM 278 or 212</td>
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<tr>
<td>CHEM 316L</td>
<td>Inorganic Chemistry Laboratory</td>
<td>Prereq: CHEM 316</td>
</tr>
<tr>
<td>CHEM 320</td>
<td>Analytical Separations</td>
<td>Prereq: CHEM 221 or permission of instructor</td>
</tr>
<tr>
<td>CHEM 321L</td>
<td>Advanced Analytical Laboratory</td>
<td>Prereq: CHEM 221 and 221</td>
</tr>
<tr>
<td>CHEM 332</td>
<td>Structural Biochemistry</td>
<td>Prereq: CHEM 237</td>
</tr>
<tr>
<td>CHEM 332L</td>
<td>Structural Biochemistry Laboratory</td>
<td>Coreq: CHEM 265 or 267</td>
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<tr>
<td>CHEM 333</td>
<td>Metabolism 1</td>
<td>Coreq: CHEM 265 or 267</td>
</tr>
<tr>
<td>CHEM 333L</td>
<td>Metabolism Laboratory</td>
<td>Coreq: CHEM 265 or 267</td>
</tr>
<tr>
<td>CHEM 355</td>
<td>Physical Chemistry</td>
<td>Prereq: CHEM 223 and MATH 173 or equivalent</td>
</tr>
<tr>
<td>CHEM 355L</td>
<td>Physical Chemistry Laboratory</td>
<td>Prereq: CHEM 332</td>
</tr>
<tr>
<td>CHEM 356</td>
<td>General Physical Chemistry</td>
<td>Prereq: CHEM 221 and 221</td>
</tr>
<tr>
<td>CHEM 356L</td>
<td>General Physical Chemistry Laboratory</td>
<td>Coreq: CHEM 265 or 267</td>
</tr>
<tr>
<td>CHEM 357</td>
<td>Physical Chemistry for the Life Sciences</td>
<td>Prereq: CHEM 123 and MATH 113 or equivalent</td>
</tr>
<tr>
<td>CHEM 357L</td>
<td>General Physical Chemistry Laboratory</td>
<td>Coreq: CHEM 265 or 267</td>
</tr>
</tbody>
</table>

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**Course Descriptions**

**Chemistry**

CHEM 311 W 2C 0.5

**Radiochemistry**


CHEM 312 F,S 2C,1T 0.5

**Transition Metal Chemistry**

The transition elements and their compounds. Stereochemistry of complex ions, ligand field and molecular orbital theories of metal-ligand bonding; electronic spectra and magnetochemistry of complexes; reaction mechanisms (if time permits). *Prereq: CHEM 212*

CHEM 313 W 2C,1T 0.5

**Chemistry of Main Group Elements**

A systematic approach to the syntheses, properties, reactions and structures of main group element compounds. Trends in chemical behaviour, bonding and stereochemistry. Electron deficient compounds, the rare gases, chemistry of phosphorus, nitrogen and sulfur will be dealt with in detail. *Prereq: CHEM 212*

CHEM 314L F,W,S 3L 0.25

**Inorganic Chemistry Laboratory 1**

An introduction to practical inorganic chemistry. *Prereq: CHEM 214L*

CHEM 315L F,W 6L 0.5

**Inorganic Chemistry Laboratory 2**

Advanced experiments in inorganic chemistry. *Prereq: CHEM 315L*

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 218 or 212*

CHEM 316L F 3L 0.25

**Inorganic Chemistry Laboratory**

Selected experiments for students taking CHEM 316. *Prereq: CHEM 254 or equivalent*

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 and 221*

CHEM 332 F 2C 0.5

**Structural Biochemistry**

Determination of concentration, structure and sequence of proteins, nucleic acids and polysaccharides. Protein synthesis. Enzyme kinetics. Enzymes. *Prereq: CHEM 237*

CHEM 332L F 3L 0.25

**Structural Biochemistry Laboratory**

Selected experiments for students taking CHEM 332. *Prereq: CHEM 332*

CHEM 333 F,W 2C 0.6

**Metabolism 1**

Metabolism of carbohydrates, lipids and amino acids. *Prereq: CHEM 237 or 332 for 1982-83 only*

CHEM 333L F,W 3L 0.25

**Metabolism Laboratory**

Selected experiments for students taking CHEM 333. *Prereq: CHEM 333*

**Note**

Prereq in 1983-84 for CHEM 432 and 433.

CHEM 350 W 2C 0.5

**Spectroscopy and Molecular Structure**

Introduction to concepts and applications of microwave, Raman, IR, electronic and resonance spectroscopy with respect to molecular parameters. *Prereq: CHEM 355*

CHEM 353 F,S 3C 0.5

**Introduction to Polymer Science**

Basic definitions and polymer nomenclature, molecular weight averages and distributions, polymer stereochemistry, step-growth and chain-growth polymerization reactions, applications of polymers. *Prereq: CHEM 254 or equivalent*

CHEM 355 F,W,S 2C,1T 0.5

**Physical Chemistry 3**

Introduction to the microscopic description of physical processes, laws governing electrons and atoms and the properties of atomic and molecular states, application to electromagnetic radiation interacting with atom and molecules producing transitions between states. *Prereq: CHEM 255 and MATH 215 or equivalent*

CHEM 355L F,W,S 3L 0.25

**Physical Chemistry Laboratory 1**

Selected experiments for students taking CHEM 355. *Prereq: CHEM 355*

CHEM 356 F 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 solution, phase equilibria, chemical equilibrium and the properties of electrolytes. *Prereq: CHEM 123 and MATH 113 or equivalent*

CHEM 356L F 3L 0.25

**General Physical Chemistry Laboratory 1**

Selected experiments for students taking CHEM 356. (A special section in Winter term will be available for Honours Biology and Chemistry students only) *Prereq: CHEM 356*

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 and MATH 113 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

CHEM 358L F,W 6L 0.5
Physical Chemistry Laboratory 2
Selected experiments for students taking CHEM 358.
Prereq: CHEM 355L

CHEM 362 W (even years) 2C 0.5
Mechanistic Organic Chemistry
Simple molecular orbital theories and their use in organic chemistry. Effects of substituents and reaction conditions on the mechanism of organic reactions.
Prereq: CHEM 265
Coreq: CHEM 365 or 366

CHEM 363 W 2C 0.5
Applied Organic Chemistry
The organic chemistry involved in selected industrial processes will be discussed. Petroleum chemistry, synthesis of dyestuffs, pharmaceuticals, pesticides, organic polymers, etc.
Prereq: CHEM 265 or 267

CHEM 365 F 2C 0.5
Organic Chemistry 3
Stereochemistry and conformational analysis of organic molecules. Acidity and basicity. Formation and reactions of enolate anions with emphasis on their synthetic utility.
Prereq: CHEM 364 or 267
Antireq: CHEM 366, 368
Final offering 1982.

CHEM 366 F 2C 0.5
Structural and Synthetic Organic Chemistry
Stereochemistry of organic molecules; synthesis of selected organic compounds examined in detail with emphasis on cyclo-addition reactions and condensation reactions.
Prereq: CHEM 267 or 364
Antireq: CHEM 265

CHEM 366L F, 3L 0.25
Organic Chemistry Laboratory
Selected experiments for students taking 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 365, 366

CHEM 368L F,W,S 6L 0.5
Organic Chemistry Laboratory 2
Selected experiments for students taking CHEM 368.

CHEM 369 F,W 2C 0.5
History of Chemistry
The development of chemistry will be traced from alchemy to the 20th century. The contributions of famous scientists to the concepts and models of modern chemistry will be emphasized.
Prereq: Completion of two years of a Chemistry Honours or Major program.

CHEM 409 W (odd years only) 2C 0.5
Solid State Chemistry
Packaging 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 ultra-pure materials, trace and micro determinations.
Prereq: CHEM 221 or permission of instructor

CHEM 421 W 2C 0.5
Mass Spectral and Chromatographic Analysis
Techniques and fundamental principles of combining chromatography and mass spectrometry for the identification of chemical compounds.
Prereq: CHEM 320 and 264, or permission of instructor.

CHEM 422 F 2C 0.5
Thermal and Electrical Analytical Methods
Techniques and fundamental principles of thermal and electroanalytical methods.
Prereq: CHEM 221 and PHYS 243 or permission of instructor.

CHEM 432 F 2C 0.5
Biochemistry 3
Kinetics, stereo-specificity, structure and function of enzymes, bio-energy, oxidative phosphorylation.
Prereq: CHEM 333

Note
Beginning in 1983-84, CHEM 333 and 333L will be prerequisite for both CHEM 432 and 433. Also, CHEM 332 will be corequisite for CHEM 432.
CHEM 432L F 3L 0.25
Biochemistry 3 Laboratory
Selected experiments for Honours Biology and Chemistry students taking Chemistry 432.
Final offering 1982.

CHEM 433 W 2C 0.5
Biochemistry 4
Chemistry and biosynthesis of porphyrins. Metabolism of amino acids, purines and pyrimidines. Roles of vitamins in biological transformations. Respiration, muscular contraction.
Prereq: CHEM 432
See Note under CHEM 432

CHEM 433L W 3L 0.25
Biochemistry 4 Laboratory
Selected experiments for Honours Biology and Chemistry students taking Chemistry 433.
Final offering 1983.

CHEM 434 W 2C 0.5
Applied Biochemistry
Chemistry and function of antibiotics; blood coagulation and related topics. Immuno-chemistry. Nutritional aspects of food.
Prereq: CHEM 333

CHEM 435 F 2C 0.5
Bioorganic Mechanisms
Modern techniques of biosynthetic studies. Enzyme reaction mechanisms.
Prereq: CHEM 332 and one of 368, 366, 365.

CHEM 452 F 2C 0.5
Colloids, Liquid Crystals and Bilayer Chemistry
The colloidal size range, the importance of the interface, classical studies on Brownian motion, light scattering, the micelle formation of detergents in water and solubilisation. Phase diagrams of soaps and lipids and their study by X-ray diffraction and NMR. The biological membrane as an entity of colloidal size. The related spectroscopy, microscopy, etc. of lyotropic liquid crystals and bilayers.
Prereq: CHEM 255
Not offered 1982-83.

CHEM 453 W 2C 0.5
Polymer Properties and Polymerization
Copolymerization, emulsion polymerization, ionic and coordinate polymerization, basics of polymerization process selection.
Prereq: CHEM 353 or equivalent.

CHEM 454 F 2C 0.5
Surface Chemistry
An introduction to the physical chemistry of surfaces. Qualitative and quantitative descriptions of surfaces and interfaces and the development of relevant techniques and theories. Application to surface tension, spreading, wettling, adsorption, and other interfacial phenomena.
Prereq: CHEM 255

CHEM 455 F 3C 0.5
Electrochemistry
Electric conductance and transport, thermodynamics of electrolytic cells. Reversible and irreversible electrode processes, metallic corrosion; study of selected industrial electrochemical processes.
Prereq: CHEM 254 or 356

CHEM 456 W 2C 0.5
Catalysis
An introduction to heterogeneous catalysis. Examination of the physical manifestations of catalysis and the development of experimental techniques and theoretical methods for the measurement and elucidation of catalytic phenomena.
Prereq: CHEM 255

CHEM 457 W 1C, 3L 0.5
Experimental Aspects of Polymer Science
Selected experiments to illustrate polymerization, polymer properties and fabrication processes.
Prereq: CHEM 353 or equivalent

CHEM 458 F 2C 0.5
Quantum Chemistry
The nature of electronic structure and chemical bonding in \( H_2 \) and other simple molecules and its implications for theories of chemical reactions.
Prereq: CHEM 355

CHEM 464 F 2C 0.5
Spectroscopy in Organic Chemistry
Elucidation and identification of organic structures by contemporary spectroscopic techniques.
Prereq: CHEM 265 or 364

CHEM 465 W 2C 0.5
Special Topics in Organic Chemistry
Topics will be selected from photophysics, organometallics, synthesis, heterocyclics, natural products, molecular rearrangements. (May be taken in third and fourth year as 465A and 465B provided topics are different).
Prereq or coreq: CHEM 365 or 368

CHEM 492 Y 9L 1.5
Advanced Laboratory
Laboratory work on a senior year research project. See CHEM 492 co-ordinator for descriptive booklet and details.

Department of Civil Engineering

Professor, Chairman of the Department Vacancy

Professor, Dean of Engineering
W.G. Lennox, BASc, MSc (Waterloo), PhD (Lehigh), PEng

Professor, Associate Chairman
Graduate Studies
S.T. Ariaratnam, BSc (Eng)(Ceylon), MSc (London), PhD (Cambridge)

Professor, Associate Chairman, Undergraduate Studies
D.E. Grierson, BASc, MASC, PhD (Waterloo), PEng

Professors

E.F.P. Burnett, BSc (Capetown), DIC, MS, PhD (London), PEng
M.Z. Cohn, CSc (Bucharest), PEng
G.J. Farquhar, BSc (Waterloo), PhD (Wisconsin), PEng
G.M.L. Glawdwell, BSc, PhD, DSC (London)
R. Green, BSc (Eng)(London), MSc (Queen's), MSc (Waterloo), PhD (Texas), PEng
R.C.G. Haas, BSc, MSc (Alberta), PhD (Waterloo), PEng
V.K. Handa, BSc (Calcutta), BSc (Eng) (London), MSc (Queen's), MSc, PhD (Waterloo), PEng
B.G. Hutchinson, BE (Sydney), MSc (Queen's), PhD (Waterloo), PEng
H.H.E. Leipholtz, Dipl Eng, Dr. Ing. Docent Habil (Stuttgart), PEng
Recipient of the Distinguished Teacher Award
N.C. Lind, MSc (Tech. Univ. of Denmark), PhD (Illinois), FRSC, PEng
E.A. McBean, BASc, BSc (British Columbia), SM, PhD (MIT), PEng
W.A. McLaughlin, PEng (Saskatchewan), MS, PhD, PEng
G.M. McNeice, BASc (Waterloo), PhD (London), PEng
Course Descriptions

Civil Engineering

J.T. Pindera, Dr of Tech Sciences
(Warsaw), Docent Habil (Cracow), PEng

T. Prasad, BSc, MSc (Banaras Hindu
Univ.), PhD (Cambridge)

R. Roorda, BASc (Waterloo), PhD
(London), PEng

J. Schroeder, BEng, MEng (McMaster),
PhD (Waterloo), PEng

A.N. Sherbourne, BASc (London), MS
(Lehigh), MA, PhD (Cambridge),
PEng

J. Shortreed, BEngSc (Western Ontario),
MSc (Queen's), PhD (Northwestern),
PEng

K.N. Smith, BASc (Toronto), MASC
(Illinois), PhD (Waterloo), PEng

S.I. Solomon, CivHyd Enq (Bucharest),
PhD (City Univ., London), PEng

T.H. Topper, BASc (Toronto), PhD
(Cambridge), PEng

E. Unny, BSc (Madras), Mtech
(Kharagpur), Dr Ing (Dresden), PEng

Associate Professors

R.W. Cockfield, BASc, MSc (Queen's),
PhD (Waterloo), PEng

J.E. Gale, BA, BASc (Memorial), MSc
(Western Ontario), MEngSc, PhD
(California, Berkeley), PEng

N. Kouwen, BASc, PhD (Waterloo),
PEng

B. LeLievre, 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.F. Sykes, BASc, MASC, PhD
(Waterloo), PEng

J.C. Thompson, BASc (Toronto), MS,
PhD (Illinois), PEng

S. Yagar, BASc, MASC (Toronto), PhD
(California) PEng

Assistant Professor

F.F. Saccomanno, BSc, MCP
(Montana), PhD (Toronto)

Adjunct Professors

P.M. Allen

D.A. Godden, BASc (Toronto), LLB
(Osgoode Hall) LLM (York)

D.T. McClurkin, Chartered Accountant

N.W. McLeod, BASc (Alberta), MSc
(Saskatchewan), ScD (Michigan),
PEng

W.R. Petri, DiplEng (Berlin), PEng

D.W. Schmurr, BASc (Toronto), LLB
(Osgoode Hall), PEng

O. Stradal, CE, DSc (Prague)

Faculty members holding cross-
appointments as shown

1Civil Engineering and Applied
Mathematics

2Civil Engineering and Mechanical
Engineering

3Earth Sciences and Civil Engineering

4Architecture and Civil Engineering

Course Descriptions

CIV E 110 W 3C 0.5
Urban Transport Problems and
Prospects
Overview of urban development and
role played by transport. Dimensions of
current issues such as congestion,
travel equity, pollution and energy
consumption. Transport demands and
relation to land use. Transport planning
options; transport technology: general
development options. Not intended for
civil engineering students at any level.
Not recommended for first year
students.

CIV E 116 W,S 2C,4L/T 0.5
Engineering Concepts 2
A continuation of GEN E 115 with
applications of graphics, measurement and
other analytic principles to
introductory problems in the various
disciplines of Civil Engineering: an
introduction to engineering design
methods as applied to Civil Engineering
and including specification
development, information-gathering,
concept formulation, feasibility analysis
and report writing.

CIV E 200 S,F 2C,3T 0.5
Civil Engineering Project 1
Functional designs of standard civil
engineering structures. The creation and
evaluation of alternative geometric
configurations in accordance with user
requirements. Informational content of
previous courses is augmented with
lectures on typical civil engineering
problems and solutions.

CIV E 203 F,W 3C,2T 0.5
Statics
An analytical treatment of static
equilibrium of particles and rigid
deformable bodies. Distributed forces:
centroids and centres of gravity,
moments of inertia. Analysis of
structures: trusses, forces in beams and
cables. Friction.

CIV E 204 F,W 3C,2T 0.5
Dynamics
An introduction to the Kinematics and
Kinetics of particles and rigid bodies.
Kinematics of particles; Kinetics of
particles; Newton's Second Law; energy
and momentum; impulsive motions;
systems of particles. Kinematics of rigid
bodies; plane motion of rigid bodies,
equations of motion; energy and
momentum; impulsive motions.

CIV E 205 F,S 3C,2T 0.5
Mechanics of Deformable Solids 1
Introduction of the concepts of stress
and strain. Stress-strain relations for
linearly elastic materials; Analysis of the
response of prismatic members to axial,
shearing, flexural and torsional loads;
strain energy, failure hypotheses,
instability in columns.

CIV E 221 F,W 3C,2T 0.5
Calculus
A review of Year 1 Calculus. Hyperbolic
Functions. Partial derivatives. Multiple
integration with applications: Vector
analysis. theorems of Green and Gauss.
line integrals. Elements of Fourier
series.

CIV E 222 F,S 3C,2T 0.5
Differential Equations
An introduction to linear and partial
differential equations. Standard
methods of solution, applications to
physical and engineering problems,
linear equations with constant
coefficients, systems of differential
equations, solution by series, numerical
methods, partial differential equations.

CIV E 224 F,W 3C,2T 0.5
Probability and Statistics
Role of Probability in engineering and
decision-making under uncertainty.
Data analysis. Basic probability
concepts. Probability distributions.
Functions of random variable.
Estimation theory. Empirical
determination of distribution models.
Regression analysis.

CIV E 226 F,W 3C,3L/T 0.5
Structure and Properties of Materials
A basic course in structure, behaviour
and application of engineering
materials. Bonding forces. Crystalline
and amorphous structures. Structural
defects. Phase transformations and
equilibria. Structures and responses of
metals, ceramics and polymers.
Corrosion. Modes of deformation and
failure.
Course Descriptions
Civil Engineering

CIV E 280  F,S  3C,2L/T  0.5
Fluid Mechanics
An introductory course in fluid mechanics. Fluid properties, fluid statics; Bernoulli equation; the momentum equation and applications; laminar and turbulent flow; closed conduit flow; pipe network analysis; unsteady flow in pipes.

CIV E 291  1 wk fld lab  0.5
Survey Camp
A one-week course in surveying. Introduction to surveying, length measurements, levelling, transit surveys.

CIV E 292  F,W  3C,2T  0.5
Engineering Economics
An introductory course on the principles of engineering economy. Basic concepts; capital; interest formulas and derivations; annual worth comparisons; present worth; return on investment; benefit-cost ratio; depreciation effect on taxes.

CIV E 294  F,S  3C,2T  0.5
Thermal Sciences
An introductory course in thermal science. Provides an understanding of thermodynamic principles as well as engineering aspects of heat transfer including applications to practical engineering problems.

CIV E 298  F,W  1S  0.0
CIV E 299  S,F  1S  0.0
Seminar
The engineer in society. Principles, methods and practice of Civil Engineering. Informal lectures.

CIV E 300  F,W  2C,3T  0.5
Civil Engineering Project 2
Projects ranging from feasibility studies to detailed designs by student teams. Each team member is responsible for a definable portion of a project. The work of the individual is integrated with other team members to produce a complete solution described in a report containing all appropriate calculations and schematics. Particular emphasis is placed on the utilization and integration of knowledge acquired in the more specialized courses, augmented with lectures on project administration.

CIV E 303  W,S  3C,2T  0.5
Structural Analysis 1

CIV E 304  F,W  3C,2T  0.5
Mechanics of Deformable Solids 2
An advanced course in mechanics of solids. Torsion of non-circular sections, hollow section; Warping of cross-sections; Membrane Stresses in shells; bending of flat plates; beams on elastic foundations; buckling of columns, arches, beams and plates.

CIV E 313  W,S  3C,2T  0.5
Structural Concrete Design 1

CIV E 324  W,S  3C,2T  0.5
Transport Engineering 1
Urban road traffic stream properties; Behaviour of signalized intersections. Road classification: Network flows; Spatial interaction models; Trip generation: Modal choices analysis

CIV E 343  F,W  3C,2T  0.5
Water Distribution and Collection Systems
Water requirements; water and waste volumes; water storage. Water supply and distribution systems, computer models. Urban hydrology, storm sewers, flood routing; Wastewater collection, sanitary sewers, Hydraulics of treatment works.
CIV E 398 W.S 1S 0.0
CIV E 399 F.W. 1S 0.0
Seminar
The engineer in society. Principles, methods and practice of Civil Engineering. Informal lectures.

CIV E 400 W 1C,2T 0.5
Civil Engineering Project 3
The purpose is to provide the students with an opportunity to demonstrate their capacity to engage in the practice of civil engineering as a profession. The students are encouraged to independently identify and resolve a problem within the scope of their chosen area of specialization, utilizing knowledge gained from their academic and employment experiences.

CIV E 403 F.S 3C,2T 0.5
Structural Analysis 3
Approximate methods of analysis for a variety of structural forms. Application of approximate techniques to beams, building frames, shear wall structures, plates, buckling and vibration problems. Approximate structural design.

CIV E 404 W 3C,2T 0.5
Structural Analysis 4
Matrix and computer methods of structural analysis. Application of the force and displacement methods of analysis to space frameworks, nonlinear structures and continuum discretized into finite elements.

CIV E 405 W 3C,2T 0.5
Structural Dynamics and Stability
Dynamics of discretized structures. Free and forced vibrations of single and multidegree of freedom systems. Impact. Flexural vibrations of beams and plates. Static and dynamic instability of beams, shafts and frames.

CIV E 413 F.S 3C,2T 0.5
Structural Steel Design

CIV E 415 W 3C,2T 0.5
Structural Systems

CIV E 430 W 3C,3L 0.5
Experimental Mechanics
Principles and techniques of experimental determination of responses of engineering structures to mechanical, thermal and wind loads, in real and simulated conditions. Foundations of modeling, observations and measurements. Selected experimental techniques; strain gauges, photo-elasticity, holography, dynamic techniques, thermoelasticity, more.

CIV E 440 F.S 3C,2T 0.5
Urban Traffic Management
Analysis of urban traffic flow, capacity and queueing. Methods for improved flows; signal progression, intersection design, optimization models, computer control, vehicle restrictions. Design of parking. Traffic safety. Pedestrian effects. Simulation of traffic.

CIV E 442 W 3C,2L 0.5
Pavement Structural Design
Pavement Design, Soil identification, subgrade design, base courses, flexible pavement design, design and testing of asphaltic concrete mixes, surface treatments.

CIV E 444 W 3C,2T 0.5
Urban Transport Planning
Application of concepts of CIV E 342, 343, 344 to typical urban transportation planning situations. Urban transit, a regional shopping activity centre, a major housing development considered using case studies. Methods of earlier courses linked to typical real life problems.

CIV E 453 F.S 3C,2T 0.5
Engineering Geology
A course in engineering geology: engineering properties and characteristics of typical landforms, soils, rocks, and ground water regimes; introduction to earthquake resistant design and air-photo interpretation.

CIV E 454 W 5T 0.5
Geotechnical Engineering
This course simulates geotechnical consulting practice. Students are exposed to real situations which require problem identification, evaluation of geotechnical data, analysis, design and report preparation.

CIV E 472 F.S 3C,2T 0.5
Wastewater Treatment
Introduction to wastewater treatment. Wastewater quantity; Wastewater characteristics; Primary treatment; Secondary treatment: Sludge treatment and disposal; industrial wastewater management. Design project.

CIV E 473 W 3C,2T 0.5
Pollution in the Aquatic Environment

CIV E 480 W 3C,2T 0.5
Basic Principles of Water Resources

CIV E 486 F.S 3C,2T 0.5
Hydrology
An introduction to hydrology, the hydrologic cycle. Runoff phenomena; River basin characteristics; Statistical and probability analysis of hydrologic data; Time series analysis; Non-stationary aspects of hydrology; Forecasting.

CIV E 491 W 3C,2T 0.5
Engineering Law
Course Descriptions
Classical Studies: Classical Civilization

Lecturer (Part-Time)
A.M. Iwusi, MA (Rutgers)

Participating Faculty in Classics at
Wilfrid Laurier University
H.A. MacLean, BA (McMaster), MA,
PhD (Toronto)
D.W. Roller, BA, MA (Oklahoma), PhD
(Chicago)
D.C. Forsyth, BA (Dalhousie), PhD
(Sydney)
C.W. Caughlan, BA, MA (McGill), PhD
(Chicago)
J. Zeyl, BA, MA (Toronto), PhD
(McMaster)

Course Descriptions

Classical Civilization
(Courses in Translation)

CIV 266  W 3C 0.5
Classical Verse in Translation 2
Tragedy and Comedy: a study of
Classical Greek tragic drama, featuring
the plays of Sophocles and Euripides.
The art of Greek comedy will be
examined through the plays of
Aeschylus, Euripides, and Aristophanes.
The course will not normally be required to do additional
work on Aeschylus.

CIV 261  W 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.

CIV 301  F 3C 0.5
Greek History
A survey of ancient Greece,
emphasizing its political, military, social
and economic aspects.
This course is acceptable for credit by
the History Department.

CIV 255  F 3C 0.5
Roman History
A military, political, social, economic
survey of Rome from earliest times to
the Empire's fall.
This course is acceptable for credit by
the History Department.

Note
Classical Studies accepts HIST 237/238
as term courses for Classical
Civilization credit. But a student may
depart from the requirement to do additional
work.
Ancient Myth and Religion 2
A study of Greek and Roman legend, including the cycles of Troy, Mycenae, Thebes; the Argonauts, the heroes, Odysseus; and of the mystery religions (with their relation to Christianity).

Greek and Rome
The relationship between Christianity and the Roman Empire from the beginning to 200 A.D., including the trial of Christ, the trials of Paul, the burning of Rome in 64 A.D., and the subsequent outlawing of Christianity.

From Dlocletlan to Constantine
A study of the political and economic collapse of the Roman Empire, oriental ideas of the ruler, paganism, and the persecution of the Christian Church.

From Aristotle to the close of classical antiquity.

CIV 382 W 3C 0.5
Constantine the Great
A study of Constantine's rise to power as sole ruler of the Roman Empire, his measures to secure the empire and its economy, his relationship with the Christian Church, and the establishment of 'new Rome'.

CIV 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.

CIV 401
Atlantic: The Making of Myth
Not offered 1982-83.

CIV 460
Greek Civilization and History
Not offered 1982-83.

CIV 490 Y 2S 1.0
Roman Civilization and History
Senior Seminar. An intensive study of various problems and aspects of Roman Civilization and History.
Prereq: C CIV 202 or 252 or 352 or instructor's permission.
This course is acceptable for credit by the History Department.

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.

GRK 100 A F 3C 0.5
Introductory Ancient Greek A
Fall term of GRK 100.
See note below.

GRK 100B W 3C 0.5
Introductory Ancient Greek B
Winter term of GRK 100
See note below.

Note
These term courses are available only to part-time students, students in the Cooperative system or with the permission of the Department.

GRK 231 F 3C 0.5
Intermediate Greek 1: The World of Heroes
Selections from Homer, Herodotus and Sophocles.
Prereq: GRK 100, Grade 13 Greek or instructor's permission.

GRK 232 W 3C 0.5
Intermediate Greek 2: The Intellectual Revolution
Selections from Euripides, Thucydides and Plato.
Prereq: GRK 100, Grade 13 Greek of instructor's permission.

GRK 262
Introduction to Plato
Not offered 1982-83.

GRK 271 W 3C 0.5
Hellenistic and Later Greek Literature
Selections from Christian and pagan writers.
Prereq: GRK 100, Grade 13 Greek or instructor's permission.
Offered 1982-83 at Wilfrid Laurier University.

GRK 351
Greek Composition and Grammar
Not offered 1982-83.

GRK 361 W 3C 0.5
The Drama of Euripides
An examination of the dramatic art of Euripides by translation of selected plays and the reading of other plays in translation.
Prereq: One full 200 level Greek course or instructor's permission.

GRK 362
The Drama of Sophocles
Not offered 1982-83.

GRK 371
Introduction to the Greek Historians
Not offered 1982-83.
GRK 372 F 3C 0.5
Herodotur
Selections from the Persian Wars.
Prereq: One full 200 level Greek course or instructor's permission.
Offered 1982-83 at Wilfrid Laurier University.

GRK 452
Homer
Not offered 1982-83.

GRK 461
The Drama of Aeschylus
Not offered 1982-83.

GRK 462
The Comedy of Aristophanes
Not offered 1982-83.

GRK 461
The Philosophy of Plato
Not offered 1982-83.

GRK 462
The Philosophy of Aristotle
Not offered 1982-83.

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.

Note
Senior standing or instructor's permission is a prerequisite for any 400 level Greek course.

Latin
LAT 100 Y 3C 1.0
Introductory Latin
A course designed for students beginning the study of Latin or who have not yet reached the level expected in LAT 203/204. The aim is to attain as rapidly as possible the ability to read simple prose. The emphasis is on forms and structure; reading of connected passages will begin early in the first term.

LAT 100A F 3C 0.5
Introductory Latin A
Fall term of LAT 100.
See note below.

LAT 100B W 3C 0.5
Introductory Latin B
Winter term of LAT 100.
See note below.

Note
These term courses are available only to part-time students, students in the Cooperative system or with the permission of the Department.

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 100 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 251
Latin Composition and Grammar
Not offered 1982-83.

LAT 261
Latin Prose 1
Not offered 1982-83.

LAT 262 F 3C 0.5
Latin Prose 2
Selections from Livy and Suetonius.

LAT 272
An Introduction to Vergil
Not offered 1982-83.

LAT 281
Latin Poetry 1
Not offered 1982-83.

LAT 282 W 3C 0.5
Latin Poetry 2
Selections from Ovid and Martial. Offered 1982-83 at Wilfrid Laurier University.

LAT 352
The History of the Latin Language
Not offered 1982-83.
Dance Group

Assistant Professor, Chairman of Dance Group
J. Officer, ARAD (Adv. and ATC) (London) Recipient of the Distinguished Teacher Award.

Assistant Professors
R. Priddle, BPHE (Toronto), MSc (Springfield), MA (Waterloo), PhD (Waterloo)
R. Ryman, BA (York), MA (York)

Lecturer, Undergraduate Officer
N. DeShane-Gill, DA (York), MA (York)

Lecturer, Full-Time
D. Taplin, BA (Bennington), MFA (York) Instructors
D. Leslie
L. McKillop, BSc (Waterloo)
G. Miceli, BSc (Waterloo)

Course Descriptions

DANCE 110 F 2C,2T 0.5
Introduction to the World of Dance
A survey of the evolution of dance as both ritual and art and of the capacities of the discipline today. Extensive viewing of films and live performances in addition to lectures. This is not a studio course.

DANCE 111 W 2C,2std 0.5
The Elements of Dance
Discussion and experience in the material, content and form of a work of art. Studio. Problem solving in space, dynamics and rhythm. Of particular interest to students planning a career in teaching or choreography.

DANCE 220 F 2C,1.1 std 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,1 std 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 225 W 2C,1std 0.5
Dance Ethnology
Study of works of art in non-Western cultures. I.e. India, Japan, China, Africa.
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 Twentieth 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 233 W 3C 0.5
A History of Modern Dance
This course examines the major choreographic innovators who have philosophically and stylistically shaped the Modern dance idiom.
Prereq: DANCE 230
Offered alternate years.
Not offered 1982-83.

DANCE 241 F 3C 0.5
Benesh Notation 1
A theoretical and practical introduction to Benesh Movement Notation at the Elementary Level.
Prereq: 2 courses in dance technique or consent of the instructor. Offered alternate years.

DANCE 242
Labanotation 1
Offered alternate years. Not offered Fall, 1982.

DANCE 245 W 2C,2std 0.5
Modern Dance Composition
This course explores major forms and theories of modern dance choreography through studio practice and seminars.

DANCE 246
Applied Movement Analysis (Part 1)
Offered alternate years.
Not offered Fall, 1982.

DANCE 247 F 3C,2std 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 246
Offered alternate years.

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 342
Labanotation 2
Offered alternate years.
Not offered Winter, 1983.

DANCE 346
Applied Movement Analysis (Part 1)
Offered alternate years.
Not offered Fall, 1982.

DANCE 347 F 3C,2std 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
Offered alternate years.

DANCE 348
Dance and Society
Offered alternate years.

DANCE 353 W 2C,2std 0.5
Modern Dance Composition
This course explores major forms and theories of modern dance choreography through studio practice and seminars.

DANCE 364 F 2C,1T
Developmental Aspects of Movement
A study integrating the theoretical and applied aspects of motor and perceptual-motor development in children and adolescents. Tutorials include working with children in a physical activity setting. Students should register in the tutorial section below which best suits their interests.

DANCE 364A F 1T
Tutorials will emphasize creative dance activities for school age children.
DANCE 364B F 1T
Tutorials will emphasize movement programs for preschool children. Early Childhood Education students only.

DANCE 364C F 1T
Tutorials will emphasize movement education as a foundation for sport, gymnastics and dance and investigate special sport and gymnastics programs for children.

DANCE 410/411 3C
Research Project
Students will examine dance research from different approaches including experimental, descriptive, ethnological, historical and philosophical. Completion of DANCE 410 requires the submission of a research project including the problem, literature review and methodology. DANCE 411 includes completion of the project begun in DANCE 410.
Prereq: Honours Dance students only.

DANCE 412 W 3C 0.5
Technique Courses 0.25
Each of the following technique courses consists of two classes per week for one term. Students should consult with a faculty advisor concerning the applicability of these courses for entry into future courses and possible careers such as teaching.

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: Honours Dance students only.

DANCE 480, 480A, 480B, 480C F,W wkshp 0.5
Workshop Series
The following courses are designed to give the student an opportunity to take theoretical knowledge to the applied setting. Offerings each year are determined by student interests. Topics available include:

DANCE 480 Court Dance
DANCE 481 Ballet Choreography
DANCE 482 Dance Notation
DANCE 483 Modern Dance
Composition
DANCE 484 Teaching Creativity and Choreography to Children and Adolescents
DANCE 485 Methods and Teaching of Formalized Technique

DANCE 297 Elementary Folk
DANCE 397 Intermediate Folk
DANCE 497 Character Dance W

Jazz Dance: A sequence of courses in Jazz:
DANCE 198 Beginner Jazz, F, W
DANCE 198A Beginner Jazz**, F, W
DANCE 298 Elementary Jazz, W
DANCE 398 Intermediate Jazz, F
DANCE 498 Advanced Jazz, W

**For Varsity Athletes Only

Drama and Theatre Arts Group

Associate Professor, Chairman
W.R. Chadwick, BA, MA (Toronto), PhD (London)

Assistant Professor
M. van Dijk, BA, MA (Wellington), PhD (Toronto)

Lecturers
C.D. Abel, BA (Queen's), MA (Toronto), LRAM (Speech and Drama)
D.W. Downs, BA (McMaster)

Course Descriptions

Note
Laboratory sessions and rehearsal periods may be added to any course at the discretion of the instructor.

DRAMA 101A F 3C 0.5
Introduction to the Theatre 1
Introductory study of the theatre as a major art form. Selected plays as produced in their historical contexts. Contributions of the actor, designer and technician to theatrical production.

DRAMA 101B W 3C 5.0
Introduction to the Theatre 2
An extension of the studies described in 101A.

DRAMA 102 F W 4L 0.5
Introduction to Acting
An introduction to acting. The class will be structured as a rehearsal, where the students will explore improvisation and text work, concentrating on the
practical problems of an actor’s experiences in creating a role.
Limited Enrolment.
Prereq: Coreq: DRAMA 101A or B

DRAMA 221 F 6L 0.5
Intermediate Acting 1
An extension of Drama 102. This course stresses development of the actor through scene study.
Prereq: DRAMA 102.

DRAMA 222 W 6L 0.5
Intermediate Acting 2
An extension of Drama 221.
Prereq: DRAMA 221 and permission of the instructor.

DRAMA 243 F 2C,2L 0.5
Introduction to Technical Production 1
Theory and practice of building painting, rigging and shifting scenery; construction of properties; familiarity with lighting instruments, sound equipment and their control systems. Students must spend a certain number of hours working on department productions.
Prereq: Permission of the instructor.

DRAMA 244 W 2C,2L 0.5
Introduction to Technical Production 2
An extension of the studies described in DRAMA 243.
Prereq: DRAMA 243.

DRAMA 251 F 3C 0.5
Survey of Dramatic Literature and Dramatic Theory 1
(Cross-listed with C CIV 266.)
The Greek and Roman periods.

Note
The course and the next four courses divide the dramatic literature and theory of the Western world into five historical periods. Each course will cover about fifteen plays and the major works of dramatic theory of the period.

DRAMA 252 3C 0.5
Survey of Dramatic Literature and Theory 2
The Middle Ages, the Elizabethans and Jacobean (excluding Shakespeare) and the Spanish Golden Age.

DRAMA 253 3C 0.5
Survey of Dramatic Literature and Theory 3
French neo-classicism, the Restoration period and sentimental drama.

DRAMA 254 3C 0.5
Survey of Dramatic Literature and Theory 4
The late eighteenth, nineteenth and early twentieth centuries, romanticism and naturalism.

DRAMA 255
Survey of Dramatic Literature and Theory 5
Not offered 1982-83.

DRAMA 258
Masterpieces of Western Drama, A Study of Performance 1.
Not offered 1982-83.

DRAMA 259
Masterpieces of Western Drama, A Study of Performance 2.
Not offered 1982-83.

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 one dramatic literature class and permission.

DRAMA 262 W 3C 0.5
Introduction to Directing 2
Prereq: DRAMA 261, two dramatic literature classes and permission.

DRAMA 264 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 two dramatic literature classes.

DRAMA 301 F 3C 0.5
Script Interpretation 2
An extension of the studies described above in 301.
Prereq: DRAMA 101A and B and at least two dramatic literature classes.

DRAMA 302 W 3C 0.5
Design for the Theatre 1
An introduction to the theory and practice of theatre design through studio experience.
Prereq: DRAMA 243

DRAMA 321 F 6L 0.5
Advanced Acting 1
Advanced work in acting. Course involves individual and ensemble work in selection from specific plays with attention given to various periods and styles in acting.
Prereq: DRAMA 221 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 331 F 3LD 0.5
Design for the Theatre 1
An extension of the studies described in DRAMA 311, 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 243

DRAMA 342 W 4L 0.5
Lighting Design for the Theatre 2
Advanced studies in theatre lighting design, including major production experience.
Prereq: DRAMA 341.

DRAMA 343 F 2L,2C 0.5
Theatre Technology 1
Advanced studies in the theory and practice of theatre technology, including an apprenticeship program.
Prereq: DRAMA 243 and 244.

DRAMA 344 W 2L,2C 0.5
Theatre Technology 2
A continuation of the studies described in DRAMA 343.
Prereq: DRAMA 344.
Theatre Criticism

DRAMA 348
Arts Administration 1
Not offered 1982-83.

DRAMA 349
Arts Administration 2
Not offered 1982-83.

DRAMA 351 0.5
Canadian Drama
See ENGLISH 316.
(Cross-listed with English 316).

DRAMA 361 F std 0.5
Advanced Directing 1
Each student in the course will be
required to form his or her own
production company and mount a play.
Prereq: DRAMA 261 or 262 and at least
three dramatic literature classes and
permission.

DRAMA 362 W std 0.5
Advanced Directing 2
An extension of the studies described in
DRAMA 361.
Prereq: DRAMA 361 and at least four
dramatic literature classes.

DRAMA 371 F 3C 0.5
Theatre History 1
A survey of theatre history from
Classical Greece to 1600. Students are
advised to take this course in their third
year.

DRAMA 372 W 3C 0.5
Theatre History 2
An extension of studies described in
DRAMA 371.

DRAMA 406 (ABC) F std 0.5
Theatre Workshop 1
Participation in stage production for
advanced students.
Prereq: Permission of the play director
and DRAMA 101A and B.

DRAMA 407 (ABC) W std 0.5
Theatre Workshop 2
Participation in stage production for
advanced students.
Prereq: Permission of play director and
DRAMA 101A and B.

DRAMA 409 F 3C 0.5
Theatre Criticism
Study and practice of the criticism of
theatre production and performance.
This course will not normally be taken
until the student's final year.

Theatre Production and Performance.

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.

DRAMA 422 W 6L 0.5
Advanced Acting Workshop 2
An extension of DRAMA 421.
Prereq: DRAMA 421 and permission of
instructor.

DRAMA 490 (A-E) F wkshp 0.5
Selected Seminars in Drama and
Theatre Arts
Seminars in special areas of drama and
theatre.
Prereq: Permission of the department.

DRAMA 491 (A-E) W wkshp 0.5
Selected Seminars in Drama and
Theatre Arts
Seminars in special areas of drama and
theatre.
Prereq: Permission of the department.

DRAMA 499 Y T 1.0
Senior Seminar
Open only to drama honours students
in their fourth year. It is designed to
give the student an opportunity to com-
plete a comprehensive presentation in
his or her major area of concentration.

Department of Earth Sciences

Professor, Chairman of the Department
P. Fritz, Dipl. Geol. Dr. rer. nat.
(Stuttgart)

Professors
J.A. Cherry, BE (Saskatchewan), MS
(California, Berkeley), PhD
(Illinois), PEng
R.N. Farvolden, MSc (Alberta), PhD
(Illinois)
P.F. Karrow, BSc (Queen's), PhD
(Illinois)
R.W. Macqueen, BA, MA (Toronto), PhD
(Princeton)

Associate Professors
E.C. Appleyard, BSc (Western Ontario),
MSc (Queen's), PhD (Cambridge)
E.O. Frind, BASc, MSc, PhD (Toronto),
PEng
J.E. Gale, BA, BSc (Memorial), MSc
(Western Ontario), MEngSc, PhD
(California, Berkeley), PEng

R.W. Gilham, BSA (Toronto), MSc
(Guelph), PhD (McGill)
J.P. Greenhouse, BSc, MSc (British
Columbia), PhD (California)
D.E. Lawson, BSc, MSc (New
Brunswick), PhD (Reading)
A.V. Morgan, BSc (Leicester), MSc
(Calgary), PhD Birmingham
E.J. Reardon, BSc (St. Francis Xavier),
PhD (Pennsylvania State)
R.G. Roberts, BA (Cambridge), MSc,
PhD (McGill)

Assistant Professors
J.F. Barker, BSc, MSc (McMaster),
PhD (Waterloo)
J.A. Legault, BSc, MSc (Ottawa), PhD
(Okahoma)

Research Professor
R.L. Thomas, BSc, PhD (Wales)
O.L. White, BSc, MASc (Toronto), PhD
(Illinois), PEng

Senior Demonstrators
J.L. Lang, BSc, MBA (Queen's)
K. Lahay, BSc, MSc (Guelph)

Faculty members holding cross-
appointments as shown
Earth Sciences and Man-Environment
Studies

Course Descriptions

Details of the undergraduate programs
offered by the Faculty of Science are to
be found in Chapter 15.

EARTH 121-122 is normally regarded as
a prerequisite for any Major programs in
Earth Sciences. Those who are looking
for a shorter, more general introduction
to geology should consider SCI 100.
Second, third and fourth year courses
may involve field trips in the fall. All
those enrolled in Honours Earth Sciences programs are required to take a two-week field camp at the end of the third year (EARTH 390). The cost will range from $50-$100 per student. Regular Earth Sciences students are encouraged to seek geological employment in the summers.

EARTH 121 F 2C,3L 0.5
Introductory Geology 1
An introduction to rocks and minerals and the processes of their formation. The structure of the earth, plate tectonics and its relationship to deformation, metamorphism and formation of magmas. Earth resources.

EARTH 122 W 2C,3L 0.5
Introductory Geology 2
An introduction to processes that shape the earth’s landscapes. Consideration of the time concept in geology. Introduction to fossils, their occurrence and uses in earth sciences. The geological history of North America.

EARTH 221 W,S 3C,1T 0.5
Geochemistry 1

EARTH 231 F 2C,3L 0.5
Mineralogy and Crystallography

EARTH 232 W,S 2C,3L 0.5
Petrography
Optical properties and identification of minerals under the microscope. The study of rocks in thin section. The classification and identification of sedimentary, igneous, and metamorphic rocks. Prereq: EARTH 231.

EARTH 235 F 2C,3L 0.5
Stratigraphy

EARTH 236 F 2C,3L 0.5
Principles of Paleontology
The principles of paleontology with particular stress on the species concept and evolution: examples will be drawn primarily from the fossil record of plants and vertebrates. Laboratory work will include projects related to lecture topics. Prereq: EARTH 121-122.

EARTH 260 W,S 2C,3L 0.5
Introductory Structural Geology

EARTH 331 F 2C,3L 0.5
Igneous Petrology

EARTH 332 W 2C,3L 0.5
Metamorphic Petrology

EARTH 333 W 2C,3L 0.5
Introductory Sedimentology

EARTH 336 F 2C,3L 0.5
Paleontology
Advanced paleontology emphasizing morphology, classification, evolution, paleoecology and stratigraphic value of fossil invertebrates. Laboratory study of fossil collections. Prereq: EARTH 236.

EARTH 338 W 2C,3L 0.5
Rock Mechanics
Review of stress and strain. Mohr’s circle, strength theories, laboratory tests, classification of rocks. Rock mechanics considerations in the construction of shafts, drifts, tunnels, foundations and rock slopes. Laboratory exercises will deal with uniaxial, triaxial, flexure, hardness and tensile testing of rock. Problem sets will be assigned. Prereq: A course in Statics and Mechanics of deformable materials, or consent of instructor.

EARTH 342 F 2C,3L 0.5
Geomorphology

EARTH 345 W 2C,2L 0.5
Historical Geology
A systematic review of the geological history of North America from the Precambrian to the Recent exemplified by regional geology. Laboratory work will include study of rock and fossil regional suites and geological maps. Prereq: EARTH 235.

EARTH 355 F 3C 0.5
Statistical Methods in Geology
Introduction to the principles of probability and statistics and their application in the earth sciences. Evaluation of quantitative data, statistical models. Prereq: MATH 113 and an introductory course in computer programming.
Tectonic syntheses based on the theory in the light of world geology.

**EARTH 360 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 368 F 2C 0.5**

**Geophysics 1** (identical to PHYS 368)

**Prereq:** MATH 113, PHYS 121-122 or equivalent.

**EARTH 369 W 3C 0.5**

**Geophysics 2** (identical to PHYS 369)
The geology of the ocean basins. Topics in physical oceanography. Physical properties of ocean water, heat budget of the world oceans. Oceanic circulation, Coriolis effects. Some idealized current regimes.

**Prereq:** MATH 113 and PHYS 121-122 or equivalent.

**EARTH 370 W 3C,2L 0.5**

**Economic Geology**
The occurrence and geological setting of metallic, non-metallic minerals and construction materials. Energy resources. Special emphasis on Canada's resource industries. The laboratory will involve sampling methods, ore calculation and property evaluation.

**Prereq:** EARTH 231, 232

**EARTH 390 W field lab**

**Field Camp**
Ten day field camp at Whitefish Falls, held at beginning of spring term.

**EARTH 421 W 2C,3L 0.5**

**Geochronology**
The application of chemical thermo-geodynamics to geochemical problems. Development of the three laws of Thermodynamics: Gibbs free energy and equilibria constants. Introduction to various topics in aqueous geochemistry such as mineral equilibria, ion exchange and redox equilibria. Various aspects of organic geochemistry and geochemical exploration will also be treated.

**Prereq:** First year chemistry, EARTH 221

**EARTH 427 W 2C,3S 0.5**

**Crustal Evolution**
An analytical critique of the plate tectonics theory, its historical

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, exploration, and conservation of groundwater. Groundwater-surface water interactions, effect of man's activities on ground water 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:** GEOG 300 and GEOG 401

**EARTH 456 F 3C 0.5**

**Numerical Methods in Geoscience**

**Prereq:** MATH 113 and an introductory course in computer programming.

**EARTH 461 W 3C,1T 0.5**

**Applied Geophysics 2**
A detailed examination of selected topics in exploration geophysics, with an emphasis on data processing and computer modelling of geophysical responses.

**Prereq:** EARTH 360 and an introductory course in computer programming.

**EARTH 470 F 3C,2L 0.5**

**Metallic Mineral Deposits**
The petrology and genesis of metalliciferous ore deposits. The description of classic deposits; the stability of ore minerals; ore minerals in aqueous systems. The laboratory will include instruction and practice in ore microscopy.

**Prereq:** EARTH 370

**EARTH 480 S field lab 0.5**

**Field Study**
Depending on the demand and the availability of an instructor, a six week field course may be offered in an area of unusual geological interest during the
ECON 102 F,W,S 3C 0.5
Introduction to Microeconomics
An introduction to the central economic problems of society, the functioning of a mixed capitalism enterprise system, the economic role of government, the composition of and pricing of national output, pricing of productive factors, and income distribution. Only one of ECON 101 and 103 may be taken. Also offered at St. Jerome's College.

ECON 103 F,W 0.5
Introduction to Economic Concepts and Current Problems
The focus of the course is on the use of economic theory for understanding the behavior of consumers and of large corporations in the modern industrial world, and on the discussion of such urgent current problems as the energy crisis, population explosion, income inequality, economic policies of large conglomerate business, the arms race, urban congestion, environmental pollution and resource uses. Only one of ECON 101 and 103 may be taken.

ECON 201 F,W,S 3C 0.5
Microeconomic Theory
Theory of consumer demand, production theory, market structure, resource pricing and allocation under perfect and imperfect competition. Prereq: ECON 101 or 103 or 100a/100b

ECON 202 F,W,S 3C 0.5
Macroeconomic Theory
Theory of the determination of the level of national income, employment and the price level. Prereq: ECON 102 or ECON 100a/100b

ECON 211 F,W,S 3C 0.5
Mathematics for Economists
Application of elementary mathematics to problems in economic theory. Topics include the graphical functions, elementary exponential and logarithmic functions and differentiation - all developed within the context of economic theory. Prereq: ECON 101 or 102 or 103/102 or 100a/100b

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. Prereq: ECON 101/102 or 103/102 or 100a/100b.
ECON 231  F,W  3C  0.5  
Introduction to International Economics  
Theory of comparative advantage and the gains from trade; tariff theory; concepts and measurement of balance of payments, exchange rate systems; reform of international monetary system.  
Prereq: ECON 101/102 or 103/102 or 100a/100b

ECON 241  W  3C  0.5  
Cost-benefit Analysis and Project Evaluation  
Prereq: ECON 201

ECON 263  W  3C  0.5  
Economic History of Canada  
A study of the economic development of Canada; export staple theory, industrial structure and national policies analysed in a Classical-Marxian framework.  
Prereq: ECON 101/102 or 103/102 or 100a/100b.

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**Department of Economics: Course Offerings**

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ECON 301 F,W 3C 0.5
Intermediate Microeconomics
Distribution theory; production, consumption and general equilibrium analysis; welfare economics.
Prereq: ECON 201

ECON 302 F,W 3C 0.5
Monetary Theory and Banking
Monetary theory and banking in an open economy; national policies for achieving full employment, price stability, and equilibrium in the balance of payments.
Prereq: ECON 201, 202, 231

ECON 303 F 3C 0.5
Economic Thought
A critical survey of the development of economic thought from the pre-Socratics to the Post-Keynesians, Emphasis on Classical Economics.
Prereq: ECON 201, 202, 231

ECON 311 F 3C 0.5
Introduction to Mathematical Economics
Mathematical treatment of some micro- and macro- partial and general equilibrium models; programming and game theoretic techniques; stability analysis; simple growth models.
Prereq: ECON 201, 202, 211 (or MATH 130)

ECON 321 W 3C 0.5
Introduction to Econometrics
Introductory level course in econometrics; includes economic model building and testing, regression and correlation analysis, and price indices.
Prereq: ECON 221

ECON 331 F 3C 0.5
International Trade 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 inter-regional systems. Models examined include input-output, export-base, shift-share, neo-classical, cumulative causation.
Prereq: ECON 201, 231

ECON 335 W 3C 0.5
Economic Development
The nature of the problem of economic development; theories of economic development; major policy issues in economic development.
Prereq: ECON 201, 202, 231

ECON 341 F 3C 0.5
Public Finance
The economic rationale of governmental fiscal activity; cost-benefit analysis; the structure and economic effects of public expenditure and revenues; the analysis of income, consumption and wealth taxes; introduction to fiscal federalism.
Prereq: ECON 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 or 103 or 100A (ECON 201 is recommended).

ECON 344 W 3C 0.5
Consumer Theory
The development of economic principles for consumer analysis. The course appraises market responsiveness as well as conditions causing problems for public and private consumption. It also evaluates alternative economic policies for correcting such conditions.
Prereq: ECON 201

ECON 345 F 3C 0.5
Industrial Organization
An analysis of the characteristics of industrial structure, behaviour and performance with special reference to Canada. Competition and "rationalization" policy in Canada and other selected countries.
Prereq: ECON 201

ECON 351 F 3C 0.5
Labour Economics
Wage theory, training and mobility theory, economics of information in Canadian labour markets; other investments in human capital; manpower policies.
Prereq: ECON 201

ECON 353 W 3C 0.5
Population Economics
Population objectives; demographic techniques; economic interrelationships with fertility, mortality and migration; determinants and consequences of current world population changes.
Prereq: ECON 201

ECON 355 W 3C 0.5
Economics of Energy and Natural Resources
An analysis of the economics of conservation, especially the adequacy of the market mechanism as an allocator of resource use over time. The political economy of the world's supply of and demand for energy resources and major issues in Canadian energy policy will be considered.
Prereq: ECON 201 (ECON 241 is recommended).

ECON 357 W 3C 0.5
Environmental Economics
Application of economic theory to problems of the environment, in particular, air, water, and land pollution. Emphasis is on the theory of the management of common property resources.
Prereq: ECON 201

ECON 361 North American Economic History
Not offered in 1982-83.

ECON 363/364 F.W 3C 0.5/0.5
Contemporary Canadian Problems 1, 2
A "topic oriented" seminar course. The class agrees to study a Canadian problem selected from a list that includes poverty, unemployment, industrial policy, and so forth. The format assists the student in gaining analytical skill through work on the selected topics.
Prereq: ECON 201, 202

ECON 365 W 3C 0.5
Economic Development of Modern Europe, 1780-1973
Prereq: ECON 101/102 or 103/102 or 100A/100B
ECON 381-389 3S 0.5 each
Special Topics
One or more special half courses will be offered at different times as announced by the Department.
Prereq: Consent of instructor

ECON 401 F 3C 0.5
Advanced Macroeconomic Theory
Production and consumption theory; advanced theory of oligopoly; price competition; non-price competition; growth decisions of the firm; financial decisions of the firm; decision-making under risk and uncertainty.
Prereq: ECON 301

ECON 402 W 3C 0.5
Advanced Macroeconomic Theory
Classical and Keynesian models and recent contributions; theory of economic policy; inflation and unemployment; modern theories of economic growth.
Prereq: ECON 301, 302

ECON 403 W 3C 0.5
Economic Analysis, Forecasting, and Public Policy
The course focuses on the problems of forecasting economic activity (as measured by the principal macroeconomic variables), and of designing and implementing policies to control those variables; topics covered include a critical review of current forecasting models, problems associated with lags in the impact of policies, and so forth.
Prereq: ECON 301, 302, 321

ECON 411
Mathematical Economics
Not offered 1982-83.

ECON 413 W 3C 0.5
Economic Growth Theory
Classical, neoclassical, and Cambridge theories of growth; study of production, technical progress, and consumption; aggregate and two-sector models of growth; growth theory in an open economy.
Prereq: ECON 301, 302, 311

ECON 421/422 F,W 3C 0.5/0.5
Econometrics 2
Review of linear algebra, and development of basic statistical inference; formulation, identification, estimation, and tests of single equation and simultaneous equation regression models of micro- and macroeconomics; empirical models.
Prereq: ECON 201, 202, 211, 221, 321

ECON 431 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 the Public Sector 2
Fiscal stabilization, fiscal federalism, public pricing, international public finance, social security and other contemporary policy issues.
Prereq: ECON 441

ECON 451 3C 0.5
Advanced Topics in Resource Economics
Advanced analysis of selected topics in the area of energy, land, and labour resources.
Prereq: ECON 201, 202, 231, 355

ECON 461
Comparative Economic Systems
This course seeks to explain and evaluate various theoretical frameworks utilized in the analysis of different types of Economic Systems. The emphasis is placed upon those frameworks applicable to capitalism and socialism. Topics which are dealt with include Marx's theory of capitalism, the analysis of decentralized Economic Systems in terms of Modern Walrasian theory, theories of monopoly capitalism, the development and operation of the Stalinist Command Economy, alternative principles of Socialist Economic Organization and various types of planning procedures.
Prereq: ECON 201 and 202

ECON 461-489 3S 0.5 each
Special Studies
Research and reading courses under the direction of individual instructors. Admission by consent of instructor.
Course Descriptions

Electrical Engineering

Associate Professors
J.D. Adleveich, BE (Saskatchewan), PhD (Imperial College, London), PEng
M.I. Elmasry, BSc (Caro), MASc, PhD (Ottawa), PEng
J.A. Field, BE (Saskatchewan), MASc, PhD (Toronto), PEng
B.A. Francis, BSc, MEng, PhD (Toronto)
J.V. Hanson, BASc (Toronto), MSc, PhD (Imperial College, London)
J.S. Keeler, BASc, MASc (Toronto), PEng
W.D. Little, BASc, MASc, PhD (British Columbia), PEng
W.N. Meakle, BASc, MASc (Toronto), PEng
V.H. Quintana, BEng (Chile), MSc (Wisconsin), PhD (Toronto), PEng
W.J. Wilson, BE, MSc (Saskatchewan), PhD (Cambridge), PEng

Assistant Professors
S.K. Chaudhuri, PhD (Manitoba)

Adjunct Professors
R.G. Anthes, BASc, MASc (Toronto), PEng
J. Carr, PhD (Waterloo)

Lecturers
J.T. Mowchenko, BASc (Saskatchewan)

Laboratory Director
R.L. Wright, PEng

Faculty member holding cross-appointment as shown
'In Department of Computer Science

Course Descriptions

EL E 123 W.S 3C,1T,3L 0.5 Electrical Engineering Circuits

EL E 126 W.S 3C,1T,3L 0.5 Electrical Engineering Concepts
Introduction to Digital Computers
Fourier series, partial differential equations. selected variables, wave equation, heat equation and Laplace's equation. Fourier integral, properties of complex analytic functions, complex integration.

EL E 201 W,F 1C 0.0 Seminar
General Seminar

EL E 202 F,S 1C 0.0 Seminar
General Seminar

EL E 205 (Math 211) W,F . 2C,2T 0.5 Advanced Calculus for Electrical Engineers 1
Advanced Calculus for Electrical Engineers 2
Fourier series, partial differential equations. selected variables, wave equation, heat equation and Laplace's equation. Fourier integral, properties of complex analytic functions, complex integration.

EL E 222 W,F 2C,1T,2L 0.5 Introduction to Digital Computers

Prereq: GEN E 121 or equivalent.

EL E 233 W,F 3C,1T 0.5 Physical Electronics
Particle and wave theory of light, photoelectric effect, Compton effect. Structure of hydrogen atom; many-electron atoms. Solid state physics: semiconductors, n and p-type materials, Fermi levels, mass action law, charge neutrality, diffusion. Introduction to p-n junctions.

EL E 241 W,F 3C,2T 0.5 Electrical Networks 1
Introduction to network variables and laws, resistors, sources and simple circuits; resistance networks, capacitors and inductors; first order circuits, sinusoidal steady-state analysis.

EL E 261 S,F 3C,1T 0.5 Energy Processing and Conversion

EL E 271 S,F 3C,1T 0.5 Electric and Magnetic Fields
Vector analysis, Coulomb's law and electric field intensity, electric flux density, Gauss' law and divergence; energy and potential; conductors, dielectrics, capacitance; experimental mapping methods. Poisson's and Laplace's equations; the steady magnetic field; magnetic forces, materials and inductance. Time varying fields and Maxwell's equations.

EL E 293 W,F 1C,4L 0.5 Measurement and Instrumentation 1
The principal objectives of this course are to introduce students to the methods and techniques for measuring electrical variables and parameters and to give them laboratory experience with electrical instruments, devices and circuits. Instruments studied include oscilloscopes, multimeters, power supplies, dc and ac bridges, signal generators and electronic volt meters. The devices and circuits include linear and non-linear resistors, capacitors and inductors, RC, RL and RLC networks. Open Lab.

EL E 294 S,F 1C,1T,3L 0.5 Measurement Instrumentation
Experiments related to material covered in courses EL E 261 and EL E 271 will be performed. This course also includes
Further topics on instrumentation and measurement techniques. 'Open lab.

EL E 301  W, S  1C  0.0  Seminar
General Seminar

EL E 302  W,F  1C  0.0  Seminar
General Seminar

EL E 316  W,S  2C,2T  0.5  Probability and Statistics
Conditional probability and independence; Bayes' Theorem; random variables; functions of random variables; distribution functions; applications to reliability and failure rates; marginal and conditional distributions; correlation and applications to regression and statistical testing.

EL E 317  W,F  3C,1L  0.5  Signal Analysis Methods
Representation of periodic and nonperiodic signals in both continuous time and discrete time forms; the concept of sampling; the development and application of Fourier series, Fourier transforms, and the convolution integral to continuous time signals and systems; linear modulation, and modulation techniques such as DSB, AM, SSB, etc.; the z-transform and its application to discrete time sequences and systems.

EL E 323  W,S  2C,1T,2L  0.5  Principles of Digital Circuits and Systems

EL E 342  W,S  2C,2T  0.5  Electric Networks 2
Review of sinusoidal steady-state, node, and mesh analysis; the Laplace transformation and applications; transient response of second and higher order circuits; two-part network parameters.
Prereq: EL E 241 or equivalent

EL E 351  W,S  2C,1T,3L  0.5  Electronic Devices
Review of semiconductor properties, Boltzmann relations. Derivation of dc and ac characteristics of p-n junctions and bipolar transistors. Small and large signal models. Introduction to field effect transistors. 'Alternate weeks.
Prereq: EL E 233 or equivalent

EL E 352  W,F  2C,1T,3L  0.5  Electronic Circuits
Large-signal amplifiers; biasing networks and stability, single and multistage small-signal amplifiers; the hybrid-pi model; high and low frequency effects; feedback amplifiers and stability criteria; oscillators; noise in electronic circuits. 'Alternate weeks.

EL E 362  W,S  2C,1T,3L  0.5  Energy Conversion
Electric motors and generators.
Prereq: EL E 261

EL E 372  W,F  2C,1T,3L  0.5  Transmission Lines and Electromagnetic Fields
Transmission lines, distributed parameters; telegrapher's equations; sinusoidal waves; terminated lines, matching with the Smith Chart; Electromagnetic Fields; Maxwell's equations; plane waves; reflection and refraction; Poynting vector; waveguides.
Prereq: EL E 261

EL E 380  W,F  2C,2T,3L  0.5  Introduction to Systems and Control
An introduction to control. Advantages of closed-loop feedback systems. The role of the system mathematical model. Block diagrams and signal flow graphs. The basic control system design problem, stability in control systems. Frequency response analysis techniques. 'Alternate weeks.

EL E 401  S,F  1C  0.0  Seminar
General Seminar

EL E 402  W  1C  0.0  Seminar
General Seminar

EL E 407  W  2C,2T  0.5  Numerical Methods

EL E 418  S,F  2C,1T,1L  0.5  Communication Systems
Review of signal analysis and linear modulation; angle modulation and FM spectra; noise in circuits and communication channels; noise figure and noise temperature; performance of linear and exponential modulation systems in the presence of noise; analog pulse modulation, PAM, PPM, PDM, noise in pulse modulation systems. 'Open.

EL E 419  W  3C,1T  0.5  Digital Communication
Review of sampling and quantization; data transmission and digital data systems; pulse code modulation, and delta modulation; noise and errors in pulse communications; matched filters, probability of error and correlation detection; intersymbol interference, distortion and equalization; signal design and transmission line coding; introduction to channel capacity and error control coding.
Prereq: EL E 316, 317 or equivalent

EL E 425  S,F  2C,1T,1L  0.5  System Simulation
A study of computer simulation techniques; principles of analog computation; models, scaling procedures; digital simulation languages, computer simulation and investigation of continuous systems; differential equations, transfer functions, boundary value problems; application of hybrid computers. 'Open

EL E 426  W  3C,1L  0.5  Software Engineering
Prereq: EL E 222 or equivalent.'Project.
EL E 427 S.F 2C,1T,1L 0.5
Digital Hardware Engineering
Design of digital systems using MSI/LSI chips. Arithmetic processors. Computer subsystem and I/O interfacing. Microprocessor applications. Prereq: EL E 222, EL E 323 or equivalent. Open

EL E 434 W 2C,2T 0.5
Quantum Electronics and Magnetics
Lasers principles; solid state, semiconductor and gas lasers. Laser applications, holography, Ferromagnetism, ferrimagnetism, diamagnetism and paramagnetism, electron-spin resonance, core and bubble memories.

EL E 435 S.F 2C,2T 0.5
Semiconductor Devices 1
This course deals with the theory and characteristics of modern semiconductor devices, SGR, power rectifiers, MOSFETs, JFETs, radiation detectors, solar cells, LEDs, CCDs, IMPATT and Gunn effect devices, step recovery diodes, P-I-N diodes, Schottky diodes, memory devices.

EL E 436 W 3C,1T 0.5
Semiconductor Devices 2
Techniques for the design and realization of discrete and integrated circuit elements, bipolar, JFET and MOSFET models. Integrated circuit biasing. Design and implementation of logic circuit elements. Semiconductor memories. RAMs, ROMs, shift registers.

EL E 443 W 2C,1T,1L 0.5
Electric Networks 3
Two-port descriptions of ideal active devices; simulation of nonideal linear active devices; formulation and solution of network equations; network functions and their sensitivity in the frequency domain; introduction to passive and active filters, approximation theory and simple synthesis, time domain solutions, computer-aided analysis and design of networks, simulation of nonideal nonlinear devices. Prereq: EL E 342 or equivalent.

EL E 448 S.F 2C,2T 0.5
Linear Systems
Three types of linear multivariable systems are studied: 1) real time-continuous systems; 2) real time-discrete systems; and 3) modulo-two time-discrete systems. The unifying approach of state equations is developed and the importance of linear algebra is emphasized. Topics include: time domain analysis, transform analysis (Laplace- and Z-transforms), stability considerations, system equivalence, system decomposition, system realization. The necessary matrix and linear-algebra theory is developed as required.

EL E 453 W 2C,1T,1L* 0.5
Linear Electronic Circuits
Applications of bipolar and field-effect transistors. Design of operational amplifiers. IC temperature compensation. Differential, low noise and power amplifiers, receiver front end design. Modulators, mixers, detectors. Power supplies. 'Project.'

EL E 454 S.F 2C,1T,1L* 0.5
Nonlinear Electronic Circuits
Switching characteristics of semiconductor devices, non-sinusoidal wave generation and shaping, voltage and current sweeps. Linear circuits and gates, digital integrated circuits, DCTL, DTL, ECL, T*I and IHL. Open

EL E 459 W 2C,1T,1L* 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 audiometry, acoustical measurements, audio electronics and applications. Every third week

EL E 463 S.F 2C,1T,1L* 0.5
Power Electronics
Characteristics and ratings of power semiconductor devices with emphasis on the thyristor, General methods of achieving design objectives. Performance and analysis of power conversion circuits for both static and rotating loads. Open

EL E 464 W 3C,3L* 0.5
High Voltage and Insulation Engineering
Nature and origin of high voltage surges encountered on power systems. Traveling waves on transmission systems; insulation engineering; electrostatic fields in high voltage apparatus; insulation failure: corona; insulation testing; circuit breakers and surge protection devices; insulation coordination. Alternate weeks.

EL E 465 W 2C,2T 0.5
Power Systems
Introduction to system concepts: aspects of power system planning and operation. Energy sources; environment 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
Rectangular and circular waveguides; simple waveguide discontinuity; periodic transmission systems; microwave scattering theory; ferrite components; klystrons; travelling-wave amplifiers; backward-wave oscillator, magnetron, solid-state microwave devices. Every third week

EL E 474 S.F 2C,1T,1L* 0.5
Antenna and Propagation Engineering
An introduction to electromagnetic radiation theory and antennas; linear radiators, the dipole, linear arrays, Schelkunoff, binomial and Chebyshev arrays, aperture antennas. Schelkunoff equivalence theorem, frequency independent antennas, theory of antenna measurements. Every third week. Prereq: EL E 372 or equivalent.

EL E 481 S.F 2C,1T,1L* 0.5
Control Systems 1

EL E 482 W 2C,1T,1L* 0.5
Control Systems 2

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
Department of English

Associate Professor, Chairman of Department
W.R. Macnaughton, BA (Toronto), MA, PhD (Wisconsin)

Associate Professor, Associate Chairman and Undergraduate Officer
R.R. Dubinski, BA, MA (Western Ontario), PhD (Toronto)

Associate Professor and Graduate Officer
G.E. Siethaug, BA (Pacific Lutheran), MA, PhD (Nebraska)

Professor and Director of the Office of Part-Time Studies and Continuing Education
J.C. Gray, BA (Washington State), MA (Connecticut), PhD (Syracuse)

Professors
L.A. Cummins, 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)
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)
H.B. Ellis, BA (Rollins), MA, PhD (Illinois)
S. Fogel, BA (Carleton), MA (British Columbia), PhD (Purdue)
R.N. Gosselink, BA (Kansas), MA, PhD (Colorado)
P.M. Hinchcliffe, BA (British Columbia), MA, PhD (Toronto)
J. C. Gray, MA, PhD (Illinois)
W. R. Macnaughton, MA (Montana), PhD (Iowa)
C.E. McGee, BA, MA, PhD (Toronto)
S.E. McMullin, BA, MA, CARLTON (Dalhousie)

Lecturers
L. Dorney, BA, MA (Louisville)
J. Miller, BA, BLS (McGill), MA, MPhil (Waterloo), PhD (York)
J.S. North, BA, MA (British Columbia)

Assistant Professors
M.A. Gerhardstein, MA (Montana), PhD (Iowa)

Jointly appointed from Architecture
For courses in Drama, see Drama and Theatre Arts Group in this Chapter.

Although the Department of English provides advisors to help students to choose their 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.

Note 1
W.K. Thomas's Correct Form of Essay Writing is the official style sheet for all undergraduate English courses.

Note 2
The "normal" number of lectures per week in each course is three; however, instructors determine how often their particular class will meet.

Note 3
In all English courses, emphasis will be placed on student essays written in connection with the reading.

Course Descriptions

Consult the table for an up-to-date list of courses offered in 1982-83.

Group One

1. Courses in this group count towards a degree as electives in any program in the University. None of them, however, fulfills a core requirement for a General or an Honours program in English.

A) Courses in Group 1(A) are primarily concerned with assisting students 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 209 Advanced Essay Writing
ENGL 210 Report Writing
ENGL 309 Seminar in Essay Writing
ENGL 335 Creative Writing

B) Courses in Group 1(B) 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 150 English as an Instrument of Thought and Communication 1
ENGL 151 English as an Instrument of Thought and Communication 2
ENGL 140R The Use of English 1
ENGL 141R The Use of English 2
ENGL 240R Form and Function 1
ENGL 241R Form and Function 2

Note
R Courses are administered by Renison College.

1A)

ENGL 109 F.W.S 0.5
Introduction to Essay Writing 1

The course teaches the construction of the expository essay with attention to the structure of good paragraphs, to techniques of putting the essay together, and to the nature of the language. Ten to twelve short writing assignments are required. Also offered at St. Jerome's College.
ENGL 110 W 0.5
Introduction to Essay Writing 2
The course teaches the construction of the persuasive essay, with attention to the elements of logical thinking, to the techniques of successful persuasion, and to the demands of the library research paper. Six to eight writing assignments are required.
Prereq: ENGL 109

ENGL 129R F.W 1C,2L PT 0.5
Introduction to Written English
Instruction provided in basic grammar, sentence and paragraph structure, elements of composition and essay writing including focus on theme, development of central idea, exposition and argumentation. Minimum of four hours of instruction each week with additional tutorial hours as required.
Prereq: Open only to students whose maternal language is not English and who lack language mastery sufficient for admission to other introductory English language courses.

ENGL 209 F 0.5
Advanced Essay Writing
Provides further opportunities for serious students of writing to study and to practice descriptive, expository, argumentative, and persuasive writing. In addition to lectures, there are workshop sessions in which student writing is discussed.
Prereq: Second-year standing or above.

ENGL 210 F,W,S 0.5
Report Writing
The many functions of the report - an orderly and objective communication of factual information which serves some specific purpose - are taught. Students will receive practice in research, in organization, and in writing many kinds of reports.
Prereq: Second-year standing or above.

ENGL 309
Seminar in Essay Writing
Not offered in 1982-83

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.

1B)
ENGL 150 F.W 0.5
English as an Instrument of Thought and Communication 1
The course is designed to improve the reading and writing of students from all disciplines. In order to develop clarity of thought and critical awareness, students will identify and study in several media the various ends that are served by language: objective reporting; persuasion; argument; and emotional, social, and artistic expression. About eight written exercises are assigned.
Prereq: ENGL 150.

ENGL 151 W 0.5
English as an Instrument of Thought and Communication 2
A continuation of ENGL 150. From a basis of simple semantics and elementary logic, students will proceed to examine more complex language in fiction and other forms of literature. About six written exercises are assigned.
Prereq: ENGL 150.

ENGL 140R F,W,S 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 103A or consent of instructor.

ENGL 141R W 0.5
The Use of English 2
A continuation of ENGL 140R. The study of factual, emotive, scientific and imaginative writing; relevance, context; meaning, tone, feeling and intention.
Prereq: ENGL 140R.

ENGL 240R F 3C 0.5
Form and Function 1
The uses of literacy and the functions of language as acquired in ENGL 140R/141R. These will be applied to the more advanced form of the literary and critical assignment essay, involving comparison, evaluation and exposition.

ENGL 241R
Form and Function 2
Not offered in 1982-83.

Note
R Courses are administered by Renison College.

Group Two

Courses in this group carry degree credit and may be counted as fulfilling the minimum requirements for a General or Honours program in English.

ENGL 102 Y. 1.0
The Major Forms of Literature
Different kinds of literature will be explored so as to discover how the shape of a literary work contributes to its meaning. Students will read ballad, lyric, and narrative poetry; classic tragedy and comedy and absurdist, existential and expressionist plays; novels and short stories.
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.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 105B</td>
<td>Twentieth-Century Literature in English, 1930-80</td>
<td>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.</td>
</tr>
<tr>
<td>ENGL 108</td>
<td>Themes of Literature</td>
<td>An exploration of the great variety of literature through thematic perspectives.</td>
</tr>
<tr>
<td>ENGL 108A</td>
<td>The Hero</td>
<td>A study of human excellence in thought and action embodied in representative men and women, as seen through works of literature.</td>
</tr>
<tr>
<td>ENGL 108B</td>
<td>Utopia and Anti-Utopia</td>
<td>This course will attempt to acquaint the student with forms of the literary artist’s moral vision of man in “Utopian” writings. It will involve an examination of the role of the imagination in helping to inform and embody cultural ideas of various periods.</td>
</tr>
<tr>
<td>ENGL 108C</td>
<td>Literature and Morality</td>
<td>Works in English literature from its beginnings are selected for their bearings on questions of morality.</td>
</tr>
<tr>
<td>ENGL 108D</td>
<td>The Quest Theme in Literature</td>
<td>Not offered in 1982-83.</td>
</tr>
<tr>
<td>ENGL 108E</td>
<td>Women in Literature</td>
<td>A study of the nature and role of women in British, Canadian, and American literature. Works by both men and women will be studied in which women are seen in such forms as earth mothers, people, sex objects, and bitches. Also offered at St. Jerome’s College.</td>
</tr>
<tr>
<td>ENGL 108F</td>
<td>The Rebel</td>
<td>A study of various works of literature in which the protagonist is a rebel against existing existing norms. The course will examine a number of rebel types and concepts, moral implications and final outcomes either in successful realization or in tragic defeat. Also offered at St. Jerome’s College.</td>
</tr>
<tr>
<td>ENGL 108H</td>
<td>Isolation and Alienation</td>
<td>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.</td>
</tr>
<tr>
<td>ENGL 108K</td>
<td>Literature and Science</td>
<td>A study of literature of various kinds and from various periods in which writers have dealt with science and shown the influence of technology on human life.</td>
</tr>
<tr>
<td>ENGL 108L</td>
<td>Shakespeare</td>
<td>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.</td>
</tr>
<tr>
<td>ENGL 201</td>
<td>The Short Story</td>
<td>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.</td>
</tr>
<tr>
<td>ENGL 202A/B</td>
<td>The Bible and Literature</td>
<td>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.</td>
</tr>
<tr>
<td>ENGL 203</td>
<td>Introduction to Folklore</td>
<td>An introduction to the scope and aims of folklore, together with a survey of the major types of folklore in the English tradition from nations of the English-speaking world. Topics such as oral literature, myth, legend, tale, and marchen will be discussed.</td>
</tr>
<tr>
<td>ENGL 204</td>
<td>Introduction to Folklore</td>
<td>Similar to 203 but dealing with folk-drama, ballads, songs, medicines, riddles, chants, proverbs, and charms.</td>
</tr>
<tr>
<td>ENGL 205R</td>
<td>The Canadian Short Story</td>
<td>The Canadian short story, from its beginnings - in the bush, in the north, on the land, in the small towns -through the struggles of an urbanizing society to the present. Students will be expected to work in some depth with individual authors. Note: R Courses are administered by Renison College.</td>
</tr>
<tr>
<td>ENGL 208</td>
<td>Literary Genres and Themes</td>
<td>Forms of Fantasy This course will deal with the history and forms of fantasy written for adults. In considering the genre, related forms like the romance, the fairy tale, the fable, and the gothic horror story will be discussed. Authors such as Morris, C.S. Lewis, Tolkien, Williams, and White will be studied.</td>
</tr>
</tbody>
</table>
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 208D 0.5
Modern Satire
The mode of satire in the fiction, drama, poetry and discourse of the 20th century. Particular attention to the literary works of Waugh, Huxley, Orwell, Parker, Heller, Hiebert, and a dramatist of the absurd, but also attention to satiric cartoons and nightclub satire.

ENGL 208E 0.5
Women Writers of the 20th Century
A study of such major 20th-century women writers as Woolf, Hellman, Murdoch, McCarthy, Lessing, 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 208Q 0.5
Ordered Chaos: The Apocalyptic Vision in Literature
A study of dehumanized worlds in fiction that can be called "apocalyptic". Works by such writers as St. John the Divine, Shakespeare, Mary Shelley, Aldous Huxley, Mordecai Richler, and Kurt Vonnegut will be studied.

ENGL 211/212
The Novel
The novel, by its nature, constitutes an attempt to formulate and to interpret the bewildering human experience. This course undertakes an exploration of the forms that attempt can take. British, Canadian, and American novels will be studied. The two halves of the course may be taken independently.
Also offered at St. Jerome's College.

ENGL 211 F 0.5
The Novel 1
A study of the novel in English from its beginnings to the late 19th century. Also offered at St. Jerome's College.

ENGL 212 W 0.5
The Novel 2
A study of the novel in English from the late 19th century to the present. Also offered at St. Jerome's College.

ENGL 214 0.5
Themes in Canadian Literature
The course will survey a theme which is significant to the understanding of the Canadian literary mind. Topics will vary from section to section. Also offered at St. Jerome's College.

ENGL 215 0.5
Canadian Regional Literature
The course will provide a survey of literature written about a distinctive region of Canada.

ENGL 232 0.5
The Development of Drama to 1660
A study of the origins and development of English drama, with special concentration on 16th-century non-Shakespearean drama.

ENGL 233 0.5
Drama from 1660
A study of the principal playwrights, plays, and movements in dramatic history from the re-opening of the theatres in 1660 to the present day.

ENGL 234/334
The Practice and Theory of Criticism
The study and practice of skills needed for a close, analytical reading of literary texts and for the writing of critical analyses on them; studies of theories concerning literature and literary criticism.
Also offered at St. Jerome's College.

ENGL 251A 0.5
The Practice and Theory of Criticism 1
The first half of ENGL 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 305 Y 1.0
Old English
An introduction to the literature and language of pre-Conquest England. The principal literary methods, themes, and types of English literature up to the 12th century constitute the material of study in this course.
Also offered at St. Jerome's College.

ENGL 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
A Study of the minor poems of Chaucer, "The Book of the Duchess", "Parliament of Fowls", and "Trostus", along with related Middle English texts
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 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 316 0.5
Canadian Drama
A study of plays by such dramatists as
Merrill Denison, Robertson Davies, Gratien Gélinas (in translation), James
Heaney, John Coultier, George Hyia, and Michel Tremblay (in translation).
Background for 20th-century drama will be provided in lectures.
(Cross-listed with 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 333 0.5
Contemporary British Literature
Not offered in 1982-83.

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 one or two 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, Styrson, Grau,
O'Connor, Wright, and Ellison.
Prereq: ENGL 343 or consent of
instructor.

ENGL 346 W 0.5
American Fiction
Special emphasis will be given to the
works of two or three major American
novelists such as Herman Melville and
William Faulkner.
Prereq: 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, Herrick,
Herbert, Vaughan, and Marvell and to
the prose works of Bacon, Burton, and
Browne. Approximately half the course
will be devoted to an intensive study of
Milton's English poetry and a selection of
his prose works.
Also offered at St. Jerome's College.

ENGL 350F 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 364/365/366
Selected Studies
Designed to provide a study in depth of
problems and/or authors selected by
the instructor. Students interested in
initiating such courses are encouraged
to do so by bringing their ideas to the
attention of individual instructors.
Prereq: consent of instructor.
Also offered at St. Jerome's College.

ENGL 373A/B
An Introduction to the History of
English
The process of linguistic change as
exemplified in the development of the
English language form its origins in
Indo-European and Germanic through
modern dialects. Traditional, structural
and generative approaches will be
employed.
Also offered at St. Jerome's College.

ENGL 373 A F 0.5
A 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
ENGL 375A/R
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 grammar ranging from the traditional to the structural and transformational-generative.
Also offered at St. Jerome's College.

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.
Also offered at St. Jerome's College.

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.
Also offered at St. Jerome's College.

ENGL 376R
Our Changing Language: Syntax and Semantics 1
Not offered in 1982-83.

ENGL 377R
Our Changing Language: Syntax and Semantics 2
Not offered in 1982-83.

ENGL 386R F 3C 0.5
Twentieth-Century Literature 1
A survey of writing in the age of anxiety with particular focus on the, psychoanalytic novel. The concept of the anti-hero in the various approaches. Emphasis will be placed on the satirical, emotional and intellectual writing in novels by Graham Greene, Aldous Huxley, D.H. Lawrence and Evelyn Waugh.

ENGL 387R W 3C 0.5
Twentieth-Century Literature 2
The course complements ENGL 386R by studying the same topics in relation to modern dramas generally classified under the title of "The Theatre of the Absurd".
Note: R courses are administered by Renison College.

ENGL 410A/B
Restoration and Eighteenth-Century Literature
An historical and critical study of the principles and practice of the English Romantic authors from Blake to Keats, with primary emphasis on poetry.
Also offered at St. Jerome's College.

ENGL 415 0.5
Major Canadian Writers
An intensive study of the work of two or three major Canadian authors. Writers who may be studied include Morley Callaghan, F.P. Grove, Robertson Davies, A.M. Klein, Thomas Haliburton, Irving Layton, Margaret Atwood, and Margaret Laurence.
Also offered at St. Jerome's College.

ENGL 430A/B
The Romantic Movement
An historical and critical study of the poetry and critical theory of Blake, Wordsworth, and Coleridge. Emphasis is primarily on poetry; selected minor writers may be considered.
Also offered at St. Jerome's College.

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.
Also offered at St. Jerome's College.

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). Prerequisite 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 451A F 0.5
Literature of the Victorian Age 1
An historical and critical study with emphasis on the 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 460A F 0.5
British Literature, 1885-1914
A study of works by such writers as Shaw, Conrad, and Yeats.
Also offered at St. Jerome's College.

ENGL 460B W 0.5
British Literature, 1914-1945
A study of works by such writers as James Joyce, D.H. Lawrence, and T.S. Eliot.
Also offered at St. Jerome's College.

ENGL 495 Y 1.0
Supervision of Honours Essay

Course Descriptions

Faculty of Environmental Studies

There are a number of courses offered in the Faculty of Environmental Studies of an integrative nature which extend across the academic interests of the four units: School of Architecture, Department of Geography, Department of Environmental Studies, and School of Urban and Regional Planning. The courses are of general interest and are open to all students in the University. There is no Department of Environmental Studies. Students interested in this area are urged to consult the course offerings of the four individual units mentioned above. These four departments/schools offer a variety of related courses allowing in-depth studies of topics covered in the Environmental Studies courses.

The following persons have wide ranging interest and hence have been appointed to the Faculty of Environmental Studies rather than to a specific Department and/or School:

Professor
C.K. Knapper, BA Hons (Sheffield), PhD (Saskatchewan)
PH. Nash, BA, MA (UCLA), CE (Grenoble), MCP, MPA, PhD (Harvard), MCIP, AICP

Associate Professors
D. Eotrin*, BA, LLB (Alberta) (part-time)
R.T. Newkirk*, BA, MSc, PhD (Western Ontario) (on Sabbatical Leave 1982-83)
D.H. Wood*, BComm, LLB (Toronto) (part-time)

Assistant Professor
M.E. Haigh*, BSc, MSc, PhD (McMaster)

Adjunct Professor
M.M.R. Freeman, BSc (Reading), PhD (McGill)

Adjunct Lecturers
K. Elliott, Diploma Creative Arts
D.G.E. Wicken, Diploma AA

Faculty members with cross and/or joint appointments as shown:
1Environmental Studies and Psychology
2Environmental Studies and Planning
3Environmental Studies and Man-Environment Studies
4Environmental Studies, Planning, Biology and Health Studies

Course Descriptions

ENVS 195A F 3C 0.5
Introduction to Environmental Studies
An introduction to the study of the environment, the ecological principles, and the interrelationships between man and his environment. The course will provide an understanding of the relationship between people and their environment.

ENVS 195B F 3C 0.24 0.75
Field Ecology
An introduction to the study of the environment, the ecological principles, and the interrelationships between man and his environment. The course will provide an understanding of the relationship between people and their environment.

ENVS 201 F.W 3C.15S 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 - EnvS 401 and EnvS 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.

ENVS 202 W 1C.2L 0.5
Environmental Studies
Social Science Approaches to Environmental Problems
Research strategies for the understanding and resolving of environmental problems, based upon concepts and methods derived from the social and behavioural sciences. Particular attention is given to determining the appropriate mix of research strategies for a range of problem situations in terms of data validity and reliability, time and financial constraints, and ethical considerations. Prereq: 2nd year or consent of instructor.

ENVS 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. Prereq: ENV S students; others with consent of instructors.

ENV S 253 W 3C 0.5 Media Tools for Environmental Studies - Advanced Level
Builds on work performed in the basic course. Photographic colour theory and practice, basic audio recording, editing and production, and presentation formats are investigated in workshop situations. A major project is developed using pre-research material assigned by the instructor. Students work in small groups to produce a slide-sound program of environmental concern. Prereq: ENV S 252.

ENV S 271 F,W 3C,1L 0.75 Introduction to Quantitative Research Methods
An introduction to scientific method, descriptive and inferential statistics, sampling design. The course emphasizes the methodological and interpretative problems involved in using selected quantitative methods to investigate selected environmental topics. Prereq: only for students in Environmental Studies.

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. Prereq: ENV S 271.

ENV S 310 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 exploration of the methods of social science suitable for the study of environmental behaviour and the substantive findings from such applications. Prereq: Second, third or fourth year students only.

ENV S 333 W 0.5 Parkland Management
Systems planning, master planning and site planning for Ontario’s non-urban parks. Design and management for linear open space, such as rivers, trails, and coasts. Environmental assessment as it relates to amenity resources. Evaluating the effectiveness of the public participation process. Prereq: Consent of instructor.

ENV S 358 W 3C 0.5 Environmental Pollution and Its Control
Societal trends affecting pollution generation. Chemical basis of pollutant behaviour. Specific problem areas such as municipal, industrial, and nuclear waste disposal, occupational disease, and agricultural chemicals. Some topics presented via guest lecturers or films. No prereq.

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. Prereq: 3rd and 4th year students in Environmental Studies; enrollment is by research team only with representatives from at least 3 units of the faculty (max. 7 people) and subject to selection of an advisor and a satisfactory project or research proposal.

ENV S 401 F 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. Prereq: ENV S 201.

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, the provincial cabinet and the Niagara Escarpment Commission in the planning process will be discussed. Prereq: ENV S 201.

ENV S 411 F 3S 0.5 Alternative Future Environments 1
Analysis of “ideal” environments of the past, including “utopian” communities. Scrutiny of current “concepts” of future environments, including distillation of works of Bell, Clarke, Commoner, de Chardin, de Jouvenel, Dror, Doxiadis, Ehrlich, Forrester, Fuller, Kahn, Mead, Meadows, McHale, Michael, Polak, Thobald, Thompson, Toynbee, and Ward. Prereq: 3rd or 4th year standing or consent of instructor.

ENV S 412 W 3S 0.5 Alternative Future Environments 2
Examination of “issues” in futuristics and their “methodological” problems, with particular attention to resources utilization. Socio-Cultural Change Theory and Policy Science. Science fiction, Extrapolation, and Technology Forecasting, Societal Indicators, Quality of Life, and Technology Assessment. Probable and Possible Urban Futures. Prereq: ENV S 411 or consent of instructor.

ENV S 417 F 3S 0.5 Land Use History and Landscape Change 1
Literature, theory and method relating to man’s effects on landscapes and ecosystems. A human ecological approach. Case studies and field work. Prereq: Consent of instructor.

ENV S 418 W 3S 0.5 Land Use History and Landscape Change 2
Research on literature, theory and method relating to man’s effects on landscapes and eco-systems. Prereq: ENV S 417 and consent of instructor.

ENV S 444 F 3C,2L 0.10 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 sustainable 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: 4th year students or consent of instructor.
Course Descriptions

Fine Arts

Department of Fine Arts

Professor, Chairman
A.M. Urquhart, BFA (Buffalo)

Professors
V. Burnett, BS (Columbia), MA (California)
N.L. Patterson, BA (Washington)

Associate Professor
D.I. MacKay, BFA (Mt. Allison), MFA (Cornell)

Assistant Professors
A. Green, BFA (Art insit. of Chicago)
B. Irland, BFA (Illinois), MFA (Massachusetts)
E. Kiman, MA, PhD (Toronto)
A. Roberts, BA (Guelph), MA (Claremont)
J. Uhde, MA (Purkyne's University Brno), PhD (Waterloo)

Adjunct Professor
P. Swann

Adjunct Associate Professor
M. Bird, BA, MA, PhD (Iowa)

Course Descriptions

FINE 110 F 3C 0.5
Introduction to World Art 1
A comparative survey of Prehistoric and Ancient Art, and of Oriental, African, New World and Oceanian Art, emphasizing visual form as an expression of its historical and cultural context.

FINE 111 W 3C 0.5
Introduction to World Art 2
A comparative survey of Western Art from the Classical to the Modern period, emphasizing visual form as an expression of its historical and cultural context.

FINE 120 F,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 two and three dimensional materials and media. Lab fee.

FINE 121 W 6std 0.5
Fundamentals of Visual Art 2
A continuation of FINE 120 with emphasis on colour. Prereq: FINE 120

FINE 210 F 3C 0.5
Modern Art 1
An examination of the history of Modern Art from the late 18th century up to the time of impressionism.

FINE 211 W 3C 0.5
Modern Art 2
A continuation of FINE 210, commencing with impressionism and proceeding through the major trends of the early 20th century up to the contemporary period.

FINE 212 F 3C 0.5
Italian Renaissance Art 1
A survey of painting, sculpture, and architecture, especially in Florence and Siena, starting with Giotto and his contemporaries and covering innovations in perspective, anatomy, and iconography through the end of the 15th century.

FINE 213 W 3C 0.5
Italian Renaissance Art 2
A continuation of FINE 212 starting with the masters of the High Renaissance, Leonardo, Raphael and Michelangelo, and proceeding through Mannerism, Baroque and Rococo in Florence, Venice and Rome.

FINE 216 F 3C 0.5
Northern Renaissance and Baroque Art 1400-1700
The survey concentrates on artistic developments in Northern Europe, with reference, where appropriate, to the art of Italy.

FINE 217 0.5
Medieval Art and Architecture 400 A.D.-1400 A.D.
Offered alternate years.

FINE 218 0.5
Western Religious Art
Admission by consent of instructor.

FINE 220 F 6std 0.5
Fundamentals of Painting 1
An exploration of the problems and possibilities of painting as a vehicle for serious creative expression. The fundamentals of composition and painting techniques will be presented through a series of studio projects. Lab fee. Prereq: FINE 120/121 or consent of instructor.

FINE 220A F 6std 0.5
Watercolour Painting
An exploration of the technique of watercolour painting as a means of creating both non-objective and representational forms on a two-dimensional surface. Lab fee. Prereq: FINE 120/121.

FINE 221 W 6std 0.5
Fundamentals of Painting 2
A continuation of the studio projects begun in Fine Arts 220 with a greater emphasis on the development of individual expression. Lab fee. Prereq: FINE 220 or consent of instructor.

FINE 222 F 6std 0.5
Fundamentals of Sculpture 1
An introduction to 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. Lab fee. Prereq: FINE 120/121.

FINE 223 W 6std 0.5
Fundamentals of Sculpture 2
An introduction to multi-media sculpture. Additive and subtractive use of wood, metal and plaster casting, together with a mastery of three-dimensional forms in a variety of media. Lab fee. Prereq: FINE 222.

FINE 223A
Clay Studies from the Human Form
Not offered 1982-83.

FINE 224 F,W 4std 0.5
Introduction to Drawing
Half the time will be devoted to drawing from the model and the remainder to a series of drawing concepts. At least one field trip will be included. Art Gallery of Ontario or the Albright Knox in Buffalo. Lab fee. Prereq: FINE 120/121.

FINE 225 W 6std 0.5
Analytical Figure Drawing
Analytical figure drawing from the model will be combined with a study of human anatomy for artists. Lab fee. Prereq: FINE 120/121.

FINE 226
Printmaking
Introduction to materials and methods of printmaking. Current offerings are given below.

FINE 226A W 4std 0.5
Printmaking (Intaglio)
An introduction to basic intaglio techniques including etching and engraving through workshops, class demonstrations and field trips. Lab fee. Prereq: FINE 120/121 or consent of instructor.
FINE 226B 0.5
Printmaking (Relief)
Offered in Alternate Years.

FINE 226C 0.5
Printmaking (Screen)
Offered in Alternate Years.

FINE 227 0.5
Scientific Drawing
Offered in Alternate Years.

FINE 228
Applied Arts
The history, design and practice of various applied arts will be explored in slide lectures and studio projects. Specific arts will vary from year to year; current offerings are given below.

FINE 228D F 3std 0.5
Applied Graphics
A studio course using applied graphics techniques, including illustration, typographic composition, and perspective drawing. Methods of preparing work for reproduction will also be explored.

FINE 228E W 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, documentation, serigraphy, photo-realism and mixed media. Intended for Fine Arts majors. Supplies at student’s expense.
Prereq: FINE 120/121

FINE 229A F 4std 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 120/121

FINE 232W F 0.5
The Film as a Modern Medium
A study of the technical problems of filmmaking, leading to the writing, production and editing of a silent film. This is a WLU course for Film Studies Majors/Minors only.

FINE 233W W 0.5
Sound and Colour in Film
A study of the principles of sound recording for film and of the colour laboratory and its techniques. The students will produce a short colour-sound film.
Prereq: FINE 232W, any other film course or consent of instructor. This is a WLU course for Film Studies Majors/Minors only.

FINE 242W F 0.5
Canadian Film
A study of Canadian Film, from 1895 to the present, based on the screening and analysis of selected films. This is a WLU course for Film Studies Majors/Minors only.

FINE 244 F D.C 0.5
History of Film 1
General history of world cinema in its silent era (1886-1929), covering the work of outstanding directors, important movements and the contribution to the film medium as an independent art form. (Regular screening of a variety of films. Film Fee.

FINE 245 W DMC 0.5
History of Film 2 - Sound Film
A continuation of FINE 244. The expression of film history into the sound era (since 1929) including the most recent period. (Regular screening of a variety of films.) Film fee.
Admission by consent of instructor.

FINE 246 F 2C.1D 0.5
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 with RS 260. Film fee: $5.

FINE 247 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 with RS 267. Film fee: $5.

FINE 248R W 2C.1D 0.5
Film as Social Criticism
Cinema as “prophetic voice,” exploring the films of various directors as they pertain to selected themes which include technology and dehumanization, individual and collective goals, social realities and dreams, and the quest for individual and cultural identity. Film fee $5.00.

FINE 310 3C 0.5
Greek Art and Architecture (C CIV 351)
A survey of the art and architecture of the ancient Greek world from the Minoans to the Hellenistic periods. Consult Classical Studies.

FINE 311 3C 0.5
Roman Art and Architecture (C CIV 352)
A survey of the art and architecture of the Roman world from Etruscan to imperial times. Consult Classical Studies.

FINE 313 0.5
Special Topics in 19th Century Art
Offered in Alternate Years.

FINE 316 0.5
Canadian Native Art
Admission by consent of instructor.

FINE 317 W 3C 0.5
Canadian Art
An examination of Canadian Art extending through the important styles of settlers, especially from Britain and France, in the seventeenth, eighteenth and nineteenth centuries, to the development of the nationalist styles of early twentieth century, culminating in contemporary Canadian art.

FINE 318 0.5
Canadian Ethnic and Traditional Arts
Admission by consent of instructor.

FINE 319 W 3C 0.5
Contemporary Art
A seminar exploring the contemporary avant garde art movements through critical analysis, historical correlation, discussions with artists and trips to Toronto and New York. Topics covered will include environmental sculpture, conceptual trends, earth works, performance, technology, postal art, and the business aspects of art. No prerequisite.

FINE 319A W 3C 0.5
Special Topics in 20th Century Art:
1900-1940
An in-depth 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 their 4th year honours presentation.
Prereq: FINE 211 or consent of instructor.
FINE 319B F 3C 0.5
Special Topics in 20th Century Art: 1940-1970
A survey of the major movements during the thirty year period following the beginning of World War II, including Op Art, Action Painting, the Beat Consciousness, Happenings, Pop Art, Assemblage, Post-Abstractive Abstraction and Field Painting, and Kinetic and Light Sculpture.

FINE 320 F 6std 0.5
Advanced Painting 1
Drawing upon the experience gained in Fine 220/221, this course will emphasize the student's individual development as a beginning painter, through independent problems, along with class discussions and individual critiques. Lab fee.
Prereq: FINE 220/221 or consent of instructor.

FINE 321 W 6std 0.5
Advanced sculpture 1
A continuation of Fine Arts 320 with a further emphasis on independent problems. Lab fee.
Prereq: FINE 320 or consent of instructor.

FINE 322 F 6std 0.5
Advanced sculpture 2
An exploration of sculpture problems in a variety of media as vehicles for serious creative expression. Wood, metal, glass and soapstone will be used for visual portrayal of spatial ideas. Lab fee.
Prereq: FINE 222/223.

FINE 323 W 6std 0.5
Advanced sculpture 3
Organization and integration of sculptural concepts in clay to develop a series of representational or abstract sculptures. Clay and glaze technology for oxidation stoneware firing will be stressed.
Prereq: FINE 322.

FINE 323A 0.5
Assemblage
Offered in Alternate Years.

FINE 324 F 6std 0.5
Advanced Drawing
A course in which drawing is investigated as a means of expression and communication. The human figure, objects, and the landscape will be studied as sources of artistic imagery. The student will be encouraged to experiment with imagery, to develop personal vision, and to devise individual formal means of expression. Lab fee.
Prereq: FINE 224 or consent of instructor.

FINE 325 W 6std 0.5
Advanced Drawing 2
Continuation of FINE 324.

FINE 326A W std 0.5
Advanced Printmaking
A continuation of printmaking concepts for independent study. Lab fee. Admission by permission of instructor.

FINE 328 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 including Roman, Uncial, Gothic, Italic and Fraktur.

FINE 329 F 3std,C 0.5
Illustration
Studio work in techniques and theory of book illustration, together with slide lectures on the history of printed forms. Prereq: Consent of Instructor.

FINE 344A
Topics in European Film History 1
Alternates with FINE 370 Not offered 1982-83.

FINE 345A
Topics in European Film History 2
Alternates with FINE 371 Not offered 1982-83.

FINE 346R/347R 0.5/0.5
Special topics in Film
Special topics will be announced from year to year.

FINE 370
Film Theory 1 (Motion Picture Language)
Not offered 1982-83.

FINE 371 W D,2std 0.5
Film Theory 2 (Motion Picture Theories)
An extension of FINE 370. The main accent will be placed upon major theories of cinema, such as those of Kracauer, Metz and Eisenstein, and upon the development of the students' own critical expression. The impact of the film medium upon modern society will also be discussed as well as the relationship between film and television. Film fee.
Prereq: FINE 370 or consent of instructor.

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 as it is currently understood. Students will examine methods of formal and stylistic analysis, iconographical interpretation and the application of social and political history to understanding of works of art. Required of all art history majors who take FINE 490/491.
Prereq: Consent of Instructor.

FINE 391 W R 0.5
Selected Subjects in Fine Arts
Admission by consent of instructor. Studio and practice courses under the direction of individual instructors.

FINE 392 F R std 0.5
Selected Subjects in Fine Arts
Admission by consent of Instructor. Studio and practice courses under the direction of individual instructors.

FINE 393 W R std 0.5
Selected Subjects in Fine Arts
Admission by consent of Instructor. Studio and practice courses under the direction of individual instructors.

FINE 399 W R 0.5
Senior Graphics Techniques 1
Admission by consent of Instructor.

FINE 400 W R 0.5
Senior Graphics Techniques 2
Admission by consent of Instructor.

FINE 420 F 4std 0.5
Senior Graphics Techniques 1
Admission by consent of Instructor.

FINE 421 W 4std 0.5
Senior Graphics Techniques 2
Admission by consent of Instructor.

FINE 470
Senior Seminar in Film Concepts 1
Not offered 1982-83.

FINE 471 W 0.5
Senior Seminar in Film Concepts 2
Admission by consent of Instructor.

FINE 472 F R 0.5
Senior Seminar 1
Admission by consent of Instructor.

FINE 473 W R 0.5
Senior Seminar 2
Admission by consent of Instructor.
ASSOCIATE PROFESSORS
J.R. Finn, CR, Associate Professor and Chairman of the Department
W.D. Wilson, MA, PhD (Trinity College, Dublin)

PROFESSORS
A. Ages, BA (Carleton), MA, PhD (Ohio State)
J.R. Finn, CR, BA (Western Ontario), MA (Toronto), PhD (Illinois)
J.L. Myers, VA (Western Ontario), MA, PhD (Johns Hopkins)

ASSOCIATE PROFESSORS
PHH. Dubé, BA, MA (Toronto), PhD (Ohio State)
J.R. Dugan, BA, MA (Toronto), PhD (Yale)

FINE 490  F S.std, R 0.5
Senior Honours Presentation 1
Each student will work under the direction of a Fine Arts faculty member on an advanced creative project. The result of this endeavor will be presented in the form of an exhibition or its equivalent (i.e.: film, illustrated book, portfolio, or essay), which will be examined by faculty members of Fine Arts and also where pertinent, by members of other departments. Required of all students in Honours Fine Arts. Admission by permission only.

FINE 490A  F S.std, R 0.5
Senior General Seminar
As in FINE 490, each student will work under the direction of a Fine Arts faculty member on an advanced creative project, and will participate in group critiques and discussions. 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.

ASSISTANT PROFESSORS
H.S. Fournier, BA (Toronto), MA, PhD (Western Ontario)
R.J. Fournier, BA, MA, PhD (Western Ontario)
D.W. Russell, BA, MA, PhD (Toronto)
P. Socken, BA (Toronto), MA (Iowa), PhD (Toronto)

Sessional Appointments
C.A. Abbott, BA, MA, PhD (Ohio State)
M. Hennig, BA (Western Ontario), MA (Waterloo)

Lecturers
M. Adriaen, BA, MA (Toronto), DEA (Paris)
N. Vassiliadis, Baccalauréat és Arts, Licence és Lettres (Laval), MA (Toronto)

Waterloo at Laval
There is an arrangement between the Department and the Université Laval, at Québec, whereby Waterloo students may study for a year or a term at Laval. Further particulars may be obtained from the Department.

First-Year French Courses
In order that the ability of students in French may be properly assessed, students must consult the Department, which reserves the right to place students of FR 151, 152, and FR 155 into the appropriate course.

Level 1: Courses for Students Who Have Not Completed High School Grade 13 French
FR 151  F.W,S 3C,1L 0.5
Basic French
An elementary French language course designed to give a comprehensive approach to French language study to the beginning student of French. Involves reading, writing and speaking French. Successful completion of FR 151 qualifies a student to take FR 152.

FR 152  F.W,S 3C,1L 0.5
Basic French
A continuation of the work done in FR 151. Successful completion of FR 152 qualifies a student to take FR 153. Prereq: FR 151 or consent of Department. Also offered at St. Jerome's College.

FR 155  3C,1L 0.5
Intensive Review of French
A one-term course which gives intensive review of French language study for students who do not have the equivalent of Ontario Grade 12 French or consent of the Department. Not open to students who have completed FR 151/152. Students who complete FR 155 may enrol in FR 192A or FR 196.

French for Reading Knowledge
Intended for students who have never had French before. Students must have an adequate knowledge of the English language to enroll in FR 198 and FR 199.

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. Prereq: Consent of Department.

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.

Level 2: Courses for students who normally have completed High School Grade 13 French, or who have otherwise acquired an equivalent command of French.

Students wishing to enrol in these courses will be required to take the French Language Placement Test administered by the Department at the beginning of the Fall term. The Department reserves the right to refuse admission to any of its language courses on any level to a student who has, in the Department's view, attained a level of competence either inferior to or superior to the levels of competence outlined in each course description.
Successful completion of FR 192 or FR 192B or FR 195/196 automatically entitles the student to register in the General or Honours Degree program in French. Students intending to do Major or Honours programs in French are urged to do both FR 192 and FR 195/196.

FR 192 Y 4C, 1L 1.0
French Language
A very intensive French language course, taught in French. Emphasis will be placed on strengthening oral expression, comprehension of spoken French, reading and writing skills. Taught in French.
Prereq: Grade 13 French, FR 152, 155 or consent of the Department. Also offered at St. Jerome's College.

FR 192A F.W 4C, 1L 0.5
French Language
Fall term of FR 192; see note below.

FR 192B W 4C, 1L 0.5
French Language
Winter term of FR 192; see note below.

Note
These term courses are available only to students in the Co-operative system or with the permission of the Department.

FR 195 F 3C 0.5
French Literature 1
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 II
A study of various critical approaches and their application to French literature, with emphasis on the literature of France. A continuation of French 195. Taught in French.
Prereq: Grade 13 French or equivalent, FR 152, 155 or consent of Department.

Second-Year French Courses
Area Numbering System

FR 409-419 Medieval Language or Literature
FR 420-429 Renaissance Literature
FR 230-239, 17th Century French 330-339 Literature
FR 430-439, 18th Century French 440-449 Literature
FR 253-259, 19th Century French 350-359 Literature
FR 360-369, 20th Century French 460-469 Literature
FR 270-279, French-Canadian 370-379 Literature
FR 203, 303, French 403 Linguistics
FR 409-419, 20th Century French 460-469 Literature
FR 270-279, French-Canadian 370-379 Literature
FR 203, 303, French 403 Linguistics
Note 1
Please refer to the degree requirements outlined in the Faculty of Arts Program Section, Chapter 8.

Note 2
Students registered in the General French degree program must complete one term course in at least three of the areas listed above, as well as FR 300 or its equivalent.

Note 3
Students registered in the Honours French or Honours French (Applied Studies Co-op) degree program must complete one term course in at least six of the areas listed above, as well as FR 401/402 or their equivalent.

Note 4
Students registered in a Joint Honours program combining French with another subject must complete one half-credit in at least five of the above areas, as well as FR 401/402 or their equivalent.

Language
Note
French Honours and Major students are required to take FR 251. In addition one of FR 207/208, FR 252, or FR 255 must be taken for credit towards the Major or Honours program; however, the student should note that only one of FR 207/208, FR 252, or FR 255 may be counted as credit toward the area of specialization.

FR 205 F.W,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.
Prereq: FR 192. 195/196. 206. 251 or consent of Department.

FR 207 F.W,S 3C, 1L 0.5
Spoken French
Advanced level for continued intensive oral and aural training in the classroom. There will be particular emphasis on comprehension and conversation, with the class being divided into small groups for practice in speaking.
Prereq: FR 192, 195/196, 206, 251 or consent of Department.

FR 208 F.W,S 3C, 1L 0.5
Spoken French
Continuation and completion of work begun in FR 207.
Prereq: FR 207 or consent of Department.

Note
Each classroom section of FR 205, 206, 207, 208 will be limited to a maximum enrollment of 15 students.

FR 210 2C 0.5
Report Writing in French
This course is designed to give students practice in the research, organization and the writing of a variety of reports in the French language.
Prereq: FR 192. 195/196 or consent of Department.

FR 251 F 3C, 1L 0.5
French Language
Continued training in spoken and written French, with emphasis on more difficult problems of the language. Taught in French.
Prereq: French 192, 195/196 or consent of Department.

FR 252 W 3C, 1L 0.5
Written and Spoken French
Training in spoken and written French.
Prereq: French 251 or consent of Department.

FR 255 2C, 1L 0.5
Business French
An intensive course designed to enable the student to carry on standard business practices in spoken and written French.
Prereq: FR 192, 195/196 or consent of Department.

FR 203 W 3C 0.5
Introduction to the Phonetics of French
The essential practical objectives of this course will be to present the complete phonetic system of contemporary French.
Course Descriptions
French

French, including the system of intonation, and to study the relationship between the spoken and written forms of the language. Taught in French. Prereq: FR 192 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 232 W 3C 0.5
Topics and Problems in Seventeenth Century French Literature
A more detailed study of writers/works of the classical period. Taught in French. Prereq: FR 192, 196, or consent of Department.

FR 250 F 3C 0.5
Survey of Nineteenth Century French Literature
This course will trace the development of French Literature from the French Revolution to the end of the nineteenth century. Taught in French. Prereq: FR 192, 196, or consent of Department.

FR 254 W 3C 0.5
Topics and Problems in Nineteenth Century French Literature
This course will study in depth one genre of the nineteenth century. Taught in French. Prereq: FR 192, 196, or consent of Department.

FR 273 W 3C 0.5
Aspects of Québec
A presentation of traditional and contemporary Quebec in the fields of the Arts, literature, music, politics and society. Taught in French. Prereq: FR 192, 196 or consent of Department.

FR 275 3C 0.5
Contemporary French-Canadian Novel
A study of a limited number of texts by authors such as Gabrielle Roy, Anne Hébert, Jacques Godbout, André Langevin, Hubert Aquin, Gerard Ressette. Taught in French. Prereq: FR 192, 196 or consent of Department.

FR 291 F 3C 0.5
French and French-Canadian Civilization 1
This course traces the cultural development of France and Québec from their origins to the beginning of the Napoleonic Empire. Emphasis is given to the study of music, art, architecture, literature, ideas and "daily life" in their historical context.

Note
This course will be taught in English. It is open to Arts students in second year and higher, and to others in any year. Open to students majoring or honouring in French only with the permission of the Department.

FR 292 W 3C 0.5
French and French-Canadian Civilization 2
This course completes the study of the cultural development of France and French Canada to 1900. After that the course emphasizes a study of life in these two areas today. Considerable attention will be paid to art, politics, industry, etc. Prereq: FR 291 is recommended.

Note
See note under HH 291.

Advanced Level French Courses

FR 300 Y 3C.1L 0.5
French Language
Advanced grammar and composition, including translation; oral practice and corrective phonetics. Taught in French. Prereq: FR 250, 252 or consent of Department.

FR 301 F,W 3C.1L 0.5
French Language
Fall term of FR 300; see note below.

FR 302 F,W 3C.1L 0.5
French Language
Winter term of FR 300; see note below.

FR 310 2C 0.5
French for Accounting
This course will provide students with the vocabulary, style and syntax to carry on basic accounting in French. Prereq: FR 192, 196, or consent of Department.

FR 311 2C 0.5
Legal French
This course will provide students with the vocabulary, style and syntax required to understand as well as to write legal documents in French. Prereq: FR 192, 196, or consent of Department.

Note
A student registered in the General French or Honours French degree programs may include FR 310 and FR 311 as non-French electives. These courses may not be counted as one of the French courses required to complete the major.

FR 401 F 0.5
Advanced Language Study
Consult the Department for further details of this course. Prereq: FR 300, 302 or consent of Department.

FR 402 W 0.5
Advanced Language Study
Consult the Department for further details of this course. Prereq: FR 401 or consent of Department.

FR 501 F 0.5
Problems of the French Language
Advanced training in stylistics and in problems of translation. Admission to the course by permission of the Department only.

FR 502 W 0.5
Problems of the French Language
Advanced training in stylistics and in problems of translation. A continuation of FR 501. Admission to the course by permission of the Department only.

Literature and Linguistics Courses

FR 303 F 3C 0.5
Introduction to Linguistics
This course will introduce students to a basic theoretic reflection on language. Beginning with an analysis of various linguistic studies dealing with French, it will present the basic terminology of contemporary linguistics in the areas of phonology, morphology and syntax. Taught in French. Prereq: FR 250, 252 or consent of Department.
FR 342 F 3C 0.5
Survey of Eighteenth Century French Literature
This course will trace the development of French literature from 1700-1800. Taught in French.

FR 343 W 3C 0.5
Topics and Problems in Eighteenth Century French Literature
A more detailed study of one or more aspects of the Enlightenment. Taught in French.

FR 363 F 3C 0.5
Survey of Twentieth Century French Literature
This course will trace the development of French literature from 1900 to the present. Taught in French.

FR 364 W 3C 0.5
Topics and Problems in Twentieth Century French Literature
A more detailed study of one or more aspects of the modern period. Taught in French.

FR 371 (formerly FR 471) 3C 0.5
French-Canadian Poetry
A study of its evolution from Octave Crémazie to Anne Hébert. Taught in French.

FR 372 (formerly FR 472) 3C 0.5
Contemporary Quebec Theatre
A study of the themes, structures and evolution of contemporary Quebec theatre, based on the principal plays of authors such as: Gratien Gélinas; Marcel Dubé; Yves Thériault; François Loranger; Anne Hébert; Jacques Ferron; Jacques Langrand; Michel Tremblay. Taught in French.

FR 391 (formerly FR 491) 3C 0.5
French Women Writers
A study of selected works by women writers in France from the Middle Ages to the twentieth century. The course will focus on the literary quality of these works and on their value as reflections of the position of women in French society throughout the period. Taught in French.

FR 403 (formerly FR 492) 0.5
Introduction to Linguistic Thought
A general introduction to modern linguistic thought as developed principally by Saussure and his successors, the Prague School and the Structuralists, as well as the new tendencies in linguistics (socio-linguistics, pragmatics, discourse analysis). Taught in French.

FR 409 F 3C 0.5
Medieval French Language
Introduction to the early development of French. Offered at St. Jerome's College.

FR 410 W 3C 0.5
Medieval French Literature
An introduction to French literature of the Middle Ages through the study of representative texts, including excerpts from the epic, courtly and satirical works. Taught in French.

FR 421 0.5
French Prose of the Renaissance
Readings in sixteenth century literature: Rabelais, Montaigne, etc. Taught in French.

FR 422
French Poetry of the Renaissance
Not offered in 1982-83.

FR 482 F 3C 0.5
Study of Individual Authors
Each year a different author is the subject of specialized study to permit an in-depth exploration of his literary qualities. Taught in French.

FR 483 W 3C 0.5
Literary Criticism
The theoretical and practical study of a major trend or number of trends in contemporary French literary criticism. Taught in French.

FR 490-496 0.5
Study of Individual Authors
Not open to Year 1 students.

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 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.

GEN E 115 F 2C,4L 0.75
Engineering Concepts
An introduction to some of the basic methods and principles used by engineers including fundamentals of graphics, projections, spatial coordinate plotting, free-hand sketching, vector graphics.

GEN E 121 W,S 3C,2T 0.5
Digital Computation
Introduction to electronic digital computers, hardware and software organization: basic features of FORTRAN IV; examples of efficient numerical algorithms for basic scientific computations.

GEN E 123 W,S 3C,1T, 3L (4 times/term) 0.5
Electrical Engineering
Introduction to electric charge and fields: ac circuit analysis; Kirchhoff's circuit laws; two ports and op-amps; capacitance, induced voltage; introduction to motors and their characteristics. (For year 1 Chemical, Civil and Geological Engineering students).

GEN E 124 W,S 3C,1T, 3L (4 times/term) 0.5
Electrical Engineering
Introduction to electric charge and fields: ac circuit analysis; Kirchhoff's circuit laws; two ports and op-amps; capacitance, inductance and impedance; magnetic force and induced voltage. Semiconductors. Instrumentation. (For Year 1 Mechanical Engineering students.)
Department of Geography

Associate Professor. Chairman of the Department
C.R. Bryant, BA, PhD (London)

Professor. Associate Chairman
R.E. Preston, BA (Central Washington), MA (Washington), PhD (Clark)

Professor, Dean of Environmental Studies
J.G. Nelson, BA (McMaster), MA (Colorado), PhD (Johns Hopkins)

Professor, Associate Dean
(Senior Lecturer) Graduate Officer
W.B. Mitchell, BA, MA (British Columbia), PhD (Clark)

Professor, Associate Professor
A.D. Van, BA (Wayne State), MA (Clark), PhD (London) (on Sabbatical Leave, 1982-83)

Research Associates
E. Preston, BA. MA, PhD (London) (on Sabbatical Leave, Winter Term, 1982-83)

Course Descriptions

Introduction to Human Geography
A survey of human geography through a survey of some of the concepts, methods, techniques and applications of geographical analysis to human cultural pattern. Directed towards the man-land theme and the location analysis theme.

Introduction to Physical Geography
Emphasis on the natural environment as an integrated system of which it is a part. Selected aspects of weather, climate, water, soils, biota, landforms along with the flows of energy, water and matter and their resultant effects on the subsystems of the natural environment are studied.

Introduction to the Field of Geography
The goals of this course are to introduce first year geographers to Geography as a profession, different approaches to solving geographical problems, research report writing, and to the Geography program at the University of Waterloo. Prereq: Geography Majors only or students intending to major in Geography.

ENVS 111
Introduction to the Study of the Future
Course Descriptions for Environmental Studies courses (ENV S) begin on page 308.
ENV S 198
Introduction to Environmental Problems

ENV S 200
Field Ecology

ENV S 201
Introduction to Environmental and Planning Law

GEOG 201 W,S 2C,2L 0.75
Some Basic Topics of Physical Geography
Further studies of energy and matter flows in the atmosphere and on the land. Specific topics include radiation, energy and circulation regimes of the earth-atmosphere system and the dynamics and morphology of earth structures, stream systems and glacial landform systems. Prereq: GEOG 102.

ENV S 202
Social Science Approaches to Environmental Problems

GEOG 202 F,S 3C 0.5
Some Basic Topics of Economic and Urban Geography
An analysis of the locational structure of economic activities in the overall context of regional development and with the use of case studies. Basic concepts and tools are explained; these are used to analyse the location structure of primary, secondary and tertiary activities. Prereq: A 1st year human geography course.

GEOG 203 W 2C,2L 0.75
Some Basic Topics of 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,S 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
Africa
Not offered 1982-83.

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 inter-relationships. Utilization of natural resources, the effects of increasing population density, the occupancy and utilization of urban and rural lands, and the effects of man's tools, techniques and institutions on the earth's surface.

GEOG 221 F 3C 0.5
The United States
Focuses on population shifts, environmental issues, and regional economic development in the context of the nation and selected regions.

GEOG 225R
Urbanization in the Third World
Not offered 1982-83.

GEOG 226R F 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
Geography of Population
Not offered 1982-83.

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.

ENV S 252
Media Tools for Environmental Studies

ENV S 253
Media Tools for Environmental Studies - Advanced Level

GEOG 260 F,W 2C,2L 0.75
Introduction to Cartography and Map Analysis
Basic concepts involved in the analysis and use of existing types of cartographic products. Background theory of the production and reproduction of topographic and thematic maps, including historical development, collection of data and symbolization.

ENV S 271
Introduction to Quantitative Research Methods

GEOG 272
Computer Programming in Environmental Studies

GEOG 275 F,W 2C,2L 0.75
Introductory Air Photo Analysis and Remote Sensing
Basic techniques of handling air photos, viewing them stereoscopically (in 3D), identifying and describing features, making measurements and general use in the broad field of geographic and environmental studies. Introduction to specialized types of air photos, satellite imagery and remote sensing techniques. Lab fee $10-$15.

GEOG 300 F 2C,4flab 0.75
Geomorphology and the Southern Ontario Environment
Emphasizes field work and field trips in exploring the evolution of Southern 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. Lab fee $10-$15. Prereq: GEOG 201, or consent of instructor. Third and Fourth Year Students only.

GEOG 301 S 3C 0.5
Climatology

GEOG 302 F 2C,2L 0.75
Geomorphological Process
The impact of processes in landform development and modification. Techniques of measurement particularly as they show the impact of changes under different climatic conditions and processes connected with glaciation and deglaciation, and eolian, karst, coastal and fluvial landforms. Prereq: GEOG 201 or consent of instructor.

GEOG 303 W 2C,2L 0.75
Physical Basis and the Geography of Water
Specific topics include: the earth's water balance and cycle, oceans, lakes and swamps, snow cover, ground ice, glacier ice and streams. Attention is directed to the impact of water on the earth's surface, the role of water in the earth's system, and water as a resource and hazard. Some field work. Prereq: GEOG 201, or consent of instructor.
GEOG 307 F,W 2C,1D 0.5  
Social Survey Techniques  
Social research and the planning process; interview and self-administered surveys; questionnaire design; profile data; sampling; data processing; non-survey data collection techniques; practical applications. Same as Plan 307.  
Prereq: Second or third year Geography students and ENV S 271; other ENV S students with consent of instructor.

ENV S 310  
Behavioural Studies

GEOG 311 F,S 3C 0.5  
Regional Industrial Development  
Manufacturing and transportation in the context of economic development at regional and urban scales. Aims at deepening conceptual insights and fostering appreciation of their relevance to understanding particular areas. Empirical focus on Canada and the U.K.  
Prereq: GEOG 202 or consent of instructor.

GEOG 315 W 3C 0.5  
Agricultural Geography  
The geographical dimensions of agricultural systems. Issues include the diffusion of innovations, regional evolution of agricultural structure and vertical integration. Comparative study of 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. Same as Plan 316.  
Prereq: ENV S 271 or consent of instructor.

GEOG 317 Nonparametric Statistics  
Not offered 1982-83.

GEOG 318 F 3C 0.5  
Spatial Analysis  
Advanced quantitative analysis and sampling in a spatial context. A selection of techniques from gravity models, linear programming, nearest neighbor analysis, Markov chain analysis, graph theory, simulations, and trend surface analysis. Same as Plan 318.  
Prereq: ENV S 271 or consent of instructor.

GEOG 319 F 2C,1L 0.5  
Economic and Social Techniques for Regional Planning  
Study and critical appraisal of a selection of descriptive and evaluative regional analysis techniques in common use. Reliability and applicability will be reviewed. Emphasis given to economic considerations of regional development. Discussion of input-output analysis; cost-benefit analysis, planning, programming and budgeting systems; and social area analysis. Same as Plan 319.  
Prereq: ECON 101, 102 or consent of instructor.

GEOG 322 F,W 3C 0.5  
Geographical Study of Canada  
Geographical basis of Canada and Canadian issues. Selected problems relating to nationalism, regionalism, environmental quality, urbanization, regional disparities and resource development.

GEOG 323 F 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 Special Topics in Development of the Third World  
Not offered 1982-83.

GEOG 330 Cultural Geography  
Not offered 1982-83.

GEOG 331 Special Topics in Cultural Geography  
Not offered 1982-83.

GEOG 332 F 3C 0.5  
Special Topics in the Geography of Population  
Detailed study of selected topics of population geography.  
Prereq: 2nd year students or higher.

ENV S 333  
Parkland Management

GEOG 341 F 2C,1S 0.5  
Historical Geography of Canada 1  
The changing geographies of settlement and resource use from the Discoveries to the early nineteenth century.  
Prereq: A second year human geography course or consent of instructor.

GEOG 342 W 2C,1S 0.5  
Historical Geography of Canada 2  
The changing geographies of settlement and resource use in the nineteenth and early twentieth centuries.  
Prereq: A second year human geography course or consent of instructor.

GEOG 345 F 3C 0.5  
Political Geography  
A study of differences from place to place in political phenomena. Subjects covered include the interrelationships of states and nations, centripetal and centrifugal "forces" within states, electoral geography, boundary and frontier problems, the location of capital cities, internal organization of states, external relations, and geopolitics.  
Prereq: A 2nd year human geography course or consent of instructor.

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  
An examination of theories, models, and research procedures dealing with the growth and support of urban centres and city systems. With relationships between aspects of urbanization and regional development, and with analytical techniques useful in studying such topics.  
Prereq: GEOG 202 or GEOG 251 or consent of instructor.

GEOG 352 W 3C 0.5  
The Rural-Urban Fringe of Canadian Cities  
Study of the processes underlying the natural, economic and cultural environments of the rural-urban fringe. Emphasis will be placed on the use, ownership, development and management of land and the interrelationships between the resource base and urban demands on it.  
Prereq: GEOG 202.
GEOG 356 W.S 3C 0.5 Resources Management
Reviews selected theories, methods, and terminology related to economic, behavioural, institutional and decision-making aspects of resources and environmental problems. Lab fee $10-$15.
Prereq: ENV S 271 or consent of instructor.

GEOG 357 F,W 3C 0.5 Conservation and Resource Management
History of the conservation movement; ecological principles of conservation and resource management. Analysis, use and planning of recreational resources. Same as Plan 357. Lab fee $10-$15.
Prereq: ENV S 200.

ENV S 358 Environmental Pollution and Its Control
GEOG 358 W 3C,1L 0.75 Water Planning and Management: Strategies and Experiences
Benchmark theory and principles of comprehensive water planning and integrated river basin management. Selected international to local scale case studies. Lab fee $10-$15.
Prereq: GEOG 356 or consent of instructor.

GEOG 359 W 2C,1L 0.5 Geography of Energy
Discusses issues related to energy resources. The course examines both Canadian (National) energy management problems and international issues such as cartels and relationship between energy and economic development.
Prereq: GEOG 202 or consent of instructor.

GEOG 360 F 1C,2L 0.5 Preparation of Maps and Illustrations
Basic equipment, materials and techniques involved in the practical construction of maps and other forms of cartographic illustrations, including conventional drafting and plotting procedures, symbolization of data, and map editing for reproduction.
Prereq: GEOG 260

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 environments. Lab fee $10-$15.
Prereq: GEOG 275 and either GEOG 201 or EARTH SCI121-122 or SCI 100.

GEOG 376 F 2C,3L 0.75 Environmental Remote Sensing
Theoretical and practical aspects of remote sensing (RS). Interaction between electromagnetic radiation, environmental media and sensors.
Analysis of non-photographic systems like RADAR and LANDSAT. Methods of RS data processing and analysis and the application of RS techniques to studies of physical and human environments. Lab fee $10-$15.
Prereq: GEOG 275

ENV S 380/381 Environmental Studies Workshop
GEOG 381 F,W,S 3C 0.5 The Nature of Geography
Prereq: Any three GEOG credits or consent of instructor.

GEOG 390 F,W,S 2S 0.5 Senior Honours Research Essay Proposal
Participants are responsible for developing a research proposal under the supervision of an appropriate faculty member. Normally taken in the third year.
Prereq: Honours Geography students only; cannot be counted for credit towards a general degree.

GEOG 391 F Fldlab 0.5 Field Research
One week field camp session during which a specific area will be analysed from a geographic point of view.
Students will be expected to undertake individual or group analysis of specific problems and must present the results in a written report.
Prereq: Third Year Honours Geography students only; cannot be counted for credit towards a general degree.
Estimated cost to student: $100-$120.
ENV S 401 Environmental Law
ENV S 402 Planning Law

GEOG 400 Climatic and Periglacial Morphology
Not offered 1982-83.

GEOG 401 F 3S 0.5 Glacial Geomorphology and Some Contemporary Applications
Advanced study of the total effect of glaciation. Glacial and fluvialglacial erosion and deposition and their effects on landscapes will be analyzed. Special attention on the environmental influences of glaciation and on practical applications of glacial geomorphologists' techniques and information.
Prereq: One of GEOG 300, GEOG 302 or EARTH 342.

GEOG 403 Advanced Cartography 1
Not offered 1982-83.

GEOG 404 W 3C 0.5 Advanced Cartography 2
Advanced study of the basic techniques of map production, the theory of cartographic communication and map design. Technical aspects include photomechanics, scribing, process photography, typography, proofing and printing processes. Theoretical topics include the map as a communication system, advanced map design and principles of information selection and generalization. Lab fee $10-$15.
Prereq: GEOG 360

GEOG 406 W 2C,1L 0.5 Tropical Geomorphology
Basic geomorphological concepts and their application in a tropical environment. Special emphasis on morphology and processes as related to the geological foundation.
Prereq: One of GEOG 300, GEOG 302, EARTH 342 or consent of instructor.

GEOG 407 F,S Fldlab 0.75 Field and Lab Techniques in Geomorphology
An analysis of the range of techniques used by geomorphologists. This course will involve intensive field surveying, mapping and laboratory work. There will be a $15 charge per student for field trip expenses.
Prereq: GEOG 300, GEOG 302, EARTH 342 or consent of instructor.

GEOG 408 Special Topics in Climatology and Natural Hazards
Not offered 1982-83.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Description</th>
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<tbody>
<tr>
<td>GEOG 409</td>
<td>Energy Balance Climatology</td>
<td>Not offered 1982-83</td>
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<tr>
<td>GEOG 410</td>
<td>Recreation Geography</td>
<td>The environmental implications of existing and potential recreational demands. Recreational travel, site capability, economic and ecological impact models will be considered as well as the behavioural aspects of amenity resources. Prereq: GEOG 356</td>
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<tr>
<td>ENV S 411</td>
<td>Alternative Future Environments 1</td>
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<tr>
<td>ENV S 412</td>
<td>Alternative Future Environments 2</td>
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<tr>
<td>GEOG 412</td>
<td>Geography of Manufacturing Firms and Industries</td>
<td>Not offered 1982-83.</td>
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<tr>
<td>GEOG 414</td>
<td>Energy Resources Management</td>
<td>Energy management theories and methods 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 359 and either GEOG 311 or GEOG 356 or consent of instructor.</td>
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<tr>
<td>ENV S 417</td>
<td>Land Use History and Landscape Change 1</td>
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<tr>
<td>ENV S 418</td>
<td>Land Use History and Landscape Change 2</td>
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<tr>
<td>GEOG 421</td>
<td>Europe and the Mediterranean</td>
<td>Detailed study of physical, cultural, economic and political geography, including the development of cities, problems of agriculture, changing industrial patterns, distribution of trade, regional disparities, and planning on the city, regional and national levels.</td>
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<tr>
<td>GEOG 422</td>
<td>Canada</td>
<td>Seminar on the geographical analysis of selected Canadian development problems. Emphasis on topics of continuing Canadian concern. Prereq: GEOG 352 or PLAN 222.</td>
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<tr>
<td>GEOG 423</td>
<td>Central and Eastern Europe</td>
<td>Not offered 1982-83.</td>
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<td>GEOG 424</td>
<td>Soviet Union</td>
<td>Not offered 1982-83.</td>
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<td>GEOG 425</td>
<td>Africa</td>
<td>Not offered 1982-83.</td>
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<tr>
<td>GEOG 430</td>
<td>Field Research in Regional Geography</td>
<td>Not offered 1982-83.</td>
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<tr>
<td>ENV S 444</td>
<td>Land Evaluation and Resources Management</td>
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<tr>
<td>GEOG 448</td>
<td>Urban Historical Geography</td>
<td>Not offered 1982-83.</td>
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<tr>
<td>GEOG 450</td>
<td>City and Regional Systems</td>
<td>A continuation of Geography 349 and 350 with an emphasis on student projects. Prereq: GEOG 350 and GEOG 349 or consent of instructor.</td>
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<tr>
<td>GEOG 451</td>
<td>Soils Geography</td>
<td>Not offered 1982-83.</td>
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<tr>
<td>GEOG 452</td>
<td>Problems of Rural Land Use</td>
<td>The nature of rural land problems and a critical evaluation of the methods of rural land use planning, in both metropolitan areas and underdeveloped or depressed rural regions. Prereq: GEOG 315 and/or GEOG 352</td>
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<tr>
<td>GEOG 456</td>
<td>Land Dereliction &amp; Rehabilitation 1</td>
<td>Examination of the reasons for land dereliction, its processes, and effects. Analysis of rehabilitation techniques includes principles of landscape architecture and optimizing ecological considerations and use of post operation areas. Prereq: 4th year students or consent of instructor.</td>
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<tr>
<td>GEOG 461</td>
<td>Land Dereliction &amp; Rehabilitation 2</td>
<td>Not offered 1982-83.</td>
</tr>
<tr>
<td>GEOG 470</td>
<td>Applied Air Photo Interpretation</td>
<td>Advanced air photo interpretation and its application in geomorphology, geology, resources inventory, engineering soils, hydrology, and pre-planning studies (terrain analysis). Projects in specific fields of interest form a significant part of the course. Lab fee $10-$15. Prereq: GEOG 375 and GEOG 300 or GEOG 302 or consent of instructor.</td>
</tr>
<tr>
<td>GEOG 471</td>
<td>Advanced Remote Sensing</td>
<td>The principles of earth resource analysis using remotely sensed imagery and digital data will be studied with emphasis upon satellite platform sources. The coordination of supplemental imagery and ground truth missions with satellite data will be considered in a multi-strategy perspective. Lab fee $10-$15. Prereq: GEOG 376.</td>
</tr>
<tr>
<td>GEOG 475</td>
<td>Special Reading and Seminar on Selected Topics</td>
<td>A brief outline is to be filed with the Chairman or UG officer. Prereq: 3 full credits in GEOG and consent of instructor.</td>
</tr>
<tr>
<td>GEOG 476</td>
<td>Special Readings and Seminar on Selected Topics</td>
<td>A brief outline is to be filed with the Chairman or UG officer. Prereq: 3 full credits in GEOG and consent of instructor.</td>
</tr>
<tr>
<td>GEOG 481</td>
<td>Frontiers in Geography</td>
<td>Not offered 1982-83.</td>
</tr>
<tr>
<td>GEOG 482</td>
<td>Geography and Education</td>
<td>Organizational concepts in geography for instructional purposes. Conceptual frameworks for teaching environmental studies. Educational principles, theory and practice. Prereq: Honours Geography. Man-Environment Studies, Architecture or Urban and Regional Planning. Preference given to those in third year who are interested in being teaching assistants in their fourth year.</td>
</tr>
<tr>
<td>ENV S 500</td>
<td>Professional Development in Environmental Management</td>
<td></td>
</tr>
</tbody>
</table>
GEOG 490A  F,W,S  3S  0.5  
Senior Honours Research Essay  
Preparatory work and first draft of essay.  
Prereq: GEOG 390; only fourth year Honours students.

GEOG 490B  F,W,S  6S  1.0  
Senior Honours Research Essay  
Completed Essay.  
Prereq: GEOG 390 and GEOG 490A; only fourth year Honours students.

Geological Engineering  
Associate Professor, Chairman of the Geological Engineering Board  
J. Gale, BSc, DEd, MSc, PhD (California-Berkeley), PEng  
Professor, Chairman of Earth Sciences  
P. Fritz, Dipl Geol, Dr rer nat. (Stuttgart)  
Professor, Chairman of Civil 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 Civil Engineering  
N. Kouwen, BASc, PhD (Waterloo), PEng  
B. LeLievre, BEng (W Australia), MASC, PhD (Waterloo), PEng  
E.L. Matyas, BASc (Toronto), DIC, PhD (London), PEng  
J.C. Thompson, BASc (Toronto), MS, PhD (Illinois), PEng  
Associate Professors, Department of Civil Engineering  
N. Kouwen, BASc, PhD (Waterloo), PEng  
B. LeLievre, BEng (W Australia), MASC, PhD (Waterloo), PEng  
E.L. Matyas, BASc (Toronto), DIC, PhD (London), PEng  
J.C. Thompson, BASc (Toronto), MS, PhD (Illinois), PEng

Course Descriptions  
GEO E 116 (EARTH 122)  
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.

All other courses in the Geological Engineering program are listed under the course descriptions in Earth Sciences or Civil Engineering.

Graduate Study in this area can be done in either Earth Sciences or Civil Engineering.

Department of Germanic and Slavic Languages and Literatures  
Professor, Chairman of the Department  
J.W. Dyck, AB (Bethel), MA (Missouri), PhD (Michigan)  
Associate Professor, Associate Chairman Graduate Studies  
M. Kuxdorf, BA, MA, PhD (Alberta)  
Associate Professor, Associate Chairman Undergraduate Studies  
F. Jakobsen, BA, MA (Ontario), PhD (Waterloo)  
Professors  
E. Heier, BA, MA, PhD (British Columbia), PhD (Michigan)  
S. Hoefert, BA, MA, PhD (Toronto)  
Associate Professors  
G. Brude-Firnau, Staatsexamen (Berlin), PhD (Yale)  
H.W. Panthel, BA, MA, PhD (Waterloo), MA (Cincinnati), PhD (Waterloo)  
M. Richter, Staatsexamen (Berlin and Bonn), MA, PhD (Toronto)  
W. Shleest, MA, PhD (Ottawa), Dr. phil. (München FU)  
J. Whiton, BA, MA, PhD (Minnesota)  
A. Zweers, Doctorandus (Amsterdam), litt Dr. (Groningen)  
Assistant Professors  
D.G. John, BA, MA, PhD (Toronto)  
R. Karpicak, BA, MA (Manitoba), PhD (Ottawa)  
B. Kejna-Sharratt, MA (Warsaw), BA (London), MA (McMaster), PhD (Toronto)  
T. Sommer, BA, MA, PhD (Waterloo)  
Visiting Assistant Professor - Mannheim  
B. Krawe, Dr. phil. (Karlsruhe)  
Lecturers  
S. Dyck, BA (London), MPhil (Waterloo)  
B. Kaltz, Staatsexamen, Dr. phil. (Mainz)  
H. Marsden, BA (Randolph-Macon), MA (Waterloo)

Mannheim Program  
The Department offers a program of studies at the University of Mannheim in Germany, where students may obtain full credits for a year of study. For further information see p. 107 and consult the Department.

Course Descriptions  
German  
First Year Courses  
In choosing first year courses, students should read carefully the course descriptions and differentiations:

A. GER 101/102, 105/106, 111/112 are beginners courses for students who know little or no German and are therefore not open to those with Grade 13 German or equivalent. Additional information is available on p. 106 and from the Undergraduate Officer in the Department.

GER 101  F,W,S,J  3C,1L  0.5  
First Year German  
For students with little or no knowledge of German. The basic elements of German grammar with an emphasis on oral practice and pronunciation. Language laboratory. Introduction to aspects of German culture and reading of appropriate graded texts.

GER 102  F,W,S,A  3C,1L  0.5  
First Year German  
As GER 101.  
Prereq: GER 101

GER 105  F  3C  0.5  
German for Reading Knowledge  
The elements of German grammar with practice in pronunciation. Selected readings from the humanities and social sciences. This course is designed to assist undergraduate and graduate students in acquiring a reading knowledge of German.
GER 105 W 3C 0.5
German for Reading Knowledge
As GER 105.
Prereq: GER 105.

GER 111 F,W,S 3C 0.5
First Year Scientific German
For students with little or no knowledge of German. The basic elements of German grammar and pronunciation with an emphasis on reading and translation of elementary scientific literature from various fields.

GER 112 F,W,S 3C 0.5
First Year Scientific German
As GER 111.
Prereq: GER 111.

B. GER 121/122 and 151/152 are first year courses for students who have completed at least two years of High School German or an equivalent background in the language. If in doubt, consult the Department.

GER 121 F 3C 0.5
Studies in German Literature with Language Practice
An introduction to German literature designed to accomplish the transition from language studies to reading and discussing literary texts. Grammar review, conversation practice, and the reading of selected works.
Prereq: At least two years of High School German, or equivalent.

GER 122 W 3C 0.5
Studies in German Literature with Language Practice
As GER 121.
Prereq: GER 121.

GER 151 F 3C 0.5
German Conversation and Grammar Review
Conversation on topics of everyday life as well as on political, social, and cultural aspects of the German-speaking countries: West and East Germany, Austria, and Switzerland. Comprehensive grammar review, vocabulary building, written practice. Language lab is recommended.
Prereq: At least two years of High School German, or equivalent.

GER 152 W 3C 0.5
German Conversation and Grammar Review
As GER 151.
Prereq: GER 151

GER 201 F 3C 0.5
Second Year German
This course is a continuation of first year GER 101/102. It offers extensive practice in both the spoken and written language. It provides vocabulary building, grammar review, and exercises in pronunciation and comprehension.
Language Lab.
Prereq: GER 102 or equivalent.

GER 202 W 3C 0.5
Second year German
As GER 201.
Prereq: GER 201.

GER 211 F 3C 0.5
Intermediate Scientific German
Grammar review and more advanced study of German structure and idiom. Reading and translating of scientific writings for vocabulary building and mastery of difficulties peculiar to technical style. Reading material is selected according to the field of the individual student.
Prereq: GER 106, 112 or equivalent.

GER 212 W 3C 0.5
Intermediate Scientific German
As GER 211.
Prereq: GER 211.

GER 251 F 3C 0.5
German Conversation and Composition
This course offers extensive practice in both the spoken and written language. It provides vocabulary building, grammar review, and exercises in pronunciation and comprehension.
Option Language Lab.
Prereq: GER 122, 152 or equivalent.

GER 252 W 3C 0.5
German Conversation and Composition
As GER 251.
Prereq: GER 251.

GER 261 F 3C 0.5
The Age of Goethe (Classicism)
Reading, interpretation, and critical analysis of representative works (Goethe, Schiller, Holderlin, etc.)
Prereq: GER 122, 152 or equivalent.

GER 262 W 3C 0.5
The Age of Goethe (Romanticism)
Reading, interpretation, and critical analysis of representative works (Novalis, Tieck, Brentano, etc.)
Prereq: GER 122, 152 or equivalent.

GER 271 F 3C 0.5
German Thought and Culture
A survey of cultural currents to the time of Enlightenment. Lectures will focus on major developments in literature, philosophy, religion, art, architecture, and music as seen against the historical background of the German speaking peoples.
Taught in English.

GER 272 W 3C 0.5
German Thought and Culture
A survey of cultural events from Goethe to the present. Lectures will focus on major developments in literature, philosophy, religion, art, architecture, and music as seen against the historical background of the German speaking peoples.
Taught in English.

GER 281 F 3C 0.5
Post-War Literature
Reading and interpretation of major works since 1945 in prose, drama and poetry. Main authors: Brecht, Borchert, Boll, Frisch, Dorrenmatt, Grass, Eich.
Prereq: GER 122, 152 or equivalent.

GER 282 W 3C 0.5
Post-War Literature
As GER 281.
Prereq: GER 122, 152 or equivalent.

GER 291 F 3C 0.5
Survey of German Literature
Introduction to the major periods of German literature. Readings and interpretation of representative texts.
Prereq: GER 122, 152, 202 or equivalent.

GER 292 W 3C 0.5
Survey of German Literature
As GER 291.
Prereq: GER 122, 152 or equivalent.

GER 311 F 3C 0.5
Theory of Translation
Theory, methodology, and techniques of translation. Patterns and problems in the translation of scholarly texts from the arts and sciences, with special emphasis on idiom and structure as compared with the target language.
Prereq: GER 212 or equivalent.

GER 312 W 3C 0.5
Theory of Translation
As GER 311.
Prereq: GER 311.
Course Descriptions
Germanic and Slavic: Dutch

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 Durrenmatt. Taught in English.
Prereq: Open to students from all departments: not normally to first year students.
This course is complemented in the Winter term by RUSS 356.

GER 356 F 3C 0.5
Young Germany and Biedermeier
Reading, interpretation, and critical analysis of prescribed prose, drama and poetry. (Grillparzer, Mörike, Stifter, Gotthelf, etc.)
Prereq: GER 122, 152 or equivalent.

GER 361 F 3C 0.5
Young Germany and Biedermeier
Reading, interpretation, and critical analysis of prescribed prose, drama and poetry. (Grillparzer, Mörike, Stifter, Gotthelf, etc.)
Prereq: GER 122, 152 or equivalent.

GER 362 W 3C 0.5
Poetic Realism
Reading, interpretation, and critical analysis of prescribed prose, drama and poetry (Storm, Keller, Ludwig, Hebbel, Raabe, Fontane, etc.)
Prereq: GER 122, 152 or equivalent.

GER 371 F 3C 0.5
Modern German Literature
Reading, interpretation, and critical analysis of prescribed texts relating to the "Moderne" and various literary movements around the turn of the century.
Prereq: GER 122, 152 or equivalent.

GER 372 W 3C 0.5
Modern German Literature
Reading, interpretation, and critical analysis of prescribed texts from the early 20th century to the end of World War II (Kafka, Brecht, etc.).
Prereq: GER 122, 152 or equivalent.

GER 391 F 3C 0.5
Masterpieces of German Literature in Translation
A study of significant prose and drama from 1770 to the present representing themes such as Man and Revolution, Duty vs. Inclination, Flesh vs. Spirit, Modern Germany East and West. Works studied include Danton's Death (Büchner), Maria Stuart (Schiller), Demian (Hesse), Galileo (Brecht), and Cat and Mouse (Grass).

GER 392 W 3C 0.5
Masterpieces of German Literature in Translation
As GER 391.

GER 395Z F 2.5
Waterloo in German Program.
See page 000 for description.

GER 396Z W 2.5
Waterloo in German Program
As 395Z.

GER 441 F 3C 0.5
Humanism, Reformation and Baroque
Reading, interpretation, and critical analysis of prescribed texts (Erasmus, Luther, Sachs, Optiz, Gryphius, Grimmeilshausen, 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 445 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 451 F 3C 0.5
Advanced Conversation, Grammar and Composition
As GER 445.
Prereq: GER 451 or equivalent.

GER 461 F 3C 0.5
Introduction to the History of the German Language with Readings in Middle High German
Prereq: GER 122, 152 or equivalent. Offered in alternate years.

GER 462 W 3C 0.5
Middle High German Literature
Reading and interpretation of samples from the major works of the MHG period, with emphasis on writers of the first "Blutezeit" in German literature (1170 to 1250): Early Minnesang, Walther von der Vogelweide, Nibelungensied, Hartmann von Aur, Wolfram von Eschenbach, etc.
Prereq: GER 122, 152 or equivalent. Offered in alternate years.

GER 471 F 3C 0.5
German Poetry
A study of the main thoughts, themes, forms, and schools in German poetry from the beginning to Goethe.
Prereq: GER 122, 152 or equivalent.

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 495-498 F.W.S.M. R each 0.5
Reading Courses in Approved Topics
Prereq: Fourth year students only.

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.
Course Descriptions
Germanic and Slavic: Russian

Russian

Russian Workshop in the USSR
A "Total Immersion" Russian language workshop consisting of 2 sessions (12 days each) at the Russian Language Seminar in the Soviet Union, usually in Dyuny near Leningrad. Daily instruction by Russian faculty at the elementary, intermediate, and advanced levels, according to the proficiency of the students. Pre-req: At least one year of Russian language at the university level or equivalent.

Credits: 1.5 for completion of
a) first year Russian: 133, 134, 135, or
b) second year Russian: 233, 234, 235, or
(c) third year Russian: 333, 334, 335, or
d) fourth year Russian: 433, 434, 435.

Note:
The Workshop may be attended more than once. However, a maximum of 1.5 credits will normally be granted towards a degree.

RUSS 101 F 3C,1L 0.5
First Year Russian
(Science Oriented) For students with little or no knowledge of Russian. The elements of Russian grammar and composition; with emphasis on oral practice and pronunciation. Language Laboratory and Visual Aids. Selected readings of major Russian authors. Open to all university students, except those who have credit for RUSS 111/112.

RUSS 102 W 3C,1L 0.5
First Year Russian
As RUSS 101.
Pre-req: RUSS 101 or equivalent.

RUSS 111 F,S,W 3C 0.5
First Year Russian
(Science Oriented) For students with little or no knowledge of Russian. Essential grammar, sentence structure. Reading and translation of scientific literature according to the students' fields of interest. Open to all university students, except for those who have credit for RUSS 101/102.

RUSS 112 W,F 3C 0.5
First Year Russian
As RUSS 111.
Pre-req: RUSS 111, 101 or equivalent.

RUSS 201 F 3C 0.5
Intermediate Scientific Russian
A review of the fundamentals of grammar is followed by a more advanced study of the language structure and idiom. Readings and translation from contemporary scientific writing with the aim of helping the student to acquire a greater vocabulary and to master the stylistic difficulties peculiar to technical writing. Pre-req: RUSS 102, 112 or equivalent.

RUSS 202 W 3C 0.5
Intermediate Scientific Russian
As RUSS 201.
Pre-req: RUSS 201 or equivalent.

RUSS 251 F 3C 0.5
Conversation, Composition, Grammar and Phonetics
The course is conducted largely in Russian and provides intensive practice in spoken Russian. Vocabulary building, comprehension, pronunciation and intonation are stressed. Pre-req: RUSS 102, 112 or equivalent.

RUSS 252 W 3C 0.5
Conversation, Composition, Grammar and Phonetics
As RUSS 251.
Pre-req: RUSS 251 or equivalent.

RUSS 261 F 3C 0.5
Introduction to Russian Literary Movements
Reading of representative works from Russian Classicism, Romanticism, 19th Century Realism, and various periods of 20th century Russian literature. Pre-req: RUSS 102 or equivalent.

RUSS 262 W 3C 0.5
Introduction to Russian Literary Movements
As RUSS 261.
Pre-req: RUSS 261 or equivalent.

RUSS 271 F 3C 0.5
Russian Thought and Culture
A survey of cultural history from 862 to 1905. Lectures will focus on major developments in literature, philosophy, art, architecture, and music as seen against the background of Russia's historical past. Discussion will be devoted primarily to works of Russian literature. This course is taught in English. Open to all students.

RUSS 272 W 3C 0.5
Russian Thought and Culture
A survey of cultural history from 1905 to the present. Lectures will focus on major developments in literature, philosophy, art, and music as seen against the background of Russia's historical past. Discussion will be devoted primarily to works of Russian literature.

This course is taught in English. Open to all students.

Note:
Arts students can take RUSS 271 and 272 in their second or subsequent years; students for other faculties, in any year (See Chapter 8 for course requirements in the Faculty of Arts).

RUSS 281 F 3C 0.5
Russian Short Story
A study of the form and a detailed examination of Russian short stories by major representative writers. Conducted in English. Extra work in Russian required of Russian majors only. Open to all students.

RUSS 282 W 3C 0.5
Russian Short Story
As RUSS 281.
Conducted in English. Extra work in Russian required of Russian majors only. Open to all students.

RUSS 311 F 3C 0.5
Theory of Translation
Theory, methodology, and techniques of translation. Patterns and problems in the translation of scholarly texts from the arts and sciences, with special emphasis on idiom and structure as compared with the target language. Pre-req: RUSS 202 or equivalent.

RUSS 312 W 3C 0.5
Theory of Translation
As RUSS 311.
Pre-req: RUSS 311.

Senior language and literature courses in Russian will normally only be offered in alternate years.

RUSS 351 F 3C 0.5
Intermediate Conversation and Composition
Written reports on prescribed themes and topics. Oral drill and translation. Pre-req: RUSS 252 or equivalent.
RUSS 352 W 3C 0.5
Intermediate Conversation and Composition
As RUSS 351. Prereq: RUSS 351 or equivalent.

RUSS 356 W 3C 0.5
The Stage as Forum: Russian Drama in Translation
Major Russian dramas will be studied from various points of view, including historical importance, themes, and technique. The course includes theory and selected dramas of such playwrights as Gogol, Chekhov, Tolstoy, Gorky, Mayakovsky, and Pogodin. The course is conducted entirely in English. Fall term: See GER 355. Open to students from all departments. Not normally open to first year students.

RUSS 381 3C 0.5
The Peoples of the Soviet Union
Especially emphasized will be the study of non-Slav peoples of the Caucasus and Central Asia. European Russian and Siberia. Czarist and Soviet policy towards national minorities. assimilation and integration problems in the light of linguistic division; development of literary languages. Some achievements of Soviet anthropology. Open to all students.

RUSS 382 3C 0.5
The Peoples of the Soviet Union
As RUSS 381. Open to all students.

RUSS 391 F 3C 0.5
Great Russian Novels
Reading and interpretation of 19th century novels selected from the works of Pushkin, Lermontov, Gogol, Turgeniev, and Tolstoy. Lecture on social and intellectual background. Conducted in English. Extra work in Russian required of Russian majors only. Open to all students.

RUSS 392 W 3C 0.5
Great Russian Novels
Reading and interpretation of 19th and 20th century novels selected from the works of Dostoevsky, Gorky, Pasternak, Solzhenitsyn, and Zamiatin. Lectures on social and intellectual background. Conducted in English. Extra work in Russian required of Russian majors only. Open to all students.

RUSS 441 3C 0.5
East Slavic Epic Tradition
A study of the origins and development of the Epic tradition in East Slavic Literature. Conducted in English. Open to all students.

RUSS 442 3C 0.5
Russian Epic Tradition
As RUSS 441. Conducted in English. Open to all students.

RUSS 451 F 3C 0.5
Advanced Conversation, Grammar and Composition
This course is conducted in Russian and provides intensive practice in spoken and written Russian on the advanced level. Prereq: RUSS 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, Kataev, Sholokhov, A.N. Tolstoy). Conducted in English. Extra work in Russian required of Russian majors only. Open to all students.

RUSS 462 W 3C 0.5
Twentieth Century Russian Literature
Reading, interpretation, and critical analysis of selected fiction and drama (Arbusov, Bulgakov, Erenburg, Nabokov, Pasternak, Solzhenitsyn). Conducted in English. Extra work in Russian required of Russian majors only. Open to all students.

RUSS 481 F 3C 0.5
Russian Poetry
A study of themes and forms of representative authors of Classicism, Romanticism (Lomonosov, Derzhavin, Pushkin, Lermontov, Nekrasov, Fet, Tuichev, etc.). Prereq: RUSS 102 or equivalent.

RUSS 482 W 3C 0.5
Russian Poetry
A study of themes and forms of representative authors from Symbolism to the present (Blok, Esenin, Mayakovsky, Akhmatova, etc.). Prereq: RUSS 102 or equivalent.

RUSS 485 F 3C 0.5
History of Russian Literature
This course deals with the emergence of the Russian national literature, emphasizing the cultural and intellectual setting from the beginning to 1917. Literary movements and major representative works not studied in other courses will be discussed. Conducted in English. Extra work in Russian required of Russian majors only. Open to all students.

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. Conducted in English. Extra work in Russian required of Russian majors only. Open to all students.

RUSS 496-498 F.W.S 0.5
Reading Courses in Approved Topics
Open to fourth year students only.

Polish

POLSH 101 F 3C 0.5
First Year Polish
The fundamentals of Polish grammar are taught with emphasis on oral practice and pronunciation. An introduction to Polish culture is given as well. The instruction is in English. Open to all university students.

POLSH 102 W 3C 0.5
First Year Polish
As POLSH 101. Prereq: POLSH 101 or equivalent.

POLSH 201 F 3C 0.5
Intermediate Polish
This course will be conducted largely in Polish and provides intensive practice in grammar, composition, and conversation. Prereq: POLSH 102 or equivalent. Taught in alternate years.

POLSH 202 W 3C 0.5
Intermediate Polish
As POLSH 201. Prereq: POLSH 201 or equivalent. Taught in alternate years.
Ukrainian

UKRAN 101 F 3C,1L 0.5
Beginners’ Ukrainian
For students with no prior knowledge of Ukrainian. The basic elements of Ukrainian grammar and composition with emphasis on oral practice and pronunciation. Introduction to aspects of Ukrainian culture. Open to undergraduate students of all departments; recommended to graduate students of Russian as a second Slavic language.
Prereq: UKRAN 101 or equivalent.

UKRAN 102 W 3C,1L 0.5
As UKRAN 101.
Prereq: UKRAN 101 or equivalent.
Prereq: UKRAN 202 or equivalent.

UKRAN 201 F 3C,1L 0.5
Intermediate Ukrainian
This course will be conducted in Ukrainian and provides intensive practice in grammar, composition, and conversion.
Prereq: UKRAN 102 or equivalent.
Taught in alternate years.

UKRAN 202 W 3C,1L 0.5
Intermediate Ukrainian
As UKRAN 201.
Prereq: UKRAN 201 or equivalent.
Taught in alternate years.

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. This course is 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. Ssymonenko, L. Kostenko, V. Korotych, and others). This course is taught in English. Open to all students.

UKRAN 401 F 3C 0.5
Ukrainian Romanticism
Taras Shevchenko and his Time. Kharkov and Kiev as literary centres. Reading and critical analysis of prescribed texts (Shevchenko, Kulish, Kostomarov, etc.).
Prereq.: UKRAN 202 or equivalent.

UKRAN 402 W 3C 0.5
Ukrainian Romanticism
The literary revival in Western Ukraine. A critical study of the literary movement with special emphasis on the major authors (Shashkevych, Vahylevych, Holovatyj and others).
Prereq: UKRAN 202 or equivalent.

Department of Health Studies

Associate Professor, Chairman of Department of Health Studies
A. Rast, RA (Queen’s), PhD Waterloo

Assistant Professor, Associate Chairman Undergraduate Affairs
R.S. McCall, BSc (McGill), PhD (Purdue)

Assistant Professor, Associate Chairman Graduate Affairs
K. Prkachin, BA, MA, PhD (British Columbia)

Associate Professors
M.T. Sharratt, BA, MA (Western Ontario), PhD (Wisconsin)
R.P. Schlegel, BA (Western Ontario), MSc (Illinois), PhD (Ohio State)

Assistant Professors
M.E. Haigh, BSc, MSc, PhD (McMaster)
L. Hoffman-Goetz, BA (SUNY, Binghamton), MA, PhD (Michigan)
N. Kreiger, BA (Pennsylvania), MPH, PhD (Yale)
D. Mille, BS (Purdue), PhD (Indiana)
A. Myers, BA (Winnipeg), MA, PhD (York)
P. Wainwright, BSc (Rhodes, S.A.), MA, PhD (Waterloo)

Adjunct Assistant Professor
H.W. Gruchow, BSc, MSc, PhD (Wisconsin)

Faculty Members Holding Cross Appointments as shown:
1Department of Kinesiology
2School of Urban and Regional Planning

Course Descriptions

HLTH 140 F,W 3C,1T 0.5
Introduction to Health Sciences 1
An exploration of the biological basis of health and disease, strategies for prevention and treatment of disease, and the moral, social, and psychological impact of innovations in health care on Canadian society. Topics include human reproduction, (conception, pregnancy and childbirth, sexual development and expression), human heredity (chromosomal disorders, genetic diseases, birth defects), and acute disease states (infectious diseases, cancer, immune deficiencies).

HLTH 141 F,W 3C,1T 0.5
Introduction to Health Sciences 2
An exploration of the biological basis of health and disease, strategies for prevention and treatment of disease, and the moral, social, and psychological impact of innovations in health care on Canadian society. Topics include the human nervous system (neurological disorders, mental illness, brain dysfunctions, drug abuse), lifestyles and health (heart disease, obesity, exercise, smoking), and health care systems (environmental health, medical abuses, aging, and dying).

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.
Prereq: HLTH 140 and 141

HLTH 241 W 3C 0.5
Disease Process
An introduction to the study of factors governing the occurrence of diseases in human populations, using selected diseases to illustrate disease mechanisms and identification of risk factors.
Prereq: BIOL 230, 233, KIN 317 or equivalent.

HLTH 245 F 3C 0.5
Community Health
This course examines health care delivery systems by considering organizational principles, manpower issues, health resources and economics, service utilization and alternatives to the institutional model. There is a focus on societal and political issues which affect the health of the society through the delivery system.
Prereq: Health Studies students only, or permission of instructor.
HLTH 302 F 2C 0.5
Introduction to Biomathematics 1
(MTHEL 302a) Biometry is a biological discipline requiring both a knowledge of mathematics and some basic understanding of specific biological phenomena. The course material has been selected from genetics and genetiology to provide examples of where both mathematics and biology have contributed to the advancement of knowledge in interdisciplinary areas. Prereq: KIN 116 or first year Chemistry or consent of instructor.

HLTH 303 W 2C 0.5
Introduction to Biomathematics 2
(MTHEL 302b) A continuation of Biomathematics 1. Topics considered are first order reaction kinetics in biological systems including a discussion of radioisotope and C14 dating, higher order kinetics including statistical considerations in enzyme kinetics, models for and the measurement of evolution from a knowledge of genetics and protein structure and assessing the relative importance of environmental factors as evolutionary determinants. Prereq: HLTH 302.

HLTH 340 F 3C 0.5
Environmental Health
An examination of the effects of environmental pollutants and occupational hazards on human health. Emphasis will be placed on the biological mechanisms by which environmental toxicants cause human disease and disability. Prereq: KIN 317 or equivalent.

HLTH 344 W 3C 0.5
Program Evaluation
A comprehensive and systematic introduction to the key concepts, methodologies, and issues related to program evaluation in general and their application to health programs in particular. Administrative and policy implications as well as the technical/methodological evaluation issues that face individuals involved in administering, planning, implementing, and evaluating health programs will be discussed. Prereq: Basic courses in Statistics and in Research Design.

HLTH 346 W.S 3C 0.5
Nutrition (KIN 346)
An elementary course in nutrition with special emphasis on diet for sport and certain physiological conditions. Prereq: KIN 317 or equivalent.

HLTH 348 W.S 3C 0.5
Social Psychology of Health Behaviour (KIN 348) 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.

HLTH 349 F.S 3C 0.5
Principles of Behaviour Modification (KIN 349) 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.

HLTH 407 W 3C 0.5
Physiology of Coronary Heart Disease (KIN 407) 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 exercise in the rehabilitation process. Prereq: KIN 300 or permission of instructor.

HLTH 410 W 3C 0.5
Growth, Development and Aging (KIN 410) The physiology of human growth, development and aging is examined, with special reference to the influence of diet, environment, exercise and disease on the normal processes. Prereq: KIN 200, BIOL 230 and 233.

HLTH 431 F.W.S 0.5
Research Project
An independent research project on an approved topic, supervised by a faculty member. Includes an approved proposal and completion of the first three chapters of the thesis — Introduction, Review of literature, and Methods.

HLTH 432 F.W.S 0.5
Research Project
An independent research project on an approved topic, supervised by a faculty member. Includes data collection, data analysis and presentation of results in thesis form. Prereq: Completion of HLTH 431.

HLTH 443 W 3C 0.5
Behaviour and Chronic Disease
A critical analysis of various behavioural strategies for the prevention of coronary heart disease, hypertension, chronic obstructive pulmonary disease, and lung cancer. The role of behaviour in the pathogenesis of disease and the feasibility of behavioural change for prevention of disease will be discussed. Prereq: HLTH 344, 348, 349.

HLTH 444 W 3C 0.5
Seminar in Health Behaviour
A study of current issues pertaining to health and health behaviour. Topics include pertinent research in the field of health which have significant values to the individual, family and community, as well as a study of the problem areas in health behaviour. Prereq: Health Studies students only, or permission of instructor.

HLTH 445 W 3C 0.5
Independent Study
For the student who desires to pursue a particular topic in depth through guided independent research and/or reading. A faculty member must approve a student's project prior to registration. May be repeated in subsequent terms. Prereq: Consult with Department.
Department of History

Associate Professor, Chairman of the Department
J.W. Walker, BA (Toronto), MA (Waterloo), PhD (Dalhousie)

Associate Professor, Associate Dean (Special Programs), Faculty of Arts
J.O. Stubbs, BA (Toronto), MSc (Econ) (London), DPhil (Oxford)

Professors
P.G. Cornell, ED, MA, PhD (Toronto) FRHistS
M.J. Craton, BA (London), MA, PhD (McMaster) FRHistS
F.H. Epp, BA (Bethel College), MA, PhD (Minnesota), LLB (Brandon) G
F.C. Gérard, MA (College St. Dominique, France), BD, STM (McGill), PhD (Harvard) G
P. Keresztes', BA (Toronto), MA, PhD (McMaster)
W. Klaassen, BA (McMaster), DPhil (Oxford) G
H. MacKinnon, BA (Montreal), PhL, STL (Gregorian), MA (Toronto), DPhil (Oxford), Recipient of the OCUPA Distinguished Professor Award
J.F. H. New, BA, MA (Melbourne), PhD (Toronto), FRHistS
G. M. Ostrander, BA (Columbia), MA, PhD (California-Berkeley)

Adjunct Professors (Wilfrid Laurier University and Guelph)
R.P. Fuks, BA (Toronto), MA (Maryland), PhD (Chicago), (WLU)
W. Stanford Reid, BA, MA (McGill), PhD (Pennsylvania), FRHistS (Guelph)

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)
P.J. Harrigan, BA (Detroit), AM, PhD (Michigan)
L.A. Johnson, BA (Waterloo), MA, MPhil (Toronto)
R.C. MacGillivray, BA (Queen's), AM, PhD (Harvard)
K.M. McLaughlin, BA (Waterloo), MA (Dalhousie), PhD (Toronto) J
E.P. Patterson, BA (Baylor), MA (Kansas), PhD (Washington)

R. Sawatsky, BChEd (CMBC), BA (Bethel College), MA (Minnesota), MA, PhD (Princeton) G
P.S. Smith, MA (Toronto), PhD (New Mexico) J
J.A. Wahl, CR, BA (Western Ontario), MA, PhD (St. Louis) J

Assistant Professors
D.J. Horton, BA (Waterloo Lutheran), MA (Waterloo), PhD (McGill)
S.K. Johannessen, BA (Evangel College), MA, PhD (Missouri)
W.O. Packull, BA (Guelph), MA (Waterloo), PhD (Queen's) R
D.E. Wright, BA (Cambridge), MA, PhD (McMaster)

Classics

History Courses

100 Level: Introductory Courses.
For First Year Arts students and for all other students interested.

200-249: Survey Courses.
Primarily intended for non-History Majors, but open to History Majors

250-257: 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.

Course Descriptions

HIST 100 F 0.5
Landmarks in World History
A thematic introduction to the development of the world's major civilizations. This year's theme is "Community and Social Order", examining the dynamic relationship between individuals and their social structures, and their state.
Instructors: Harrigan, Wahl, Walker

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 Immigration; Mass Production; the Great Depression: War and Global Americanism.
Instructor: Ostrander

HIST 102B W 0.5
Imperialism in the Twentieth Century
An introduction to the colonial experience and to the processes of national emergence in the twentieth century. Special reference is made to the Caribbean area.
Instructor: Craton

HIST 102C W 0.5
The Origins of Wars in the Twentieth Century
An analysis of the diplomatic, political, economic, ideological, social and cultural explanations of the causes of the major wars of this century with special emphasis on Canada.
Instructor: English

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.
Instructors: Harrigan, Packull
Offered at Renison College and at St. Jerome's College.

HIST 102E W 0.5
Canadian History
Selected major themes from pioneer life to Canadian involvement in twentieth century wars.
Instructor: McLaughlin
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. Sartre, Shakespeare to Marx and Freud.
Instructor: New
embrace on love, marriage and the family in the West since the sixteenth century.
Instructor: Johannesen
Offered at St. Jerome's College.

HIST 203X F 0.5
Modern Quebec
The course will discuss the problem of Quebec in contemporary Canada by analyzing the historical background of key issues like separatism, the survival of the French language, French-Canadian nationalism and the Quiet Revolution.
Instructor: Johnson

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.
Instructor: Johnson

HIST 205X F 0.5
Canadian Business History
A study of the development of business in Canada at both the general economic and the individual enterprise level.
Instructor: Johnson

HIST 206X F 0.5
History of Canadian Minorities
An introduction to the history of selected racial and regional minorities in Canada. The course examines the emergence of minority communities, and their position in modern Canadian society.
Instructor: Patterson

HIST 207 W 0.5
East Central European History 1914-1982
With particular emphasis on Russia, Poland and Germany, the course will focus on the cataclysmic events in this region since 1914 (war, revolution, nazism, holocaust, sovietization, and recent crises in E. Europe) and how they have altered twentieth century historical consciousness.
Instructor: Davies
Offered at St. Jerome's College.

HIST 208 W 0.5
The Cold War: American-Russian Relations since November, 1917
An examination of this confrontation by traditionalist and revisionist (New Left) historians: Wilson versus Lenin, 1917.
Instructor: Harrigan, Wright
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.  
Instructor: Patterson

HIST 216 F 0.5  
Irish History: Achievement, Unification, Revolt  
Political, social and religious history of Ireland from the beginning of the golden age of Irish medieval civilization to the Act of Union, c. 400 to 1800.  
Instructor: MacGillivray

HIST 217 W 0.5  
Irish History: The Nineteenth and Twentieth Centuries  
Political, social and religious history of Ireland emphasizing social changes, the struggle for Home Rule and the Republic, 1800 to present.  
Instructor: MacGillivray

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.  
Instructor: Packull  
Offered at Renison College.

HIST 223 F 0.5  
Canadian Culture and Society to 1900  
An inquiry into the nature of the Canadian experience by examining concepts and themes that were significant before the twentieth century.  
Instructor: Cornell

HIST 224 W 0.5  
Canadian Culture and Society in the Twentieth Century  
An approach to modern Canadian development as the people have wrestled with such phenomena as: war, depression, internal and external tensions, urban growth, the "post-industrial" society.  
Instructor: Cornell

HIST 226 F 0.5  
The Middle East Conflict  
A survey of regional, religious and imperial rivalries from ancient to modern times, with emphasis on the twentieth century and the Arab-Israeli conflict.  
Instructor: Epp  
Offered at Conrad Grebel College.

HIST 235 (RS 230) 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.  
Instructor: Kaassen  
Offered at Conrad Grebel College.

HIST 237 F 0.5  
Ancient Civilization 1  
A survey of the social, political and cultural history of the Ancient Near East and Greece at the time of Alexander the Great. Special emphasis will be placed on methods of government and international relations.  
Instructor: Wahl  
Offered at St. Jerome's College.

HIST 238 W 0.5  
Ancient Civilization 2  
An introduction to the social, political and cultural history of Rome in its development from a Republic to an Empire. Special attention will be placed on the sources of political power.  
Instructor: Wahl  
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 Doukhobors, Hutterites, Jehovah's Witnesses, Jews, and Mennonites (including the Amish). Emphasis on twentieth century.  
Instructor: Epp  
Offered at Conrad Grebel College.

HIST 247 F 0.5  
Mennonite History 1 (1525-1920)  
Origins and developments in Switzerland, Germany, and the Netherlands. Migrations to, and settlements in, Prussia, Russia and North America. Topics include church-state relations, community formation, separation and assimilation, and conflicts in the Great War.  
Instructor: Epp  
Offered at Conrad Grebel College.

HIST 248 W 0.5  
Mennonite History 2 (1920-1975)  
The world-wide Mennonite struggle for survival and meaningful identity in such settings as Communist Russia and Nazi Germany. Other topics: migrations to Latin America, assimilation in North America, new communities in Africa and Asia.  
Instructor: Epp  
Offered at Conrad Grebel College.

HIST 251X W 0.5  
History of Medieval Europe from 814-1303  
The political, cultural, economic and ecclesiastical development of Europe from Charlemagne to Philip IV of France.  
Instructor: Wahl

HIST 252X W 0.5  
Europe in the Nineteenth Century  
European social and cultural history, 1815-1914. This course will consider the inter-relations between ideas and institutions during a period of industrialization, urbanization and mass education.  
Instructor: Davies

HIST 253X F 0.5  
Canadian History: The British Period  
The evolution of Canadian society in the face of dominant British and American influences.  
Instructors: English, McLaughlin  
Also offered at St. Jerome's College.

HIST 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.  
Instructors: English, Horton, McLaughlin  
Also offered at St. Jerome's College in Winter term.

HIST 255X F 0.5  
British Empire and Commonwealth  
A wide-ranging survey. The first lecture each week will provide a narrative framework, the second, illustrative detail. At weekly seminars students will discuss, successively, significant individuals, colonies, commodities, institutions, documents and books which they have chosen and researched for themselves.  
Instructor: Craton
Course Descriptions

History

HIST 258X F 0.5
History of the United States since 1865
A survey of American society, politics and thought and of the relations of the United States with the outside world from 1865 to the present.
Instructor: Ostrander

HIST 257 W 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, ideas and ideologies.
Instructor: Johannesen

HIST 304 W 0.5
English History 1215-1485
A study of government, Church and society in the later middle ages.
Instructor: Cherniavsky

HIST 305 W 0.5
English History 1485-1603
A study of achievements and crises in politics and society, and of changes and continuities in religion and philosophy in the Tudor period.
Instructor: Packull

HIST 307 F 0.5
British History 1760-1867
A study of a people, power, thought and culture in the world’s first industrializing society.
Instructor: Wright

HIST 308 W 0.5
British since 1067
A study of the British experience and of Britain’s part in world history from the 1660’s to the 1980’s.
Instructor: Wright

HIST 311 W 0.5
Western European Cultural History 1815-1890
Evolution of the idea of consciousness as seen in the major works and manifestoes of artists, writers, musicians, architects and thinkers of the period with particular emphasis on the roles assigned to “artists” (broadly defined) in the shaping of consciousness and society.
Instructor: New

HIST 322 F 0.5
History of Canadian-American Relations since 1914
An examination of the history of relations between the two countries since 1914. Topics of a political, economic, social and cultural nature will be studied.
Instructor: Ostrander

HIST 325 F 0.5
History of Canadian Indians to 1870’s
“From Freedom to Conquest”. The history of Indian-white contact and its effect on the life and culture of the native Canadians.
Instructor: Patterson

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.
Instructor: Patterson

HIST 329 W 0.5
History of Anglo-American Law
The emphasis will be on the early development of the common law in England and the formulation of constitutional law in the United States.
Instructors: Cherniavsky, Ostrander

HIST 334 W 0.5
Mystical and Utopian Movements from the 12th to the 17th Century 1
A study of the recurring dream of the coming golden age in the High Middle Ages beginning with Joachim of Fiore, including the Spiritual Franciscans and the Taborites, and ending with the Revolutionary of the Upper Rhine. Alternates with HIST 347.
Instructor: Klaassen
Offered at Conrad Grebel College.

HIST 334 W 0.5
Mystical and Utopian Movements from the 12th to the 17th Century 2
A study of the Utopian theme from the German Peasant Revolt of the Fifth Monarchy Men, including More’s Utopia and several other lesser known statements.
Alternates with HIST 346.
Instructor: Klaassen
Offered at Conrad Grebel 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 twentieth century.
Instructor: Epp
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.
Instructor: Cruzen

HIST 355 F 0.5
Russian History 1613-1825
The course will focus on selected themes in the development of the Russian state and society from the beginning of Romanov rule to the middle of the nineteenth century.
Instructor: Davies

HIST 356 W 0.5
Russian History since 1825
The course will focus on selected themes in Russia’s development in the nineteenth and twentieth centuries, including the Soviet period.
Instructor: Davies

HIST 358 F 0.5
German History 1740-1945
The development of Germany from the Austrian-Prussian rivalry of 1740 through the end of World War II.
Instructor: Packull
Offered at Renison College.

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.
Instructor: Cherniavsky

HIST 379 W 0.5
Reformation History
An analysis of the economic changes, the rise of “new monarchs”, the nature and effect of the “religious reformation”, the expansion of Europe to the “new world” with their implications for sixteenth century Europe.
Instructor: Packull
Offered at Renison College.
HIST 386 F 0.5
Ontario History to Confederation
The course will examine the growth of Ontario from a pioneer settlement, with particular emphases on economic, social, political and cultural aspects of change. An emphasis will also be placed on the sources and methods of local historical research.
Instructor: MacGillivray

HIST 387 W 0.5
Ontario History since Confederation
The course will examine the emergence of Ontario as an industrial giant and the development of its hegemony in Canada. An emphasis will also be placed on the sources and methods of local historical research.
Instructor: Cornell

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.

ITAL 100J Y 3C, 1L 1.0
Introduction to Italian
An intensive study of the fundamentals of grammar and conversation. The language laboratory will be used. In the first year of Italian, emphasis will be placed on the fundamentals of grammar and speech.

ITAL 101J F, W 3C, 1L 0.5
Introduction to Italian
Fall term of ITAL 100J.

ITAL 102J F, W 3C, 1L 0.5
Introduction to Italian
Winter term of ITAL 100J.

ITAL 190J Y 3C, 1L 1.0
Intermediate Italian
Advanced study of grammar, conversation and an intensive study of one or two novels. Some finer points of grammar will be studied but will actually be a secondary aspect. A survey of 19th century literature will be offered.
Prereq: ITAL 100J or consent of instructor.

ITAL 191J F 3C, 1L 0.5
Intermediate Italian
Fall term of ITAL 190J.

ITAL 192J W 3C, 1L 0.5
Intermediate Italian
Winter term of ITAL 190J.

ITAL 251J F 3C 0.5
Conversation and Composition
This course offers extensive practice in idiomatic spoken and written language. Conversation will be based on social, political, and cultural aspects of Italian life.
Prereq: ITAL 190J (191J/192J), or permission of instructor.

ITAL 292J W, A 3C 0.5
Italian Culture
This course, given in English, aims at giving the student a well-balanced view of Italy and her culture, through the study of her Geography, History, Religion, Literature, Arts, Music and her contribution to the world and to North America in particular.
Prereq: Second year standing.

ITAL 293J F 3C 0.5
From Dante to Machiavelli
Not offered 1982-83.

ITAL 320J
Italian Literature from 1600-1800
Not offered 1982-83.
ITAL 331J  F  3C  0.5
Masterpieces of Italian Literature in Translation
Major authors will be studied to provide an understanding of the historical significance of Italian literature, especially the Medieval and Renaissance periods. Taught in English. No prereq.

ITAL 332J  W  3C  0.5
Masterpieces of Italian Literature in Translation
Continuation of ITAL 331J. Taught in English. No prereq.

ITAL 391J  F  2S  0.5
The Modern Italian Novel
A brief study of the development of the Italian novel since Manzoni with concentration on the novels just before and after World War II. Prereq: ITAL 190J, 191J/192J or consent of instructor.

ITAL 393J  W  2S  0.5
Modern Italian Poetry
A survey of the major Italian poets from the Futurists through to Montale and their influence on European poetry. Prereq: ITAL 190J, 191J/192J or consent of instructor.

ITAL 396J  F  2S  0.5
Special Topics/Directed Readings
This course gives the student an opportunity to study authors and works of special interest which are not covered in other courses. No prereq.

ITAL 397J  W  2S  0.5
Special Topics/Directed Readings
Winter term of ITAL 396J. No prereq.

Department of Kinesiology

Course Descriptions
Kinesiology

ITAL 331J  F  3C  0.5
Masterpieces of Italian Literature in Translation
Major authors will be studied to provide an understanding of the historical significance of Italian literature, especially the Medieval and Renaissance periods. Taught in English. No prereq.

ITAL 332J  W  3C  0.5
Masterpieces of Italian Literature in Translation
Continuation of ITAL 331J. Taught in English. No prereq.

ITAL 391J  F  2S  0.5
The Modern Italian Novel
A brief study of the development of the Italian novel since Manzoni with concentration on the novels just before and after World War II. Prereq: ITAL 190J, 191J/192J or consent of instructor.

ITAL 393J  W  2S  0.5
Modern Italian Poetry
A survey of the major Italian poets from the Futurists through to Montale and their influence on European poetry. Prereq: ITAL 190J, 191J/192J or consent of instructor.

ITAL 396J  F  2S  0.5
Special Topics/Directed Readings
This course gives the student an opportunity to study authors and works of special interest which are not covered in other courses. No prereq.

ITAL 397J  W  2S  0.5
Special Topics/Directed Readings
Winter term of ITAL 396J. No prereq.
Dance students or permission of instructor.

Prereq: Kinesiology, Health Studies and Dance students or permission of instructor. No Year 1 students are admitted.

KIN 201 W 3C,2L 0.5
Human Anatomy of the Brain, Head and Neck
The anatomical structure and function of the brain, cranial nerves and sense organs of the head are emphasized. Included is an introduction to the histology of the nervous system. An opportunity for some dissection of the head and neck is provided.
Prereq: KIN 200 or consent of Instructor

KIN 222 F 3C,2L 0.5
Statistical Techniques Applied to Kinesiology
An introduction to descriptive and inferential statistics and the interpretation of data. A major consideration of the course is the use of statistics in the solution of problems in Kinesiology.
Prereq: KIN students only

KIN 252 W,S 3C 0.5
An Introduction to the Sociology of Sport
An introduction to the characteristics, processes and problems of sport as a social system. In addition, the social psychological aspects of sport involvement are considered.
Prereq: KIN 103 and SOC 101. Cross-listed as REC 203 and SOC 348

KIN 255 W 3C,2L 0.5
Introduction to Psychomotor Behaviour
An information processing approach is used to introduce the principles of learning and performing fine and gross motor skills. In addition, social psychological variables are studied as they relate to the facilitation or decrement in learning and performance.
Prereq: KIN 103 and PSYCH 101

KIN 280
Administration
Not offered 1982-83.

KIN 300 F,S 3C,2L 0.5
Physiology of Physical Activity
A study of the effects of physical activity on the muscular, circulatory and respiratory systems and the mechanisms through which the body adapts to activity and environment.
Prereq: BIOL 230, 233.

KIN 317 F 3C 0.5
Human Biochemistry
An elementary course in human biochemistry including the metabolism and function of proteins, carbohydrates, lipids, and hormones. Emphasis is placed on the application of biochemical principles to human movement.
Prereq: KIN 116 or equivalent.

KIN 321 W,S 3C,2L 0.5
Introduction to the Biomechanics of Human Movement
Anatomical, neural and mechanical considerations in the qualitative and quantitative analysis of human movement are examined. Concepts related to the biostatics and biodynamics of linked segment models of human motion are introduced.
Prereq: PHYS 103, KIN 200 and 222.

KIN 330 W,S 3C 0.5
Research Design
An introduction to the basic principles of scientific inquiry in Kinesiology. A systematic treatment of the logic and practice of methods and techniques employed in research related to physical activity with an examination of design, sampling, data gathering and analysis.

KIN 335 W,S 3C,2L 0.5
Evaluation of Human Motor Performance
The nature and methodology of assessment is reviewed from theoretical and empirical perspectives. Taxonomies of motor performance are examined and principles developed for the measurement of specific construction in field and laboratory situations.
Prereq: KIN 222.

KIN 340 F 3C,2L 0.5
An Introduction to Sports Medicine
An introductory course to the area of sports medicine, including the prevention, care and rehabilitation of common sports injuries. Considerable attention is directed towards the mechanisms of traumatic injuries as well as the management in the acute, intermediate and advanced stages of injury care.
Prereq: KIN 200, 3rd and 4th year students only.

KIN 341 W 3C,2L 0.5
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 (HLTH 346)
An elementary course in nutrition with special emphasis on diet for sport and certain physiological conditions.

KIN 348 W,S 3C 0.5
Social Psychology of Health Behaviour (HLTH 348)
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

KIN 349 F,S 3C 0.5
Principles of Behaviour Modification (HLTH 349)
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

KIN 352 F 3C 0.5
Aging, the Aged and Leisure: A Sociological and Social Psychological Perspective (SOC 373)
Employing a sociological and psychological frame of reference, the process and problems of aging are analysed. Special emphasis is given to the problem of leisure time in the later years of life.
Prereq: SOC 101 and one other SOC course. Offered every year only.

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 inter-group 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, 295.

KIN 357 W 2C,1T 0.5
Motor Learning
A course focused on the bases and applications of theories of motor...
psychological and neurophysiological processes as they relate to these theories.
Prereq: KIN 222, 255.

KIN 401 W,S 3C,2L 0.5
Physiological Adaptations to Physical Activity
An analysis of the physiologic adaptations that occur in response to protracted physical activity and the influence of such adaptations on the response to work in a variety of environmental conditions. Special emphasis is given to the changes occurring in skeletal and cardiac muscles and the neuro endocrine mechanisms involved.
Prereq: KIN 300 and 317.

KIN 402 F 3C 0.5
Hydro space, Altitude and Aerospace Physiology
An examination of man's cardiorespiratory responses at rest and during work to selected stresses of hyperbaric and hypobaric environments.
Prereq: KIN 300.

KIN 405 W 3C,2L 0.5
Exercise Management
An examination of the rationale and procedures used in the development of exercise programs for normally healthy individuals.
Prereq: KIN 300 and 321.

KIN 407 W 3C 0.5
The Physiology of Coronary Heart Disease (HLTH 407)
An examination of the pathology, risk factors and rehabilitation programs related to coronary heart disease. Major emphasis is placed on the cardiorespiratory implications of exercise in the rehabilitation process.
Prereq: KIN 300 or equivalent.

KIN 410 W 3C 0.5
Growth, Development, and Aging
The physiology of human growth, development and aging is examined, with special reference to the influence of diet, environment, exercise and disease on the normal processes.
Prereq: KIN 200 and BIOL 230.

KIN 416 W 3C 0.5
Neuromuscular Integration
An examination of the neural processes involved in the maintenance of posture and the control of movement.
Prereq: KIN 201 and PSYCH 261 or permission of instructor.

KIN 420 F 3C 0.5
Kinesiological Considerations in Equipment Evaluation
The principles of 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, 3D and 4th year students only or consent of instructor. KIN 425 is advisable and may be taken concurrently.

KIN 425 F 3C,2L 0.5
Biomechanics of Human Movement
The quantitative measurement and analysis of the movement of the human musculo skeletal system. Multisegment dynamic movements will be studied using existing computer programs, with emphasis on kinematics, kinetics and energetics, as well as the use of EMG in the assessment of the control of the movement. Examples are presented from pathological, normal and athletic movement.
Prereq: KIN 321.

KIN 426 W 3C,2L 0.5
Biophysical Signal Processing and Control Systems
Basic electricity and electronics required for the understanding of bioelectric recording and electrophysiology. Application of signal processing to biophysical signals encountered in kinesiology. Mathematical modelling of passive and active systems and the control systems (cardiac; respiratory; neuromuscular) associated with human movement.
Prereq: KIN 321, KIN 300, KIN 357 or permission of instructor.

KIN 431 F,W,S 0.5
Research Proposal
An independent paper in the form of a research proposal on an approved topic, supervised by a faculty member (see KIN 432 for range of topics). The proposal shall consist of three chapters which include: (1) an introduction or statement of the problem, (2) a review of the literature, (3) methods and procedures.
Prereq: 4th year Honours Kinesiology.

KIN 432 F,W,S 0.5
Research Project
An independent research project on an approved topic, supervised by a faculty member. (The first three chapters are completed as KIN 431). The project may include survey, experimental or theoretical research, program evaluation, mathematical modelling, fitness appraisal, etc.
Prereq: KIN 431. It is strongly recommended that students planning graduate studies take KIN 431 and KIN 432.

KIN 433 F,W,S 0.5
Senior Essay
An extensive critical review of the literature on an approved topic. The topics will be broader in scope than those associated with specific research proposals.
Prereq: 4th year Honours Kinesiology.

KIN 442 W 2C,2L 0.5
Adapated Physical Activity
The study of individual problems and their implications for the Kinesiologist. Body mechanics problems, orthopaedic disabilities, neurological disabilities, heart disturbances and respiratory problems are discussed.
Prereq: KIN 300.

KIN 452 F,S 3C 0.5
Sport in Society
An advanced course in the sociology of sport with a particular focus on sport in Canadian society. Topics include the structure and processes of Canadian sport and its place in Canadian social structure and culture.
Prereq: KIN 252 or REC 203 or SOC 348.

KIN 453 F,S 3C 0.5
The Psychology of Sport and Physical Activity
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 (PSYCH 307)
An examination of issues related to understanding the cerebral organization of motor skill. Discussion of how certain movement disorders are a reflection of disturbances at different stages in the sequence of information processing.
Prereq: One of PSYCH 206, 207, or KIN 356.

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.
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.

<table>
<thead>
<tr>
<th>Code</th>
<th>Activity</th>
<th>Level</th>
<th>Code</th>
<th>Activity</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>KIN 180</td>
<td>Elem. Basketball, W.S</td>
<td></td>
<td>KIN 283</td>
<td>Gymnastics - Apparatus, W (Men)</td>
<td></td>
</tr>
<tr>
<td>KIN 183</td>
<td>Gymnastics - Floor</td>
<td></td>
<td>KIN 284</td>
<td>Gymnastics - Apparatus, W (Women)</td>
<td></td>
</tr>
<tr>
<td>KIN 187</td>
<td>Beginner Swimming, F</td>
<td></td>
<td>KIN 285</td>
<td>Elem. Football, F,S</td>
<td></td>
</tr>
<tr>
<td>KIN 281</td>
<td>Elem. Volleyball, F</td>
<td></td>
<td>KIN 287</td>
<td>Elem. Soccer, F (even years)</td>
<td></td>
</tr>
<tr>
<td>KIN 282</td>
<td>Elem. Lacrosse, W</td>
<td></td>
<td>KIN 288</td>
<td>Elem. Wrestling, W</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>KIN 289</td>
<td>Elem. Rugger, F (odd years)</td>
<td></td>
</tr>
</tbody>
</table>

Legal Studies

The Legal Studies Committee

Associate Professor, Committee Chairman and Undergraduate Advisor: M.F. McDonald, BA, (Toronto), MA, PhD (Pittsburgh)

Professor: D.C. Mackenzie, BA, MA, PhD (Princeton)

Associate Professors: C.G. Brunk, BA (Wheaton), MA, PhD (Northwestern)
J.A. Wahl, CR, BA (Western Ontario), MA, PhD (St. Louis, J)

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)

Courses

Students must complete five year-course equivalents of designated Legal Studies courses, as indicated below.

Section 1

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIST 210</td>
<td>History of Law</td>
<td>0.5</td>
</tr>
<tr>
<td>PHIL 327A</td>
<td>Philosophy of Law - Part 1</td>
<td>0.5</td>
</tr>
<tr>
<td>P SCI 292</td>
<td>Aspects of Canadian Law</td>
<td>0.5</td>
</tr>
<tr>
<td>SOC 370G</td>
<td>Sociology of Law</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Total credits in Section 1: 2.0

Section 2

Students are required to complete successfully two year-course equivalents from the following courses. Students in the faculty of Environmental Studies must take ENV 201, 401, and 402 plus one other course in Section 2.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECON 294</td>
<td>Business Law</td>
<td>0.5</td>
</tr>
<tr>
<td>ENV 201</td>
<td>Introduction to Environmental Planning</td>
<td>0.75</td>
</tr>
<tr>
<td>ENV 401</td>
<td>Environmental Law</td>
<td>0.75</td>
</tr>
<tr>
<td>ENV 402</td>
<td>Planning Law</td>
<td>0.75</td>
</tr>
<tr>
<td>HIST 329</td>
<td>The History of Anglo-American Law</td>
<td>0.5</td>
</tr>
<tr>
<td>PHIL 327B</td>
<td>Philosophy of Law - Part 2</td>
<td>0.5</td>
</tr>
<tr>
<td>P SCI 291</td>
<td>The Canadian Legal Process</td>
<td>0.5</td>
</tr>
<tr>
<td>P SCI 333</td>
<td>Administrative Law (in 1980/81 offered as P SCI 392)</td>
<td>0.5</td>
</tr>
<tr>
<td>P SCI 363</td>
<td>Canadian Constitutional Law (in 1980/81 offered as P SCI 392)</td>
<td>0.5</td>
</tr>
<tr>
<td>SOC 224</td>
<td>Law and Order: Regulating Deviance</td>
<td>0.5</td>
</tr>
<tr>
<td>SOC 227</td>
<td>Crime and Society</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Total credits in Section 2: 2.0

Section 3

Students are required to complete successfully one year-course equivalent from the following courses.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECON 493</td>
<td>Taxation: Personal</td>
<td>0.5</td>
</tr>
<tr>
<td>ECON 494</td>
<td>Taxation: Corporations</td>
<td>0.5</td>
</tr>
<tr>
<td>HIST 211</td>
<td>British History to 1890</td>
<td>0.5</td>
</tr>
<tr>
<td>HIST 212</td>
<td>British History from 1890</td>
<td>0.5</td>
</tr>
<tr>
<td>PACS 202</td>
<td>Peace &amp; Conflict Studies</td>
<td>0.5</td>
</tr>
<tr>
<td>PHIL 215</td>
<td>Professional Ethics</td>
<td>0.5</td>
</tr>
<tr>
<td>PHIL 226</td>
<td>Ethics &amp; the Life Sciences</td>
<td>0.5</td>
</tr>
<tr>
<td>PHIL 329</td>
<td>War, Peace, and Justice</td>
<td>0.5</td>
</tr>
<tr>
<td>P SCI 225</td>
<td>History of Political Theory</td>
<td>1.0</td>
</tr>
<tr>
<td>P SCI 260A</td>
<td>Canadian Government &amp; Politics</td>
<td>0.5</td>
</tr>
<tr>
<td>SOC 222</td>
<td>Juvenile Delinquency</td>
<td>0.5</td>
</tr>
<tr>
<td>SOC 223</td>
<td>Deviance: Perspectives &amp; Processes</td>
<td>0.5</td>
</tr>
<tr>
<td>SOC 329</td>
<td>Crime as Business</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Total credits in Section 3: 1.0
Course Descriptions
Man-Environment Studies

Course Descriptions

(Environments Studies course descriptions (ENV S) begin on page 308.)

3Environments Studies and Psychology

3Environments Studies

3Man-Environment Studies and
Environmental Studies

M ENV 191 W 4S,lwkshp 0.5
Seminar-Workshop
Continuation of M ENV 190.
Prereq: Honours Man-Environment Studies.

ENV S 195A
Introduction to Environmental Studies

ENV S 195B
Introduction to Environmental Problems

M ENV 241 W 3C 0.5
Field Ecology

M ENV 247 F 3C 0.5
Social Change
An analysis of major theories of social change. The sources and patterns of change processes with emphasis on the environmental contexts. Provides an opportunity to explore aspects of change which are of special interest to the student.

M ENV 250A or B F.W 3C 0.25/0.5
Environmental Methods & Techniques 2
Series of concurrent six week workshops to introduce methods and techniques appropriate for investigating different environmental problems. Students to select any two from a series of workshops such as field studies, laboratory analyses, questionnaire design, survey research, small group dynamics and participant observation of social interactions.
Prereq: Man-Environment Studies or consent of instructor.

M ENV 150 F 3C 0.5
Environmental Methods and Techniques 1
Series of concurrent six week workshops to introduce methods and techniques for investigating different environmental issues. Students to select any two from a series of workshops such as field studies, laboratory analyses, questionnaire design, survey research, small group dynamics and participant observation of social interactions.
Prereq: Man-Environment Studies or consent of instructor.

M ENV 151 W 3C 0.5
Environmental Methods and Techniques 2
Continuation of M ENV 150.

M ENV 190 F 4S,lwkshp 0.5
Seminar-Workshop
Faculty supervised individual or small group investigation of selected environmental issues to help develop skills for defining and resolving problem situations.
Prereq: Honours Man-Environment Studies.
M ENV 290 W 3C 0.5  
Visual Perception and Communication  
An exploration of the nature of perception and its relationship to communication with special reference to visual phenomena.  
Prereq: Consent of the instructor.

ENV S 271  
Introduction to Quantitative Research Methods

ENV S 272  
Computer Programming in Environmental Studies

ENV S 275 F,W 2R 0.5  
Special Readings  
Background reading and study in consultation with Faculty. Typically utilized when a student must study a topic in connection with other work, but no course offering that topic is available.  
Prereq: Consent of instructor.

M ENV 290 F 4S/wkshp 0.5  
Seminar-Workshop  
Examination of design and conduct of research. Students will prepare a proposal for a project to be conducted during the balance of the term and in M ENV 291, in consultation with faculty advisors.  
Prereq: Man-Environment Studies

M ENV 291 W,S 4S/wkshp 0.5  
Seminar-Workshop  
Continuation of project begun in M ENV 290.  
Prereq: M ENV 290

M ENV 295 F 2C,1S 0.5  
Development of Environmental Thought 1  
Through the use of Ascent of Man film series and a number of texts, this course will provide an historical perspective on the development of environmental thought, with special emphasis on the role of science and technology.  
Prereq: Man Environment Studies or consent of instructor

M ENV 295 F 2C,1S 0.5  
Development of Environmental Thought 2  
Continuation of M ENV 295.  
Prereq: M ENV 295

ENV S 310  
Behavioural Studies

M ENV 320 F,W 3C 0.5  
Environmental Economics  
Principal economic concepts and their environmental implications. Examination of the economic approach to environmental quality. Introduction to social benefit-cost analysis as applied to environmental problems.  
Prereq: Consent of the instructor.

M ENV 331 F 2C 0.5  
Environmental issues in a Global Perspective  

ENV S 333  
Parkland Management

M ENV 335 W 2C 0.5  
Anthropology of Education  
A seminar on selected theories of socialization, acculturation and enculturation. These theories will be related to what in the west is usually categorized as "education". There will also be some emphasis on understanding how field work should be done in educational settings. Students should be prepared to do some field work themselves.  
Prereq: ANTH 102A or consent of instructor.

M ENV 337 W 3C 0.5  
Environmental Management  
Major problems and issues in the management of environmental impacts stemming from development projects. Synthesis of ecological, economic and institutional aspects. Integrating environmental management with social and economic development policies and 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.  
Prereq: Second year or above Environmental Studies students or consent of instructor.

M ENV 340 F 3C 0.5  
Chemical Basis of Pollution Control and Waste Management  
Important principles of inorganic, physical, and organic chemistry, and material balance principles of chemical engineering are presented at a practical level. Application to pollution control, waste management, and/or transportation accidents accompanies discussion of each principle.  
Prereq: A grade 13 chemistry course or consent of instructor.

M ENV 350 F 2C 0.5  
Community Action on Environmental Problems  
The citizen's role in the solution of environmental problems. The work of various community groups is examined and evaluated. Students take part in one group project to experience the process at first hand.

M ENV 351 W 3S 0.5  
Organizations and Environmental Management  
Analyses of inter-jurisdictional and inter-organizational arrangements governing major environmental-resource complexes in Canada. Policy and other issues relating to the development of coherent, effective planning and management systems for such complexes. The course will focus on one particular environmental-resource complex each year to serve as an on-going case study. Examples may include the Great Lakes system, agricultural lands in Canada, development north of 60°, off-shore resources to the 200-mile limit.

M ENV 356 W 3C 0.5  
Canadian Non-Renewable Resources  
An introduction to mineral resources and the state of reserves of selected minerals. Geological factors affecting the occurrence of economic minerals and rocks, concentrating upon energy minerals. Political and social implications are discussed. Cross-listed as SCI 350.
340 Course Descriptions
Man-Environment Studies

ENV S 358
Environmental Pollution and Its Control

M ENV 360 F 3C 0.5
Man and Nature
An exploration of Man's position in Nature as viewed in science and arts and in different cultures. Course materials will be drawn from many sources including philosophy, psychology, religions, biology and literature.
Prereq: Third and fourth year students and consent of instructor.

M ENV 361 F.S 3C 0.5
Communication Systems and International Development
Study of the role of mass media - films, TV, radio, press - in formulating concepts of development and change in different societies.
Prereq: M ENV 260 or consent of instructor.

M ENV 375 F.W 2R 0.5
Special Readings or Seminars on Selected Topics
Prereq: Consent of instructor.

M ENV 375E/475E Case Studies in Canadian Energy Policy
M ENV 375F/475F Environments of Work
M ENV 375I/475I International Development and Environmental Issues
M ENV 375K/475K Issues in Resources Law
M ENV 375P/475P Environmental Education
3/SQ Ecological and Social Dimensions of Planning and Development in Tropical Islands
M ENV 375Z Politics of the Environment

ENV S 380/381 Environmental Studies Workshop

M ENV 385 F 3C 1S 0.5
Technology/Lifestyles for a Conserver Society
Based upon a Conserver Society approach, the course will focus upon energy as a central and symbolic issue. Energy alternatives will be discussed with emphasis on the technologies of alternate energy systems and on the social, political and economic implications.
Prereq: Second year or above.

M ENV 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.
Prereq: Man-Environment Studies.

M ENV 390B F 8S, wkshp 1.0
Seminar-Workshop
Same as M ENV 390A but with additional intensive investigation of the project as warranted by the project and by student ability.
Prereq: Man-Environment Studies and consent of faculty.

M ENV 391A F.W 4R, wkshp 0.5
Seminar-Workshop
Continuation of M ENV 390A.
Prereq: M ENV 390A

M ENV 391B W 8S, wkshp 1.0
Seminar-Workshop
Continuation of M ENV 390D.
Prereq: M ENV 390B

M ENV 400 Y 3C 1.0
Senior Honours Seminar
Case study analysis of environmental problems and their handling by various organizations, institutions, and inter-organizational arrangements. Actor analysis, feasibility studies, program evaluation, and 'environmentally sound' development. Roles for 'environmentalists' in various organizational contexts.
Prereq: Third or fourth year Man-Environment Studies or consent of instructor.

M ENV 401 Environmental Law
M ENV 402 Planning Law
M ENV 411 Alternative Future Environments 1
M ENV 412 Alternative Future Environments 2
M ENV 417 Land Use History and Landscape Change 1
M ENV 418 Land Use History and Landscape Change 2
M ENV 444 Land Evaluation and Resources Management

M ENV 445 Technology Assessment and Policy Analysis
Not offered 1982-83.

M ENV 450 Environmental Design
Not offered 1982-83.

M ENV 470 Y 3C 1.0
Environmental Teaching and Learning
Examination of physical and social environments which induce particular kinds of learning. Practical training and experience in project development and co-ordination, leadership and group facilitation processes.
Prereq: Third and fourth year Honours Man-Environment Studies or consent of instructor.

M ENV 475 F.W 2R 0.5
Special Readings or Seminar on Selected Topics
See course descriptions under M ENV 275 and 375.
Prereq: Consent of instructor.

M ENV 476 Y 2R 1.0
Special Readings or Seminar on Selected Topics
Prereq: Consent of instructor.

M ENV 480 Special Topics Seminar
Not offered 1982-83.

M ENV 490A, B, or C Y 1.0/2.0/3.0
Senior Honours Assignment
490A (1 course credit)
490B (2 course credits)
490C (3 course credits)
A project of sufficient scope to demonstrate mastery of problemsolving 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.

ENV S 500 Professional Development in Environmental Management
Department of Management Sciences

Professor, Chairman of the Department
D.W. Conrath, BA (Stanford), MS (Carnegie Tech), MA, PhD (UC, Berkeley) PEng

Professors
D.J. Glough, BASc, MBA (Toronto), PEng
P. M. Reilly, BASc (Toronto), DIC PhD (London), FSS, PEng
S.D. Saleh, BA (Cairo), MA, PhD (Case Western Reserve)

Associate Professors
I. Bernhardt, BA (New York Univ.), PhD (UC, Berkeley)
P. Brill, BSc (Carleton), MA (Columbia), PhD (Toronto)
F.E. Burke, BA (London), PEng
M.J. Magazine, BS (CCNY), MS (NYU), MEng, PhD (Florida), PEng
J.B. Muir, BASc (Toronto), MMath, PhD (Waterloo), PEng
M. Scrabin, MBA, PhD (Simon Fraser)
R.G. Vickson, BSc (British Columbia), PhD (Massachusetts Institute of Technology)

Assistant Professors
J.D. Fuller, BSc, (Queen’s), MSc, PhD (British Columbia)
F. Safayem, BS (Idaho), MSc, PhD (Victoria)

Research Assistant Professors
C.A. Higgins, BMath, MMath, PhD, (Waterloo)
C.S. Thachenkary, BSc (Toronto), MASc, PhD (Waterloo)

Lecturer
V. Mason, BASc, MASc (Toronto), PEng

Faculty Member holding cross appointment as shown:
*Department of Chemical Engineering

Course Descriptions
Management Sciences
Management Studies

M SCI 23 F,W,S 2C,1T 0.5
Managerial and Engineering Economics 1
This course is designed to satisfy Engineering Economics requirements of the Canadian Accreditation Board. Price and output decisions. Choosing among alternative inputs and production processes. Evaluating alternative investments, equipment service life, and new products.

M SCI 31 W 2C,1T 0.5
Probability and Statistics 2
Linear statistical models. General regression theory and applications. Design of orthogonal experiments and industrial applications. Correlation coefficient analysis. Elementary time series analysis.
Prereq: M SCI 21 or equivalent

M SCI 43 W 2C,1T 0.5
Managerial and Engineering Economics 2
Prereq: M SCI 23 or equivalent.

M SCI 44 F.S 3C 0.5
Organizational Behaviour 1
Introduction to the concepts of learning, person perception, attitudes and motivation in an organization. Consideration of communication, roles, norms and decision making within a group. Discussion of power, control, leadership and management in light of the above concepts.

M SCI 46 F.W,S 3C 0.5
Operations Research 1

M SCI 47 F.S 3C 0.5
Operations Research 2
Classification of stochastic processes. Recurrent events including birth and death processes, and branching processes. Waiting line models and applications. Markov processes and decision problems. Applications include inventory control, reliability, equipment replacement, maintenance, design of service facilities, etc.
Prereq: M SCI 21 or equivalent, and M SCI 46

M SCI 48 W 3C 0.5
Introduction to Production Management
Introduction to a number of problem areas in the management of production/industrial engineering. Topics chosen from production planning and inventory control, planning/control of large projects, quality control, reliability/maintenance, facilities layout, job design, production standards and work measurement.

M SCI 53 F,W 3C 0.5
Organizational Behaviour 2
Macro theories of organization and organizational processes are discussed. First half of course examines the development of organizational theories. The second half discusses organizational processes such as conflict and communication control. Throughout, an effort is made to relate course material to organizational structures.
Prereq: M SCI 44

Management Studies

Courses are offered in five fundamental areas of management: money, people, materials, data and communications. These courses are taught by experts in Management Sciences, English, Philosophy, Psychology, Economics, Computer Science and Mathematics.

As a university program, Management Studies must be taken in conjunction with an existing Honours Major. Students should be prepared to take a number of courses that presuppose a thorough understanding of basic mathematics.
A Management Studies Major or Minor can reduce or eliminate the need for make-up courses in management often required for a business promotion. Furthermore, the skills and knowledge gained from the program allow the graduate to manage his personal life and professional career with purpose and efficiency. As such, a university degree with a Management Studies option will be attractive to employers. Although M120A, M1248, CS180 and STAT 210 are recommended as a sufficient body of knowledge as corequisites and prerequisites, alternative sequences of courses in some Faculties may be substituted according to the following table. It should be noted that the alternative sequences are most applicable in the case of the Minor.

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The programs for a Joint Honours or for a Minor in Management Studies are as follows:

Joint Honours 'x' with Management Studies
(Where 'x' is any departmental area which chooses to make a Joint Major designation in Management Studies available to its Honours students.)

In addition to the Honours requirements of 'x', a minimum average of 70% must be achieved on the following twenty half credits:

ACC 121/122* or 191/192; ACC 131 or BUS 111W;
ECON 101;
M SCI 44, 53 or PSYCH 333, SOC 340;
CS 330, 331;
ENGL 210 or SCI 209 plus an oral report on a written paper.

Students planning to enter either of the above programs must consult with their Faculty Advisor and in addition should inform the Director of the Program who is at present Professor C.F.A. Beaumont, Chairman, Department of Applied Mathematics.

ENGL 210 or SCI 209 plus an oral report on a written paper.
One of ACC 231, ES 201, P SCI 291, 292;
Plus two two-course sequences to be approved by a Faculty Advisor.

The following are examples of some two and four course sequences which may be chosen:

Environmental Management
PLAN 357, ENV S 400
Public Administration
P SCI 331, 332
Financial Reporting
ACC 291, 292, 491, 492
Management Information Control Systems
ACC 381, 382, 441, 441
Financial Management and Investments
ACC 371, 372, 381, 371
Econometrics
ECON 102, 321, 421, 422
Taxation
ACC 291, 292, 461, 462
Industrial Psychology
PSYCH 333, 339 if not already taken
Formal Organizations
PSYCH 333, SOC 340 if not already taken

*ACC 121/122 is a terminal sequence of courses in Accounting and is recommended for non-accountants.

Faculty of Mathematics

Dean of the Faculty of Mathematics
J.A. George, MSc (Alberta), PhD (Stanford)

Associate Deans, Undergraduate Studies
K.D. Fryer, BA, (Western Ontario), PhD (Toronto)
I.J. McGee, BASc (Toronto), MSc (Waterloo), PhD (Yale)

Associate Dean, Graduate Studies
R.B. Simpson, MASc (Toronto), PhD (Maryland)

Director of Undergraduate Affairs
P.C. Brülling, BA (McMaster), MA (Waterloo)

Director, Mathematics Faculty, Computing Facility
J.J. Morris, BSc (Leicester), PhD (St. Andrews)

Director of Computer Communications Network Group
E.G. Manning, MSc (Waterloo), PhD (Illinois)

Director, Mathematics/Commerce Group
C.F.A. Beaumont, BA, (McMaster), MA (Toronto)

Associate Director, Mathematics/ Commerce Group
R.G. Dunkley, BA (Western Ontario)

Associate Director, Operations Research Group
R.N. Burns, BSc (Toronto), PhD (Waterloo)

Lecturers
P.A. Didur, BSc, BA (Manitoba), MMath (Waterloo)
R.G. Scoins, MMath (Waterloo)
Course Descriptions
Mathematics

Special Lecturer and Resident Counsel
in Mathematics and Engineering
R.G.R. Lawrence, QC

University Computing Officer
W.M. Gentleman, BSc (McGill), PhD (Princeton)

Department of Applied Mathematics

Associate Professor and Chairman of the Department
C.F.A. Beaumont, BA (McMaster), MA (London)

Professor
J. Cizek*, RNDr, W.M. Gentleman, & SC (McGill), PhD
Special Lecturer and Resident
R.G. C.F.A. Beaumont, Mathematics

H.F. Davis, S.G. F.O. Goodman, & SC
G.M.L. Gladwell*, BSc.

B. Forte2, W.H. Hui, & SC
J. PaIdus', MA. McKiernan6, F.R. McCourtS, BSc, MSc,
I.J. McGee, BASc

J. Wainwright, BSc (Natal), C. Rogers, BA (Oxford), MEd (Toronto),
M.M. Associate P.J. Ponzo, J. Froese, C.B. Collins, G.J. Lastman, G.W.
R.G. McLenaghan. MSc (Princeton)
in Mathematics and Engineering

Department

Adjunct Professors
M.A. Donelan, PhD (British Columbia)
D. J. Henderson, BS (British Columbia),
PhD (Utah), FinstP
H. Rund, PhD (Cape Town), Habilitation
(Freiburg)
R.E. Woolsey, PhD (Texas)

Faculty Members holding cross-appointments as shown:
1Applied Mathematics and Chemistry
2Applied Mathematics/Statistics/Computer Science/Pure Mathematics
3Computer Science and Applied Mathematics
4Civil Engineering and Applied Mathematics
5Chemistry and Applied Mathematics
6Pure Mathematics and Applied Mathematics
7Physics and Applied Mathematics

Department of Combinatorics and Optimization

Professor and Chairman of the Department
J.A. Bondy, DPhil (Oxford)

Associate Professor and Associate Chairman of the Department
C.E. Haff, BS (Stanford), PhD (Waterloo)

Associate Professor and Associate Chairman of the Department
P.J. Schellenberg, PhD (Waterloo)

Distinguished Professor
W.T. Tutte, PhD (Cambridge), FRSC

Professors
G. Berman, MA, PhD (Toronto)
J. Edmonds, BA (George Washington),
MS (Maryland)
K.D. Fryer, BA (Western Ontario), PhD (Toronto)

Associate Professors
J. Li. Morris3, BSc (Leicester), PhD (St. Andrews)
R.A. Wentzells, BSc (Acadia), PhD (Western Ontario)

Assistant Professors
S.P. Lipshtiz, BSc (Natal), MSc (South Africa), PhD (Witwatersrand)
W.F. Shadwick, BA, MA (Western), PhD (London)
M.E. Snyder, BSc (Western Ontario),
MSc (Waterloo)

Lecturer
B.J. Marshman, PhD (Waterloo)

Adjunct Professors
M.A. Donelan, PhD (British Columbia)
D. J. Henderson, BS (British Columbia),
PhD (Utah), FinstP
H. Rund, PhD (Cape Town), Habilitation
(Freiburg)
R.E. Woolsey, PhD (Texas)

Faculty Members holding cross-appointments as shown:
1Applied Mathematics and Chemistry
2Applied Mathematics/Statistics/Computer Science/Pure Mathematics
3Computer Science and Applied Mathematics
4Civil Engineering and Applied Mathematics
5Chemistry and Applied Mathematics
6Pure Mathematics and Applied Mathematics
7Physics and Applied Mathematics

Department of Computer Science

Professor and Chairman of the Department
J.A. Brzozowski, MASc (Toronto), PhD (Princeton)
Course Descriptions
Mathematics

Department of Pure Mathematics

Professor and Chairman of the Department
G.E. Cross, MA (Dalhousie), PhD (British Columbia)

Associate Professor and Associate Chairman for Undergraduate Affairs
W.J. Gilbert, MA (Cambridge), DPhil (Oxford)

Assistant Professor and Associate Chairman for Graduate Affairs
C.L. Stewart, BSc (British Columbia), MSc (McGill), PhD (Cambridge)

Distinguished Professor
J. Aczel, PhD (Budapest), HabilitDSc (Hungarian Academy of Sciences), FRSC

Professors
S. Burris, PhD (Oklahoma)
D.Z. Djokovic, PhD (Belgrad)
B. Forte, PhD (Pisa), HabillDSc (Rome)
H. Haruki, PhD (Osaka)
P. Hoffman, BA (Toronto), PhD (Manchester)
P. Kannappan, BScHons (Annamalai), PhD (Washington)
J.W. Lawrence, MSc (McGill), PhD (Carleton)
M.A. McKiernan, MA (Loyola), PhD (Illinois Institute of Technology)
R.A. Staal, PhD (Toronto)
J.W. Tucker, BSc (London), PhD (London)

Associate Professors
J.A. Baker, MA (Saskatchewan), PhD (Waterloo)
L.J. Cummings, PhD (British Columbia)
L.J. Dickey, MA (Arizona), PhD (Wisconsin)
D.A. Higgs, BScHons (Witwatersrand), MA (Cambridge), PhD (McMaster)
A. Kerr-Lawson, BA (Toronto), MA (Chicago), PhD (McMaster)
E. Moskal, BA (Toronto), PhD (Illinois)
D. Mowat, PhD (Waterloo)
C.T. Ng, BSc (Chinese University of Hong Kong), PhD (Waterloo)
F.C.Y. Tang, BSc (Hong Kong), MS (South Carolina), PhD (Illinois)
F. Zorzitto, BSc (Windsor), PhD (Queen's)

Assistant Professors
A.A. Adamson, MMath (Waterloo), PhD (Berkeley)
K.R. Davidson, BMath (Waterloo), PhD (Berkeley)
K.A. Rowe, BSc (Toronto), MS (Wisconsin), PhD (Illinois)

Faculty Members holding cross-appointments as shown:
1Applied Mathematics/Statistics/Computer Science/Pure Mathematics
2Computational Science and Statistics
3Computer Science and Applied Mathematics
4Computer Science and Electrical Engineering
5Computer Science and Combinatorics and Optimization
6Statistics and Computer Science
7Electrical Engineering and Computer Science

Department of Pure Mathematics

Professor and Chairman of the Department
G.E. Cross, MA (Dalhousie), PhD (British Columbia)

Associate Professor and Associate Chairman for Undergraduate Affairs
W.J. Gilbert, MA (Cambridge), DPhil (Oxford)

Assistant Professor and Associate Chairman for Graduate Affairs
C.L. Stewart, BSc (British Columbia), MSc (McGill), PhD (Cambridge)

Distinguished Professor
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D.Z. Djokovic, PhD (Belgrad)
B. Forte, PhD (Pisa), HabilitDSc (Rome)
H. Haruki, PhD (Osaka)
P. Hoffman, BA (Toronto), PhD (Manchester)
P. Kannappan, BScHons (Annamalai), PhD (Washington)
J.W. Lawrence, MSc (McGill), PhD (Carleton)
M.A. McKiernan, MA (Loyola), PhD (Illinois Institute of Technology)
R.A. Staal, PhD (Toronto)
J.W. Tucker, BSc (London), PhD (London)

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L.J. Cummings, PhD (British Columbia)
L.J. Dickey, MA (Arizona), PhD (Wisconsin)
D.A. Higgs, BScHons (Witwatersrand), MA (Cambridge), PhD (McMaster)
A. Kerr-Lawson, BA (Toronto), MA (Chicago), PhD (McMaster)
E. Moskal, BA (Toronto), PhD (Illinois)
D. Mowat, PhD (Waterloo)
C.T. Ng, BSc (Chinese University of Hong Kong), PhD (Waterloo)
F.C.Y. Tang, BSc (Hong Kong), MS (South Carolina), PhD (Illinois)
F. Zorzitto, BSc (Windsor), PhD (Queen's)

Assistant Professors
A.A. Adamson, MMath (Waterloo), PhD (Berkeley)
K.R. Davidson, BMath (Waterloo), PhD (Berkeley)
K.A. Rowe, BSc (Toronto), MS (Wisconsin), PhD (Illinois)

Faculty Members holding cross-appointments as shown:
1Applied Mathematics/Statistics/Computer Science/Pure Mathematics
2Computational Science and Applied Mathematics
3Pure Mathematics and Philosophy
4Pure Mathematics and Combinatorics and Optimization
5St. Jerome's and Pure Mathematics
Course Descriptions
Mathematics

Department of Statistics

Associate Professor and Chairman of the Department
J.F. Lawless, BSc, MSc, PhD (Waterloo)

Associate Professor and Associate Chairman of the Department
E.M. Thompson, BSc (Toronto), MSc, PhD (Ithaca)

Associate Professor and Associate Chairman, Actuarial Science
W.H. Aitken, BA (Toronto), FSA, FCIA, EA

Professors
W.F. Forbes, BSc, PhD, DSc (London), DIC, ARCS
B. Forte, PhD (Pisa), Habilitatione (Rome)
W.M. Gentleman, BSc (McGill), PhD (Princeton)
V.P. Godambe, MSc (Bombay), PhD (London)
J.D. Kalbfleisch, BSc, MMath, PhD (Waterloo)
J.G. Kalbfleisch, BSc (Toronto), MA, PhD (Waterloo)
P.M. Reilly, UE, BSc (Toronto), DIC, PhD (London), PEng
K.R. Shah, BA, MA (Bombay), PhD (Indian Statistical Institute)
D.A. Sprott, BA, MA, PhD (Toronto), FRCS, FRPS
M.D. Vogel-Sprott, BA (McMaster), MA, PhD (Toronto)

Associate Professors
B. Abraham, BSc (Kerala), MSc (Quebec), PhD (Wisconsin)
G.W. Bennett, BSc, BA, PhD (Adelaide)
M.A. Bennett, BA (Nottingham), FSA, FCIA
A. Breder, BSc (McGill), MA, PhD (California-Berkeley), ASA, FSA, FCIA
K.S. Brown, BMath, PhD (Waterloo)
W.H. Cherry, BSc, PhD (Melbourne)
J.F. Gentleman, BA, MS (Chicago), PhD (Waterloo)
R.J. MacKay, BSc (Waterloo), MSc, PhD (Toronto)
H.H. Panjer, BA, MA, PhD (Western), FSA, FCIA
R.G. Reynolds, BSc, MSc (Manitoba), FSA, FCIA
W.S. Rickett, BSc, PhD (Waterloo)
J.C. Robinson, BSc, MSc, PhD (Waterloo)
R.V. Thysell, BA (Montana), MA, PhD (Iowa)
J.B. Whitley, BA, MA (Western Ontario), PhD (Toronto)
J.C. Young, BSc (Toronto), MSc (Waterloo), PhD (Edinburgh)

Assistant Professors
R.L. Brown, BMath (Waterloo), FSA, FCIA, ACAS
M.J. Goddard, BSc (Toronto), MSc, PhD (LSHTM)
I.P. Goulden, BMath, MMath, PhD (Waterloo)
D.E. Matthews, BA, MA (Western Ontario), PhD (London), DIC
C. Minder, Dipl Math (Basel), MMath, PhD (Waterloo)

Lecturer
C. Springer, BSc, MSc (McGill)

Adjunct Professors
H.M. Atrubin, BA (Manitoba), FSA, FCIA
A. Finch, BSc, ARCS, PhD, DSc (London), DIC
J.M. Gani, BSc (London), PhD (ANU), DSc (London), DIC, FAA
J.A. Mereu, BA (Western), FSA, FCIA

Faculty Members holding cross-appointments as shown:
1. Applied Mathematics/Statistics
2. Computer Science/Pure Mathematics
3. Computer Science and Statistics
4. Chemical Engineering and Statistics
5. Statistics and Psychology
6. Psychology and Statistics
7. Statistics and Recreation
8. Statistics and Computer Science
9. Combinatorics and Optimization and Statistics

Strategy Board Members

University of Waterloo Faculty of Mathematics

Dr. D.C. Baxter
Assistant Auditor General
Control Evaluation Branch

E.G. Burton
Vice President, Business Services
Noranda Mines Limited

A. Gordon
Deputy Minister
Ministry of Government Services

S.L. Hartley
Senior Vice President, Finance
The Molson Companies Ltd.

C.A. Hayles
Assistant General Manager
Marketing Department
Imperial Oil Limited

R.D. Hossack
Partner
Currie, Coopers & Lybrand

W.D. Jones
Senior Manager
Systems and Data Processing
The Steel Company of Canada, Ltd.

Dr. G.E. Lee-Whiting
Head, Theoretical Physics Branch
Chalk River Nuclear Laboratories
Atomic Energy of Canada Ltd.

R.G. Logan
Director External Programs
IBM Canada Limited

E.L. Pursey
Vice President and Controller
Accounts and Control Division
Canadian Imperial Bank of Commerce

Dr. C.D. Sadlier
Assistant Vice President, Systems Planning
Bell Canada

D.W. Seaborn
Vice President, Product Development
Systemhouse Ltd.

G.F. Sekely
Director, Information Systems
Canadian Pacific Limited

B.J. White
Director
Operations Staffing Support Division
Public Service Commission Canada

R.P. Wismer
Vice President Development
Canadian Imperial Bank of Commerce

The University of Waterloo Strategy Board was established to provide liaison between the Faculty of Mathematics and knowledgeable representatives from key sectors of the economy. Board meetings are normally held twice a year.

Faculty of Mathematics

Course Offerings - Notes

1. Courses with the following abbreviations are offered by the Faculty of Mathematics: 'ACTSC' (Actuarial Science), 'AM' (Applied Mathematics), 'C&O' (Combinatorics & Optimization), 'CS' (Computer Science), 'MATH' (Non-departmental faculty courses), 'MTHEL' (Mathematics Elective), 'PMATH' (Pure Mathematics), 'STAT' (Statistics). The course descriptions which follow appear in ascending order by course number within these groups. Unless otherwise indicated, and provided space is available, these courses are 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, 107, 110a/b, 111a/b, 112, 113, 114, 115a/b, 210, 211, 212, 213a/b, 215, 216, 226; STAT 202, 204, 205, 210, 300, 500.
Actuarial Science

Course Descriptions

ACTSC 221 F.W.S 3C 0.5
Mathematics of Investment
The theory of rates of interest and discount. Annuities and sinking funds with practical applications to mortgage and bond questions. Yield rates. Prereq: At least second year standing. N.B.: Credit will be granted for only one of ACTSC 221, 231. ACTSC 221 cannot be counted for credit toward a BMath Honours Actuarial Science degree.

ACTSC 222 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 one 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 130a/b Credit will be granted for only one of ACTSC 221, 231.

ACTSC 232 F.W.S 3C 0.5
Introduction to Life Contingencies
Application of probability to problems of life and death including population theory for the stationary case. 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 and MTHEL 305a Credit will be granted for only one of ACTSC 222, 232.

ACTSC 331 F,G 3C 0.5
Life Contingencies - Single Lives
Reserves, company expenses and premium and cash value calculations.

ACTSC 332 W 3C 0.5
Life Contingencies - Multiple Lives
Joint Life, Last Survivor probabilities, insurances and annuities. Simple and compound contingent functions and reversionary annuities. Other special benefits. Prereq: ACTSC 232

ACTSC 333 F,S 3C 0.5
Finite Differences
Application of the theory of finite differences to the development of function approximations primarily by collocation and osculatory polynomials. Analysis of error in such approximations. Summation formulæ. Introduction to data graduation. Prereq: MATH 120b, 124b

ACTSC 338 W 3C 0.5
Graduation of Life Tables
Continuation of ACTSC 337. Approximate integration and differentiation. Iteration, theory and methods of data graduation. Prereq: ACTSC 337 or consent of instructor.

ACTSC 339
Topics in Actuarial Mathematics
Not offered in 1982-83.

ACTSC 341 F,S 3C 0.5
Risk Theory 1

ACTSC 342 W 3C 0.5
Risk Theory 2

ACTSC 431 F,S 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 432 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 433 F,S 3C 0.5
Basic Pension Mathematics

ACTSC 434 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 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 441
Advanced Topics in Actuarial Mathematics
Not offered in 1982-83.

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 453 F,S 3C 0.5
Basic Pension Mathematics

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 and 305b

ACTSC 458 W 3C 0.5
Insurance Law
Topics in Canadian and American Insurance Law.
Prereq: ACTSC 331, MTHEL 305a and 305b

ACTSC 463
Topics in Casualty Insurance 1
Topics in casualty insurance chosen from areas such as coverages, rate-making and underwriting.
Prereq: ACTSC 232
Not offered in 1982-83.

ACTSC 464
Topics in Casualty Insurance 2
A continuation of ACTSC 463.
Prereq: ACTSC 463
Not offered in 1982-83.

ACTSC 491
Seminar in Actuarial Mathematics 1
Not offered 1982-83.

ACTSC 492
Seminar in Actuarial Science 2
Not offered 1982-83.

Applied Mathematics
Course Descriptions
Mathematics: 

AM 111 W 3C.1T 0.5
Applications of Mathematics 2 (For Biology Students)
Prereq: AM 101, or consent of instructor.
Not open to students in the Faculty of Mathematics.

AM 260 F,W 2C 0.5
Mathematical Modelling
Mathematical models for problems in the physical and biological sciences. Typical problems chosen from ecology, special relativity, spread of epidemics, rumours and tumors. Solutions to problems will be obtained primarily by differential equations.
Prereq: MATH 120b

AM 270 F,W 2C 0.5
Mathematical Modelling
Further mathematical models from various disciplines. An introduction to Newtonian mechanics will also be included in the course.
Prereq: AM 260 or consent of instructor.

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 2C,1T 0.5
Elementary Differential Geometry and Tensor Analysis
Curves in Euclidean 3-space (E3) and the Serret-Frenet formulae; 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 with PMath 365.

AM 364 W 2C,1T 0.5
Special Relativity
A tensorial formulation of special relativity, Lorentz transformations and flat space-time; relativistic mechanics and collision phenomena; Maxwell's equations in tensorial form and some of their solutions; energy-momentum tensor of the electromagnetic field and of a fluid; spinors and representations of the Lorentz group. Reference will be made throughout to the experimental verification of special relativity.
Prereq: AM 362/PMATH 365, PHYS 364, or consent of instructor. Not offered 1982-83.

AM 365 W 2C,1T 0.5
Introduction to Continuum Mechanics
Prereq: MATH 230b, or consent of instructor.

AM 371 F,S 2C,1T 0.5
Partial Differential Equations of Applied Mathematics 1
First order partial differential equations and methods of characteristics; second order partial differential equations, boundary value problems and related numerical methods, vibrating string, 2-D membranes, heat equation and related problems; introduction to vector analysis.
Prereq: AM 260, MATH 230b, or consent of instructor.

AM 372 W 2C,1T 0.5
Introduction to General Relativity
Flat space-time 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/PMATH 365 or consent of instructor.
A student may receive credit for only, one of AM 372, AM 364 and for only one of AM 372, AM 464.
Course Descriptions
Mathematics:
Applied Mathematics

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 391 W 2C,1T 0.5
Ordinary Differential Equations 2
Prereq: AM 381.

AM 395 F 2C,1T 0.5
Mechanics
Prereq: MATH 230b or consent of instructor.

AM 389 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 matroids, numerical and multilinear approximation, tensors, and special functions.
Prereq: MATH 224b

AM 461 F 2C 0.5
Non-Linear Differential Equations
Non-linear mechanics, stability, quasi-linear and strongly non-linear systems, linear periodic systems, non-linear integral equations.
Prereq: AM 381/391, or consent of instructor.

AM 462 F 2C 0.5
Measure and Integration
The theory of measure and the Lebesgue integral.
Prereq: MATH 332a and PMATH 351a.

AM 463 F 2C,1T 0.5
Introduction to Differentiable Manifolds
Differentiable manifolds, vector fields, linear connections, tensor fields, differential forms, and the Cartan structure equations.
Prereq: AM 362 or consent of instructor.
Cross-listed with PMATH 463.

AM 464 F 2C,1T 0.5
Introduction to General Relativity
Curved space-time and the Einstein field equations; the Schwarzschild solution; experimental tests of general relativity; the weak field limit; introduction to black holes; construction of stellar models; introduction to cosmology: 3 + 1 decomposition of space-time and the Cauchy initial value problem; methods of solving the field equations.
Prereq: AM 364 and AM 362 and consent of instructor.

AM 465 Y 2C 1.0
Quantum Mechanics
Prereq: MATH 234A, AM 371 or consent of instructor.

AM 466 F 3C 0.5
Fluid Mechanics A
Fundamental equations of inviscid fluids, compressibility, vorticity; two and three-dimensional irrotational, incompressible flow, Blasius' theorem, Joukowski hypothesis. Water Wave Motion.
Prereq: AM 365.

AM 468 F 2C 0.5
Topics in Applied Mathematics
A selection of special topics given by members of the Applied Mathematics Department.
Prereq: Consent of instructor.

AM 472 W 2C 0.5
Linear Operators
Linear operators in Hilbert spaces. Compact operators. Introduction to functional analysis.
Prereq: AM 462 or consent of instructor.

AM 474 F 2C,1T 0.5
Selected Topics in Differential Geometry
Depending on instructor, topics from pseudo-Riemannian and Riemannian geometry such as: isometries and Killing vector fields, sectional curvatures, submanifolds; normal co-ordinates; variation of geodesics and Jacobi fields; conformally related spaces.
Prereq: PMATH 463/AM 463 or consent of instructor. Cross-listed with PMATH 465.

AM 476 W 3C 0.5
Fluid Mechanics B
Prereq: AM 466.

AM 478 W 2C 0.5
Topics in Applied Mathematics
Same as in AM 468.
Prereq: Consent of instructor.

AM 481 Y 2C 1.0
Partial Differential Equations of Applied Mathematics 2
Second-order partial differential equations and characteristics; d'Alemberts' solution of the wave equation, concepts of distributions, construction of Green's functions, Fourier integral theorem, integral transforms, integral equations, variational properties of eigenvalues and eigenfunctions, special functions, asymptotic series. All these methods are applied to physical problems.
Prereq: AM 371, 381, 391, or consent of instructor.
Calculus of Variations
Prereq: MATH 230b, or consent of instructor.

Electromagnetism
Applications of Maxwell’s equations. Introduction to wave guides and antennae.
Prereq: PHYS 253 or consent of instructor.

Statistical Mechanics
Applications of probability theory to theoretical Physics.
Prereq: Consent of instructor.

Control Theory
Prereq: Consent of instructor.

Reading Course

Combinatorics and Optimization

Course Descriptions

C&O 220 F,W 3C 0.5
Introductory Combinatorics
Prereq: None.
Credit will be granted for only one of C&O 220 or C&O 230. C&O 220 cannot be counted for credit toward a BMath Honours degree. Offered by 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 one of C&O 220 or C&O 230.

C&O 270 F,W 3C 0.5
Introduction to Optimization
Applications.
Prereq: MATH 120b and MATH 124a
C&O 270 is recommended, but not required, for 300-level modelling courses. C&O 350, 367 and 370 are basic courses in optimization and modelling, and may be taken in the second term of Year 2. Also offered by St. Jerome’s College in Fall term.

C&O 330 F,W 3C 0.5
Enumeration and Design
Prereq: MATH 224b and C&O 230.

AM 482 F 2C,1T 0.5
Calculus of Variations

AM 485 F 2C 0.5
Electromagnetism

AM 486 F 2C 0.5
Statistical Mechanics

AM 488 W 3C 0.5
Control Theory

AM 489 F 0.5
Reading Course

AM 495 W 2C,1T 0.5
Flexibility

AM 499 W 0.5
Reading Course

AM 365

AM 482
Calculus of Variations
Prereq: MATH 230b, or consent of instructor.

AM 485 Electromagnetism
Applications of Maxwell’s equations. Introduction to wave guides and antennae.
Prereq: PHYS 253 or consent of instructor.

AM 486 Statistical Mechanics
Applications of probability theory to theoretical Physics.
Prereq: Consent of instructor.

AM 488 Control Theory
Prereq: Consent of instructor.

AM 489 Reading Course

AM 495 Flexibility
Basic equations of elasticity for homogeneous isotropic bodies: bending of beams; plane elastic waves; Rayleigh surface waves, Love waves. Solution of problems by potentials, variational methods and Saint Venant’s principle.
Prereq: AM 385.

AM 499 Reading Course

C&O 220 Introductory Combinatorics
Prereq: None.
Credit will be granted for only one of C&O 220 or C&O 230. C&O 220 cannot be counted for credit toward a BMath Honours degree. Offered by St. Jerome’s College in Winter term.

C&O 230 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 one of C&O 220 or C&O 230.

C&O 270 Introduction to Optimization
Applications.
Prereq: MATH 120b and MATH 124a
C&O 270 is recommended, but not required, for 300-level modelling courses. C&O 350, 367 and 370 are basic courses in optimization and modelling, and may be taken in the second term of Year 2. Also offered by St. Jerome’s College in Fall term.

C&O 330 Enumeration and Design
Prereq: MATH 224b and C&O 230.

C&O 311 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 224d
Offered by St. Jerome’s College.

C&O 342 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 and C&O 230

C&O 343 Graph Theory 2
Prereq: C&O 342

C&O 350 Linear Programming
Prereq: MATH 224a

C&O 351 Network Flow Theory
Prereq: C&O 350

C&O 367 Mathematical Programming
Prereq: MATH 220a and MATH 224a

C&O 331 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 224d
Offered by St. Jerome’s College.

C&O 342 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 and C&O 230

C&O 343 Graph Theory 2
Prereq: C&O 342

C&O 350 Linear Programming
Prereq: MATH 224a

C&O 351 Network Flow Theory
Prereq: C&O 350

C&O 367 Mathematical Programming
Prereq: MATH 220a and MATH 224a
C&O 370 F.S 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: MATH 124h*

C&O 371 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 380 W,S 3C 0.5
**Mathematical Discovery and Invention 1**
a study of about 100 challenging problems taken from many areas of elementary mathematics - number theory, combinatorics, geometry, probability, logic.
*Prereq: None.*

C&O 381 Mathematical Discovery and Invention 2
Not offered 1982-83.

C&O 382 F 2C 0.5
**Combinatorial Geometry**
Combinatorial aspects of the plane. The number of regions determined by various geometrical curves. Pick's theorem, Sylvester's triad problem, squaring the rectangle, convex sets and finite geometry.
*Prereq: None.*
*Offered at St. Jerome's College.*

C&O 430 F 3C 0.5
**Algebraic Enumeration**
The course is an extension of C&O 330. The combinatorics of Euclidian 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**
This is a continuation of C&O 330. Topics covered include error correcting codes, resolvable designs, affine designs, weighing matrices, and their interaction.
*Prereq: C&O 330 and MATH 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 W 2C 0.5
**Topics in Combinatorics**
An undergraduate seminar in combinatorics. The primary objective is to study current work in specific areas of combinatorics. Course content may vary from term to term.
*Prereq: Consent of instructor.*

C&O 440 F 2C 0.5
**Topics in Graph Theory**
An in-depth study of one or two topics in graph theory. Course content may vary from term to term. Topics may include planar graphs, extremal graph theory, directed graphs, enumeration, algebraic graph theory, probabilistic graph theory, connectivity, graph embedding, colouring problems.
*Prereq: C&O 342 or consent of instructor.*

C&O 450 W 2C 0.5
**Combinatorial Optimization**
*Prereq: C&O 351*

C&O 452 S 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.R 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 C&O 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 459 S 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
**Quadratic Programming**
Not offered in 1982-83.

C&O 466 W 2C 0.5
**Continuous Optimization**
*Prereq: C&O 367*

C&O 480 F 2C 0.5
**History of Mathematics 1**
A study of selected topics from Greek geometry. Some related work of post-renaissance scholars is included. Topics
include: famous construction problems, pythagorean arithmetic, regular solids, four discoveries of Archimedes, the problem of Apollonius; selected works of Archimedes, Euclid, Apollonius, Euler, Steiner. 
Prereq: None.
C&O 481 W 2C 0.5
History of Mathematics 2
A study of selected topics from post-renaissance mathematics. Topics include material on prime numbers, Fermat's Last Theorem, the Gaussian Integers, the Fibonacci Sequence, other topics from elementary number theory, a collection of outstanding problems in geometry (Fagnano, Steiner-Lemus, Morley). 
Prereq: None.
C&O 499 F.W.S 2R 0.5
Reading in Combinatorics and Optimization 
Prereq: Consent of department.

Computer Science

Course Descriptions

Notes
1. The Computer Science Department is experiencing tremendous demand for its courses beyond available resources. Regrettfully, admission to specific Computer Science courses cannot be granted to all students. Every effort will be made to accommodate those students who pre-register during published University pre-registration periods. While priority will be given to these pre-registrants, admission to individual courses cannot be guaranteed. Limits on the number of courses per term will be published at pre-registration times. As a general guideline, students will be asked not to enrol in courses beyond their year level. Where necessary preference will be given to students in Honours programs in the Faculty of Mathematics.

2. Please note that the terms in which courses are offered may deviate from those published below. Students are advised to consult the course offerings list at pre-registration time.

3. 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: CS112, CS 115, CS 116, CS 316

CS 112 F,W 2C.2T 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 algorithms and algorithms; implementation in a procedure-oriented language (usually FORTRAN IV); execution of these programs using several systems. 
Prereq: none
Credit will only be granted for one of CS 112, CS 116, CS 118 or CS 140.

CS 115 W 2C.2L 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 only be granted for one of CS 115 or CS 180. CS 115 cannot be counted for credit toward a BMath degree.

CS 116 F 2C,1T 0.5
Introduction to Computing
This course provides students in programs of study which do not emphasize mathematics with an appreciation of the capabilities and limitations of machine computing and a reasonable capability for programming in one or more programming languages. Topics will include: concept of an algorithm, representation of information, programming in a higher level language, concept of a compiler. 
Prereq: none
Credit will only be granted for one of CS 112, CS 116, CS 118 or CS 140. CS 116 cannot be counted for credit toward a BMath General or Honours degree.

CS 118 F.W 3C.2L 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 IV). Topics discussed are: solution of equations, computation of integrals, graph plotting, and simulation. 
Prereq: Grade 13 mathematics is recommended.
Credit will only be granted for one of CS 112, CS 116, CS 118 or CS 140.

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 IV). Topics discussed are: solution of equations, computation of integrals, graph plotting, and simulation. 
Prereq: Grade 13 mathematics is recommended.
Credit will only be granted for one of CS 112, CS 116, CS 118 or CS 140. Special sections of this course will teach PASCAL rather than WATFIV-S.

CS 180 F,W 2C.2L 0.5
Introduction to File Processing
Introduction to the use of computers. Concept of an algorithm. Language and notation for describing algorithms. Analysis and solution of problems dealing with files. Introduction to a procedure-oriented language (usually COBOL). The preparation and debugging of programs in such a language. Topics include: file processing and maintenance, sorting, report generation, and file design. 
Prereq: Grade 13 mathematics is recommended. Credit will only be granted for one of CS 115 or CS 180.
CS 210  F  3C  0.5  
Introduction to Numerical Computing  
A survey of numerical procedures with emphasis upon computer implementation using the FORTRAN IV programming language. Topics include: interpolation, curve fitting, solution of non-linear equations, numerical integration, numerical solution of ordinary and partial differential equations, matrix algebra, and solution of systems of linear equations.  
Prereq: at least one course in calculus, algebra, and computer science.  
CS 210 cannot be counted for credit toward a BMath Honours degree.  
Credit will only be granted for either CS 210 or for the courses in the CS 370/371 sequence.

CS 240  F.W.S  2C.2T  0.5  
Programming Principles, Languages, and Techniques  
A disciplined approach to program design. The need for and use of various control structures and data structures. Features of several high level languages; techniques for their effective use. Specific topics include: structured programming, linked list processing, recursion, string processing, tree processing and language development.  
Prereq: CS 140 or CS 180 or the equivalent, CS 250 is highly recommended.

CS 250  F.W.S  2C.2T  0.5  
Characteristics of Computers and Computer Systems  
Introduction to machine and assembly language programming and basic machine architecture. Addressing modes, indexing, and indirection. Subroutine linkage and macro instructions. Characteristics of peripheral devices. A survey of software which assists user programs: assemblers, compilers, loaders, input/output routines, operating systems.  
Prereq: CS 116 or CS 118 or CS 140 or CS 180.

CS 316  W  2C.2L  0.5  
Introduction to Statistical Problem Solving by Computer  
This is an applications oriented course. which prepares the nonmathematical student to use the computer as a research tool. Topics include aids for statistical analysis and the preparation of documents such as reports and theses. The course provides sufficient background for application to other problems specific to the individual's field.  
Prereq: A one term statistics course. 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 introduction to modern computer techniques for solving mathematical problems.  
Prereq: CS 180; (ACC 1211122 or 191/192) or consent of instructor. CS 330 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 and Data Communications  
A user-oriented approach to data communications and to the management of large collections of data. The three basic models (hierarchical, network, and relational) are presented. Specific examples are used to illustrate database design. Data communication principles are related to specific business applications.  
Prereq: CS 330 or CS 340 or consent of instructor. Credit will only be granted for one of CS 338 or CS 448. CS 338 cannot be counted for credit toward a BMath Honours Computer Science degree. Note: Formerly CS 331.

CS 340  F.W,S  3C  0.5  
Data Structures  
The study of data structures in a language independent setting. Levels of data description and their role in design of structures. The effects of secondary storage. Introduction to the analysis of algorithms. Topics include: primitive data types, sequences, representing data structures, arrays and tables, trees and forests, sets.  
Prereq: CS 340. C&O 230 is recommended.

CS 350  F.W,S  3C  0.5  
Machine Structures  
The intent is to give a basic understanding of what goes on inside a computer, machine architecture, and of some fundamental operating system services. Topics include: introduction to an actual computer, representation of data; memory; central processor; addressing schemes; input/output; linking and loading.  
Prereq: CS 250 or EL E 222. CS 369 or EL E 323 is a recommended corequisite.

CS 360  F.W.S  3C  0.5  
Introduction to the Theory of Computing  
Models of computers including finite automata and Turing machines. Basics of formal languages with applications to syntax of programming languages. Unsolvable problems and their relevance to the semantics of programming. Concepts of computational complexity including algorithm optimality.  
Prereq: CS 240.

CS 369  F.W.S  3C  0.5  
Digital Networks  
Prereq: Cs 250 or EL E 222.

CS 370  F.W,S  2C.2T  0.5  
Introduction to Scientific Computation: Numerical Algebra  
Pitfalls in computation; solution of linear algebraic equations; finding zeros of a single nonlinear equation and systems of nonlinear equations; the algebraic eigenvalue problem. The emphasis is on exposure to modern computer techniques for solving mathematical problems. Heavy use of mathematical subroutine libraries is anticipated.  
Prereq: Knowledge of a high level programming language, preferably FORTRAN: MATH 220a/b, and MATH 224a. Credit will only be granted for either CS 210 or for courses in the CS 370/371 sequence.
CS 371  F,W  2C,2T  0.5
Introduction to Scientific Computation: Numerical Approximation
Polynomial interpolation; least squares and minimax approximation; numerical integration and differentiation; numerical solution of initial value problems and boundary value problems. As in CS 370, the intent is to expose students to modern computer techniques for solving mathematical problems.
Prereq: Knowledge of a high level programming language, preferably FORTRAN; MATI 220a/b, and MATH 224a. Credit will only be granted for either CS 210 or for courses in the CS 370/371 sequence.

Note
Enrolment in some fourth year courses may be restricted to students registered in Honours Computer Science.

CS 432  W  3C  0.5
Business Systems Analysis
Prereq: CS 340, or CS 330 and 338 and fourth year standing.
Credit will only be granted for one of CS 432 or CS 434 or CS 482. CS 432 cannot be counted for credit toward a BMath Honours Computer Science degree.

CS 434  W  3C  0.5
Computer Auditing
The responsibility of the auditor in relation to computer systems. Systems of controls and cost/efficiency analysis of controls. Computer audit techniques. Case studies including examples of poorly controlled systems and computer abuse.
Prereq: BUS 477W and either CS 338 or CS 448. Credit will only be granted for one of CS 432 or CS 434 or CS 482. CS 432 cannot be counted for credit toward a BMath Honours Computer Science degree.

CS 437  W  3C  0.5
Simulation by Computer
An introduction to the basic techniques of simulation. Discrete simulation models; random number generators; the SIMSCRIPT and GPSS languages; analysis of simulation output; continuous simulation models and the CSMP language.
Prereq: STAT 220; CS 330 and CS 338, or CS 340. Credit will only be granted for one of CS 437 or CS 457. CS 437 cannot be counted for credit toward a BMath Honours Computer Science degree.

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, CS 360

CS 444  W  3C  0.5
Compiler Construction
Prereq: CS 340, 350, 360

CS 446  F,W,S  3C  0.5
Applications Software Engineering
Practical computing problems encountered in scientific applications: an overview of batch operating systems; the importance of loaders and overlays; check points, post mortems, and operating system services; FORTRAN as a programming language; current programming techniques: design and use of program libraries and human engineering of input and output; magnetic tapes and bulk storage.
Prereq: At least two of CS 340, 350, 370, 371.

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. Credit will only be granted for one of CS 338 or CS 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 blocks" - central processing units, stores, input/output systems, and bus structures. Case studies of machines.
Prereq: CS 350 and (CS 369 or EL E 323).

CS 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 340 and CS 350.

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 340 and CS 350

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: The equivalent of CS 240, CS 340, CS 350, CS 450, CS 457, STAT 230/231, and STAT 333.
Course Descriptions
Mathematics:
Computer Science

CS 457 W 3C 0.5
Queueing Models: Analysis, Simulation, and Computer Applications
An introduction to the basic results of queueing theory and the techniques of discrete event simulation. Emphasis is placed on the application of queueing models to computer systems and computer communication networks.
Prereq: STAT 231 and STAT 333; CS 240 and CS 350. Credit will only be granted for one of CS 437 or CS 457. CS 437 cannot be counted for credit toward a B.Math Honours Computer Science degree.

CS 462 F 3C 0.5
Formal Languages and Parsing
Prereq: CS 240, CS 360. This course may also be offered in the Spring.

CS 464 W 3C 0.5
Computability and Recursive Function Theory
Models of the computational process as reflected by computers, linguistic systems, functional specifications, transformational systems, formal logic, etc. Equivalence of these models. Computational complexity for specific models and abstractions fitting all models. Formal reducibilities between computational problems, and the complexity of these reducibilities.
Prereq: CS 360

CS 466 F,S 3C 0.5
Algorithm Design and Analysis
Design of good algorithms and analysis of the resources they consume. Lower bounds on the resource requirements of algorithms to compute certain functions. Problems from the following areas are discussed in this light: sorting and order statistics, data structures, arithmetic computations, the NP-complete problem.
Prereq: CS 340. CS 350 is recommended.

CS 468 W 3C 0.5
Program Verification
Methods of program verification. Implications for structural programming, inductive reasoning about recursive programs and recursively defined data structures.
Prereq: CS 360

CS 472 W 3C 0.5
Numerical Linear Algebra
Prereq: CS 370, MATH 224b

CS 473 F 3C 0.5
Numerical Linear Programming
Methods for the minimization and maximization of piecewise linear functions and linear functions subject to linear constraints, with applications to linear programming and data fitting. Emphasis is on algorithms, numerical considerations and software implementation.
Prereq: One of CS 370, C&O 360, or consent of instructor. Cross-listed with C&O 458.

CS 474 S 3C 0.5
Numerical Approximation
Prereq: CS 371, MATH 322B

CS 476 F 3C 0.5
Numerical Solution of Differential and Integral Equations
Prereq: Consent of the instructor.

CS 478 W 3C 0.5
Numerical Solution of Partial Differential Equations
Prereq: Consent of the instructor.

CS 482 F,S 3C,2T 0.5
Techniques in Systems Analysis
Techniques in organization and management theory. Organization of large software systems. Data base concepts. Implementation of computer-based information systems. Survey of current topics of interest such as distributed processing, microcomputers and on-line systems.
Prereq: CS 340 and fourth year standing in Honours Computer Science. Credit will only be granted for one of CS 432 or CS 434 or CS 482.

CS 486 W 3C 0.5
Introduction to Artificial Intelligence
Prereq: CS 240

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

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, colour shading techniques, and some additional topics will be covered.
Prereq: CS 340 and CS 350; MATH 234A
2. The Faculty of Mathematics has completed the implementation (begun in 1980/81) of curriculum changes in its Linear and Abstract Algebra core courses. MATH 221a/b, 231a/b, 241a/b, 321a/b, 331a/b, MATH 341a/b have been phased out and replaced by MATH 224a/b, 234a/b, 244a/b, 324, 334, PMATH 344. Degree requirements involving Algebra courses in this and subsequent calendars will be described in terms of the new courses. Students who have completed the old Algebra sequence will obviously not be expected to retake courses from the new sequence. Students with at least one half-credit in the old sequence who have not completed the entire sequence must seek clarification of their position by contacting the Mathematics Undergraduate Office. Under no circumstances, without written Faculty approval, should students mix courses from the old and new Algebra sequences.

MATH 103 F 3C,1T 0.5
Introductory Algebra (For students in Arts/Social Sciences)
An introduction to applications of algebra to business, the behavioural sciences, and the social sciences. Topics will be chosen from set theory, permutations and combinations, binomial theorem, probability theory, systems of linear equations, vectors and matrices, mathematical induction.
N.B.: Not open to students in the Faculty of Mathematics. MATH 103 does not cover all the material normally included in Grade 13 Algebra; however, superior performance (approximately 80%) would probably provide an adequate background for most courses that demand Grade 13 Algebra as a prerequisite (e.g., MATH 124a). Grade 12 Mathematics is recommended.

MATH 104 W 3C,1T 0.5
Introductory Calculus (For students in Arts/Social Sciences)
An introduction to applications of calculus in business, the behavioural sciences, and the social sciences. The models chosen will include the study of polynomial, rational, exponential and logarithmic functions; elementary analytic geometry; linear and quadratic systems of equations. The major concepts introduced to solve problems are: rate of change; optimization; growth and decay; and integration.
N.B.: Not open to students in the Faculty of Mathematics. MATH 104 does not cover all the material normally included in Grade 13 Calculus, however, superior performance (approximately 80%) would probably provide an adequate background for most courses that demand Grade 13 Calculus as a prerequisite (e.g., MATH 124a). Grade 12 Mathematics is recommended.

MATH 105 F 3C,0.5
Mathematics (For Environmental Studies Students)
Quantitative analysis in environmental research. Elementary concepts in Algebra: notation, terminology, operations. Probability Theory, Permutations and Combinations, approaches to probability, dependent and independent events, conditional probability, distribution functions, including the Binomial, Poisson and Normal distributions, with applications to problems in Environmental Studies.
N.B.: Not open to students in the Faculty of Mathematics.

MATH 106 F 3C,1T 0.5
Mathematics (For Kinesiology Students)
Algebraic functions and their graphs; exponential and logarithmic functions; elementary differential and integral calculus; applications and problems associated with kinesiology.
N.B.: Not open to students in the Faculty of Mathematics. This course is open to Kinesiology students who have not taken Grade 13 Calculus.

MATH 107 F 3C,1T 0.5
Mathematics (For Kinesiology Students)
Content similar to that of MATH 106 except that it will be assumed that students have completed Grade 13 Calculus. Accordingly, there will be broader consideration of applications.
N.B.: Not open to students in the Faculty of Mathematics.

MATH 110a F 3C,2T 0.625
Calculus 1a (For Engineering Students)
Functions and their inverses, limits, continuity and derivatives. The trigonometric functions, their inverses and derivatives. Applications to rate, max./min. curve sketching problems. Sequences, the definite integral, the fundamental theorem of calculus. Applications to area and volume problems.
N.B.: Not open to students in the Faculty of Mathematics.
Algebra and Vector Geometry

Students in the Faculty of Mathematics.

MATH 114 F 3C,2T 0.5
Calculus 1b (For Engineering Students)
Prereq: MATH 110a. Not open to students in the Faculty of Mathematics.

MATH 111a F 3C,1T 0.5
Algebra and Solid Geometry (For Arts and Science Students).
Elementary Number Theory, number systems, mathematical induction, the Binomial Theorem, complex numbers, polynomials.
Prereq: Grade 13 Algebra is recommended but not required. Not open to students in the Faculty of Mathematics.

MATH 111b W,S 3C,1T 0.5
Algebra and Solid Geometry (For Arts and Science Students).
Determinants, vectors, matrices, elementary solid geometry, systems of linear equations.
Prereq: Grade 13 Algebra is recommended but not required. Not open to students in the Faculty of Mathematics.

MATH 113 Y 3C,2T 1.0
Calculus (For Arts and Science Students)
Prereq: Grade 13 Calculus. Not open to students in the Faculty of Mathematics.

MATH 114 F 3C,2T 0.625
Algebra and Vector Geometry (For Engineering Students)
Prereq: Grade 13 Algebra. Not open to students in the Faculty of Mathematics.

MATH 115a F 3C,2T 0.5
Calculus (For Co-op Physics and Chemistry)
Real numbers, functions, trig functions. Limits. The derivative, differentiation, higher order derivatives, implicit functions, differentials, applications of the derivative. The definite integral. Antidifferentiation. Logarithms and exponential functions. Inverse functions.
Prereq: Grade 13 Calculus. Not open to students in the Faculty of Mathematics.

MATH 115b W,S 3C,2T 0.5
Prereq: MATH 115a. Not open to students in the Faculty of Mathematics.

MATH 120a F 3C,1T 0.5
Calculus Functions and limits, differentiation of trigonometric, logarithmic, exponential, implicit functions, the chain rule, Rolle's theorem, the mean value theorem, extreme value theorem, applications of the derivative, the differential, the definite integral, fundamental theorem of calculus.
Prereq: Grade 13 Calculus. Credit will be granted for only one of MATH 120a, 130a, 140a. Also offered at St. Jerome's College.

MATH 120b W,S 3C,1T 0.5
Calculus Functions and limits, differentiation of trigonometric, logarithmic, exponential functions, the chain rule, Rolle's theorem, the mean value theorem, extreme value theorem, applications of the derivative, the differential, the definite integral, fundamental theorem of calculus.
Prereq: MATH 120b. Credit will be granted for only one of MATH 120b, 130b, 140b. Also offered at St. Jerome's College.

MATH 134a F,S 3C,1T 0.5
Algebra Basic set theory, cardinality, elementary number theory, number systems, polynomials.
Prereq: Grade 13 Algebra. Credit will be granted for only one of MATH 124a, 134a, 144a. Also offered at St. Jerome's College.

MATH 134b F,W,S 3C,1T 0.5
Linear Algebra 1 Systems of equations, vector spaces, matrices, determinants, geometric applications.
Prereq: Grade 13 Algebra (MATH 134a or 80% in MATH 124a, is recommended, but not required). Credit will be granted for only one of MATH 124b, 134b, 144b. Also offered at St. Jerome's College.

MATH 140a F 3C 0.5
Calculus MATH 140a is an advanced-level, enriched version of MATH 130a.
Prereq: Grade 13 Calculus and a Grade 13 Math. Average of at least 85% (or permission of instructor). Credit will be granted for only one of MATH 120a, 130a, 140a.

MATH 140b W,S 3C 0.5
Calculus MATH 140b is an advanced-level, enriched version of MATH 130b.
Prereq: MATH 140a (or permission of instructor). Credit will be granted for only one of MATH 120b, 130b, 140b.
MATH 144a F 3C 0.5 Algebra
MATH 144a is an advanced-level, enriched version of MATH 134a.
Prereq: Grade 13 Algebra and a Grade 13 Math. Average of at least 85% (or permission of instructor). Credit will be granted for only one of MATH 124a, 134a, 144a.

MATH 144b W,S 3C 0.5 Linear Algebra 1
MATH 144b is an advanced-level, enriched version of MATH 134b.
Prereq: MATH 144a (or permission of instructor). Credit will be granted for only one of MATH 124b, 134b or 144b.

MATH 210 F,W 3C 0.5 Calculus 2 (For Chemical Engineers)
Partial differentiation, the gradient, multiple integrals with applications, line and surface integrals, divergence and curl, theorems of Green and Stokes. Applications to physical problems. Prereq: MATH 110a/b. Not open to students in the Faculty of Mathematics.

MATH 211 F,W 2C,2T 0.5 Calculus 2 (For Electrical Engineers)

MATH 212 F,S 2C,2T 0.5 Advanced Calculus (For Electrical Engineers)

MATH 213a F 3C 0.5 Calculus 2 (For Science Students)
Infinite series. Partial derivatives, chain rule, total differential, Taylor's theorem, extreme values. Prereq: MATH 113 or MATH 115a/b or equivalent. Not open to students in the Faculty of Mathematics.

MATH 213b F,W,S 3C 0.5 Calculus 2 (For Science Students)
Multiple integrals. Vector calculus: gradient, directional derivative, divergence, curl, line integrals and path independence. Green's theorem, Stokes' theorem and Gauss' theorem. Prereq: MATH 213a or MATH 220a or equivalent. Not open to students in the Faculty of Mathematics.

MATH 215 F,W 3C 0.5 Differential Equations (For Science Students)
Complex numbers. Partial differentiation. Solution of ordinary differential equations with emphasis on special functions encountered in chemistry (Hermite and Legendre equations). Introduction to matrix algebra and eigenvalue problems. Prereq: MATH 113 or MATH 115a/b or equivalent. Not open to students in the Faculty of Mathematics.

MATH 216 F,S 3C 0.5 Differential Equations (For Physics or Chemical Engineering Students)

MATH 220a F,W 3C,1T 0.5 Advanced Calculus
Differential calculus for functions of several variables. Limits and continuity, partial derivatives, differentiability, chain rule, Taylor's formula, extreme values, mappings and Jacobians. Integral calculus of functions of several variables: multiple integrals, iterated integrals, change of variables, applications to area and volume calculations. Prereq: MATH 130b or 80% in MATH 120a/b. Coreq: MATH 134b. Credit will be granted for only one of MATH 220a, 230a, 240a. Also offered at St. Jerome's College.

MATH 220b F,W,S 3C,1T 0.5 Advanced Calculus
Line integrals, Green's theorem and path independence. Sequences and series of functions: uniform convergence and power series. Introduction to ordinary differential equations: first and second order linear equations, power series solutions, applications. Prereq: MATH 230a. Credit will be granted for only one of MATH 220b, 230b, 240b. Also offered at St. Jerome's College.

MATH 224a F,W 3C 0.5 Linear Algebra 2
Linear transformations, eigenvalues, characteristic polynomials, inner products. Prereq: MATH 134b or 80% in MATH 124b. Credit will be granted for only one of MATH 224a, 234a, 244a. Also offered at St. Jerome's College.

MATH 224b F,W 3C 0.5 Abstract Algebra 1
Elementary group and field theory and other topics in algebra. Prereq: MATH 224a. MATH 224b is not open to Honours Mathematics students.
**Course Descriptions**

**Mathematics**

**Mathematics Electives**

- **MATH 234b** F,W,S 3C 0.5
  - *Abstract Algebra 1*
  - Groups, fields and other topics in abstract algebra.
  - Prereq: MATH 234a. Credit will be granted for only one of MATH 224b, 234b.
  - Also offered at St. Jerome's College.

- **MATH 240a** F,W 3C 0.5
  - *Advanced Calculus*
  - MATH 240a is an advanced-level, enriched version of MATH 230a.
  - Prereq: MATH 140b (or permission of instructor). Credit will be granted for only one of MATH 220a, 230a, 240a.

- **MATH 240b** F,W,S 3C 0.5
  - *Advanced Calculus*
  - MATH 240b is an advanced-level, enriched version of MATH 230b.
  - Prereq: MATH 240a (or permission of instructor). Credit will be granted for only one of MATH 220b, 230b, 240b.

- **MATH 244a** F,W 3C 0.5
  - *Linear Algebra 2*
  - MATH 244a is an advanced-level, enriched version of MATH 234a.
  - Prereq: MATH 144a (or permission of instructor). Credit will be granted for only one of MATH 224a, 234a, 244a.

- **MATH 244b** F,W,S 3C 0.5
  - *Abstract Algebra 1*
  - MATH 244b is an advanced-level, enriched version of MATH 234b.
  - Prereq: MATH 244a (or permission of instructor). Credit will be granted for only one of MATH 224b, 234b, 244b.

- **MATH 322a** F,W 3C 0.5
  - *Introduction to Real Analysis*
  - Elementary properties of the real number system including the completeness property and its relations to the concepts of limit, continuity and differentiability; mean value theorem; Riemann integration and the integrability of continuous and monotonic functions; uniform convergence; uniform continuity and their relation to the above. The emphasis will be on applications.
  - Prereq: MATH 220a (MATH 220b desirable). MATH 322a is not open to Honours Mathematics students.

- **MATH 322b** W,S 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. MATH 322b is not open to Honours Mathematics students.

- **MATH 324** F,W,S 2C,1T 0.5
  - *Abstract Algebra 2*
  - Topics in abstract algebra: groups, rings, fields and applications.
  - Prereq: MATH 224b. MATH 324 is not open to Honours Mathematics students.

- **MATH 332a** F,W 3C 0.5
  - *Real Variables*
  - Prereq: MATH 230a (MATH 230b desirable). Credit will be granted for only one of MATH 322a, 332a, PMATH 351a.

- **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 one of MATH 322b, 332b, PMATH 352a.

- **MATH 333** F,W,S 2C,1T 0.5
  - *Abstract Algebra 2*
  - Topics in abstract algebra: groups, rings, fields and applications.
  - Prereq: MATH 234b. Credit will be granted for only one of MATH 324, 334, PMATH 344.

- **MATH 360a** F,S 2C,1T 0.5
  - *Introduction to Information Theory with Applications*
  - Prereq: none.

**Mathematics Electives**

**Course Descriptions**

- MATH 100 F,W,S 2C 0.5
  - *Commercial Law for Mathematics Students*
  - Prereq: none.

- MATH 102 W,S 3C 0.5
  - *Uses and Abuses of Statistics*
  - This course provides an appreciation of how to correctly use statistical arguments in a wide variety of applications. Topics include descriptive statistics, sample surveys, experimental design, index numbers, regression models.
  - Prereq: none.

- MATH 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, current text books.
  - Prereq: none.

- MATH 302a F 2C 0.5
  - *Introduction to Biomathematics 1*
  - Biometry is a biological discipline requiring both a knowledge of mathematics and some basic under-
standing of specific biological phenomena. The course material has been selected from Genetics and Gerontology to provide examples of where both mathematics and biology have contributed to the advancement of knowledge in interdisciplinary areas.

Prereq: none.
Cross-listed with HLTH 302

MTHEL 302b W 2C 0.5
Introduction to Biomathematics 2
A continuation of Biomathematics 1. Topics considered are first order reaction kinetics in biological systems, including statistical considerations in enzyme kinetics, models for and the measurement of Evolution from a knowledge of genetics and protein structure enzyme kinetics, models for and the measurement of Evolution from a knowledge of genetics and protein structure

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.

PMATH 352b W 3C 0.5
Complex Analysis
Continuation of 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.

PMATH 365 F,S 2C,1T 0.5
Differential Geometry and Tensor Analysis
Curves in Euclidean 3-space (E3) and the Serret-Frenet formulae; surfaces in E3 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.

PMATH 367 W 3C 0.5
Set Theory and General Topology
Intuitive set theory, metric spaces, point set topology.

PMATH 990
Readings in Pure Math

PMATH 430a F,W,S 2C,1T 0.5
Introduction to Mathematical Logic
A broad introduction to Mathematical Logic. The logic of sentences: truth-functions and axiomatic approaches (eg. Natural Deduction and Gentzen sequencies). A brief introduction to the logic of predicates and to the foundations of mathematics. This course will be of interest to all math students. Credit will be granted for only one of PMATH 430a or 432a.
Course Descriptions
Mathematics:

Statistics

Course Descriptions

PMATH 430b W 2C,1T 0.5
Introduction to Mathematical Logic
Continuation of PMATH 430a. Gödel's incompleteness theorem (in outline). Logicism, intuitionism, formalism. Selected topics (some of intuitionistic logic, modal logic, the representation theorem for Boolean Algebras normally are treated).
Prereq: PMATH 430a. This course will be of interest to all math students. Credit will be granted for only one of PMATH 430b or 432b.

PMATH 432a F 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 one of PMATH 430a or 432a. Offered alternate years. Next offered Fall 1983.

PMATH 432b W 3C 0.5
Mathematical Logic
Continuation of PMATH 432a. A treatment of at least one of the following: set theory, model theory, undecidability.
Prereq: PMATH 432a. Credit will be granted for only one of PMATH 430b or 432a. Offered alternate years. Next offered Winter 1984.

PMATH 441a 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 one of PMATH 340 or PMATH 441a. Offered alternate years. Next offered Fall 1982.

PMATH 441b W 2C 0.5
Number Theory
Continuation of PMATH 441a.
Prereq: MATH 334 (or PMATH 344) and PMATH 441a. Offered alternate years. Next offered Winter 1983.

PMATH 443
Linear Algebra 2
Not offered 1982-83.

PMATH 445 F 2C 0.5
Ring Theory
Continuation of the theory of rings and-modules. 
Prereq: MATH 334 or PMATH 344. Offered in Fall 1982 and Winter 1984.

PMATH 446 F 2C 0.5
Group Theory
Permutations, Cayley Theorem, Sylow Theorem, Jordan-Hölder Theorem, nilpotent and solvable groups, direct and semidirect products, free groups. Prereq: MATH 334 or PMATH 344. Offered in Fall 1983.

PMATH 447 W 2C 0.5
Field Theory

PMATH 451a F 3C 0.5
Measure and Integration
An introduction to integration and measure theory with emphasis on the real line.
Prereq: MATH 332a or PMATH 351a/b

PMATH 451b W 3C 0.5
Functional Analysis
Banach spaces and linear operators. Prereq: PMATH 451a

PMATH 452a
Complex Analysis 2a
Not offered 1982-83.

PMATH 452b
Complex Analysis 2b
Not offered 1982-83.

PMATH 461
Finite Geometries
Not offered 1982-83.

PMATH 463 F 2C,1T 0.5
Differentiable Manifolds
Differential Manifolds, vector fields, linear connections, tensor fields, differential forms and structure equations. 
Prereq: PMATH 365/AM 362 or consent of instructor. Cross-listed with AM 463.

PMATH 465 W 2C,1T 0.5
Selected Topics in Differential Geometry
Topics from pseudo-Riemannian and Riemannian geometry such as: isometries and Killing vector fields; sectional curvatures; submanifolds; normal co-ordinates; variation of geodesics and Jacobi fields; conformally related spaces. 
Prereq: PMATH/AM 463 or consent of instructor. Cross-listed with 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 2C 0.5
Functional Equations
Cauchy's, Pexider's, and similar equations. Equations for polynomials and trigonometric functions. Reduction to differential equations. Applications.

PMATH 470b
Functional Equations
Not offered 1982-83.

PMATH 499
Readings in Pure Math

Statistics

Course Descriptions

STAT 202 F 2C,1L 0.5
Elementary Statistics for Biologists
Elementary probability, populations, samples and distributions with biological examples. Methods for data summary and presentation including an introduction to interactive programming. Estimation, hypothesis testing, two-sample techniques and paired comparisons. Contingency tables. Prereq: none. STAT 202 is for Science students only.

STAT 204 F 2C,1L 0.5
Statistics for the Physical Sciences 1
Descriptive statistics. Probability, random variables, discrete and continuous distributions. Estimation and hypothesis testing, goodness of fit. Prereq: none. STAT 204 is for Science students only.

STAT 205 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. Prereq: STAT 202 or 204. STAT 205 is for Science students only.

STAT 210 F.W 3C,1T 0.5
Applied Probability and Statistics
Sampling from a normal population. Student-t, chi-square, F distributions. Estimation and hypothesis testing. Simple linear regression.

Prereq: MATH 110a/b. This course is for students in Mechanical Engineering, and is cross listed in Management Sciences as MSCI 21.

STAT 220 F.W.S 3C,1T 0.5 Introduction to Statistical Methods
Probability theory; discrete and continuous random variables, expectation.
Prereq: MATH 120b. STAT 220 is not open to Honours Mathematics students. Credit will be given for only one of STAT 220, 230.

STAT 221 F.W.S 3C,1T 0.5 Introduction to Statistical Methods 2
Tests of significance, maximum likelihood estimation and large sample theory; estimation and testing in the normal distribution. Correlation, regression and the method of least squares.
Prereq: STAT 220. STAT 221 is not open to Honours Mathematics students. Credit will be given for only one of STAT 221, 231.

STAT 230 F.W.S 3C,1T 0.5 Probability
The laws of probability, discrete and continuous random variables, expectation, central limit theorem.
Prereq: MATH 130b. Credit will be given for only one of STAT 220, 230.

STAT 231 F.W.S 3C,1T 0.5 Statistics
Estimation, tests of significance, probability plots. Contingency tables, normal distribution theory, simple linear regression.
Prereq: STAT 230, MATH 230a. Credit will be given for only one 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. How to take a representative sample; efficient estimation of population quantities and sample size determination: ways of reducing response bias.
Prereq: An introductory half course in statistics. STAT 300 cannot be taken for credit toward a BMATH degree.

STAT 320 W, 3C 0.5 Statistical Methods and Theory
Prereq: STAT 221 and MATH 220b. Not open to Honours Mathematics students. Credit will be given for only one of STAT 320, 330.

STAT 321 F,W 3C 0.5 Applied Regression Analysis
Prereq: STAT 221. Not open to Honours Mathematics students. Credit will be given for only one of STAT 321, 331.

STAT 330 F,W 3C 0.5 Statistical Theory and Methods
Prereq: STAT 231 and MATH 230b. Credit will be given for only one of STAT 320, 330.

STAT 331 F.W,S 3C 0.5 Applied Linear Models
Prereq: STAT 231 and MATH 234a. Credit will be given for only one 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.
Prereq: STAT 221 or the equivalent. Credit will be given for only one of STAT 332, 454.

STAT 333 F,W,S 3C 0.5 Applied Probability
Prereq: STAT 230 or STAT 220/221.

STAT 334 W 3C 0.5 Probability and Stochastic Processes
Prereq: STAT 333 or consent of instructor.

STAT 430 F.S 3C 0.5 Experimental Design 1
Introduction to designed experiments. Basic experimental designs. Factorial arrangement of treatments. Confounding and fractional replication. Selected topics.
Prereq: STAT 331 or consent of the instructor. May not be offered in Spring Term.

STAT 431 W 3C 0.5 Experimental Design 2
Selected topics in the design and analysis of experiments.
Prereq: STAT 430. May not be offered in 1982-83.

STAT 440 W 2C 0.5 Exploratory Data Analysis
Prereq: STAT 331 and an ability to program in FORTRAN.

STAT 442 F 2C 0.5 Statistical Methods for Business and Industry
The decision problem; Bayesian and classical analyses; acceptance sampling; sequential procedures; an introduction to the statistical aspects of quality control.
Prereq: STAT 320 or 330.

STAT 443 W 3C 0.5 Forecasting
Prereq: STAT 321 or 331.
STAT 444 S 2C.1S 0.5
Statistical Methods with Socio-Economic Applications 1

STAT 445 Statistical Methods with Socio-Economic Applications 2
Continuation of STAT 444. Prereq: STAT 444. May or may not be offered in 1982-83.

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 designs and estimation procedures. Statistical inference in survey sampling. Interrelationships between survey sampling and the design of experiments. Prereq: STAT 331; STAT 330 is recommended. Credit will be given for only one of STAT 332, 454

STAT 455 S 3C 0.5
Sample Survey Design
A continuation of STAT 454.

STAT 464 W 2C 0.5
Topics in Probability Theory
Prereq: STAT 333/34 or consent of instructor. May or may not be offered 1982-83.

STAT 466 Topics in Statistics 1
Prereq: STAT 330/331 or consent of instructor. May or may not be offered 1982-83.

STAT 467 Topics in Statistics 2
Prereq: STAT 330/331 or consent of instructor. May or may not be offered 1982-83.

STAT 468 0.5
Readings in Statistics 1

STAT 469 0.5
Readings in Statistics 2

STAT 500 W 2C.1T 0.5
Principles of Survey Design
The design of surveys of human or natural populations for research and planning. How to take a representative sample, efficient estimation of population quantities and sample size determination; ways of reducing response bias. Prereq: An introductory half course in statistics. STAT 500 is intended for senior undergraduates and graduate students in faculties other than Mathematics. It cannot be taken for credit towards a Mathematics degree. May or may not be offered in 1982-83.

STAT 520 Introduction to Mathematical Statistics
May or may not be offered 1982-83.

Department of Mechanical Engineering

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Adjunct Professors
J.W. Church, BSc (Queen's), MASc (Toronto)
H.G.H. Lawrence, QC

Undergraduate Programs
Details of the undergraduate program in Mechanical Engineering are to be found in Chapter 10. All courses extend over one term only, and consist of 3 hours of lectures per week unless otherwise specified. In general, the only prerequisites are the core courses, unless otherwise specified.

Course Descriptions

M.E 100 F,W 3C 0.5
Introductory Survey of Law
The rights and responsibilities of the engineer as a citizen of Ontario and Canada under the law; brief history of Canadian law differentiating between Civil and Criminal Law, the rights and duties of citizens and police, a review of Domestic Law, Real Estate Law, Landlord and Tenant Law. The law as it may pertain to the engineer in his profession, brief reviews of the Laws of Contracts, Patents, 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 128 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 problems in the various disciplines of Mechanical engineering; an introduction to engineering design methods as applied to Mechanical Engineering and including specification development, information-gathering, concept formulation, feasibility analysis and report writing. Prereq: GEN E 115

M.E 200 F,W 1C 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

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 relevance of materials to engineering practice. The microstructure of materials, crystallinity and crystal imperfections, glasses and amorphous solids.

M.E 219 F,W 2C,1D,1T 0.5
Mechanics of Deformable Solids 1

M.E 220 S,F 2C,1D,1T 0.5
Mechanics of Deformable Solids 2
A general treatment of the behaviour of structural components from the study of stress and strain in solids. Topics include super-position, energy theorems, theories of failure, elastic and inelastic analysis of symmetrical bending, torsion of circular members, columns and stability, and virtual work.

M.E 230 S,F 3C,3L 0.5
Control of Properties of Materials

M.E 250 S,F 3C,1L 0.5
Thermodynamics

M.E 300 S,W 1C 0.0
Introduction to Mechanical Engineering 2
Technical specialties in Mechanical Engineering, discussion of options, curriculum, seminars and technical topics in the various options.
Course Descriptions
Mechanical Engineering

M E 304 S,F 3C,1T 0.5
(Formerly ME 204)
Numerical Analysis
A survey of numerical procedures with emphasis upon computer implementation using the WATFIV programming language. In particular, the following topics are covered: interpolation, curve fitting, solution of non-linear equations, numerical integration, numerical solution of ordinary differential equations, matrix algebra and solution of systems of linear equations, and problems in the solution of partial differential equations.

M E 305 S,W 3C,1T 0.5
Partial Differential Equations

M E 321 S,W 3C,1L 0.5
Kinematics and Dynamics of Machines

M E 322 F,W 3C,1T,1L 0.5
Mechanical Design 1
Analysis and synthesis of machine elements. Factors affecting working stresses, fatigue, creep and impact considerations. Design of shafting, springs, screws, clutches, shafts and gears.

M E 340 S,W 3C,1T 0.5
Manufacturing Processes
The principles of manufacturing unit processes including casting, forming, machining and joining. Interactions between design, materials (metals, polymers, ceramics) and processes. Advantages and limitations, relative cost, and production rates of competitive processes.

M E 351 S,W 3C,3L 0.5
Fluid Mechanics 1
Physical properties of fluids and fundamental concepts in fluid mechanics. Hydrostatics. Conservation laws for mass, momentum and energy. Flow similarity and dimensional analysis as applied to engineering problems in fluid mechanics. Laminar and turbulent flow. Engineering applications such as flow measurement, flow in pipes and fluid forces on moving bodies. Introduction to compressible flow.

M E 353 F,W 3C,2T,1L 0.5
Heat Transfer 1
Introduction to heat transfer mechanisms. The formulation and solution of steady and transient heat conduction. Radiant heat transfer including exchange laws and view factors. Introductory convective heat transfer.

M E 354 S,W 3C 0.5
Thermodynamics 2
Emphasis on applications of thermodynamics to flow processes, real fluids, evaluation of state functions of real fluids. Non-reacting mixtures, reacting mixtures, equilibrium considerations. Introduction to the kinetic theory of gases.

M E 360 F,W 3C,2T,1L 0.5
Introduction to Control Systems

M E 362 F,W 3C,1T,1L 0.5
Fluid Mechanics 2
Basic equations of two-dimensional flow, exact viscous solutions, introduction to lubrication, boundary layers, and introduction to turbulence. Turbomachinery fundamentals and applications. Selected advanced topics.

M E 400 S,F 1C 0
Introduction to Mechanical Engineering 3
Research frontiers in Mechanical Engineering, specific discussion of research done at Waterloo, seminars by members of research group.

M E 423 F,S 3C,1T 0.5
Mechanical Design 2
This is a continuation of the M E 322 course in analysis and synthesis of machinery, including advanced analysis of machine elements such as clutches, brakes, couplings, journal bearings and gears. The latter part of the course includes advanced machine design concepts such as reliability, optimization and techniques for stimulating innovative design. A synthesis project involving the machine elements studied is usually included. Prereq: M E 322

M E 432 F,S 3C 0.5
Physical Metallurgy of Deformation and Fracture
Microscopic origins of elastic and inelastic behaviour. Plastic flow at low and high temperatures with emphasis on the microscopic mechanisms and their application to engineering design. Deformation mechanism maps. Types of fracture and micromechanism fracture maps. Application of fracture mechanics. Fatigue and cyclic hardening behaviour. Environmental effects.

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 radiative 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 for data collection, and control of pneumatic, hydraulic and mechanical systems; comparison of software and hardware techniques in such applications.

M E 463  S.F.  3C  0.5  
**Tribology 1**

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 (including 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**

M E 531  F.S  3C  0.5  
**Physical Metallurgy of Structures and Transformations**

M E 534  W  3C  0.5  
**Non-metallic Materials**
Turbomachines


Fluid Power Control Systems


M 563 W 3C 0.5

Turbomachines


M 566 S,F 3C 0.5

Fluid Mechanics 3


M 568 W 3C 0.5

Noise Analysis and Control


M 569 S,F 3C 0.5

Fluid Mechanics-Design Topics

A study of the design aspects of fluid mechanics. Unsteady flow, pipe and duct systems, two and three dimensional flow techniques, practical calculation of boundary layers, separation, base pressure, jets, wakes and shear layers, diffusers and flow distribution devices, flow control, two-phase flow, instrumentation, wind tunnel modelling, wind loading. The course will be oriented to practical design techniques for flow systems, reactors, air pollution control equipment, etc.

Course Descriptions

Music

Associate Professor, Chairman
W. R. Maust, BS (EMC), BMus (Peabody Conservatory), MMus, PhD (Indiana)
Associate Professor
H. Martens, ARCT, LRSM, BA, MA (Minneapolis), PhD (Columbia)

Lecturers
L. Enns, ARCT, DSM (CMCO), BMus (Wilfrid Laurier), MMus (Northwestern)
K. Hull, ARCT, BA (Waterloo), BMus, MMus (Western Ontario)
Percussion
D. Harrison, BIS (Waterloo)

Part-time Lecturers
G. Holmes, BSc (Columbia)
W. Janzen, BMus (Manitoba), MMus (Wisconsin)
M. Jarrett

C. Johnston, 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, BA (Manhattan School of Music, N.Y.); French Horn
Ronald Brown, BM (New England Conservatory, Boston); Percussion
Barrie Cabena, FRCO, FRCCO, FTCL, ARCM; Organ

Stanley Clark, Trombone
Cedric Coleman, BM, MM (New England Conservatory, Boston); Bassoon
Kenneth Hull, ARCT, BA (Waterloo), BMus, MMus (Western Ontario); Piano
Thomas Kay, BM (Boston); Flute
Course Descriptions

Music

Lilian Kilianski, BMus (Wilfrid Laurier), Dip. in Opera Perf. (Toronto); Voice
James Mason, BM (Shenendoah Conservatory), MM (Catholic U., Washington); Oboe
Janes Noyes; Tuba
Doug Pullen; Saxophone
Vicor Sawa, BM (McGill), MM (New England Conservatory, Boston); Clarinet
John Tickner; Trumpet
Dianne Werner; BMus Dip. in Opera Perf. (Toronto); Piano
Ilan Williams; Cello

Music Faculty. Tuition fee.

MUSIC 100G F,W,S 3C 0.5
The Basics of Music
An introduction to music terminology, techniques and styles, through lectures and listening, with examples from all eras of music history.

MUSIC 101G F,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 pass/fail basis.

MUSIC 102G F,W,S 2L 0.25
Music Ensemble
(See MUSIC 101G for course description.)

MUSIC 111G W
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 125G F 3C 0.5
Popular Music and Culture
An examination of the popular music world and the interplay between rock, folk, jazz and gospel idioms and classical music. The social, commercial and technological elements of popular music are considered.

MUSIC 150G F 3C 0.5
Introduction to Music 1
An introduction to music from early Christian chant to Beethoven through listening, lectures, discussion and analysis.

MUSIC 151G W 3C 0.5
Introduction to Music 2
An introduction to the music of the 19th and 20th centuries through listening, lectures, discussion and analysis. Compositions include symphonies, concertos, chamber music, operas, electronic, and computer music. Prereq: MUSIC 150G or consent of instructor.

MUSIC 201G F,W,S 2L 0.25
Music Ensemble
(See Music 101G for course description)

MUSIC 202G F,W,S 2L 0.25
Music Ensemble
(See Music 101G for course description)

MUSIC 250G F,S 3C,1L 0.5
Music Theory 1 (Medieval and Renaissance)
The study of scales, melody, two-part counterpoint, and basic harmonic concepts emphasizing the Middle Ages and Renaissance. Ear-training and sight-singing lab sessions will cover diatonic melodic and simple two-part exercises. Prereq: A basic knowledge of scales, triads, and musical notation.

MUSIC 251G W 3C,1L 0.5
Music Theory 2 (Baroque and Classical)
The study of four-part homophonic and contrapuntal music, of diatonic and simple chromatic harmonies, and of elementary forms, emphasizing Baroque and Classical music. Ear-training and sight-singing lab sessions will cover four-part diatonic exercises. Prereq: MUSIC 250G or permission of the instructor.

MUSIC 253G
Medieval and Renaissance Music
Not offered 1982-83.

MUSIC 254G
Baroque and Classical Music
Not offered 1982-83.

MUSIC 264G F 3C 0.5
Vocal Literature
A study of the music written for solo voice from the seventeenth century to the present. Prereq: MUSIC 100G or MUSIC 150G/151G or consent of instructor.

MUSIC 265G W 3C 0.5
Piano Literature
Not offered 1982-83.

MUSIC 266G F,W,S std 0.5
Music Studio
Private music studio in Voice, Piano, Organ, Classical Guitar and orchestral instruments. This course is available only to Music majors and minors. Prereq: Audition with Music Faculty. Studio fee.

MUSIC 267G F,W,S std 0.5
Music Studio
(See MUSIC 266G for course description.) Prereq: MUSIC 266G and consent of Music Faculty. Studio Fee.

MUSIC 273G F,W,S 3C 0.5
Traditional Folk Music
A delineation of the characteristic motifs in folk music as found in Great Britain, Canada, the United States and Australia. Various folk instruments will be introduced.

MUSIC 274G W 3C 0.5
Introduction to Jazz
A survey of the development of jazz schools and individual styles as well as a study of melodic, harmonic, and rhythmic improvisation. Styles will be demonstrated through recordings and live performance.

MUSIC 275G S 3C 0.5
Computer Applications in Music
A survey of computer applications in music history, analysis and composition. Concepts from computer science and specific techniques and implementations of these various music activities are examined. Theoretical study is coupled with practical hands-on experience. Prereq: MUSIC 100G or 150G/151G or consent of instructor.

MUSIC 280G F 3C 0.5
Canadian Music
Not offered 1982-83.

MUSIC 301G F,W,S 2L 0.25
Music Ensemble
(See MUSIC 101G for course description.)
MUSIC 302G F,W,S 2L 0.25  
Music Ensemble  
(See Music 101G for course description.)

MUSIC 353G F 3C 0.5  
Music of the Romantic Period (19th Century)  
The study of the music of the 19th century by means of lectures, seminars, reading, and listening to recordings and live performances. Representative composers include Beethoven, Schubert, Chopin, Tchaikowsky, Verdi, and Wagner.  
Prereq: MUSIC 150G/151G, or MUSIC 100G, or consent of instructor.

MUSIC 364G W 3C 0.5  
Music of the Twentieth Century  
The study of the various genres of music of the 20th century in the context of the various artistic, political, and social movements. The course will include seminars, lectures, listening, and analysis.  
Prereq: MUSIC 150G/151G or MUSIC 100G or consent of instructor.

MUSIC 355G/356G S S 0.5/0.5  
Music and Culture in Vienna  
A Spring seminar to be taught in Vienna and environs. The course includes daily lectures and attendance of music performances during the Vienna Music Festival, as well as tours of places relating to the culture of Vienna.  
Prereq: MUSIC 150G/151G or MUSIC 100G or consent of instructor.

MUSIC 360G  
Music of the Church  
Not offered 1982-83.

MUSIC 361G  
Music of the Church  
Not offered 1982-83.

MUSIC 366G F,W,S std 0.5  
Music Studio  
(See MUSIC 266G for course description.)  
Prereq: MUSIC 267G and consent of Music Faculty. Studio fee.

MUSIC 367G F,W,S 3C,1L 0.5  
Music Studio  
(See MUSIC 266G for course description.)  
Prereq: MUSIC 266G and consent of Music Faculty. Studio fee.

MUSIC 370G F 3C,1L 0.5  
Music Theory 3 (19th Century)  
The study of the harmonic, melodic, and formal aspects of 19th century music. Ear-training and sight-singing lab sessions will cover chromatic chord progressions and modulatory melodies.  
Prereq: MUSIC 250G/251G or consent of instructor.

MUSIC 371G W 3C,1L 0.5  
Music Theory 4 (20th century)  
The study of the compositional aspects of 20th century music, including extended tonality, atonality, 12-tone writing, neo-classical idioms, and contemporary compositional procedures. Lab sessions will cover non-tonal melodic reading and complex chord structures.  
Prereq: MUSIC 370G.

MUSIC 372G F 3C 0.5  
Choral Music, Repertoire and Techniques 1  
A study of conducting techniques, rehearsal procedures, and score analysis.  
Prereq: MUSIC 150G/151G and 250G/251G or consent of instructor.

MUSIC 373G W 3C 0.5  
Choral Music, Repertoire and Techniques  
Continuation of MUSIC 372G.  
Prereq: As in MUSIC 372G.

MUSIC 374G Y 2L 0.5  
Composition Seminar  
Creative and critical potential is developed through supervised practice, tutorials, and seminars. Free composition, style emulation, arranging and orchestration will be dealt with.  
Prereq: MUSIC 251G or consent of instructor.

MUSIC 375G S,W 3C 0.5  
Electronic Music  
The study of electronic music through composition, analysis, listening, history, techniques and technology. Practical electronic studio experience is included.  
Prereq: MUSIC 371G or consent of instructor.

MUSIC 376G F 3C,1L 0.5  
MUSIC Ensemble  
(See Music 101G for course description.)  
Prereq: MUSIC 150G/151G or MUSIC 100G, or consent of instructor.

MUSIC 390G W 3C 0.5  
Special Topics in Music History I  
Study of a limited field under tutorial guidance.  
Prereq: MUSIC 100G or MUSIC 150G/151G and consent of instructor.

MUSIC 391G W 3C 0.5  
Special Topics in Music History II  
Not offered 1982-83.

MUSIC 466G F,W std 0.5  
Music Studio  
(See MUSIC 266G for course description.)  
Prereq: MUSIC 367G and consent of Music Faculty. Studio Fee.

MUSIC 467G F,W std 0.5  
Music Studio  
A continuation of Music Studio. A recital is required.  
Prereq: MUSIC 466G and consent of Music Faculty. Studio Fee.

MUSIC 490G/491G F,W 0.5/0.5  
Senior Honours Seminar  
A research seminar required of all honours students. The topics will vary from year to year depending on the interests of the students and instructor(s).

School of Optometry  
Professor, Director of School  
W.S. Long, BA (Toronto), OD (College of Optometry of Ontario)

Professor, Associate Director  
J.G. Sivak, LSCO (Montreal), MS (Indiana), PhD (Cornell)

Professors  
W.K. Adrian, Dipl-Ing, Dr-Ing, (TH Darmstadt), Dr habil, apl Professor (Karlsruhe)

C.W. Bobier, BA (Toronto), MSC (Ohio State), OD (College of Optometry of Ontario)

E.J. Fisher, BA, MA (Toronto), DSc (Pennsylvania College of Optometry)

W.M. Lyle, OD (College of Optometry of Ontario), MS, PhD (Indiana)

R.D. Pellowe, OD (College of Optometry of Ontario)

A.R. Remole, BFA (Manitoba), OD (College of Optometry of Ontario), MS, PhD (Indiana)
Course Descriptions
Optometry

G.C. Woo, OD (College of Optometry of Ontario), MS, PhD (Indiana) LOSc (Melbourne)
M.E. Woodruff, OD (College of Optometry of Ontario), PhD (Indiana)

Associate Professors
R.D. Beauchamp, BA (McMaster), MA PhD (Brown)
M.G.E. Callender, OD (College of Optometry of Ontario), BSc (Sir George Williams), MSc (Waterloo)
A.P. Cullen, DipOpt (City Univ. London), MSc (Saskatchewan), OD (Penn College of Optom), PhD (City Univ. London), DCLP
T.D. Williams, OD (College of Optometry of Ontario), MS, PhD (Indiana)

Assistant Professors
J.V. Lovasik, BSc (McGill), OD, MSc, PhD (Waterloo)

Adjunct Professor
I. Baker, OD (College of Optometry of Ontario)
G.W. Wyszewski, Dipl Ing, Dr Ing (Tech. Univ. Berlin)

Adjunct Lecturers
E.L. Buchner, OD (College of Optometry of Ontario)
E.E. Daniel, BA, MA (Johns Hopkins), PhD (Utah)
R.G.P. Lawrence, O.C.

Lecturers
D.J. Egan, BS (St. Johns), BS, OD (Pennsylvania College of Optometry)
S. Hoffman, MD, DPH (Toronto)
B. Robinson, OD (Waterloo) MPH (Washington)
M.J. Samek, OD (College of Optometry of Ontario), MSc (Waterloo)

Clinic Supervisors - Part-time (1981-82)
W.B. Andrews, OD (Waterloo)
W.R. Andrews, OD (College of Optometry of Ontario)
J.G. Attridge, OD (College of Optometry of Ontario)
D. Bock, OD (Waterloo)
R.R. Bock, OD (College of Optometry of Ontario)
M. Boermans, OD (Waterloo)
J.A. Brisson, OD (Waterloo)
R.R. Chen, OD (College of Optometry of Ontario)
D.S. Craig-Paul, OD (Waterloo)
G.M. Cunik, OD (Waterloo)
P.A. Devenny, OD (Waterloo)
A.H. Dick, OD (Waterloo)
T.A. Dietrich, OD (Waterloo)
M.H. Falke, OD (Waterloo)
C.C. Foster, OD (Waterloo)
P. Galvin, OD (Waterloo)
D. Hansen, OD (Waterloo)
D.A.K. Hayhoe, OD (Waterloo)
L. Hirano, OD (Waterloo)
G.L. Hollands, OD (Waterloo)
D. Klein, OD (Waterloo)
H.B. Mayers, OD (Waterloo)
R.E. Miller, BSc (Toronto), OD (Waterloo)
D.A. Neff, OD (Waterloo)
J.M. Newman, OD (Waterloo)
J. Parks, OD (Waterloo)
R.R. Phillips, OD (Waterloo)
K. Pickard, OD (Waterloo)
R.L. Saari, OD (Waterloo)
P. Shaw, OD (Waterloo)
L. Sheldon, OD (Waterloo)
P. Sohier, OD (Waterloo)
D. Thornborrow, OD (Waterloo)
R. Watson, OD (College of Optometry of Ontario)
R.L. Wilson, OD (Waterloo)
M. Witter, OD (Waterloo)
M. Wolf, BSc, OD (Waterloo)

Clinic Residents (1981-82)
Y.J. Alloucherie, BASc, MA (Toronto), PhD (Maryland), OD (New Eng. College of Optometry)
G.Y. Mousa, MS, (AmerUnivBeirut), PhD (Western Ontario), OD (New Eng. College of Optometry)

Course Descriptions
Students in other disciplines may register for Optometry courses only upon the approval of the Director of the School of Optometry.

Clinic Supervisors - 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.

Anatomy of the Eye and Associated Structures
The gross, microscopic and ultrastructure of ocular tissues. The embryology and comparative anatomy of the eye will be emphasized. The relationship of the eye to the vascular supply of the head and the nervous system will be studied. This course is credited only upon completion of OPTOM 114.

Prereq: BIOL 201

Anatomy of the Eye and Associated Structures
The gross, microscopic and ultrastructure of ocular tissues. The embryology and comparative anatomy of the eye will be emphasized. The relationship of the eye to the vascular supply of the head and the nervous system will be studied. This course is credited only upon completion of OPTOM 114.

Prereq: BIOL 201.

Geometrical Optics

Prereq: PHYS 121, 121L, 122, 122L, MATH 113.

Physiological Optics

Prereq: OPTOM 106

Anatomy of the Eye and Associated Structures
A continuation of Optom 104.

Prereq: OPTOM 104
OPTOM 115 W 4C,1T 0.5 General Pathology
A continuation of 105.
Prereq: OPTOM 105.

OPTOM 116 W 3C,4L 0.5 Optometrical Optics
Properties of optical glass and plastic, single vision lenses and prisms, lens combinations. Optics of contact lenses and clinical instruments. Ophthalmic laboratory procedures.

OPTOM 241 F 3C,3L 0.5 Physiological Optics
Ocular motility: Kinematics of eye movements, muscle actions, measurements of eye movements, types of eye movements, innervation systems subserving eye movements, clinical application.
Prereq: OPTOM 111

OPTOM 242 F 3C,3L 0.5 Clinical Optometry
Lectures and laboratories on clinical techniques for examination of the optical properties of the eye.
Prereq: OPTOM 111

OPTOM 244 F 3C,2L 0.5 Neurophysiology of Vision
The neural processing of colour, brightness, movement and form by the retina, lateral geniculate, cortex, superior colliculus and other brain centres. Neural Mechanisms underlying binocular depth perception, the accommodative response and eye movement.
Prereq: OPTOM 104/114

OPTOM 245 F 3C 0.5 Ocular Pathology
Signs, symptoms, clinical detection of primary and secondary ocular disease; instrument techniques; record keeping, patient counselling, referral procedures; management of ocular emergencies; primary health care responsibilities.
Prereq: OPTOM 105/115

OPTOM 246 F 3C,4L 0.5 Optometrical Optics
Prereq: OPTOM 116

OPTOM 251 W 3C,3L 0.5 Physiological Optics

OPTOM 252 W 3C,3L 0.5 Clinical Optometry
Clinical techniques for the examination of the binocular relations of the non-strabismic patient, with particular emphasis on the study of the relationship between accommodation and convergence. Techniques of photometry, prism vergence tests, relative accommodation tests, retinoscopy, and monocular and binocular cross cylinder tests.
Prereq: OPTOM 241/242

OPTOM 254 W 2C,2L 0.5 Physiology of The Eye and Ocular Adnexa
The physiology of the smooth muscles of the eye, the extracocular striate muscles, the lacrimal apparatus, the cornea, the iris, the lens, the ciliary body and the vitreous body. Production and drainage of aqueous and related influences on intraocular pressure. The vascular supply of the eye.
Prereq: OPTOM 104

OPTOM 255 W 3C,2L 0.5 Ocular Pathology
A continuation of 245.
Prereq: OPTOM 245

OPTOM 256 W 2C,1T 0.5 Light and Illumination
Principles of radiometry and photometry. Illumination and related factors involved in the design and control of the visual environment in relationship to the human visual system; lighting surveys.

OPTOM 261 F 3C,3L 0.5 Physiological Optics

OPTOM 274 W 2C 0.5 Genetics for Optometrists
A brief review of Mendelian genetics, and the molecular basis of modern genetics. Inherited conditions of particular interest, e.g., colour vision, albinism, aniridia, refractive error, retinoblastoma. Genetic counselling, and the detection of carriers.
Prereq: OPTOM 245

OPTOM 342 F 3C,2L 0.5 Clinical Optometry: Case Analysis
Presentations with problem solving sessions concerning the analysis of examination data gathered for a non-strabismic patient. Issues relevant to diagnoses, modes of therapy, prognosis and counselling will be emphasized.

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 Optometrical Optics
The lecture course deals with problems involved in selecting, preparing and fitting ophthalmic materials. Optical, cosmetic and comfort requirements, and patient counselling are considered. Labs provide experience in preparing and fitting materials to patients.
Prereq: OPTOM 116, 246

OPTOM 347 F 3C,2L 0.5 Optometric Specialties: Contact Lenses
A series of lectures and laboratories on the principles and procedures of prescribing and fitting contact lenses.

OPTOM 348 Y 2C,8 Clinic 1.0 Optometric Clinic and Optometric Communication
The student is assigned to the various areas of the clinic and under the direct supervision of optometrists of the clinic staff, carries out routine clinical investigations of patients. Lectures will follow the outline of Optometry 513.
Prereq: OPTOM 242, 252

OPTUM 350 W 4C 05 Optometrical Jurisprudence and Praxis
OPTOM 351W 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.

OPTOM 357 W 2C,2L 0.5
Optometric Specialties: Aniseikonia and Low Vision Aids
A series of lectures and labs in examining low vision and aniseikonic patients with specific techniques described. Treatment and therapy will be included.
Prereq: OPTOM 342

OPTOM 358 W 30 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 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 2C 0.5
Pediatric Optometry
Special aspects of the management of vision problems of infants and young children.
Prereq: OPTOM 242, 252

OPTOM 501 F 3L 0.5
Optometry Research Project
Students with an interest in research may arrange with a professor to undertake a research project of mutual interest. This course serves as an alternative to PSYCH 357. Contact the course co-ordinator for details.
Prereq: OPTOM 261

OPTOM 502 F 3C 0.5
Advanced Contact Lens Practice
A series of lectures and practical demonstrations of the principles and procedures of advanced contact lens materials and resources including their physiological implications.
Prereq: OPTOM 242, 242, 252

OPTOM 504 F 4C,1L 0.5
Optometry Research Project
A continuation of 501. This course serves as an alternative to OPTOM 513.
Prereq: OPTOM 501

OPTOM 516 W 2 Clinic 0.5
Advanced Contact Lens Practice
A continuation of OPTOM 502 with an emphasis on research.

OPTOM 520 W 2C 0.5
Optometrical Jurisprudence
Lectures relating to the legal aspects of practising optometry in Canada. The rights and responsibilities of the optometrist in practice are examined and discussed.

OPTOM 533 W 2C 0.5
Optometry Research Project
A continuation of 501. This course serves as an alternative to OPTOM 513.
Prereq: OPTOM 501

OPTOM 554 W 2C 0.5
Genetics for Optometrists
A brief review of Mendelian genetics, and the molecular basis of modern genetics. Inherited conditions of particular interest, e.g., colour vision, albinism, aniridia, refractive error, retinoblastoma. Genetic counselling, and the detection of carriers.
Prereq: OPTOM 245

OPTOM 519 W 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 521 W 2C 0.5
Optometry Research Project
A continuation of 501. This course serves as an alternative to OPTOM 513.
Prereq: OPTOM 501

OPTOM 559 W 4C 0.5
Aspects of prevention of accidents and injury to the visual system.
The production of efficient and comfortable vision at work and recreation.
Course Descriptions
Peace and Conflict Studies

OPTOM 538 F Clinic 0.0
Vision Care Projects
All students are required to participate in vision care projects between the fourth and fifth professional years. These will involve a minimum of 400 hours and will be arranged by the faculty.
Prereq: Successful completion of Optometry 348 and 358 and permission of the Chief of Clinics.

OPTOM 599(A-E) W Comprehensive examinations in Anatomy and Physiology, Pathology and Pharmacology, Physiological Optics, Optometric Optics, Optometry. Graduation in Optometry is contingent upon successful completion of these comprehensive examinations involving oral, written and clinical applications of optometry. These examinations are ordinarily held in the final examination period of the Winter term, fourth professional year. These examinations have been approved for purposes of licensure for 1982 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)

Members of the Peace and Conflict Studies Faculty Group

Professors
L. Costa-Pinto, BA, PhD (Brazil)
F.H. Epp, (Bethel), MA, PhD (Minnesota)
W. Klaassen, BA, RD (McMaster), D Phil (Oxford)

Associate Professors
C.G. Brunk, BA (Wheaton), MA, PhD (Northwestern)
J.G. Holmes, BA, MA (Carleton), PhD (North Carolina)
M.F. McDonald, BA (Toronto), MA, PhD (Pittsburgh)
R.J. Sawatsky, BA (Bethel), MA (Minnesota), MA, PhD (Princeton)
J.O. Stubbs, BA (Toronto), MSc Econ (London), DPhil (Oxford)

Assistant Professors
G.O. Michalenko, BA, PhD (Saskatchewan)
W.B. Moul, BA, MA, PhD (British Columbia)
M. Smyth, BA (Toronto), MA, PhD (York)

Core Courses
The Core Courses for each year of the program are designed to bring together students from various disciplines who are interested in the problems of conflict and peace, with the objective of acquainting them with other disciplinary approaches to those problems. Core courses are taught in Conrad Grebel College by members of the PACS Faculty Group, other qualified and interested members of participating departments, or by eminent scholars in the field who will be invited to the University from time to time.

PACS 201 F 2C.1D 0.5 Roots of Conflict and Violence
An examination of influential theories of the nature and roots of human conflict on both the interpersonal and inter-group level. Contributions of the behavioural and social sciences, as well as the humanities, will be explored.

PACS 202 W 2C.1D 0.5 Conflict Resolution
A continuation of PACS 201, with special emphasis on the means of conflict resolution or management. Included are critical assessments of negotiation, arbitration, confrontation, litigation, violence and nonviolent resistance, and other models of conflict resolution.

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.

Peace and Conflict Studies
Content Courses Offered by PACS

In addition to the Core Courses, the PACS Program offers the following Interdisciplinary PACS-related courses which may be used to fulfill the PACS Content Course requirements.

PACS 230 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.
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. 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 the departmental sections elsewhere in this chapter.

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-Russiabn 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 1
HIST 248 Mennonite History 2
HIST 348 Radical Reformation 2

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

POLITICAL SCIENCE
P SCI 101 Introduction to Politics
P SCI 102A Imperialism and International Relations
P SCI 102K Mass Political Violence
P SCI 225 Political Theory 1
P SCI 226 Political Theory 2
P SCI 281 International Politics 1
P SCI 282 Foreign Policy
P SCI 321 Marxist Theory
P SCI 322 Marxism and Revolution after Marx
P SCI 350A The Politics of Developing Areas 1
P SCI 350B The Politics of Developing Areas 2
P SCI 380A World Politics 1
P SCI 380B World Politics 2
P SCI 479 Violence in the Political Process
P SCI 481 Research Seminar on World Politics
P SCI 483 Power Politics and World Order Studies
P SCI 484 Contemporary Foreign Relations Theories and Politics
P SCI 486 Middle Powers and World Politics

PSYCHOLOGY
PSYCH 254 Interpersonal Relations
PSYCH 318 Moral Development
PSYCH 333 Industrial Psychology
PSYCH 353 Aggression and Social Conflict
PSYCH 354 Interpersonal Processes in Critical Situations

RELIgIOUS STUDIES
R S 253 Biblical Foundations of Christian Pacifism
R S 254 War and Peace in Christian Theology
R S 263 Religion and Politics
R S 274 Religious Approaches to Personal Crises

SOCIAL DEVELOPMENT STUDIES
PSYCH 221R Interpersonal Interaction
SOC 221R Master Trends in Modern Society
SOC 225R Race and Culture and the Third World 1
SOC 226R Race and Culture and the Third World 2
SOC 321H Canadian Ethnic and Cultural Minorities
SOC 328R Canadian Ethnic and Cultural Minorities

SOCIOLoGY
SOC 106 Collective Behaviour
SOC 190G Sociology of Dissent
SOC 222 Juvenile Delinquency
SOC 227 Crime and Society
SOC 233 Social Psychology of Beliefs and Attitudes
SOC 255 Third World Development
SOC 256 Ethnic and Racial Relations
SOC 265 Political Sociology
SOC 266 Sociology of Militarism
SOC 364 Social Change
SOC 370G Sociology of Law

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

Associate Professor, Course Director and Undergraduate Advisor
E.S. Lucy, BA (Hobart)

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 background that will prepare students for administrative or managerial roles in their future careers. At the same time, it permits students the opportunity to develop in depth the specialized academic interests of their major course of study. The PAS Minor may be combined with a co-operative program in order to obtain work experience in this field.

The program of study consists of ten half-course credits that may be completed at any point in the four-year term. The courses reflect several central themes. First, analytical techniques are stressed. These “functional” tools of management have become increasingly important in administrative and
course descriptions

philosophy

business settings. Second, there is a strong emphasis on human resources. This focus is provided by courses in Political Science, Psychology, Management Science and Sociology. The third content area is concerned with the application of economic theory to the administrative role. Finally, there are two "core" courses in Personnel Administration. Students are encouraged to enrol in these courses in their second and third years of study. The two courses have a practical orientation and provide an integrative perspective on the topic area.

Core Courses

A. Analytical Techniques
1. Computer Science: One of CS 112, 116, 180
2. Statistics: MTHEL 102 or equivalent course within the student's Honours Program
3. Accounting: ACC 101 or 121

B. Human Resources
4.5. Public Administration: P SCI 331, 332.
6.7. Personnel and Industrial Psychology: PSYCH 339, and PSYCH 333 or M SCI 44
8. Industrial Sociology: SOC 242 or 342 or 340 or M SCI 53.

C. Economic Factors
9. Microeconomics: ECON 101

D. PAS Basic Course
12. Personnel Administration: PAS 200
13. Issues in Personnel Administration: PAS 300

Course Descriptions

Department of Philosophy

Professor, Chairman of the Department
R.A. George, MA, PhD (Michigan State)

Associate Professor, Associate Chairman and Undergraduate Advisor
B.P. Hendley, BA (Marquette), MA, PhD (Yale)

Professors
E.J. Ashworth, BA, MA (Cambridge), PhD (Bryn Mawr)
L.L. Haworth, BA (Rollins, MA, PhD (Illinois)
J. Minas, BA (Wayne), PhD (Illinois)
J.F. Narveson, BA (Chicago), MA, PhD (Harvard)
B.H. Suits, BA, MA (Chicago), PhD (Illinois)
J.W. Tucker, BSc, BA, PhD (London)

Professor Emeritus
P. Seligman, BA, PhD (London)

Associate Professors
W.R. Abbott, BA (Kenyon), PhD (Ohio State)
C.G. Brink, BA (Wheaton), MA, PhD (Northwestern) G
G.T. Campbell, BA (Western Ontario), PhL, PhD (Laval) J, Recipient of the Distinguished Teacher Award
F. Centore, BSc (Canisius), MA (Maryland), PhD (St. John's) J
D.T. DeMarco, BS (Stonehill, Mass.), MA, PhD (St. John's) J
J.R. Hurne, BA, MA (Western Ontario), BTh (Huron), PhD (Columbia)
A. Kant-Lawson, BA (Toronto), MA (Chicago), PhD (McMaster)
M.F. McDonald, BA (Toronto), MA, PhD (Pittsburgh)
A.C. Minas, BA (Radclyffe), MA, PhD (Harvard)
D.D. Roberts, BA (Roosevelt), MA, PhD (Illinois)
J.W. Van Evra, BA (Valparaiso), MA, PhD (Michigan State)

Assistant Professor
C.R. Girodat, BA (Western Ontario), MA (Detroit), PhD (Toronto) J
R.H. Holmes, BA, MA (Montana), PhD (Washington)
J. Wubnig, BA (Swarthmore), MA, PhD (Yale)
J.L. Zwiok, BA, (Calgary), MA, PhD (Toronto)

Faculty members holding joint appointments as shown
'Department of Pure Mathematics

Note 1
Any full course or two half courses in Philosophy can be used to satisfy the Group A (I) requirement.

Note 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.

Note 3
Courses suffixed with "J" are administered by St. Jerome's College.

PHIL 100
Introduction to Philosophy
Not offered in 1982-83.

PHIL 101 X F,W,S 3C 0.5
Introduction to Philosophy
A general introduction, designed to provide the student with an understanding of the major problems of classical and contemporary philosophy.

PHIL 102A W 2C,1D 0.5
Introduction: Knowledge and Reality
Discussion of the nature of reality. Rival theories concerning mind, matter, freedom, the existence of God, and the place of experience and reason in human knowledge are considered.

PHIL 102B X,F,W,S 3C,1D 0.5
Introduction to Social and Political Philosophy
An introduction to basic concepts and principles in classic and contemporary social and political philosophy. Differing views on basic questions are examined, with applications to such issues as capital punishment, welfare provisions, taxation, natural resource ownership, and terrorism.
PHIL 102C F.W.S 3C 0.5
Philosophy of Life
"Who am I?" "What can I hope for after death?" "How can I tell what to do?" "What can I know?" are questions that have led 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 102D W 3C 0.5
Introduction to the Philosophy of Religion
Beginning with a consideration of such contemporary religious and anti-religious options as secularism, mysticism, occultism, and charismatics, the course moves to a critical discussion of such topics as religious experience, faith, God, and miracles.

PHIL 140 F.W.S 3C 0.5
Introduction to Formal Logic
Elementary sentence and predicate logic. Translation from English into the formalism, decision methods and deductive application of Gogic Methods to Logic. This course is a preparation for courses in the foundations of mathematics, scientific methods, and more advanced logic courses.

PHIL 145 F.W.S 3C 0.5
Critical Thinking
An analysis of basic types of reasoning, structure of arguments, critical assessment of information, common fallacies, problems of clarity and meaning.

PHIL 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 mediaeval periods.

PHIL 200B W 2C,1D 0.5
Great Works of Western Philosophy: Part 11
Outstanding works from the early modern and contemporary periods.
PHIL 226 3C 0.5
Ethics and the Life Sciences
An investigation of some critical ethical
issues in human research and therapy.
Includes discussions of the right to live
and right to die, behaviour control (e.g.
psychosurgery, behaviour modification
and psychotherapy), human experi-
mentation (including "informed
consent" and fetal research) and
genetic engineering.
Prereq: One of PHIL 102R, 221, 322, or
consent of instructor.

PHIL 236 W 2C 0.5
Philosophy of Religion: The Occult
A critical philosophical discussion of
reports of several kinds of extraordinary
experiences, such as magic, extrasen-
ory perception, mysticism, and
divination will lead us to discussions of
such concepts as insanity, irrationality,
the supernatural, and the miraculous.

PHIL 240 Y 3C 1.0
Logic
A systematic development of the
propositional calculus and of the first-
order functional calculus. Some
attention will be devoted to extensions
and interpretations of such formal
systems.
Prereq: None for second-year students
and above; consent of instructor for
others.

PHIL 241 W 3C 0.5
Intermediate Logic
Axiom systems of 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 F 3C 0.5
Extensions and Applications of
Elementary Logic
The classical logic introduced in PHIL
140 will be extended to form systems of
modal logic, including logics of
obligation, belief and knowledge,
necessity, and temporal order.
Essentialism, future contingencies,
proofs for the existence of God will be
discussed.
Prereq: PHIL 140 or consent of the
instructor.

PHIL 243 W 3C 0.5
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 248 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
lawfulness, the grounds for scientific
confirmation, and the debate between
rationalism and empiricism in science.

PHIL 265 3C 0.5
The Existentialist Experience
An introduction to the existentialist view
of man using both literary and
philosophical texts from such authors as
Kierkegaard, Unamuno, Nietzsche,
Ortega y Gasset, Camus, Sartre,
Heidegger and others.

PHIL 250 3C 0.5
The Philosophy of Games
An introduction to philosophical issues
relating to sports and other games.
Among the issues examined will be the
game of nature, games and sports, and
the relevance of games and sports to
other philosophical interests; e.g.,
ethics and aesthetics.

PHIL 302 W 3C 0.5
Modern Feminism
An examination of contemporary
feminist thought, de Beauvoir through
to the present. Topics such as liberty,
responsible and liability, punishment, rights
and possession are considered.
Prereq: PHIL 327A or consent of the
instructor.

PHIL 311 W 3C 0.5
Philosophy of Education 1
A philosophical analysis of classical and
contemporary theories of education,
with a view to formulating a clear
workable concept of education, its aims
and methods.
Prereq: At least second year standing or
consent of instructor.

PHIL 312 F 3C 0.5
Philosophy of Education 2
An introduction to current work in the
field, particularly that of Peters, Hirst,
and Dearden. Special attention will be
paid to the question of the desirability
of a core curriculum and its proposed
content.
Prereq: PHIL 311 or consent of
instructor.

PHIL 322 W 3C 0.5
Contemporary Ethical Theory
Continues the history and discussion of
continuities begun in PHIL 221 with writings
from 1900 to the present. Theories such
as intuitionism, emotivism, utilitarian
ism, and relativism are examined via the
writing of such people as Moore, Hare
and Warnock.
Prereq: PHIL 221 recommended.

PHIL 327A F 0.5
Philosophy of Law - Part 1
An examination 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.

Note
This is a required course for the Legal
Studies Option.

PHIL 327B W 0.5
Philosophy of Law - Part 2
An examination of areas within the law
in which philosophical problems and
methods are featured prominently.
Topics such as liberty, responsibility
and liability, punishment, rights and
possession are considered.
Prereq: PHIL 327A or consent of
instructor.

PHIL 328
The Philosophy of Karl Marx
Not offered 1982-83.

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 conscien-
tious objection.
Prereq: PHIL 102B, or 322 or consent of
instructor.

PHIL 331 3C 0.5
Aesthetics
Philosophical consideration of works of
art and the problems of beauty using
selected readings to enable the student
to recognize and formulate his own
views in a philosophic manner.
Prereq: One full or two half Philosophy
courses, or consent of instructor.
PHIL 335 3C 0.5
Philosophy of Religion
A critical examination of the methods and substantive arguments found in selected major works of religious philosophy. The writings chosen for consideration will be announced in advance each year.
Prereq: One full or two half Philosophy courses, or consent of instructor.

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.

Note
Either 350A or 350B may be taken separately.

PHIL 359 3C 0.5
Philosophy of the Formal Sciences
A study of philosophical problems concerning mathematics. Topics discussed include formalism, intuitionism, logicism, the mathematical paradoxes, and other topics in foundations and metamathematics.
Prereq: At least second year standing or consent of instructor.

PHIL 362 3C 0.5
Philosophy of the Social Sciences
Problems about the fundamental methods and aims of the social sciences generally, and problems specific to Psychology, Sociology, Political Science, etc., and their relations to one another will be considered.
(Cross-listed as SOC 371)

PHIL 365-366 3C 0.5
Oriental Philosophy
Studies of a selected area of non-western Philosophy (e.g. Indian or Chinese). Parallels will be drawn between modes of Eastern thinking and European conceptions with emphasis on essential differences as well as similarities.
Prereq: Consent of instructor.

PHIL 380 F 3C 0.5
History of Ancient Philosophy 1
From the beginnings to Plato.
Cross-listed as CIV 361.
Prereq: One half course in Philosophy or consent of instructor.

PHIL 381 W 3C 0.5
History of Ancient Philosophy 2
Cross-listed as CIV 362.
Prereq: One half course in Philosophy or consent of instructor.

PHIL 382 F 3C 0.5
Medieval Philosophy 1
The early period of the 13th century. Among those considered will be: Augustine, Boethius, Anselm, and Abelard.
Prereq: One half course in Philosophy, or consent of instructor.

PHIL 383 W 3C 0.5
Medieval Philosophy 2
The later period from the 13th century. Among those considered will be: Bonaventure, Aquinas, Scotus, and Ockham.
Prereq: One half course in Philosophy, or consent of instructor.

PHIL 384 F 3C 0.5
History of Modern Philosophy 1
Earlier period beginning with Descartes.
Prereq: One half course in Philosophy or consent of instructor.

PHIL 385 W 3C 0.5
History of Modern Philosophy 2
Later period including Hume and Kant.
Prereq: One half course in Philosophy or consent of instructor.

PHIL 386 3C 0.5
19th Century Philosophy
The 19th century. Philosophers covered may include Hegel, Mill, Schopenhauer, James, and Kierkegaard.
Prereq: One half course in Philosophy or consent of instructor.

PHIL 402/421 3C 0.5
Studies in Ethics
Various half courses dealing with special topics; one or more of these will be offered each year as announced by the Department.
Prereq: At least one half course in ethics.

PHIL 422 3C 0.5
Political Philosophy 1
Philosophical analysis of central concepts in political theory and its relation to moral and metaphysical problems of various periods.
Prereq: At least one 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 Philosophy course.

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 ultimate nature of history and historical knowledge.
Prereq: Consent of instructor

PHIL 455 Y 3C 1.0
Metaphysics
Studies of reality, metaphysical problems and issues. The first part examines space, time, and motion. The second part cosmology (principles of the universe) examines space, time, and motion.

PHIL 455A F 3C 0.5
Ontology
The first part of PHIL 455.

PHIL 455B W 3C 0.5
Cosmology
The second part of PHIL 455.

Note
Either PHIL 455A or PHIL 455B may be taken separately.

PHIL 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 363.

PHIL 463B W 3C 0.5
Linguistic Analysis
The second part of PHIL 363.

Note
Either PHIL 463A or PHIL 463B may be taken separately.

PHIL 465 3C 1.0
Existential Philosophy
An in depth study of the thoughts of a major figure such as Kierkegaard, Unamuno, Nietzsche, Heidegger, Sartre, Camus, Marce Jaspers, Ortega y Gasset.
Prereq: Consent of Instructor

PHIL 470 3C 1.0
Phenomenology
A critical examination of the issues and methods of phenomenology, including the attempt 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 471-473 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 479 Y S 1.0
Senior Seminar and Honours Essay
All senior honours students attend this seminar in which a selection of major philosophical problems is discussed. They will also prepare a senior essay and discuss it with this group.

The following courses are administered by St. Jerome's College.

PHIL 100J Y.M 3C 1.0
Introduction to Philosophy
A broad selection of the main problems in philosophy will be considered. For example: how can we know whether anything is right or wrong? How can we know about things we cannot directly observe? Can we know whether there is a God? Is mind in any sense distinct from matter?

PHIL 120J F 3C 0.5
Philosophy of Life and Death
A study of what some of the great philosophers have said about the meaning of life and death and the transition from life to death. Students are urged to raise questions and help direct discussion.
Offered in the evening.

PHIL 130J W 3C 0.5
Philosophy of Discontent
A study of what some of the great philosophers have said about the causes of discontent. Social disobedience and the extent to which ethical principles can be altered to accommodate changing conditions are possible topics for discussion.
Offered in the evening.

PHIL 200J 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 to argue with order, with facility and without error.

PHIL 205J F 3C 0.5
Philosophy of Nature
An examination of ancient and modern accounts of the natural world. Problems include whether matter alone can account for change, whether there is more than one cause, whether nature operates by purpose or chance.

PHIL 206J 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 210J W 3C 0.5
Philosophy of Man
What is man? What is man's place among other creatures? Is man an accident of evolution? What are the major views on man as a species? How are love and sex aspects of man's life?

PHIL 218J F.J 3C 0.5
Ethical Theory
A normative approach, employing several of the classic Western traditions of rational thought, to general ethics. The various schools of ethical thought will be discussed.
Also offered in the evening.

PHIL 219J W.A 3C 0.5
Practical Ethics
This course will discuss the applications of general ethics to more specific areas of human endeavour. Among the topics discussed will be abortion, contraception, sex, obscenity, violence, drugs, egoism, dishonesty, and various forms of human exploitation.
Also offered in the evening.
PHIL 230J  F  3C  0.5
God and Philosophy
An investigation of several aspects concerning the meaning and existence of God. Is God-talk possible? Can faith and reason be reconciled? Is religious experience a meaningful argument? A wide range of different views will be considered.

PHIL 237J
Ethics and Society
Not offered 1982-83.

PHIL 260J
Issues in Higher Education
Not offered 1982-83.

PHIL 300J  F  3C  0.5
The Western Philosophical Tradition (to 1600)
An intensive overview of the major recurring themes in Western intellectual history from both an historical and a philosophical viewpoint. Prereq: Second year standing.

PHIL 301J  W  3C  0.5
The Western Philosophical Tradition (1600-Present)
A continuation of 300J. Descartes to Existentialism. Prereq: Second year standing.

PHIL 316J  W  3C  0.5
Philosophy of the Family
A philosophical examination of the family: its foundation, its purpose, its importance in personal growth and its relation to political community. Prereq: One course in moral philosophy, or consent of instructor.

PHIL 333J  Y  3C  1.0
Contemporary Philosophical Problems in Art
An examination of some of the many philosophical problems, especially in music, painting, and poetry, which confront today's artist as well as his audience. Traditional aesthetic categories are re-evaluated and contemporary philosophies of art considered. Prereq: One other philosophy course or consent of instructor.

PHIL 395J  Y  3C  1.0
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  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.

PHIL 450J  Y  3C  1.0
Being and Existence
An advanced course for the serious student, delving into the notions of reality, being, essence, existence, analogy, etc. The techniques of linguistic analysis will be employed. Also, the very possibility of any kind of metaphysics will be discussed. Prereq: Third year standing or consent of instructor.

PHIL 499J  Y  1.0
Tutorial and Honours Essay
Students wishing to enroll in 499J should consult the College Discipline Co-ordinator.

Department of Physics

Professor, Chairman of the Department
N.R. Isenor, BSc (Acadia), MSc, PhD (McMaster)

Professor, Dean of the Faculty of Science
D.E. Brodie, BSc, MSc, PhD (McMaster)

Associate Professor, Associate Chairman of the Department
J.K. Brandon, BSc, PhD (McMaster), MA (Cambridge)

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 (Penn State), PhD (Toronto)
M.P. FitzGerald, BSc, MSc (Toronto), PhD (Case)
J. Grindlay, BSc (Glasgow), DPhil (Oxford)
J. Kruuv¹, BASc (Waterloo), PhD (Western Ontario)
J.W. Leech, BS, PhD (London), FinstP
J.D. Leslie, BASc (Toronto), MS, PhD (Illinois)
A.D.S. Naqi, BA, BSc, MSc (Punjab), PhD (Delhi)
J.L. Ord, BASc (Toronto), MS, PhD (Illinois)
R.K. Pathria, BSc, MSc (Punjab), PhD (Delhi) Recipient of the Distinguished Teacher Award
W.R. Pearson², DFC, MA, DSc (Oxford), FRSC, FCIC
M.M. Pintar, BSc, MSc, PhD (Ljubljana)
G. Scoles³, BSc, PhD (Genova)
R.A. Snyder, BSc, PhD (Western Ontario)
D.M.R. Taplin², BSc (Aston), DPhil (Oxford), DSc, PEng, CEng, FIM
S.F. Wang, DSc (Nagoya)

Associate Professors
J.M. Corbett, BASc (Toronto), MSc, PhD (Waterloo)
A.E. Dixon, BSc (Mt. Allison), MSc (Dalhousie), PhD (McMaster)
P.C. Eastman, BSc, MSc, PhD (McMaster), PhD (British Columbia)
H.K. Ellenton, BSc (Western Ontario), MA (Toronto)
D. Hemming, BSc, PhD (Bristol)
J.R. Lepock¹, BS, MS (W. Virginia), PhD (Penn State)

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D. Hemming, BSc, PhD (Bristol)
J.R. Lepock¹, BS, MS (W. Virginia), PhD (Penn State)
Course Descriptions

Physics

Note 1
Details of the undergraduate program offered by the Faculty of Science are to be found in Chapter 14.

Note 2
Prerequisites are given as a guide to the student and may be waived with the consent of the instructor.

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.

PHYS 010 F,W,S 1C 0
Physics Seminar
This seminar brings together Honours Physics (including Co-op students) in Years 2 and 4, to receive information concerning the activities of the Physics Department and to hear invited speakers.

PHYS 103 W 3C,3L,2T 0.5
Mechanics in Human Movement
An introduction to the physical principles required for the analysis of the mechanics of human movement. A course for Kinesiology students. Lab alternate weeks, optional tut.

PHYS 105 F 3C,3L,2T 0.5
Electrical Science
Basic electricity, magnetism and electronics. An introduction to the physical principles required for an understanding of the electrical instruments used in Kinesiology. A course for Kinesiology students. Prereq: PHYS 103 or 104. Lab alternate weeks, optional tut.

PHYS 111 F 3C,1T 0.5
Physics For the Life Sciences 1
An introduction to physics for students intending to concentrate their further studies in biology, medicine or dentistry; includes particle kinematics and dynamics, energy and momentum conservation, gravitation, rotational mechanics, fluid mechanics, elasticity and oscillations.

PHYS 111L F 3L 0.25
Physics For the Life Sciences 1 Laboratory
For students taking PHYS 111. Lab alternate weeks.

PHYS 112 W 3C,1T 0.5
Physics For The Life Sciences 2
A continuation of PHYS 111; includes wave motion, normal modes of vibration, sound, hearing, temperature, heat, kinetic theory of gases, thermodynamics, electrostatic force and potential electric current and power, DC circuits, magnetic fields and induction.

PHYS 112L W 3L 0.25
Physics For The Life Sciences 2 Laboratory
For students taking PHYS 112. Lab alternate weeks.

PHYS 115 F 3C,2T 0.5
Mechanics
Brief review of kinematics. Particle dynamics, work, energy, conservation of energy, Conservation of linear momentum, collisions. Rotational kinematics and dynamics, conservation of angular momentum. Equilibrium of rigid bodies. For students in Year 1 Engineering.

PHYS 121 F 3C,1T 0.5
Introductory Physics 1
An introductory course in physics for students intending to concentrate on their future studies in the physical sciences, optics 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.

PHYS 121L F 3L 0.25
Introductory Physics 1 Laboratory
For students taking PHYS 121. Lab alternate weeks.

PHYS 122 W,S 3C,1T 0.5
Introductory Physics 2
This course is a continuation of PHYS 121; includes fluid statics and dynamics, oscillating systems, gravitation, electrical currents and resistive circuits, capacitative and inductive circuits, alternating currents and resonant circuits. Prereq: PHYS 121. Science students must take 122L with this course.
PHYS 125  W,S  3C,2T  0.5
Physics for Engineers

PHYS 122L  W,S  3L  0.25
Introductory Physics 2 Laboratory
For students taking PHYS 122.
Lab alternate weeks.

PHYS 162  F  3C,1T  0.5
Enriched Introductory Physics 1
This is an enriched version of PHYS 121; includes the topics listed in the description of PHYS 121 plus enrichment topics, e.g. Taylor series, numerical methods for solving differential equations and programming the Physics Nova computer.
Prereq: At least 85% average in Ontario Grade 13 Physics, Math-Functions and Relations, and Calculus. Enrolment may be limited. Science students must take 162L with this course.

PHYS 243 (Winter).
should take PHYS 250 (Fall) and PHYS 243 (Winter).
PHYS 254 F 3C 0.5

Thermal Physics and Properties of Matter
An introductory course in thermal physics, kinetic theory and properties of matter, includes thermodynamics, heat engines, kinetic theory of gases, viscosity, diffusion, transport properties of elasticity.
Prereq: First year physics and calculus. Recommended for students in Honours programs.

PHYS 256 F 3C 0.5

Wave Motion and Optics
Matrix treatment of ray tracing and wave propagation, cardinal points of optical systems, reflection and transmission coefficients. Coupled oscillators and normal modes, continuous systems and standing waves, superposition and Fourier analysis, dispersion, travelling waves and the wave equation. Interference and diffraction.
Prereq: First year physics and calculus. Physics majors must take 256L with this course. Recommended for students in Honours 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 of particles and systems of particles, Lagrangian dynamics and generalized coordinates; the Lorentz transformation and relativistic dynamics.

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. Offered alternate years with PHYS 302. Prereq: First year physics. Physics students may not take this course for credit.

PHYS 302 W 3C 0.5

Physical Techniques for Biologist 2
Infrared, Roman and fluorescence spectroscopy; nuclear magnetic and electron paramagnetic resonance spectroscopy; optical rotary dispersion and circular dichroism; X-ray diffraction; chromatography and electrophoresis; differential scanning calorimetry; ultra centrifugation; flame photometry; X-ray and atomic absorption spectroscopy; cell counting, cytofluorometry and cell viability. Offered alternate years with PHYS 301. Prereq: First year physics. 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: PHYS 222, 223, 226 and 227. Recommended for students in General 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.
PHYS 353L W 3L 0.25
Electronics 2 Laboratory
For students taking PHYS 353.
Lab alternate weeks.

PHYS 354 F,S 3C 0.5
Atomic and Molecular Physics
The Schrödinger equation applied to simple one- and three- dimension potential, hydrogen atoms, angular momentum and spin, molecular vibrations and rotations, many electron atoms, radiation processes.
Prereq: PHYS 263

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 and a first year physics course.

PHYS 359 W 3C 0.5
Statistical Mechanics
Prereq: PHYS 358

PHYS 360A F,S 3L 0.25
Intermediate Laboratory
Selected experiments in mechanics, atomic physics, solid state physics, optics and electronics. 18 hours of experiments

PHYS 360B W 3L 0.25
Intermediate Laboratory
Continuation of 360A.
18 hours of experiments

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. This course is 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. This course is primarily intended for Honours Physics students.

PHYS 365 W 3C 0.5
Mathematical Physics 2
Prereq: MATH 213a-213b and 216. This course is primarily intended for Honours Physics students.

PHYS 366 F 2C 0.5
Geophysics 1
Prereq: First year physics and calculus.

PHYS 367 W 3C 0.5
Geophysics 2
Prereq: First year physics and calculus.

PHYS 368 W 3C 0.5
Geophysics 3
Prereq: First year physics and calculus.

PHYS 369 W 3C 0.5
Geophysics 4
Prereq: First year physics and calculus.

PHYS 371A F,S 3L 0.25
Intermediate Laboratory
Continuation of 371A.
18 hours experiments

PHYS 371B W 3L 0.25
Intermediate Laboratory
Continuation of 371A.
For honours students who are taking PHYS 360A.
18 hours experiments.

PHYS 371R W 3L 0.25
Intermediate Laboratory
Continuation of 371A.
For honours students who are taking Phys 360B.
18 hours experiments.

PHYS 380 F 3C 0.5
Molecular Biophysics
Macromolecular structure and function, weak interactions, DNA replication, protein synthesis, energy production, photosynthesis, control of intracellular processes, structure of viruses, physical techniques.

PHYS 381 W 3C 0.5
Cell Biophysics
Structure and function of cellular membranes and organelles, membrane potentials and ion transport, nerve conduction, muscle contraction, vision and interaction of light with cells intercellular communication, growth control.

PHYS 432 W 3C 0.5
Physics of Solid State Devices
The theories of solid state physics are applied to explain the operation and use of several modern electronic devices, including the p-n junction, transistors, thyristors, tunnel diodes, field effect devices, optical devices, etc.
Prereq: PHYS 435

PHYS 433 Y 6L 1.0
Experimental Research Project
An experimental research project. This course is designed for students in the Honours Physics program and in the Cooperative Applied Physics program. Students in the regular Hons Physics program must take either PHYS 433 or PHYS 437. Although students in the Cooperative Applied Physics (Hons) program are recommended to take one of these courses, enrolment may be limited.

PHYS 434 F 3C 0.5
Introductory Quantum Mechanics
Prereq: PHYS 354.

PHYS 435 F 3C 0.5
Solid State Physics
Introductory concepts in crystal diffraction and the reciprocal lattice. Crystal bonding, lattice vibrations, thermal properties of insulators, free-electron theory of metals, band theory, semiconductors.
Prereq: PHYS 263.

PHYS 437A F,W 3R 0.6
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 Cooperative Applied Physics (Hons) program are encouraged to take one of these courses, enrollment may be limited.

PHYS 437B W 3R 0.5
Continued Theoretical Physics Project
A continuation and extension of the project initiated in PHYS 437A. Available only to those students who have satisfactorily completed that portion of the project contained in PHYS 437A in the immediately preceding term.

Note
Students intending to take both PHYS 437A and 437B must register for both courses, and have their registration approved by the Theoretical Physics Project co-ordinator, at the start of the Fall term.

PHYS 441 Y 3C 1.0
Electromagnetic Theory
A generalized treatment of the basic laws of electricity and magnetism, mathematical techniques for the problems of electrostatics, solution of Maxwell's equations in free space and the study of plane waves, theory of waveguides and introduction to radiation.
Prereq: PHYS 222-223 or PHYS 253, PHYS 364-365.

PHYS 442 W 3C 0.5
Structure of Solids
A survey with emphasis on the physical properties and behaviour of metals and alloys. Elastic and plastic deformations of crystals. Solidification, structure of alloys, free energy of alloy systems, equilibrium diagrams, diffusion, solid state phase transformations.
Prereq: PHYS 435

PHYS 443 W 3C 0.5
Continuum Mechanics
Prereq: PHYS 364-365.

PHYS 444 W 3C 0.5
Nuclear and Particle Physics
Prereq: PHYS 455, and PHYS 434

PHYS 445 F 3C 0.5
Modern Optics
Prereq: PHYS 256 and PHYS 354.

PHYS 449 W.S 3C 0.5
Radio Astronomy
Radio telescopes. Radio sources including the sun, H II regions, H I regions. The galactic centre, pulsars, quasars, other extragalactic sources, cosmological implications.
Prereq: PHYS 223 and PHYS 250-251

PHYS 450 F 3C 0.5
Astrophysics 3
Solar system astrophysics (excluding the sun). The physical nature of planetary (and satellite) surfaces, atmospheres and interiors. Asteroids, meteors and comets. The interplanetary medium (solar wind). Solar interactions with the interplanetary medium and earth’s magnetosphere.
Prereq: none, however, familiarity with the contents of PHYS 250-251 will be assumed.

PHYS 451 F 3C 0.5
Astrophysics 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: None, however, familiarity with the contents of PHYS 250-251 will be assumed.

Note
PHYS 350, PHYS 351 are also open to third and fourth year students. PHYS 350 and PHYS 351 are offered in alternate years to PHYS 449 and PHYS 451.

PHYS 453 W 3C 0.5
Electronics 4
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.

Note
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 456 F 3C 0.5
Mathematical Physics 3
Applications to Physics of the theory of functions of a complex variable.
Prereq: PHYS 364-365.

PHYS 465 W 3C 0.5
Mathematical Physics 4
Prereq: PHYS 464

PHYS 480 F 3C 0.5
Radiation Biophysics
The effect of radiation of various kinds on cells and tissues, exposure calculations, mechanism of damage, repair theories, genetic effect, target theory, isotopic tracers in biophysical research.

PHYS 481 W 3C 0.5
Biophysics of Organ Systems
Physics of hemostasis, interactions with the environment, circulation of blood, temperature regulation, respiration, transport problems and special organ systems.
Course Descriptions

Political Science

PHYS 482 W 3C 0.5
Biophysics of Nervous Systems
Neurons; nerve conduction, sensory transducers; coding, processing and storage of information; control of muscles and other effector organs. Recommended for third or fourth year students in Math, Eng, Sci or HKLS.

Course Descriptions

Note

Extensive descriptions of the content of Political Science courses are available in the Department at the time of pre-registration.

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.

Note

P SCI 102 consists of a series of courses dealing with different aspects of politics. Students should select the course which most closely corresponds to their interests.

P SCI 102A 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 102C W 0.5
Politics in Action
An examination of the way in which society's conflicting demands are organized, articulated, and translated into action. The part played by the various political and economic forces in society will be examined in a comparative framework.

P SCI 102D
The Political Process in the Modern Democracies
Not offered 1982-83.

P SCI 102E
Political Rights and Obligations
Not offered 1982-83.

P SCI 102F W 0.5
Populist Politics in the Third World
The course examines worker and peasant protest movements in the Third World with emphasis on Africa and Latin America. Students will study the ideas, appeal and leadership of selected Third World movements and parties, focusing upon the social and economic conditions which gave rise to them.

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 102L W 0.5
Political Influence in Ontario
An introductory description of the political process in Ontario, based on a case study of the steps taken by a particular interest group to obtain legislative recognition of their demands in the field of local government.

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.LT 0.5
Quantitative Analysis
An introduction to the use of quantitative methods in Political Science. Only a rudimentary understanding of mathematics is required.

P SCI 225 F 2C.1T 0.5
The History of Political Theory 1
A survey of the principal ideas of Western political theorists from the earliest times to the seventeenth century.

P SCI 226 W 2C.1T 0.5
The History of Political Theory 2
A survey of the principal ideas of Western political theorists since the seventeenth century.

Department of Political Science

Assistant Professor, Chairman of the Department
R.J. Williams, BA, MA (McMaster), PhD (Toronto)

Professors
I.L. Campbell, BA (Carleton), MSc (London) R
J.E. Kersell, BA, MA (Queen's), PhD (London)
T.H. Qualter, BA (New Zealand), PhD (London)
J.M. Wilson, BA, MA (Toronto)

Associate Professor
J.D. Fraser, BA (Cambridge), PhD (Leicester)
A. Kapur, BA (Punjab); MA (George Washington), PhD (Carleton)
A.D. Nelson, AB, AM, PhD (Chicago)

Assistant Professors
S.U. Hurt, BA, MA (Waterloo), PhD (York)
A.F. Cooper, BA, MA (Waterloo), DPhil (Oxford)
T.J. Downey, BA (Waterloo), MA, PhD (Western Ontario), Undergraduate Officer
W.B. Moul, BA, MA, PhD (British Columbia)
L.A. Pat, BA (Mount Allison), MA, PhD (Queen's)
J.E. Surch, BA, MA (Waterloo)
J. A. Teichman, BA, MA PhD (Toronto)
R.P. Woznitsktenkraft, RA, PhD (Alberta), Co-op Officer

Adjunct Professors
G.W. Corby, BA (WLU), LLB (Western Ontario), LLM (London)
W.W. Johnston, BA (Memorial), LLB (Queens)
W.J. Morrison, QC, BA (Western Ontario), LLB (Osgoode)
by the institutions and operations of American national government. 
No prereq for students in the second year and above.

P SCI 268 2C 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 0.5
Political Behaviour 1
Empirical approaches to the study of politics are examined in light of their assumptions, aspirations, and critics.
No prereq for students in the second year and above.

P SCI 272 W 2C 0.5
Political Behaviour 2
An examination of the political attitudes and behaviour of men and women in different political systems.
Prereq: P SCI 271 or consent of instructor.

P SCI 281 F 2C 0.5
International Politics
This course studies the transformation of the international system stressing East-West, Rich-Poor, and North-South perspectives and interactions. 
No prereq for students in the second year and above.

P SCI 282 W 2C 0.5
Foreign Policy
This course studies the roots of foreign policy behaviour of selected western and non-western (particularly Asian) states.
Prereq: P SCI 281 or consent of instructor.

P SCI 291 F.S 3C 0.5
The Canadian Legal Process
An analysis of the manner in which the Common Law functions, together with an examination of the structure and jurisdiction of the Canadian court systems. Taught by a member of the legal profession.
Prereq: Open to all students in the second year and above.

P SCI 292 W.S 3C 0.5
Issues in Canadian Criminal Law
Rational principles and concepts applicable to current emotional criminal issues are analysed by a practising crown attorney, for example, abortion, euthanasia, pornography, seat belts, homosexuality, marijuana, police power, civil rights, criminal trials, jury, capital punishment, prisons, etc.
Prereq: Open to all students in the second year and above.

P SCI 311 0.5
Methodology of Political Science: The Foundations
A selective examination of seminal works which have contributed to our understanding of the methods appropriate to the study of politics. Not a survey course.
Prereq: Consent of the instructor.

P SCI 312 2C 0.5
Approaches to Survey Analysis in Political Science
This course introduces students with previous experience in statistical methods to the special problems associated with the analysis of the nominal data collected in surveys.
Prereq: P SCI 214

P SCI 315
Research Design in Political Science
Not offered 1982-83.

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 325 W 2S 0.5
Radical Political Theory
A discussion of non-Marxian political ideas such as social gospel, populism, fascism and Fabian socialism, and their socio-economic roots and sources.
Prereq: Consent of the instructor.

P SCI 327
Political Science and Political Values
Not offered 1982-83.

P SCI 331 F 2C 0.5
Public Administration 1
An introduction to the principles of public administration focusing on the study of Canadian institutions at the federal level, 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
Analyses of problems and issues in the field applying the knowledge gained in P SCI 331.
Prereq: P SCI 331 or consent of instructor.

P SCI 333 W 0.5
Administrative Law
A study of Canadian administrative law including the delegation of political power to various administrative agencies which play a prominent role in controlling contemporary social and economic life. The supervisory role of the courts will also be examined.
Prereq: P SCI 331 or consent of instructor.

P SCI 341 F 2C,1S,1L 0.5
Provincial Politics
A comparative analysis of the political systems of the Canadian provinces which explores the possibility that as many as ten political cultures exist in Canada.
Prereq: P SCI 260A and 260B

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 one previous course in Political Science.

P SCI 344 W 2C,1T 0.5
The Politics of Local Government
A study of the political process in selected Canadian cities focusing on citizen participation, internal decision-making, leadership, and the allocation of power.
Prereq: P SCI 343 or consent of instructor.

P SCI 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 impact of world trade, colonization and foreign investment. 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 S 2S 0.5
Comparative Federal Systems
A comparative examination of federal systems, with an emphasis on the problems and processes of integration and disintegration.
Prereq: Consent of the instructor.

P SCI 352 F 3S 0.5
Comparative Legislative Systems
A comparison of the institutional and behavioural characteristics of legislatures in a comparative framework, with emphasis on Canada, the United States, Great Britain, and Australia.
Prereq: Consent of the instructor.

P SCI 362 F 2S 0.5
Soviet Government and Politics
An intensive survey of the development of Soviet political structures with analysis of the relative influence of ideological goals in the one hand and social forces on the other.
Prereq: P SCI 253-254 or consent of instructor.

P SCI 363 F 0.5
Canadian Constitutional Law
An introduction to the nature and basic principles of constitutional law. This course will deal especially with the distribution of powers in the Canadian federation, and its evolution, notably by judicial decision. Leading cases will be examined.
Prereq: P SCI 260A and 260B or 260A and consent of instructor.

P SCI 364 0.5
Politics in Italy
An examination of the social, economic, and ideological forces underlying contemporary politics in Italy. Consent of the instructor.

P SCI 371 W 2S 0.5
Political Culture
An analysis of the development of the concept of political culture as an analytical tool.
Prereq: P SCI 271/272 or consent of instructor.

P SCI 373
Political Parties
Not offered 1982-83.

P SCI 374 F 2S 0.5
Interest Group Politics
A study of interest group theory and comparative analysis of the internal politics of interest groups and their role in the political process.

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.
Course Descriptions
Political Science

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.

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. Open only to students in the third year and above.

P SCI 390-398  0.5 each
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 411
Theories and Methods of Political Science
Not offered 1982-83.

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. Prereq: Consent of instructor.

P SCI 425
English Political Theory of the Nineteenth Century
Not offered 1982-83.

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. For third year Political Science students, but open to others with prereq P SCI 221, 222, 323, or 324, or consent of instructor.

P SCI 427  F  0.5
Special Topics in Political Philosophy
A selective examination of basic problems in political philosophy in the modern and pre-modern periods. Prereq: P SCI 221, 222, 323 or 324.

P SCI 428  F  3S  0.5
State and Economic Life
An analytical and comparative study of the growth of government intervention in the economic process, and of the development of the welfare state. Prereq: Consent of the instructor.

P SCI 431  F  0.5
Canadian Public Policy
An examination of the way that policy-making processes and institutions have responded to the problems of governing in the post-war period. The focus will be on policies regarding the policy-making process itself. Prereq: P SCI 260A and 260B and consent of instructor.

P SCI 435  W  2S  0.5
The Politics of Canadian Resource Development
A seminar focusing on the strategies of resource development policies, with an emphasis on the economic, political, environmental and cultural implications of oil, natural gas, and mineral exploitation. Prereq: Fourth year standing or consent of instructor.

P SCI 436  F  3S  0.5
Comparative Public Policy
A comparative examination of public policy and approaches to the study of public policy, with case studies from Germany, Britain, France, Sweden, Canada, the United States and India. Prereq: Consent of the instructor.

P SCI 437  W  3S  0.5
The Politics of International Resources
An examination of the politics of international resources. Attention will be given to the set of issues relating to minerals, water, oceanic fisheries, oil energy, timber and labour. Prereq: Consent of the instructor.

P SCI 438  W,S  3S  0.5
The Canadian Welfare State
A seminar dealing with the rationale, history and present structure of the Canadian welfare state, with special emphasis on income security programs and policies such as Unemployment Insurance, Old Age Security and the Canadian pension system. Prereq: P SCI 260A and B, or consent of the instructor.

P SCI 439  W  3S  0.5
The Politics of Canadian Economic Policy
A seminar examining the political dimensions of selected economic policy issues such as: foreign ownership and industrial strategy, restraint in government spending, regional development and other matters. Prereq: P SCI 260A and B and ECON 100; or permission of instructor.

P SCI 442  W  3S  0.5
Politics in Ontario
A critical examination of the distinctive elements of government and politics in the Province of Ontario. Prereq: P SCI 260A and 260B or 341 or consent of the instructor.

P SCI 443
Politics in Western Canada
Not offered 1982-83.

P SCI 445
Politics in the Atlantic Provinces
Not offered 1982-83.

P SCI 453  F  3S  0.5
Comparative Politics I
Selected Topics in Comparative Politics. Prereq: Consent of the instructor.

P SCI 454  W  3S  0.5
Comparative Politics II
Selected Topics in Comparative Politics. Prereq: P SCI 453.

P SCI 461  F  2C,1S  0.5
Problems in Canadian Politics 1
A critical examination of various problems of Canadian politics, with an emphasis on political integration, federalism and political parties. Prereq: Consent of the instructor.

P SCI 462  W  0.5
Problems in Canadian Politics 2
A senior research course on selected aspects of Canadian political life, with emphasis on the preparation of a major and original research paper. For fourth year Political Science students but open to others with prereq P SCI 461.
**Course Descriptions**

**Political Science**

**Psychology**

P SCI 471 0.5

**Public Opinion and Propaganda**
A detailed study of the nature of public opinion and the attempt to control it through propaganda.
Prereq: Consent of the instructor.

P SCI 473 0.5

**Voting Behaviour**
Prereq: P SCI 214, 373 or consent of instructor.

P SCI 475 0.5

**Political Socialization**
A study of the processes and agents of political socialization and their effects on political stability or change in liberal-democratic societies.
Prereq: Consent of the instructor.

P SCI 476 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 0.5

**Senior Research Seminar: Violence in the Political Process**
Not offered 1982-83.

P SCI 481 0.5

**Research Seminar on World Politics**
Not offered 1982-83.

P SCI 483 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 0.5

**Contemporary Strategies: Theories and Policies**
The course examines strategic studies and their premises, the evolution of strategic thinking, the role of national policies of military powers. Strategic concepts are studied with specific reference to military policies of regional powers.
Prereq: Fourth year standing or consent of instructor.

P SCI 486 0.5

**Middle Powers and World Politics**
The course studies the literature on middle powers (including Canada). Particular emphasis is on the study of self-images, views of power, of power politics, and the sources of influence of these powers.
Prereq: Fourth year standing or consent of the instructor.

P SCI 490-498 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 1.0

**Senior Honours Essay**
Students wishing to undertake a senior honours essay in their fourth year should consult the Department's Undergraduate Officer.

Department of Psychology

Professor, Chairman of the Department
T.G. Waller, BS, MS (Southern Mississippi), PhD (Vanderbilt)

Associate Professor, Associate Chairman Graduate Affairs
J.A. Cheyne, BA (Waterloo Lutheran), MA, PhD (Waterloo)

Professor, Associate Chairman Undergraduate Affairs
P.M. Merkile, BA (Knox), MA, PhD (Virginia)

Associate Professor, Undergraduate Officer
R.D. Steim, BA (Queen's), PhD (Waterloo)

Professor, Dean, Faculty of Arts
R.K. Banks, BA, MA, PhD (Toronto)

Associate Professor, Associate Dean (Undergraduate Affairs), Faculty of Arts
G.A. Griffin, BA (Colgate), MA, PhD (Wisconsin), Recipient of the Distinguished Teacher Award

Professors
K.G. Dowers, BA, PhD (Illinois)
M. Breidenbaugh, BA (Wittenberg), PhD (Vienna)
M.P. Bryden, BS (MIT), MSc, PhD (McGill)
W.C. Corning, BA (Heidelberg), PhD (Rochester)
D.P. Crowne, BA (Antioch College), EdM (Rochester), PhD (Purdue)
J.A. Daq, BA (Oklahoma), PhD (Illinois)
C.K. Knapp, BA (Sheffield), PhD (Saskatchewan)
H.M. Lefcourt, BA (Antioch College), MA, PhD (Ohio State)
M.J. Lerner, BA, MA (Ohio State), PhD (New York)
R.G. Marteniuk, BPE, MA (Alberta), Cal (California)
D. Meichenbaum, AB (City College of New York), MA, PhD (Illinois)
S. Reins, MD, Scs (Charles)
M.A. Ross, BA, 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, BA, MI, PhD (Toronto), FSS
R.A. Stefy, BA (Albright), MA, PhD (Illinois)
M.D. Vogel-Sprott, BA (McMaster), MA, PhD (Toronto)
D.L. Wahlsten, BS (Alma College), PhD (California, Irvine)
M.P. Zanna, BA, PhD (Yale)

Associate Professors
R.J. Alapack, BA (Scranton), MA, PhD (Duquesne)
F.A. Allard, BA, BPE, MA, 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.M. Cornell, BA, MS, PhD (Washington)
J.G. Holmes, BA, MA (Carleton), PhD (North Carolina)
G.E. MacKinnon, BA (Queen's), PhD (John Hopkins)
P.J. Nauss, BA, PhD (Nijmegen)
J.E. Orland, BA (Western Ontario), MA (Detroit), PhD (Michigan)
H. Ross, BA (Toronto), PhD (North Carolina)
R.V. Thysell, BA (Montana), MA, PhD (Iowa)
D.M. Willows, BA (Manitoba), PhD (Waterloo)
E.E. Ware, BA, MA (Richardson), PhD (Illinois)
Course Descriptions
Psychology

Assistant Professors
D. Beemer, BA (Loyola College), MSc (Memorial), PhD (Reading), NSERC University Research Fellow
M. Daneman, BA (Witwatersrand), MA (OISE), PhD (Carnegie-Mellon)
S. Hymel, BSc, MA, PhD (Illinois)
R. H. Lauter, BSc (Fordham), PhD (Waterloo)
R. L. Silver, BA, PhD (Northwestern)
J. Theis, BA (Western Ontario), MA (Notre Dame), PhD (Windsor)
J. A. Van Ewricht, BA (Valparaiso), MA (Bowling Green), PhD (Michigan State)
E. Z. Woody, BA (Reed), MS (Oxford), PhD (Duke)

Adjunct Professors
J. R. Amdur, BA (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)
E. S. Lucy, BA (Hobart)
S. J. Segalowitz, BA (McGill), PhD (Cornell)
G. Sumner-Smith, MRCVS, BVSc (Liverpool), FR-CVS, MSc (Guelph)
J. L. Williams, BA, MA (Alberta), PhD (Missouri)

Research Assistant Professor
D. DiBattista, BA, MA, PhD (Waterloo)

Lecturers
P. Landry, BAA (Ryerson), MEd (OISE)
L. Dyck, BA, MASc (Waterloo)

Faculty Members of Psychology holding cross appointments to:
1. Optometry
2. Statistics

Faculty Members holding cross appointments to Psychology from:
3. Statistics
4. Kinesiology
5. Environmental Studies
6. St. Jerome’s College
7. Renison College

Course Descriptions

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 behavioral science. Also offered at Renison College and St. Jerome’s College.

PSYCH 102 F.W,S 3C 0.5
Introductory Psychology Special Topics
A study in greater depth of selected broad issues and problems introduced in Psychology 101. Also offered at Renison College and St. Jerome’s College.

PSYCH 102 F.W.S 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 102A 3C 0.5

Experimental Design
An examination and evaluation of psychological research to human cognitive processes. Problems and procedures of modern psychology, with an understanding of the logic and methods of inferential statistics and applications in psychology. Little mathematics background is assumed.

PSYCH 102 W 3C 1T 0.5

Perceptual Processes
An examination of data and theory concerning perceptual processes. Topics will include the perception of form and space, perceptual learning and a consideration of the effect of personality variables in perception.

PSYCH 206 F.W 3C 0.5

Literature in Psychology
An examination and evaluation of selected topics dealing with human learning, thinking, concept formation, memory and language.

PSYCH 207 F.W 3C 0.5

Psychology of Consciousness
Modes of thinking, emotion, creativity, and altered states of consciousness.

PSYCH 102 E 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 102 F 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 200 W.S 3C 1L 0.5

Measurement in Psychology
The logic of measurement in Psychology. Descriptive procedures for collecting and handling data. Making inferences from test scores. The use of correlational procedures in measuring intelligence, achievement, aptitudes, interests and personality.

PSYCH 201 F.W 3C 1T 0.5

Statistical Methods in Psychology
An introduction to data analysis. Topics covered include descriptive statistics and the logic and methods of inferential statistics with emphasis on applications in psychology. Little mathematics background is assumed.

PSYCH 202 W 3C 1T 0.5

Experimental Design
An examination of the effective use and interpretation of statistics in design and understanding of experiments in the social sciences.

Prereq: PSYCH 201

PSYCH 203 F.W.S 3C 0.5

Learning and Motivation
The role of heredity and environment in the development of intelligence, personality and personality disorders, and conflict and aggression.

PSYCH 102 C 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 102 C 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 102 B 3C 0.5

Optometry

Statistics

Kinesiology

Environmental Studies

St. Jerome’s College

Renison College

Note
See departmental course listing catalogue for specific terms of the various course offerings in 1982-83 if not indicated.
PSYCH 211 F.W.S 3C 0.5
Developmental Psychology
An examination of the process and factors of human development.
Prereq: PSYCH 101
Also offered at St. Jerome's College.

PSYCH 212 F.W.S 3C 0.5
Educational Psychology
A consideration of the main variables affecting learning in the classroom with special focus upon the conditions essential to efficient learning.
Prereq: PSYCH 101
Also offered at St. Jerome's College.

PSYCH 213 F.W 3C 0.5
Exceptional Children
Educational problems associated with mental retardation, emotional disturbances, sensory and physical impairments and intellectual giftedness.

PSYCH 214 F.W 3C 0.5
Psychology of Adolescence
A study of the psychological processes in the second decade of human development. Consideration is given to such areas as intellectual, emotional and social growth, and identity formation. Current concepts, issues, and research are stressed.
Prereq: PSYCH 211
Also offered at St. Jerome's College.

PSYCH 218 F.W 3C 0.5
Aging, Dying and Death
An examination of the psychological aspects of aging and the traditional and recent literature relating to various views on the reality of death in the life of man. Therapy with dying individuals is reviewed and evaluated.
Prereq: PSYCH 101
Offered at St. Jerome's College.

PSYCH 231 F 3C 0.5
Psychology of Religious Experience
Approaches of traditional psychological theories and especially of a modern psychology of consciousness toward phenomena of religious experience, mysticism and meditation are examined. The transcendant phenomena are compared with other altered states of consciousness.
Prereq: PSYCH 101
Offered at St. Jerome's College.

PSYCH 236 F.W 3C 0.5
A Psychological Analysis of Human Sexuality
This course will examine psychological and social psychological theories and empirical investigations of human sexuality.
Prereq: PSYCH 101 or permission of instructor.
Offered at St. Jerome's College.

PSYCH 253 F.W.S 3C 0.5
Social Psychology
An introduction to theories and research on people in their physical and social environment. Typically, topics such as conformity, persuasion, attraction, prejudice, communication, aggression, the psychology of freedom, justice and human exchange will be introduced.
Prereq: PSYCH 101. Cross-listed as PSYCH 220R

PSYCH 254 W 3C 0.5
Interpersonal Relations
A psychological analysis of social interaction. The development of interpersonal attraction from first impressions to long-term relationships. The roots of hostility, conflict and communication problems.
Prereq: PSYCH 253. Cross-listed as PSYCH 221R

PSYCH 258 F 3C 0.5
Principles and Evolution of Psychoanalytic Thought
This course expresses the fundamental psychoanalytic vision as articulated by Sigmund Freud, and its relevance to the humanities. The theme is to understand the potentially liberating spirit which is at the root of psychoanalysis.
Prereq: PSYCH 101
Also offered at St. Jerome's College.

PSYCH 261 F,W 3C 0.5
Physiological Psychology
Introduction to brain, basic physiological processes and their roles in behaviour. Course covers sensory and perceiving; neural bases of action; motivation; learning and memory; and consciousness. Both experimental and clinical data are considered.
Prereq: PSYCH 101 or permission of instructor.

PSYCH 271 F,W 3C 0.5
Animal Behaviour
Survey of mechanisms, development, adaptive value and evaluation of behaviour in non-human animals. Covers ethology, sociobiology and experimental comparative psychology. Emphasis on principles of research with laboratory and wild animals as well as methods of observing behaviour.
Prereq: PSYCH 101 or permission of instructor.

PSYCH 293 F.W 2C,2L 0.5
Research in Learning and Motivation
Open only to students in a Psychology Program (Honours, Joint Honours, General or Minor Programs).
Prereq: PSYCH 201 and one of PSYCH 203 or 271.

PSYCH 295 F,W 2C,2L 0.5
Research in Perceptual and Cognitive Processes
Open only to students in a Psychology Program (Honours, Joint Honours, General or Minor Programs).
Prereq: PSYCH 201 and one of PSYCH 205 or 271.

PSYCH 297 W 2C,2L 0.5
Research in Biopsychology
Open only to students in a Psychology Program (Honours, Joint Honours, General or Minor Programs).
Prereq: PSYCH 201 and PSYCH 261.

PSYCH 301 F,W 3C,1T 0.5
Tests and Measurement
An introduction to the theory and use of psychological tests. Special emphasis is placed on the assessment of personality, intelligence, aptitudes and interests.
Prereq: PSYCH 201.

PSYCH 305 2C,2L 0.5
Sensory Processes
A consideration of data and theory concerning sensory processes. Topics will include psychophysical methodology, sensory mechanisms, and the neuropsychological basis of perceptions.
Prereq: PSYCH 206.

PSYCH 307 3C 0.5
Cognitive Neurology
An examination of issues related to understanding the cerebral organization of motor skill. Discussion of how certain movement disorders are a reflection of disturbances at different stages in the sequence of information processing.
Prereq: One of PSYCH 206, 207, or KIN 356. Cross-listed as KIN 456.
Course Descriptions
Psychology

PSYCH 311 F,W 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 W 3C 0.5
Learning Disabilities
A critical examination of the concept of learning disability and of current issues in the assessment and remediation of learning problems.
Prereq: PSYCH 211 or PSYCH 212 or PSYCH 213
Also 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 F,W 3C 0.5
The Emotionally Disturbed Child
A review of traditional concepts, current thoughts and major research on the psychopathology of childhood. Specific attention will be given to socialization processes and educational procedures.
Prereq: PSYCH 211
Offered at St. Jerome's College.

PSYCH 322 Y 2C 1.0
Principles and Practice in Early Childhood Education I
Current principles of teaching preschool-aged children. An emphasis is placed on those curricula which aim to foster social and cognitive development. Topics include: characteristics and needs of children in group-care settings; classroom management; curriculum planning.
Prereq: Acceptance into the Early Childhood Education and Care Option

PSYCH 323 Y 3P 0.5
Practicum in Early Childhood Education I
Directed supervision with young children in group settings. The course requires 3 hours of field work per week. Must be taken concurrently with PSYCH 322.
Prereq: Acceptance into the Early Childhood Education and Care Option (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 two 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.
Pass/Fail Grading
Prereq: Acceptance into the Early Childhood Education and Care Option (General)

PSYCH 331 3C 0.5
Individual Differences
An analysis of individual and group differences in behaviour, with emphasis on studies of intelligence.
Prereq: PSYCH 200 or PSYCH 301

PSYCH 333 F 3C 0.5
Industrial/Organizational Psychology
An introduction to the methods and problems in Industrial Psychology.
Prereq: PSYCH 101

PSYCH 334 F 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 and St. Jerome's Colleges.

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 W 3C 0.5
Personnel Psychology
An examination of the following major topics in personnel psychology: employment planning, selection and recruitment, selection techniques, career development, performance appraisal, training programs, labour relations, compensations systems.
Prereq: PSYCH 333

PSYCH 340 W 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
Also offered at St. Jerome's College.

PSYCH 341 F 3C 0.5
Psychology of Early Childhood Education
An introduction to theories and issues in early childhood education. Topics include issues differentiating preschool programs and application of psychological theory/research to early education.
Prereq: PSYCH 211

PSYCH 344 W 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 F.W 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 F,W,S 3C 0.5  
Psychopathology  
The nature and origin of deviant behaviour.  
Prereq: PSYCH 101, Cross-listed as PSYCH 323R  
Also offered at St. Jerome's College.

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 two 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 201 or permission of instructor.  
Offered at St. Jerome's College.

PSYCH 393 F.W 2C,2L 0.5  
Research in Developmental Psychology  
Open only to students in a Psychology Program (Honours, Joint Honours, General or Minor Programs).  
Prereq: PSYCH 201 and 211.

PSYCH 395 F.W 2C,2L 0.5  
Research in Social Psychology  
Open only to students in a Psychology Program (Honours, Joint Honours, General or Minor Programs).  
Prereq: PSYCH 201 and 253

PSYCH 397 F.W 2C,2L 0.5  
Research in Personality and Psychopathology  
Open only to students in a Psychology Program (Honours, Joint Honours, General or Minor Programs).  
Prereq: PSYCH 201 and one of PSYCH 355 or 357

PSYCH 410 3C 1.0  
History and Systems  
An examination of current theoretical approaches to psychological problems present 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 two terms. In addition, students are required to participate in 6 complete weeks (full days) in block placements during the academic year. Must be taken concurrently with PSYCH 422.  
Pass/Fail Grading  
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 stimulation.  
Prereq: PSYCH 355, 357, 344 and 334 or suitable alternative and permission of instructor.

Seminars

Note  
See departmental listing of seminar offerings for 1982-83.

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.  
Also offered at St. Jerome's College.

PSYCH 454 2S 0.5  
Senior Seminar in Educational 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 2C 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) 2S 0.5  
Senior Seminar in Special topics  
Admission by consent of instructor.

PSYCH 464(A-Z) 2S 0.5  
Senior Seminar in Special topics  
Admission by consent of instructor.

PSYCH 465(A-Z) 2S 0.5  
Senior Seminar in Special topics  
Admission by consent of instructor.
Course Descriptions

Psychology

Recreation

PSYCH 466(A-Z) 2S 0.5
Senior Seminar in Special Topics.
Admission by consent of instructor

PSYCH 480 Y.M 3R 1.0
Directed Studies in Special Topics
For the student who desires to pursue a particular topic in depth through independent experimental research and/or extensive reading. A faculty member must approve a student's project prior to registration for this course. Open to exceptional students with permission of the instructor and the Department. Also offered at St. Jerome's College.

PSYCH 498 Y.M R 1.0
Senior Honours Essay - Review Paper
Each student will work under the direction of a member of the department on an experimental study. The result of this study will be presented in the form of a thesis, which will be critically examined by members of the department. Also offered at St. Jerome's College.

PSYCH 499 Y.M R 1.0
Senior Honours Essay - Experimental Study
Each student will work under the direction of a member of the department on an experimental study. The result of this investigation will be presented in the form of a thesis, which will be critically examined by members of the department. Also offered at St. Jerome's College.

The following courses are administered by Renison College. Since these courses are intended primarily for students in the Social Development program, students planning a General or Honours Psychology program must consult their faculty advisor concerning Psychology major credit for these courses.

PSYCH 120R F 3C 0.5
Introductory Psychology

PSYCH 121R W 3C 0.5
Introductory Psychology (Special Topics)

PSYCH 220R F 3C 0.5
Social Psychology

PSYCH 221R W 3C 0.5
Interpersonal Interaction

PSYCH 322R F 3C 0.5
Personality Theory

PSYCH 323R W 3C 0.5
Abnormal Psychology

PSYCH 367R-369R
Special Topics in Psychology

PSYCH 369R W 3C 0.5
Advanced Topics in Counselling Psychology

PSYCH 398R/399R S,F,W R 0.5
Independent Study
(Open to senior Social Development Studies majors only.)

Department of Recreation

Associate Professor, Chairman of the Department
D. Ng, BA (Lingnan). MA (Carver), MS, PhD (Indiana)

Assistant Professor and Associate Chairman, Undergraduate Affairs
R. Johnson, BA, MA (Windsor). PhD (Minnesota)

Associate Professor, Associate Chairman, Graduate Affairs
S.L. Smith, BA (Wright State), MA (Ohio State), PhD (Texas A&M)

Professor
E.M. Avedon, BBS (William and Mary), MA, EdD (Indiana)

Associate Professors
J. Levy, BA (Waterloo Lutheran), BPE (Waterloo), MSW (Waterloo Lutheran), PhD (Waterloo)
B.D. McPherson, BA, MA (Western Ontario), PhD (Wisconsin)
J. Zuzanek, CSC (Prague Institute of Sociology), PhD (Charles University, Prague)

Assistant Professors
K.S. Brown, PhD (Waterloo), P. Eagles, BSc (Waterloo), MSc (Guelph), PhD (Waterloo)
W. Frisby, MHK (Windsor)

D. Getz, BES (Waterloo), MA (Carleton), PhD (Edinburgh)
L. Heywood, BA (North Dakota), MA (Florida State), PhD (Wisconsin)
M.L. Hutchinson, BA (Queen's), MS (Dalhousie), EdD (Boston)
R.C. Mannell, BA (McMaster), MPE, PhD (Windsor)
R. Payne, BA (Guelph), MA (New England, Australia), PhD (Calgary)

Lecturer
R.D. Graham, BA, MA (Western Ontario)

Faculty member holds cross appointment as shown:
1Kinesiology
2Sociology
3Statistics

Course Descriptions

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.

HESC 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 (Kin 252)
An introduction to the characteristics, processes and problems of sport as a social system. In addition, the social psychological aspects of sport involvement are considered.
Prereq: SOC 101
Course Descriptions
Recreation

REC 204 S 3C 0.5
Leisure and Recreation in Historical Perspective
Analysis of socio-cultural determinants which have influenced Canadian Leisure behaviour.
Prereq: REC 100 or consent of instructor

REC 210 F 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 S 3C 0.5
Administration of Camping and Outdoor Education
The philosophy and objectives of camping and outdoor education; administration, organizing, planning, staff, relationships, leadership training, trends in camping and outdoor education. The emphasis in this course will be the place of the resident camp in education and recreation.
Prereq: REC 230

REC 250 F 3C 0.5
Introduction to Recreation for Special Populations
Examines the philosophical, theoretical and empirical frameworks of recreation as a therapeutic service and process to individuals with physical, emotional and intellectual disabilities.

REC 252 W,S 3C 0.5
Recreation and Mental Retardation
An analysis of the motoric and psycho-social behavioral dimensions specific to the retarded with direct and obvious applicability to the planning, implementing and evaluating of recreational programs.
Prereq: REC 250, PSYCH 312

REC 253 W S 3C 0.5
Recreation and Physical Disabilities
The psycho-social aspects of physical disabilities will be analyzed, with special focus given to the planning, implementing and evaluating of leisure activities.
Prereq: REC 250, permission of instructor

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.
Prereq: REC 250

REC 270 F 3C 0.5
Statistical Techniques Applied to Leisure Studies
An introduction to descriptive and inferential statistics and the interpretation of data. A major consideration of the course is the use of statistics in the solution of problems in recreation and leisure.

REC 300 W 3C 0.5
Philosophy of Leisure
Examination of major philosophical themes through the ages with reference to contemporary viability and effect upon social behaviour.
Prereq: Consent of instructor, third year standing

REC 301 F,S 3C 0.5
Sociology of Leisure (Soc 347)
Nature and extent of leisure phenomena in contemporary society. Examination of institutional and formal organizational aspects, social role, social research strategies employed in the study of leisure.
Prereq: Two item courses in Sociology

REC 302 W 3C 0.5
Travel and Tourism
The scope and nature of travel and tourism as contemporary leisure experiences. Economic, political and social ramifications, research strategies employed, implications for the future.
Prereq: REC 301

REC 305 W 3C 0.5
Social Psychology of Leisure
A study of the social psychological determinants and implications of the human use of discretionary time. The leisurely use of this time as well as specific play-forms and diversionary pursuits such as art, wilderness and high risk activities, humour, day dreaming, hobbies and gambling will be examined.
Prereq: PSYCH 101 and REC 201

REC 311 S 3C 0.5
School Recreation
An analysis of the relationship between recreation and education with particular emphasis on the sponsoring of community recreation programs by education authorities including leisure education and co-curriculum activities.
Prereq: REC 210

REC 312 W 3C 0.5
Recreation and Community Action
The role of the citizen in recreation systems with regard to social change. Students will examine models for social change which interrelate with recreation systems and power relationships between citizen's groups and recreation systems.
Prereq: REC 210

REC 316 F 3C,1L 0.5
Principles of Recreation Planning
An exploration of alternative approaches to the planning of recreation opportunities. The demand for and supply of recreation opportunities; standards, models and systems; recreation planning policies and agencies; and selected recreation planning issues.
Prereq: PLAN 156 or a full credit in Geography, or consent of instructor

REC 320 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
Course Descriptions
Recreation

REC 321-329 0.5
Selected Topics in Recreation
The study of particular topics pertaining to recreation. Course topics will be announced in advance, but will not be offered on a regular basis.
Prereq: Consent of instructor

REC 322 W 3C 0.5
Problems in Recreation Management
(Offered 1982-83)

REC 325 W 3C 0.5
Marine Recreation
(Offered 1982-83)

REC 326 F 3C 0.5
Introduction to Museum Management
(Offered 1982-83)

REC 331 F 2C,2L 0.5
Outdoor Education in Recreation
The present status of outdoor education in modern society; government functions and policies related to outdoor education services; the planning and administration of outdoor education activities. Current problems.
Prereq: REC 230

REC 332 F,S 2C,2L 0.5
Theory and Practice 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

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: REC 301

REC 370 F,W,S 0.5
Directed Study in Special Topics
For the student who desires to pursue a particular topic in depth through guided independent research and/or reading. A faculty member must approve a student's project prior to registration. May be repeated once in a subsequent term.
Prereq: Faculty approval

REC 371 F,W 3C 0.5
Research Designs Applicable to Leisure Studies
An introduction to the methods and techniques of research as applied to leisure studies and services. General consideration will be given to the technical problems involved in various stages of research methodology with emphasis on the logic underlying the research process.
Prereq: REC 270

REC 372 W 2C,2L 0.5
Introduction to Statistical Problem Solving by Computer
This is an applications oriented course which prepares the nonmathematical student to use the computer as a research tool. Topics include aids for statistical analysis and the preparation of documents such as reports and theses. The course provides sufficient background for application to other problems specific to the individual's field.
Prereq: A one term statistics course

REC 399 F,W 3C 0.5
Seminar in Recreation and Leisure
An in-depth analysis of the current major issues and trends. Fourth year Departmental students only.
Prereq: REC 100 and REC 230 or consent of instructor

REC 401 F 3C 0.5
The Economics of Recreation
A critical examination of the applications of market and non-market segmentation, valuation, and related concepts to recreation and leisure. Course content is based on recent research methods and findings from the field of leisure studies.
Prereq: Third year standing, ECON 101 or permission from instructor

REC 402 Colloquium on Religion and Leisure
Not offered 1982-83

REC 406 S 1.0
Comparative Recreational Systems
A study of multi-national recreation systems. Course meets on Campus and in the field in other countries. Full term study over a period of 6-8 weeks. Laboratory fee varies with field observation.

REC 410 W 3C,1L 0.5
Planning of Recreation Facilities
A course to introduce the students to the planning, design and layout of recreation areas and facilities.
Prereq: REC 210 or consent of instructor

REC 432 F 3C,1L 0.5
Interpretation
Concepts, philosophy and practices of interpretation relative to understanding the use of the natural environment.
Prereq: REC 332 or consent of the instructor

REC 434 W 3C 0.5
Advanced Park Management
A study of policies, procedures, and practices relative to the management of natural resources. Emphasis is placed on an ecological systems approach to management as it relates to parks at all levels of government.
Prereq: REC 334

REC 435 F 3C 0.5
Recreation Resource Policy
A study of policies, development and policy gaps related to recreation resources in Canada. Based on a literature review and discussion of decision-making procedures, roles and tools used in the recreation field; students are required to research real and theoretical situations for seminar presentation.
Prereq: REC 100 and REC 230 or consent of instructor

REC 470/471 F,W,S 3C 1.0
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 470.

REC 472 W 3C 0.5
Interpretation
Concepts, philosophy and practices of interpretation relative to understanding the use of the natural environment.
Prereq: REC 332 or consent of the instructor
Department of Religious Studies

Associate Professor and Chairperson
J.W. Miller, BA (Goshen), MA (NYU), BD (Princeton), ThD (Rasal) G

Professor
W. Klaassen, BA (McMaster), BD (McMaster Divinity School), PhD (Oxford) G

Associate Professors
W.E. Bildstein, BA (Western Ontario), STB (Gregorian), MA (Windsor), STD (Angelicum) J
M.S. Bird, BA, MA, PhD (Iowa) R
M.D. Bryant, BA (Concordia), STB (Harvard), MA, PhD (St. Michael's) R
F.C. Gardiner, BA (College St. Dominique, France), BD, STM (McGill), PhD (Harvard Seminary Foundation) P
D. Sahas, BD (Athens), STM (Christian Theological Seminary), PhD (Harvard 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) G

Assistant Professors
R.D. Legge, BA (Transylvania), STB (Harvard), PhD (McMaster) P

Lecturers
A.L. Evans, BA (Toronto), BD (Emmanuel), STM (McGill), DMin (Andover-Newton) P
S.D. Garber, AB, BD (Harrisonburg, Virginia), ThM, PhD (Princeton) P
S.A. MacDonald, BA, STB (Western Ontario), MA (San Francisco) J

Note
Professors designated with suffix G (Conrad Grebel), J (St. Jerome's), P (St. Paul's), and R (Rension) are located in the respective Colleges.

Course Descriptions

Note
Numbers below the course description indicate the area of Religious Studies to which the course belongs. Refer to page 117 in program section.

RS 100A-K
Introduction to Religion
An introduction to Religion, religious phenomena, beliefs, ideas, practices and experience through the study of material and examples from the various fields in Religious Studies.

RS 100A S,F.W 3C 0.5
Religions of the East
An introduction to the religious traditions of the East: history, religious beliefs and practices of Hinduism, Buddhism, Confucianism, Taoism and Shinto.
Area 1, Thompson and Legge

RS 100B F,W 3C 0.5
Religions of the West
Encounter with Judaism, Christianity and Islam: the characteristics and interaction of the three major religious traditions that have shaped the image of the Western World.
Area 1, Sahas

RS 100C F 3C 0.5
Religious Quests
Profiles, biographies and autobiographies of individuals in search of ultimate meaning. Persons studied are spiritual seekers from all walks of life: traditional religious figures, artists, novelists, scientists and others.
Area 5, Bryant

RS 100D W 3C 0.5
Religious Movements
A consideration of religious movements, old and new, inside as well as outside the traditional churches. Also, an exploration of religiously-inspired cultural movements in the social, political and artistic realms of society.
Area 5, Bryant

RS 100E W 3C 0.5
Biblical Studies 1
A survey of the literature, history and religion of ancient Israel as seen in its cultural setting in the ancient Near East.
Area 3, Miller

RS 100F F,W 3C 0.5
Biblical Studies 2
A survey of the literature, history and religious thought of the Christian community during the New Testament period as seen in its cultural setting in the Greco-Roman world.
Area 3.

RS 100H F,W 3C 0.5
Catholic Theology
A study of the principal teachings of the Christian Faith affecting Catholics today. Topics will include Bible and Tradition; worship and sacraments; authority; changing views concerning laity, women, ministry, and ecumenism.
Area 4, MacDonald, Bildstein

RS 100K F 3C 0.5
Protestant Theology
An introduction to the study of the sources and issues of traditional and contemporary, liberal and conservative, Protestantism.
Area 4, Gardiner

RS 105
Elementary Biblical Hebrew
Not offered 1982-83

RS 106 F 3C 0.5
New Testament Greek
This course consists of two parts:
a) An introduction to Greek grammar with appropriate grammatical exercises and development of vocabulary,
b) An exegetical study of the Greek text of the Synoptic Gospels, with Mark as the basis.
Area 3, Garber

RS 200 F 3C 0.5
The Study of Religion
An exploration of the nature of religion through: 1) the history of the study of religion, 2) exposure to varying methods and ways of approaching religious phenomena, and 3) consideration of accounts of religious experience.
Note: Open to RS majors only. Legge

RS 203
Wisdom, Literature in the Old Testament
Not offered 1982-83

RS 205 S 3C 0.5
The Hebrew Prophets
A study of the prophetic movement from Amos to Malachi in the historical, social, and religious context of Israel and the ancient Near East.
Area 3, Miller

RS 206
Modern Study of Jesus
Not offered 1982-83
A consideration of North American Minority Religions

Area 2, Sawatsky

Religious groups, such as Mormons and fundamentalism or revivalism.

Area 1, Sawatsky

A descriptive, historical and theological review of the wing of North American Christianity known as evangelicalism, fundamentalism, or revivalism. 

Area 2, Sawatsky

Evangelical Christianity

Area 1, Sawatsky

Minority Religions in North America

Area 1, Sawatsky

Bibliical Foundations of Christian Pacifism

Not offered 1982-83

Area 5, Bird

Christian Ethics

Area 4, Legge

An examination of the development of Christian ethics, the Christian Doctrine of Man, Christian ethics and society, and faith and reason in ethical decisions. 

Area 4, Legge

Issues in Science, Technology and Religion

Area 5, Legge

An exploration of the theoretical and practical aspects of the interaction of religious beliefs and practice with science and technology around the ethical questions associated with nuclear power, genetic engineering, information processing, and environmental issues. 

Area 5, Legge

Religion in the Canadian Experience

Not offered 1982-83

Area 4, Legge

Unity in Diversity in Canadian Religion

Not offered 1982-83

Area 4, Legge

Film and the Quest for Meaning

Area 4, Legge

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 Ina Mar Berqman. Cross-listed as FINE 246(R). 

Film fee $5.00

Area 5, Bird

Christian Ethics

Area 4, Legge

An examination of specific current individual and social problems such as human sexuality, social justice, urban decay, and human rights, in the light of Christian moral consciousness. 

Area 4, Legge

Women and the Great Religions

Not offered 1982-83

Area 4, Legge

Religion and Politics

Not offered 1982-83
Course Descriptions
Religious Studies

RS 267 W 2C.1S 0.5
Film and the Quest for Meaning 2
A consideration of selected themes -
death, evil, guilt, fate, alienation,
courage, love, redemption - in the films
of several of today's leading directors.
Emphasis upon a variety of directors
from divergent cultural backgrounds.
Cross-listed as FINF 247(R). Film fee
$5.00.
Area 5, Bird and Bryant

RS 268A F 3C 0.5
Religious Perspectives in Contemporary
Literature
A discussion of religious perspectives in
contemporary literary works. Emphasis
will be on religious pluralism as
reflected in the culture with a primary
focus on man's search for meaning,
both individually and culturally.
Area 5, Bryant

RS 268B W 3C 0.5
Religious Perspectives in Contemporary
Canadian Literature
A discussion of religious perspectives,
focused on salvation and survival
motifs, in recent Canadian poets and
novelists. Uniquely Canadian aspects of
the larger tradition in the 20th century
will be examined.

RS 269 F 3C 0.5
Myth & Symbols of the Religions of
India
An approach to understanding symbols
and perennial themes of Indian religion
through a study of representative art,
architecture and folk-literature of
Hinduism, Indian Buddhism and
Jainism.
Area 1, Thompson

RS 270 F 3C 0.5
Psychology of Religion
A study of theories of the psychological
nature of religious experience, the
sources of religious belief and the reli-
gious significance of psychological
phenomena. Topics include faith, doubt,
evangelism, conversion, faith healing,
mysticism, drugs and religious
experience, tongues-speaking.
Area 5, Evans

RS 271 W 3C 0.5
Personality and Religion
A study of the psychology of
personality in its relationship between
personality and religious thought,
experience and behaviour.
Area 5, Evans

RS 272 3C 1.0
Religious Experience of the Young
A multi-faceted examination of the
religious development of the pre-adult,
including such considerations as the
moral, psychological, philosophical,
sociological, sacramental, and spiritual
aspects of early religious development.
Area 5

RS 274 W 3C 0.5
Religious Approaches to Personal
Crises
A critical historical review of Judaeo-
Christian approaches to emotional and
interpersonal problems, with an analysis
of the clinical pastoral education
movement in the church.
Area 5, Lebold

RS 275
Religion and Psychotherapy
Not offered 1982-83.

RS 281
Theology of Worship and Sacrament
Not offered 1982-83.

RS 282
New Perspectives in Sacramental
Theory
Not offered 1982-83.

RS 291A-D
Studies in the History of Religions
Not offered 1982-83.

RS 302 W 3C 0.5
The Gospel of John
An interpretation of the Fourth Gospel
in the light of the situation of the
Church at the end of the first century,
with an emphasis on the Johannine
portrait of Jesus. The letters of John will
also be studied.
Area 3.

RS 305 Y 3C 1.0
Intermediate New Testament Greek
Extensive reading of the New
Testament, selected sections of the
Didache and other related materials.
Advanced grammar and syntax arising
from the readings.
Prereq: R 108 or consent of instructor
Area 3

RS 306 Y 3C 1.0
Intermediate Biblical Hebrew
Reading and grammatical analysis of
selected prose and poetic portions of
the Hebrew Bible.
Offered at Wilfrid Laurier University

RS 307A-D
Selected Topics in Biblical theology
Special topics will be offered, Winter
1983. Consult Department.

RS 308
The New Testament World
Not offered 1982-83.

RS 309 F 3C 0.5
New Testament Themes
A comparative study of the distinctive
ways in which New Testament writers
view key issues in the early Church;
e.g., freedom and authority, social
responsibility, the role of law, relations
with the Jewish religion, the person of
Jesus. An attempt will be made to relate
their views to issues facing Christianity
today.
Prereq: R 100F or consent of
instructor.
Area 3.

RS 313
Indian Spirituality in the Modern Era
Not offered 1982-83.

RS 314
Zen Buddhism
Not offered in 1982-83.

RS 318 F 0.5
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: R 100B or consent of
instructor.
Area 1, Sahas

RS 321 (HIST 347)
Radical Reformation 1
Not offered 1982-83.

RS 322 (HIST 348)
Radical Reformation 2
Not offered 1982-83.

RS 323 2C.1S 0.5
Medieval Church History from 312 to
1096
(Cross-listed as HIST 302.)
Area 2, Wahl

RS 324 2C.1S 0.5
Medieval Church History from
1096-1449
(Cross-listed as HIST 303.)
Area 2, Wahl
Course Descriptions
Religious Studies

R S 332
The Orthodox Church
Not offered 1982-83.

R S 326 F 3C 0.5
Anglicanism
This course surveys the development of Anglicanism, its origins, cultural involvements and expressions, its rituals, worship and distinctive thought.
Area 2, Thompson

R S 331A F 3C 0.5
The Church in the Modern World
A study of the recent transformations of the Roman Catholic Church through the events, movements, personalities, and historical realities of the past fifty years.
Area 2, MacDonald

R S 334
Iskam Teology, Philosophy and Mysticism
Not offered in 1982-83.

R S 335
Modern Theology
Not offered 1982-83.

R S 336 F 3C 0.5
Contemporary Theology
A study of major themes and movements in contemporary theology, with reference to selected thinkers, such as Barth, Tillich, Buber, de Chardin and Rahner.
Prereq: R S 231 or consent of instructor.
Area 4, Bryan

R S 338 F 3C 0.5
Theology in North America
An examination of leading ideas in the thought of major theologians in Canada (Strachan to Baum) and the United States (Edwards to Neibuhm) in order to uncover the distinctive themes of theology in North American societies.
Prereq: R S 230 or 231 or consent of instructor.
Area 4, Bryan

R S 339 F 3C 0.5
Luther and Calvin: The Reformation in Theological Outline
This course examines 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 instructor.
Area 4, Gerard

R S 344 F 3C 0.5
Theology of Radical Protestantism
A study of the development of beliefs of the churches in the Radical Reformation tradition (Mennonites, Baptists, Quakers) examined in their ecumenical contexts.
Prereq: R S 230 or 231 or consent of instructor.
Area 4, Sawatsky

R S 350 W 3C 0.5
Christian Spirituality and Mysticism
A study of the spiritual experience and mystical knowledge of great Christian mystics, from the desert Fathers and Hesychasts in the Eastern Orthodox tradition to the mystical schools of the Western Catholic tradition.
Prereq: R S 230 or 231 or consent of instructor.
Area 4, Gerard

R S 355
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 230 or 266 or 267, or consent of the instructor.
Area 5, Bird

R S 365
Religious issues in Marxism
Not offered 1982-83.

R S 368B-F
Study-Travel Seminars in Religion
Not offered 1982-83.

R S 370 F 3C 0.5
Dreams in Religious Experience
The course examines the place of dreams in religious experience from ancient to modern times. Present day advances in understanding dream symbols will be explored, as well as the possibility of incorporating the use of dreams in one's personal religious growth and development.
Prereq: R S 271 or consent of instructor.
Area 5, Evans

R S 371 F 3C 0.5
Religion and Suicidal Behaviour
A study of self-destructive behaviour and its relation to relevant religious concepts. The range of experience from illness to suicide will be explored and related to the concepts of guilt, hope, and meaning in the Christian faith.
Prereq: R S 271 or consent of instructor.
Area 5, Evans

R S 382 F 3C 0.5
The Theology of Marriage
A study of the development of the theology of marriage in the Christian tradition.
Prereq: R S 236:256 or 281:282 or consent of instructor.
Area 4, Feldstein

R S 388-399
Directed Reading in Special Subjects

R S 400A-H
Special Topics in Religious Studies
Special topics will be offered in term A in 1982. Consult Department.

R S 490A S.F.W 0.5
Honours Seminar
A course of study and research designed to provide the student with guidance and supervision towards completing an Honours research assignment.
Prereq: Fourth year standing and consent of the Undergraduate Officer.

R S 490B S.F.W 0.5
Honours Seminar
A continuation of the above.

Note
Every student in the Honours R S Program is required to take R S 490A and 490B.

R S 590-597 F.W R 0.5
Directed Research in Special Subjects for Graduate Students
Faculty of Science

The Faculty of Science offers the following courses of a general nature, intended for students registered in other Faculties (Arts, Environmental Studies, Engineering, Mathematics, Human Kinetics and Leisure Studies) as well as for Science students desiring electives. Normally, no more than three of the Science credits may be applied towards any Science degree program.

SCI 100 F 2C,1L 0.5
Introduction To Geology
A one-term survey of geology. Earth materials; Earth’s interior, surface processes and landforms. Earth history and fossils; application of geology to man’s use of the environment. Field trip. (Not normally available to students in Earth Sciences program.)

Note
Students desiring a full-year Geology elective should consider EARTH 121-122 (Introductory Geology) to be found in the listings of the Earth Sciences Department. Students who are taking, or who have taken EARTH 121-122 may not take SCI 100 for credit because of overlapping material.

SCI 110
From Matter to Man
Not offered 1982-83

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.

Prereq.

SCI 120
The Physical Sciences
Not offered 1982-83.

SCI 200 F 3C 0.5
Contemporary Science 1
The interaction between science and society will be discussed for several items of contemporary public interest. Recent topics have included noise pollution, its reduction and control; materials, structures and properties; atmospheric science, weather and climate; nuclear fusion, new future or no future; outer space exploration, its effects on the activities of man; low temperature phenomena, their impact on society. Open to students in the Faculties of Arts, Environmental Studies, Human Kinetics and Leisure Studies, Mathematics and the Program of Integrated Studies in the first as well as upper years.

SCI 201 W 3C 0.5
Contemporary Science 2
Elementary biology and genetic engineering. Radiation effects on humans and radiation pollution. Cancer - causes and cures. Freezing of human tissues and organs. (Students registered in Science or Engineering may not take this course for credit.)

SCI 202 F 3C 0.5
Energy

SCI 203 W 3C 0.5
Applied Physics in the Modern World
Selected topics in the applications of physics such as acoustics, cosmology, fusion, health physics, lasers and holography, oceanography, physics in Canada, reactor physics, space research, superconductivity, symmetry.

SCI 205 F,W 2C,2L 0.5
Physics of High Fidelity Sound Reproduction
This course applies elementary physical principles to the study of high fidelity systems. A set of laboratory experiments designed to familiarize the student with basic components is included. The course will convey an appreciation of the physics of such systems and an understanding of the specifications of modern equipment. Prereq: None, Lab, alternate weeks.

SCI 209 F W 2C 0.5
Information
Information is considered from two points of view: (1) the information explosion and you; the nature of the scientific, technical and social sciences literature. Retrieval of information: use of libraries and computers. (2) Imparting the information you have to others: the art of speaking, and writing scientific papers, reports, letters, etc. Common errors in writing. No prereq.

SCI 219 F 2C 0.5
Chemistry in Modern Society
The impact of chemistry on modern society will be considered by discussion of a number of topics including: marijuana and other non-medical drugs; food additives; birth controls; cancer-causing chemicals, pesticides and other chemical methods to control insects; chemical warfare. Prereq: at least one year of Secondary School Chemistry.

SCI 220 W 2C 0.5
Chemistry of Pollution
A study of the chemistry involved in pollution problems encountered with consumer products and in selected industries, Progress on overcoming the pollution will be discussed with emphasis on the Chemistry. (Open to all interested students.) Prereq: at least one year of Secondary School Chemistry.

SCI 237 F 3C 0.5
Descriptive Astronomy
A survey course in astronomy intended for non-Science students (primarily Arts, Environmental Studies, Human Kinetics and Leisure Studies students). The solar system, stars, the galaxy, galaxies and the universe. Open to first year or upper year students. (Not for ENG, MATH or SCI 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.)

Note
Students interested in the above courses in Astronomy (i.e. SCI 237, 238) should note that because of overlapping material both courses may not be taken for credit - only the one most suitable to their background. In addition, students who have taken 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.

SCI 249
Continents Adrift
Not offered 1982-83.

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 genetic, cytological and biochemical aspects of individual inheritance. The principles of human population genetics will be discussed. The social implications of some of the modern discoveries will be stressed. (Students whose major field is Biology may not take this course for credit).

SCI 252 W 3C 0.5
Biology and Society
A topical approach to problems of human society directly related to biological systems. Areas for discussion in any one year will be chosen from a wide range of topics. These will be dealt with both from the theoretical and practical aspects of modern biology. Open to first year or upper year students. (Students whose major field is Biology may not take this course for credit.)

SCI 270 W 3C 0.5
Nuclear Science
A non-mathematical general treatment of the following areas of nuclear science: historical development and discovery of new fundamental particles; artificial transmutation of elements; nuclear sources of energy; biological effects of radiation and use of radioisotopes in industry, medicine and agriculture. The impact of nuclear science on social, economic and political systems will be discussed. Prereq: At least one year Secondary School Chemistry or Physics

SCI 312 F 3C 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 313
Physics of Music 2
Not offered in 1982-83.

SCI 349
Introductory Pedology
Not offered 1982-83.

SCI 350 W <IC 0.5
Canadian Non-Renewable Natural Resources
An introduction to mineral resources and the state of reserves of selected minerals. Geologic factors affecting the occurrence of economic minerals and rocks, concentration upon energy supplies, metallic and non-metallic minerals. The historical development of certain extractive industries will be discussed together with the political and social implications of economic development. (Identical to M ENV 356). (Students whose major field is Earth Sciences may not take this course for credit). No prereq.

SCI 351 F T 0.5
Human Biology 1
An introduction to selected topics in human physiology and consideration of factors that influence normal physiological function. Topics discussed include the structure and mechanism of action of nerves, muscles, the cardiovascular and respiratory systems. Prereq: None. Antireq: BIOL 233 Offered only by Correspondence for 1982-83.

SCI 352 W T 0.5
Human Biology 2
An introduction to selected topics in human physiology. Attention will be given to the areas of homeostasis, nutrition, digestion, reproduction and the endocrine hormones. Prereq: None. Antireq: BIOL 233 Offered only by Correspondence for 1982-83.

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.

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 Chimique. The beginnings of the industrial revolution. Emphasis will be on reading the works of the originators of Science. Prereq: First year Science or equiv.
SCI 400B **W 2C 0.5**
The History of Science 2
The growth of scientific ideas in the 19th and early 20th centuries. Developments in physics, chemistry, geology, biology (particularly Darwin) and technology. Emphasis will be on reading the works of the originators of science. **Prereq:** First year Science or equiv.

SCI 410 **0.5**
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 three for students transferring to Co-op Science in the 28th 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. **Prereq:** at least two term courses in the biological sciences. (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. **Prereq:** ISS 131 R. **Not available to students who have taken BIOL 450.**

SCI 462 **F 2C 0.5**
Biological 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.

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**Course Descriptions**

**Social Development Studies**

Professor Emeritus
D.G.S. M Timiku, BA, MA (South Africa), MA (Yale), PhD (Natal) R

**Professors**
I.L. Campbell, BA (Carleton), MSc (London School of Economics) R
J.O. Towler, BA (Toronto), MEd, PhD (Alberta) R

**Associate Professors**
J.T. Harris, BMus (Temple), MSW (Pennsylvania) R
M.I. Nagler, BA (British Columbia), MA (Chicago), PhD (Stirling) R

**Assistant Professors**
R. Lahue, BSc (Fordham), PhD (Waterloo) R
M. Smyth, BA (Toronto), MA, PhD (York) R
M. Zentner, BA (Temple), MSW (Kansas) R

**Co-ordinator of Placements**
Promoli, BA (McMaster), Dip. Soc. Sci. (Toronto) 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. Hyra, BSc, MSc (Madras), MA (Sheffield), PhD (Pittsburgh) R

**Associate Professor, History**
W. Packull, BA (Guelph), MA (Waterloo), PhD (Queens) R

**Co-ordinator of English Language Programs**
J. Miller, BLS (McGill), MA, MPhil (Waterloo), PhD (York)

**Course Descriptions**

**Interdisciplinary Social Science**

ISS 131R **W 3C 0.5**

**Social Ideas, Social Policy and Political Practice 1**
An introduction to some of the major social and political ideas of Western civilization. Attention is given to the influence and applicability of these ideas to social policy and political practice in contemporary Canada.

ISS 150R **S.F.W 3C 0.5**

**Lifespan Crises: Introduction to Helping Strategies**
Introductory examination of theories and research related to crises in the human lifespan, and strategies of the helping professional for prevention and intervention. Topics include: symbiosis, separation, identity crises, autonomy, stress, self-control.

ISS 220R **The History of Development of Modern Day Social Problems**
Not offered in 1982-83.

ISS 221R **Community Issues**
Not offered in 1982-83.

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 131 R

ISS 240R **F 3C 0.5**

**Art and Society**
Themes and issues concerning the relationships of the individual and society as expressed through the arts. A consideration of the role of art and artists in society, and an examination of topics in the field of art and therapy. **Prereq:** at least two term courses in the social sciences.

ISS 250R **F 3C 0.5**

**Social Research 1**
Introduction to the philosophy and methods of applied social science. The problems and strategies of research design and analysis. Emphasis on collection, statistical analysis, and descriptive presentation of research data using a variety of quantitative methods.
ISS 251R W 3C 0.5
Social Research 2
A continuation of ISS 250R
Prereq: ISS 250R

ISS 320R F 3C 0.5
Critical Encounter with the 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 343R W 3C 0.5
Interdisciplinary Investigation of Human Sexuality
Content will focus on the sex research of Kinsey, Masters and Johnson, and will examine areas of import for human sexuality theory and therapy. Current sexual myths will be explored. The clinician's role in changing individual and societal attitudes and sanctions regarding sexual behavior will be examined. Social Development Studies majors only.

ISS 350(A-F)
Special Topics in Interdisciplinary Social Science
One or more half courses of an interdisciplinary nature 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.

ISS 352R 3C 0.5
The Non-Medical Use of Drugs, Drug Dependency and Its Management
(Not offered in 1982-83.)

ISS 350B 3C 0.5
Adult Education: Interdisciplinary Examination
(Not offered in 1982-83.)

ISS 350C 3C 0.5
Children in Difficulty: Biosocial Perspectives
(Not offered in 1982-83.)

ISS 350D W 3C 0.5
Adult Life Crises and Events

ISS 398R/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 469R Y 2S 1.0
Senior Seminar Workshop
Social and human phenomena will be examined holistically. Students will be encouraged to synthesize knowledge learned in other social science courses in an intensive study of specific social issues and human concerns. The issues examined will vary from year to year reflecting social change, immediate community concerns, developments in the social sciences and the interests of students and instructors. Students will be required to engage in field projects, including community based learning experiences.
Prereq: Open to senior honors students only.

PSYCH 120R F 3C 0.5
Introduction Psychology
Basic concepts and techniques of modern psychology as a behavioral science, with special emphasis on social aspects of behavior. 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
Introduction Psychology (Special Topics)
A more in-depth study of selected topics introduced in PSYCH 120R.
Prereq: PSYCH 120R

PSYCH 220R F 3C 0.5
Social Psychology
Examination of psychological principles involved in individual - society interaction. Topics may include research methods, self, sexual attitudes and behavior, person perception, attitudes, affiliation, aggression, altruism, groups, environment and behavior, loneliness, social psychology and legal process. (Cross-listed with PSYCH 253.)
Prereq: An introductory psychology course.

PSYCH 221R W 3C 0.5
Interpersonal Interaction
A consideration of selected theories of interpersonal interaction. Topics include E. Goffman, non-verbal communication, H.S. Sullivan, transactional analysis, the double-bind theory, R.D. Laing, the basic dimensions of interpersonal behavior, and social exchange. (Cross-listed with PSYCH 264.)
Prereq: PSYCH 220R or PSYCH 253.

PSYCH 322R F 3C 0.5
Personality Theory
An examination of the major theories of personality including consideration of the psychoanalytic, dispositional, humanistic, and behavioral models. (Cross-listed with PSYCH 355.)
Prereq: An introductory psychology course.

PSYCH 323R W 3C 0.5
Abnormal Psychology (Psychopathology)
A survey of concepts, theory, and research dealing with the nature and etiology of behavioral abnormality. Topics include neurosis, schizophrenia, depression, psychophysiological and behavioral disorders. (Cross-listed with PSYCH 357.)
Prereq: An introductory psychology course.

PSYCH 334 F 3C 0.5
Theories of Individual Counselling Psychology
An introduction to the methods, theories, and problems in individual Counseling Psychology.
Prereq: An introductory psychology course.
Study of other social institutions

Course.

Framework emphasizing social change of urbanization and industrialization in modern societies studied within a approach or methodological to the study of religion. Development of An application of sociological analysis.

Prereq: An introductory sociology

SOC 221R

Master

perspective which can be applied to the SOC 220R

Illustrations W III be drawn from place specifically in Canada, and in general, within North American society.

Fundamentals of Sociology 2

Prereq: Permission of Undergraduate Officer.

SOC 120R W 3C 0.5

Fundamentals of Sociology 1

An examination of the fundamental concepts of sociology and their application in seeking to understand the changing patterns and life-styles taking place specifically in Canada, and in general, within North American society.

SOC 121R

Fundamentals of Sociology 2

Not offered in 1982-83.

SOC 220R F 3C 0.5

The Individual, Society and Religion

An application of sociological analysis to the study of religion. Development of an approach or methodological perspective which can be applied to the study of other social institutions.

Prereq: An introductory sociology course.

SOC 231R S,W 3C 0.5

Master Trends in Modern Society

An introduction to the major problems of urbanization and industrialization in modern societies studied within a framework emphasizing social change. Illustrations will be drawn from emergent as well as advanced societies.

Prereq: An introductory sociology course.

SOC 225R

Race and Culture In the Third World 1

Not offered in 1982-83.

SOC 226R

Race and Culture In the Third World 2

Not offered in 1982-83.

SOC 327R F 3C 0.5

Minority Status in Canadian Society

A sociological appraisal of the fundamental concepts and issues pertaining to minority groups in Canadian society. The influences of ethnicity, social class, religion, racial factors and social status will be examined as factors that determine social mobility.

Prereq: An introductory sociology course and second year standing or consent of instructor.

SOC 328R W 3C 0.5

Canadian Ethnic and Cultural Minorities

An examination of the adjustment of Native people, French Canadians, Orientals and other minorities within the Canadian mosaic. The influences of ethnicity, social class, religion, racial factors and social status will be examined as factors that determine social mobility.

Prereq: An introductory sociology course and second year standing or consent of instructor.

SOC 367R F 3C 0.5

The Sociology of Physical Disability

Examination of the social adaptations of the physically disabled. Particular attention is given to the theoretical tradition which considers physical disability as a form of involuntary deviance which stigmatizes the individual.

Prereq: An introductory sociology course.

SOC 368R W 3C 0.5

The Sociology of Spoiled Identity

Spoiled identity resulting from deviant status inhibits if not prevents acceptance and social mobility. Consequences of spoiled identity, lowered status positions and deviant criminal and "social" adaptations are examined from a symbolic interactionist perspective.

Prereq: An introductory sociology course.

SOC 369R F 3C 0.5

Custodial and Rehabilitative Institutions

"Total institutions" are concerned with resocialization of "inmates". The philosophies, organization, goals and effectiveness in modifying and controlling behavior, of maximum security prisons, mental hospitals, isolated work environments and concentration camps constitute the central focus.

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 psychology. Available to individuals or small groups of third or fourth year Social Development Studies majors and arranged with one of the faculty members from the program.

Prereq: Permission of Undergraduate Officer.

Social Work

SOCWK 120R S,F,W 3C 0.5

Introduction to Social Work

Presentation of the value, knowledge, and skills 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 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 the understanding of the individual in the casework relationship, as well as an introduction to some appropriate casework interventions. Emphasis in the course will be theoretical.

Prereq: SOCWK 120R or consent of instructor.
on social welfare development and the continuing influence of inherent attitudes, philosophies and values on this complex institution. Focus on the Canadian welfare system. 
Prereq: SOCWK 120R or consent of instructor.

SOCWK 350(A-F) Special Topics in Social Work
One or more half courses will be offered from time to time as announced by the Social Development Studies Program. Subjects will be dependent upon special research and/or instructional interests of faculty.

SOCWK 350A S.F 3C 0.5 Mental Retardation and the Family
A critical application of theory to real situations involving the social, emotional and physical functioning of the family that has a mentally retarded member. Will also include consideration of the impact of current social policies.

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 the causes of child abuse, to develop skills identifying cases of this social problem and to explore current methods of management and treatment of persons involved in child abuse situations. 
Prereq: SOCWK 120R or consent of instructor.

SOCWK 365R F 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. 
Prereq: SOCWK 120R or consent of instructor.

SOCWK 366R W 3C 0.5 Medical Social Work 2
Develops in greater depth the concepts presented in Social Work 365R. 
Prereq: SOCWK 365R or consent of instructor.

SOCWK 398FV399R 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. 
Prereq: Permission of Undergraduate Officer

Elective Courses
The following elective courses are administered by Renison College. For fuller descriptions, see appropriate departments

ARTS
ARTS 220R Chinese Thought and Culture 1
ARTS 221R Chinese Thought and Culture 2
ARTS 320R/ Special Topics in Chinese 321R Thought and Culture

ENGLISH
ENGL 129R Introduction to Written English
ENGL 140R The Use of English 1
ENGL 141R The Use of English 2
ENGL 205R The Canadian Short Story
ENGL 240R Form and Function 1
ENGL 241R Form and Function 2
ENGL 376R Our Changing Language Syntax and Semantics 1
ENGL 377R Our Changing Language Syntax and Semantics 2
ENGL 386R Twentieth Century Literature 1
ENGL 387R Twentieth Century Literature 2

FINE ARTS
FINE 246 Film and the Quest for Meaning 1
FINE 247 Film and the Quest for Meaning 2
FINE 248R Film as Social Criticism

GEOGRAPHY
GEOG 125R Introduction to the Third World
GEOG 126R Development in the Third World
GEOG 225R Urbanization in the Third World
GEOG 226R Food and Agriculture and Integrated Rural Development in the Third World
GEOG 325R Special Topics in Development of the Third World
Sociology Course Descriptions

**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. Failding, BA, BSc, MA (Sydney), PhD (Australian National), FRSC
H.D. Kirk, BS (City College, N.Y.), MA, PhD (Cornell)
D. Kubat, MA (Kansas), PhD (L. Maximillian, Munich)
E.W. Vaz, BA, MA (McGill), PhD (Indiana)

**Associate Professors**
J. Curtis, BA (St. George Williams), MA (Central Michigan), MA (Cornell)
F.A. Fasick, BA (Penn. State), MA, PhD (Columbia)
J. Goyder, BA (Bishop's), MA, PhD (McMaster)
R.D. Lambert, BA, MA (McMaster), PhD (Michigan)

R.C. Prus, BA (Manitoba), MA, PhD (Iowa)
W.G. Scott, BA (Western Ontario), MA (Toronto)
K. Westhuys, BA (Conception), MA, PhD (Vanderbilt)
A. Wipper, BA, MA (McGill), PhD (California, Berkeley)

**Associated Faculty**

**Professors**
G.L. DeGre, BSS (City College, N.Y.), MA, PhD (Columbia), Cated Hon (San Marcos, Lima) (Ret.)
G.S. Kenyon, BPhysEd (British Columbia), MS (Indiana), PhD (NYU), Kinesiology
C. Redekop, BA (Goshen), MA (Minnesota), PhD (Chicago) Conrad Grebel College

**Professor Emeritus**
D. Smucker, BA (Bluffton), BD (Princeton), MA, PhD (Chicago), Social Sciences, Conrad Grebel College

**Associate Professors**
B. McPherson, BA, MA (Western Ontario), PhD (Wisconsin), Kinesiology
M.J. Nagler, BA (British Columbia), MA (Chicago), PhD (Stirling) Renison College
M. Shimpo, BA (International Christian, Japan), MA, PhD (British Columbia), St. Jerome's College
J. Zuzanek, BA, MA (Toronto), PhD (Waterloo), St. Jerome's College
N. Theberge, BA (Massachusetts), MA (Boston), PhD (Massachusetts), Kinesiology

**Course Descriptions**

**Sociology**

**SOC 101** S.F.W 2C 0.5

**Introduction to Sociology**
An introduction to the basic concepts and frames of reference of sociological investigation and interpretation. Topics for analysis will include communities, associations and institutions, classes and status groups, crowds and publics, social processes, and social change. Special attention is given to Canadian society.

Not open to students who have taken SOC 101(t), 101(m), or 101(u). 101(m) is an introductory course intended as an elective for mathematics students or as a basis for a combined honours in Mathematics and Sociology. 101(u) is especially designed for Planning students.

Also offered at Conrad Grebel, Renison and St. Jerome's Colleges.

**SOC 102** F.W 2C 0.5

**Social Problems**
An examination of cultural forces that create social problems and failures in personal and institutional adjustments. Specific attention is paid to the problems of emotional disturbance, poverty, delinquency and industrial disruptions in Canadian society.

**SOC 103** W 2C 0.5

**Canadian Society**
An introductory survey of Canadian society. This course will examine issues in the socio-historical development of Canadian society, its present social structure, organizations and ideologies.

**SOC 104** 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 105** 2C 0.5

**Perennial Themes in Social Thought**
Both classical and recent social theorists are shown to exhibit common preoccupations, e.g. the relation of the individual to society, the foundations of government, survival through productivity and adaptation, society's location in nature and the cosmos.

**SOC 106** W 2C 0.5

**Collective Behaviour**
The sociological analysis of the behaviour of crowds, mobs, publics and related phenomena and their relationships to social organization and social change.
SOC 107 2C 0.5
Social Structure and Character
This course will examine the connections between organized social life and types of personalities found in it. Examples will be drawn from contemporary as well as historical situations.

SOC 200 F,W 2C 0.5
Marriage and the Family
A survey of sociological perspectives on marriage and the family in urban-industrial societies. Special attention is given to marriage and the family in Canada. Comparisons with U.S. and Britain will be undertaken. Prereq: SOC 101 or consent of instructor. Also offered at St. Jerome's College.

SOC 204 F,W 2C 0.5
Sociology of Adolescence
The social definitions of adolescence in cross-cultural and historical perspective. Social roles of adolescence in the institutional structures of urban-industrial societies with special emphasis on the family, education, and the economy. The relationship of adolescents' social roles to processes of social change and stability. Prereq: SOC 101 or consent of instructor.

SOC 206 F,W 2C 0.5
Sex Roles
An examination of male and female roles in contemporary Canadian society. Current and past roles of both sexes in different societies are considered. Selected topics of interest include sex role identity and its development, male role change, media images of men and women and men's and women's liberation. Prereq: SOC 101 or consent of instructor.

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. Offered at St. Jerome's College.

SOC 214 W 2C 0.5
Social Inequality
Analysis of social classes in society including their basis for development, composition and consequences for society. Special attention is given to social stratification in Canada. Prereq: SOC 101 or consent of instructor.

SOC 222 F,W 2C 0.5
Juvenile Delinquency
A systematic analysis and criticism is presented of biological, psychological, psychoanalytical and sociological theories of juvenile delinquency. Attention is given to statistics and contemporary research with special emphasis on the distribution and types of delinquent subcultures. Prereq: SOC 101 or consent of instructor.

SOC 223 2C 0.5
Deviance: Perspectives and Processes
The deviance-making process is examined in a variety of social contexts. Examines the emergence of rules and control agencies, the processes by which persons become involved in deviant activities, and the contingencies affecting persons' careers as deviants. Prereq: SOC 101 or consent of instructor.

SOC 224 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 227 W 2C 0.5
Crime and Society
An analysis and criticism of the major theories of criminal behaviour. Emphasis is given to the relationship between social structure and criminal behaviour; types of criminal behaviour such as drug addiction statistics and contemporary research. Special attention is given to Canadian data. Prereq: SOC 101 or consent of instructor.

SOC 228 F 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 233 W 2C 0.5
Social Psychology of Beliefs and Attitudes
Examines the nature of social beliefs and attitudes toward various groups in society, such as ethnic, political and religious groups. Considers the sources, organization and distribution of beliefs and attitudes, and their implications for Canadian society. Prereq: SOC 101 or PSYCH 101 or consent of instructor.

SOC 235 W 2C 0.5
Communication
An analysis of the role of language and other symbol systems in social interaction; the interplay between communication and the social system, the formation of attitudes through language; social and individual disorders as caused by, and reflected in, the breakdown in the communication process. Prereq: SOC 101 or consent of instructor.

SOC 236 F 2C 0.5
Social Movements
The sociological analysis of varieties of social movements and their relationships to social organization and social change. Prereq: SOC 101 or consent of instructor.

SOC 238 2C 0.5
Sociology of Marketing Sales
This course considers the (social) processes by which people "do business". Focusing on day to day exchanges, ongoing relationships within the business and consumer community are examined from an interactionist perspective. Prereq: SOC 104 or consent of the Instructor.

SOC 242 2C 0.5
Industrial Sociology
Special emphasis is given in lectures, readings and assignments to the particular problems facing industrial Canada, especially in reference to regionalism, elitism, the multinational enterprise and the problem of foreign ownership. Prereq: SOC 101 or consent of instructor.
### Course Descriptions

**Sociology**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOC 243</td>
<td>W 2C 0.5</td>
<td><em>Occupational Sociology</em>&lt;br&gt;An introduction to the study of work and occupations; the problems of occupational choice, occupational socialization and identification, the concepts of career and career mobility; the professionalization process, the nature of professions; the impact of occupation on life styles, leisure and retirement.&lt;br&gt;<em>Prereq: SOC 101 or consent of instructor.</em></td>
</tr>
<tr>
<td>SOC 244</td>
<td>F 0.5</td>
<td><em>Adoptive Kinship</em>&lt;br&gt;The study of adoptive kinship sheds light on the weakening of the western family as an institution. It also reveals strains that appear to be inherent in the invention and enactment of any new institution.</td>
</tr>
<tr>
<td>SOC 247</td>
<td>2C 0.5</td>
<td><em>Sociology of Death and Dying</em>&lt;br&gt;The course deals with the current literature on death and dying; also, with the sociological implications of institutional housing of the terminal patient. Patterns of mortality as affecting different social groups and as reflecting differential life chances of individuals in society are described. North American issues of death and dying are considered against an historical background.&lt;br&gt;<em>Prereq: SOC 101 or consent of instructor.</em></td>
</tr>
<tr>
<td>SOC 248</td>
<td>W 2C 0.5</td>
<td><em>Health, Illness, and Society</em>&lt;br&gt;This course focuses on the social aspects of health and illness, including social causes of illness, the social process of becoming ill, and the social consequences of being defined as ill.&lt;br&gt;<em>Prereq: SOC 101 or consent of instructor.</em></td>
</tr>
<tr>
<td>SOC 252</td>
<td>F 2C 0.5</td>
<td><em>Migration and Society</em>&lt;br&gt;An international overview of 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 the world migration situation.&lt;br&gt;<em>Prereq: SOC 101 or consent of instructor.</em></td>
</tr>
<tr>
<td>SOC 253</td>
<td>2C 0.5</td>
<td><em>Population In Canadian Society</em>&lt;br&gt;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.&lt;br&gt;<em>Prereq: SOC 101 or consent of instructor.</em></td>
</tr>
<tr>
<td>SOC 254</td>
<td>2C 0.5</td>
<td><em>Comparative Social Structure</em>&lt;br&gt;General theoretical and methodological issues facing comparative sociology; comparative methods at work in the treatment of Western and non-Western societies (including Canada).&lt;br&gt;<em>Prereq: SOC 101 or consent of instructor.</em></td>
</tr>
<tr>
<td>SOC 255</td>
<td>2C 0.5</td>
<td><em>Third World Development</em>&lt;br&gt;An analysis of issues of social and economic development in selected areas of the Third World, including Africa, Asia, and Latin America.&lt;br&gt;<em>Prereq: SOC 101 or consent of instructor.</em>&lt;br&gt;Also offered at St. Jerome's College.</td>
</tr>
<tr>
<td>SOC 256</td>
<td>F 2C 0.5</td>
<td><em>Ethnic and Racial Relations</em>&lt;br&gt;Relations between different racial and cultural groups, analysis of majority-minority group status with special reference to Canada.&lt;br&gt;<em>Prereq: SOC 101 or consent of instructor.</em>&lt;br&gt;Also offered at St. Jerome's College.</td>
</tr>
<tr>
<td>SOC 264</td>
<td>2C 0.5</td>
<td><em>Sociology of Religion</em>&lt;br&gt;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.&lt;br&gt;<em>Prereq: SOC 101 or consent of instructor.</em>&lt;br&gt;Also offered at St. Jerome's College.</td>
</tr>
<tr>
<td>SOC 265</td>
<td>2C 0.5</td>
<td><em>Political Sociology</em>&lt;br&gt;The sociological analysis of the institutionalization of power, political movements, parties, conflict and its accommodation.&lt;br&gt;<em>Prereq: SOC 101 or consent of instructor.</em></td>
</tr>
<tr>
<td>SOC 267</td>
<td>2C 0.5</td>
<td><em>Sociology of the Contemporary University</em>&lt;br&gt;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.&lt;br&gt;<em>Prereq: SOC 101 or consent of instructor.</em></td>
</tr>
<tr>
<td>SOC 268</td>
<td>W 2C 0.5</td>
<td><em>Introductory Sociological Theory</em>&lt;br&gt;An examination of the object and function of sociological theory in social research. Types of sociological theories. Discussion of selected classics of sociological theory.&lt;br&gt;<em>Prereq: SOC 101 or consent of instructor.</em></td>
</tr>
<tr>
<td>SOC 271</td>
<td>W 2C 0.5</td>
<td><em>Social Statistics and Social Indicators</em>&lt;br&gt;A first course in sociological statistics, sampling, central tendency, probability, covariance, as illustrated in specifically sociological data.&lt;br&gt;<em>Prereq: SOC 101 or consent of instructor.</em></td>
</tr>
<tr>
<td>SOC 281</td>
<td>F C 0.5</td>
<td><em>Methods I</em>&lt;br&gt;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.&lt;br&gt;<em>Prereq: SOC 101 or consent of instructor.</em></td>
</tr>
<tr>
<td>SOC 282</td>
<td>W 2C 0.5</td>
<td><em>Methods II</em>&lt;br&gt;Continuation of Methods I. The course involves a field project, together with classroom work emphasizing the critical evaluation of research reports.&lt;br&gt;<em>Prereq: SOC 101 or consent of instructor.</em></td>
</tr>
<tr>
<td>SOC 302</td>
<td>2C 0.5</td>
<td><em>Comparative Sociology of Youth</em>&lt;br&gt;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.&lt;br&gt;<em>Prereq: SOC 101 or consent of instructor.</em></td>
</tr>
</tbody>
</table>
Course Descriptions

Sociology

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 one Sociology course in the 220 series.

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
Aging, the Aged and Leisure: A Sociological and Social Psychological Perspective
Employing a sociological and psychological frame of reference, the process and problems of aging are analyzed. Special emphasis will be given to the problems of leisure time in the later years of life. (Same as KIN 352 and REC 361).
Prereq: SOC 101 and one other Sociology course.

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. (Same as REC 301).
Prereq: Two term courses in sociology.

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. (Same as REC 303 and KIN 452).
Prereq: SOC 101 and one other Sociology course.

SOC 349 3C 0.5
World Population Problems
Comparative Analysis of population problems across societies. Focus is on social institutions and their relationships to population. Emphasis on fertility and family planning.
Prereq: SOC 101 and SOC 253.

SOC 364 F 2C 0.5
Social Change
A systematic review and analysis of sources, patterns, processes, and consequences of social change in developing countries, the role of ideas, and the breakdown and reorganization of social structure.
Prereq: SOC 101 and one other Sociology course.
Also offered at St. Jerome's College.

SOC 366 2C 0.5
Urban Sociology
The comparative study of urbanization as a process; the culture and organization of cities; urban problems; special attention is given to industrial cities of Canada, with comparative reference to the principal cities of Western societies.
Prereq: SOC 101 and one other Sociology course.

SOC 371 3C 0.5
Philosophy of Social Science
Problems about the fundamental methods and aims of the social sciences generally, the problems specific to Psychology, Sociology, Political Science, etc., and their relations to one another will be considered. (Same as PHIL 362.)
Prereq: Some previous work in a Social Science or in Philosophy.

SOC 380 2C 0.5
Qualitative Methods: Field Techniques
An application of symbolic interactionist theory, this course examines the contingencies affecting data collection and analysis of on-going group life. While doing field work, students have an opportunity to examine basic features of interactionist thought.
Prereq: SOC 101 and one other Sociology course.

SOC 381 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 one 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 one other Sociology course (SOC 271 is recommended).

SOC 404A-E,H,K,M,N,P,S,X S,F,W 0.5
Directed Readings
Selected readings and essay assignments under the direction of a faculty member.
Prereq: Fourth year standing in Sociology.

SOC 354 F 2C 0.5
Crime as Business
Exemines the inter-relatedness of crime and business, looking not only at the extent to which (1) crime represents business for its practitioners and (2) the criminal activities of legitimate business people, but also (3) the agencies regulating crime.
Prereq: SOC 101 and one Sociology course in the 220 series.

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Prereq: SOC 101 and one other Sociology course (SOC 271 is recommended).

SOC 404A-E,H,K,M,N,P,S,X S,F,W 0.5
Directed Readings
Selected readings and essay assignments under the direction of a faculty member.
Prereq: Fourth year standing in Sociology.
SOC 440A S.F.W 0.5
Directed Readings in Deviance, Criminology, and Corrections
Instructors: Prus, Vaz, Wipper and others.

SOC 440B S.F.W. 0.5
Directed Readings in Social Psychology
Instructors: Lambert, Prus, and others.

SOC 440C S.F.W. 0.5
Directed Readings in Social Inequality
Instructors: Costa-Pinto, Curtis, Goyder, Hunter, and others.

SOC 440D S.F.W. 0.5
Directed Readings in Quantitative Methods and Statistics
Instructors: Goyder, Hunter, McDaniel and others.

SOC 440E S.F.W. 0.5
Directed Readings in Social Theory
Instructors: Costa-Pinto, DeGré, Failing, and others.

SOC 440H S.F.W. 0.5
Directed Readings in the Family
Instructors: Failing, Fasick, Kirk, and others.

SOC 440K S.F.W. 0.5
Directed Readings in Industry, Work and Complex Organizations
Instructors: Scott, Wipper, and others.

SOC 440M S.F.W. 0.5
Directed Readings in Religion
Instructors: Failing, Westhues, and others.

SOC 440N S.F.W. 0.5
Directed Readings in Demography
Instructors: Kubat, McDaniel, and others.

SOC 440S S.F.W. 0.5
Directed Readings in Developing Nations
Instructors: Costa-Pinto, Wipper, and others.

SOC 440V S.F.W. 0.5
Directed Readings in Sex Roles
Instructors: McDaniel and others.

SOC 440X S.F.W. 0.5
Directed Readings in Medical Sociology
Instructors: McDaniel and others.

SOC 499 Y 1.0
Senior Honours Essay
Required of all Honours students in Sociology or by election by Joint Honours students in their fourth year. For students electing Honours Sociology (Canadian Studies), the essay should bear on some topic of particular sociological significance for Canadian society.
Prereq: Fourth year Sociology Honours.

Conrad Grebel College

SOC 190G 3C 0.5
Sociology of Disent
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 Kiri will be considered among others.

SOC 207G S 3C 0.5
Sociology of Education
This course is designed for Co-op and Regular students who plan to enter the teaching field. Attention will be focused on the concepts and theories of sociology as they apply especially to the educational system.
Prereq: SOC 101 or consent of instructor.

SOC 220G F 3C 0.5
Sociology of Business Management
A study of the structure, stratification and social roles in the organization, operation and management of small businesses. Attention will also be given to decision making, labour-management relations, the institutionalization of value systems, and job satisfaction.

SOC 225G W 3C 0.5
Sociology of Sects and Cults
A sociological analysis of religious groups and movements considered deviant by the dominant societies.

SOC 276G F 3C 0.5
The Mennonites as a Sociological Community
A case study of the Waterloo County Mennonites as a social system. Attention is paid to a methodology for studying a religious-cultural group by engaging in direct field studies. The community, charter resources, integration, family system, life ceremonies, adaptation to change, and survival techniques will be examined.
Prereq: An introductory social science course.

SOC 286G W 3C 0.5
Sociology of Ecology
A study of the interaction between social organization and ecological factors such as pollution, energy and land resources.

SOC 290G
Utopian Communities Past and Present
Not offered 1982-83.

SOC 307G W 3C 0.5
Problems in Contemporary Education
A study of problems arising from the interplay between institutionalized education and the forces of rapid social change in the contemporary society. It emphasizes the changing roles of the learners and instructors and social dimensions of newer learning theories and programs. Themes will be selected and studied in depth on a seminar basis.
Prereq: SOC 101 and 207G.

SOC 326G W 3C 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 325 or permission of the instructor.

SOC 370G F 3C 0.5
Sociology of Law
Special attention will be paid to the growing public awareness of the failure of law to provide justice or social control in a growing number of situations. Local judges, lawyers and police officials are invited to discuss such issues as the jury system, police and violence, civil rights and mass media.
Prereq: Third year standing in a social science course or by permission. May or may not be offered 1982-83.

SOC 377G 0.5
Studies in the Sociology of the Mennonites
This seminar will devote attention to research methods, sociological theory and interdisciplinary approaches to the study of Mennonite communities and culture.
Prereq: Permission of the instructor.
St. Jerome's College

The following courses are administered by St. Jerome's College.

SOC 208J  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 219J  W  3C  0.5  
**Catholic Sociological Thought**
An analysis of the distinctive emphases and perspectives which characterize contemporary sociological theory in Catholic cultures. The course will focus on theories of the family, the community, human sexuality, politics and the economy.

SOC 249J  W  3C  0.5  
**Sociology of Mental Illness**
An examination of sociological research and theory in the field of mental illness, especially as it relates to the family. Such topics as psychiatric hospitals, public attitudes and social stigma, after-care and rehabilitation, and the epidemiology of mental illness will be examined. 
Prereq: SOC 101 or permission of the instructor.

Note
For other Sociology courses offered at Renison College, please see course descriptions for Social Development Studies.

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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)

Faculty at Wilfrid Laurier University

Professors

N.H. Taylor, President of Wilfrid Laurier, BA, MA PhD (Toronto)
A.A. Borrias, BA (Kentucky), MA (Indiana), PhD (Pennsylvania State)

Associate Professor

J.V. Solanas, MA, PhD (Valencia)
Professor Emeritus

T. Laurence Dawson, BA, MA, PhD (Toronto)

Course Descriptions

SPAN 101  F,W,S  3C,1L  0.5  
**Introduction to Spanish I**
For students with no previous knowledge of Spanish. Intensive drill in the fundamentals of grammar, comprehension and speaking. Some reading, translation and composition. The language laboratory is used as an integral part of the course. (WLU 101:151-40). Cannot be taken concurrently with SPAN 111.

SPAN 102  W  3C,1L  0.5  
**Introduction to Spanish II**
A continuation of SPAN 101.
Prereq: SPAN 101 or consent of Department. (WLU 102:152-04)

SPAN 111  F  3D,1L  0.5  
**Conversational Spanish**
Intensive oral and aural training with particular emphasis on comprehension and speaking. Intended for students with no knowledge of Spanish. Limited to a maximum of 20 students. (WLU 111:161-40) Cannot be taken concurrently with SPAN 101.

SPAN 201A  F  3C,1L  0.5  
**Intermediate Spanish I**
For students with some knowledge of Spanish. Seeks to reinforce the language, both oral and written, through selections from literary works and grammar review. Language laboratory also used to increase understanding and speaking skills.
Prereq: SPAN 101:102 or consent of Department. (WLU 121:171-30)

SPAN 201B  W  3C,1L  0.5  
**Intermediate Spanish II**
A continuation of Spanish 201A.
Prereq: SPAN 201A or consent of Department. (WLU 122:172-03)

SPAN 203  F  3C,D  0.5  
**Spanish Civilization I**
Development of Spanish Civilization and culture from the earliest times to the present. This course will be taught in English. (WLU 203:253-30)

SPAN 204  
**Spanish Civilization II**
Not offered 1982-83.
(WLU 213/263-03)

SPAN 205  F  3C  0.5  
**Survey of Spanish Literature I**
Readings of major authors and study of the main literary trends from the middle ages to the eighteenth century.
Prereq: SPAN 201A/201B.
(WLU 205:255-30)

SPAN 206  W  3C  0.5  
**Survey of Spanish Literature II**
A continuation of SPAN 205 from the eighteenth century to the present.
Prereq: SPAN 205.
(WLU 206:256-03)

SPAN 217  
**Spanish American Civilization I**
Not offered 1982-83.
(WLU 223/273-30)

SPAN 218  
**Spanish American Civilization II**
Not offered 1982-83.
(WLU 233/283-03)

SPAN 227  F  3C,D  0.5  
**Survey of Spanish American Literature I**
A survey of literary trends and most significant works from the conquest to the nineteenth century.
Prereq: SPAN 201A/201B.
(WLU 208:266-30)
SPAN 228 W 3C,D 0.5
Survey of Spanish American Literature II
A continuation of SPAN 227.
Prereq: SPAN 227.
(WLU 209/259-03)

SPAN 251A F 3C,D 0.5
Composition and Conversation I
Intensive language study based on literary texts, including vocabulary, grammar and syntax. Essay writing, speeches, discussion.
Prereq: SPAN 201A/201B or consent of the Department.
(WLU 211/261-03)

SPAN 251B W 3C,D 0.5
Composition and Conversation II
A continuation of SPAN 251A.
Prereq: SPAN 251A
(WLU 212/262-03)

SPAN 265 F 3C,D 0.5
The Spanish Short Story
Selected stories from outstanding writers in Spain, primarily of the twentieth century.
Prereq: SPAN 201A/201B.
(WLU 204/254-30)

SPAN 266
The Spanish American Short Stop
Not offered 1982-83.

SPAN 304 F 2C 0.5
Romanticism in Spain
Drama: preliminary study of Moratin's Neo- Classical drama. Readings of selected plays by Duque de Rivas, Juan Eugenio Hartzenbusch, Garcia Gutiérrez and José Zorrilla. Poetry: the search for selfhood in the romantic man, as expressed in the poems of Gustavo Adolfo Bécquer, Rosalía de Castro and other poets.
Prereq: SPAN 206.
(WLU 304/354-20)

SPAN 305 W 2C 0.5
The Spanish Realist Novel
Study of the fundamental narrative techniques and ideology in some of the most representative novels of Emilia Pardo Bazán, Benito Pérez Galdós, and Vicente Blasco Ibáñez. Other realist novelists will also be discussed within the context of European positivism and the psychological schools of the period. No prerequisite.
(WLU 305/355-02)

SPAN 311 F,W 2C 0.5
Applied Spanish Stylistics
A workshop-type course designed to develop advanced oral-aural skills, consecutive translation and composition. Written and oral translation of journalistic material.
Prereq: SPAN 351A/351B.
(WLU 311-461-22)

SPAN 324 F 2C 0.5
Contemporary Spanish Theatre and Poetry
An in-depth analysis of the works of Lópex-Rubio, Casóna, Mihura, J.R. Jiménez, Salinas, D. Alonso, Aleixandre, et al, with emphasis on the works of Buero, Sastre and García Lorca.
Prereq: SPAN 206.
(WLU 324/474-20)

SPAN 325 W 2C 0.5
Contemporary Spanish Novel
Influences on the novel and literary tendencies, with stress on Cela, Matute, Laforet, Angel de Lera and Carlos Rojas. Span 206.
(WLU 325/473-03)

SPAN 326 F 2C 0.5
The Spanish Golden Age: Theatre and Poetry
A study of one verse drama each of Lope de Vega, Tirso de Molina, and Calderón de la Barca; also outstanding sonnets of the period by Garcilaso, Herrera, Góngora, Lope and Quevedo.
Prereq: SPAN 206.
(WLU 326/476-20)

SPAN 327 W 2C 0.5
The Spanish Golden Age: Don Quijote
A literary analysis of Don Quijote.
Prereq: SPAN 206.
(WLU 327/477-02)

SPAN 331 F 2C 0.5
Contemporary Spanish Essay
An overview of the historical essay in Spain: Galianet, Maragayl, Maetzu, Pidal, D'Ors, with special consideration of Madariaga, Unamuno and Ortega.
Prereq: SPAN 206.
(WLU 316/486-02)

SPAN 333 F 2C 0.5
Modern Spanish American Poetry
A study in depth of major poets and movements since Modernism.
Prereq: SPAN 227.
(WLU 319/469-20)

SPAN 334 W 2C 0.5
Modern Spanish American Prose
A critical study of masterpieces in prose from Sarmiento to the present. Prereq: SPAN 227.
(WLU 308/358-20)

SPAN 344 F,W 2T 0.5
Special Topics in Hispanic Studies
By special arrangements, an individual student or a small group of students will follow a course of study under the supervision of a faculty member.
(WLU 317/467-02)

SPAN 351A F 2C,D 0.5
Advanced Composition and Conversation I
Writing of essays and discussion based on selected themes or topics relating to Spain or Spanish America.
Prereq: SPAN 251A/251B.
(WLU 301/351-20)

SPAN 351B W 2C,D 0.5
Advanced Composition and Conversation II
A continuation of SPAN 351A.
Prereq: SPAN 351A.
(WLU 302/352-02)

SPAN 354
The Spanish American Essay
Not offered 1982-83.
(WLU 306/356-02)

SPAN 388
Aspects of Contemporary Spanish American Theatre
Not offered 1982-83.
(WLU 309/359-20)

SPAN 389
Women in Contemporary Spanish American Theatre
Not offered 1982-83.
(WLU 307/357-02)

SPAN 445
History of the Spanish Language
Not offered 1982-83.
(WLU 312/462-20)

SPAN 446 F 2C,D 0.5
Medieval Spanish Literature
Close study of the Poema de Mio Cid, El libro de buen amor and La Celestina plus selections from other works through the 15th century.
Prereq: SPAN 205/206.
(WLU 318/468-02)
SPAN 495
The Novel in Mexico
Not offered 1982-83.
(WLU 328/478-20)

SPAN 497
The Novel in South America
Not offered 1982-83.
(WLU 329/479-02)

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. Gerard, MA (College St. Dominique, France), BD, STM (McGill), PhD (Hartford Seminary Foundation), J.R. Horne, BA, MA (Western Ontario), BTh (Huron), PhD (Columbia)

Assistant Professor
R.D. Legge, BA (Transylvania), STB (Harvard), PhD (McMaster)

Course Descriptions

Studies in Personality and Religion (SIPAR)

A study of Psychology of Personality and the relationship between personality and religious thought, experience and behaviour.

ARTS 302P 0.5
Seminar on Selected Topics in Personality and Religion

Courses Selected from Participating Departments
A further understanding of this subject may be developed through the study of selected courses offered by participating departments, which will either broaden the student's comprehension of the field or permit a deeper understanding of some particular aspect of Studies in Personality and Religion. The actual combination of courses selected by a student is subject to the approval of the SIPAR advisor.

RELIGIOUS STUDIES
R S 271 0.5 Personality and Religion
A study of the psychology of personality and the relationship between personality and religious thought, experience and behaviour.

R S 272 0.5 Psychology of Religion
A study of the psychology of religion, the sources of religious belief and the religious significance of psychological phenomena. Topics include faith, doubt, evangelism, conversion, faith healing and mysticism, drugs and religious experience, tongues-speaking.

R S 275 0.5 Religion and Psychotherapy

R S 370 0.5 Dream in the Religious Experience of Mankind

R S 371 0.5 Religion and Self-Destructive Behaviour

PSYCHOLOGY

PSYCH 101 (0.5) Introductory Psychology

PSYCH 211 (0.5) Developmental Psychology

PSYCH 214 (0.5) Psychology of Adolescence

PSYCH 231 (0.5) Psychology of Religious Experience

PSYCH 254 (0.5) Interpersonal Relations

PSYCH 256 (0.5) Principles and Evolution of Psychoanalytic Thought

PSYCH 334 (0.5) Theories in Counselling Psychology

PSYCH 355 (0.5) Personality Theory

PSYCH 357 (0.5) Psychopathology

PHILOSOPHY

PHIL 111 (0.5) Philosophy of Life

PHIL 135 (0.5) Introduction to Philosophy of Religion

PHIL 201 (0.5) Love

PHIL 203 (0.5) Philosophical Perspectives on Death

PHIL 235 (0.5) Philosophy and Mysticism

PHIL 236 (0.5) Philosophy of Religion: The Occult

PHIL 470 (0.5) Phenomenology

SOCIOLOGY

SOC 101 (0.5) Introduction to Sociology

SOC 102 (0.5) Social Problems

SOC 105 (0.5) Perennial Themes in Social Thought

SOC 206 (0.5) Sociology of Sex Roles

SOC 209 (0.5) Family Origin and Personal Identity

SOC 213 (0.5) Social Psychology of Beliefs and Attitudes

SOC 247 (0.5) Sociology of Death and Dying

SOC 264 (0.5) Sociology of Religion

SOCIAL DEVELOPMENT STUDIES
SOC 220F (0.5) The Individual, Society and Religion

Department of Systems Design Engineering

Professor, Chairman
K. Husein, MSc (Istanbul), PhD (London), DSc (Eng. (London), PEng

Associate Professor, Associate Chairman, Undergraduate Studies
M.E. Jernigan, SB, SM, PhD (Massachusetts Institute of Technology), PEng

Associate Professor, Associate Chairman, Graduate Studies
K. Singhal, BSc (I.I.T., Kharagpur), MS, EngScD (Columbia)

Professor, President of the University
D.T. Wright, BASc (Toronto), MS (Illinois), PhD (Cambridge), PEng (Honorary, D Eng (Carleton), LLB (Brock), DSc (Memorial))

Professor, Associate Dean, Undergraduate Studies
P.H.O’N. Roe, BASc (Toronto), MSc 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)
Course Descriptions
Systems Design Engineering

G.N. Soulsi, BASc (Toronto) PEng
D.A. Winter*, BSc (Queen's), PhD (Dakushe), PEng
A.K. C. Wong, BSc, MSc (Hong Kong),
PhD (Carnegie), PEng

Associate Professors
M. Chandra, BSc (I.T. Kanpur), MSc, PhD (Waterloo), PEng
M.L. Constant, BSc (Toronto)
K.V. P. Hipel, BASc, MSc, PhD (Waterloo), PEng
G.F. Rabideau, BA, MA (Wisconsin),
PhD (Purdue)
P.L. Seeley, BASc (Toronto)
S. Toida, BS (Toyko), MSc, PhD (Illinois)
B.L. Wils, BASc, MSc, PhD (Waterloo), PEng

Assistant Professors
C.K.G. Hahn, MASC, (Waterloo)
G.J. Savage, BASc, MASC, PhD (Waterloo), PEng

Visiting Assistant Professor
Karmeshu, BASc, MSc, PhD (Delhi)

Adjunct Assistant Professor
M. Kamel, BSc (Alexandria), MSc (McMaster), PhD (Toronto)

'(Cross Appointment with Department of Kinesiology)
'(Until August 1982)

Systems Design Course Numbering

The numbering of Systems Design courses is as follows:

- If the course is given in the “A” term, the number in the units place is odd; otherwise, it is even.
- The number in the 10’s place refers to the year in the program in which the student will encounter the course.

The majority of Systems Design courses are given on the basis of three formal lectures and one tutorial hour each week. The department endeavours to ensure that the formal course schedule remains below 30 hours per week in each term. Beyond this, other less formally scheduled meetings between students and faculty are required. It is expected that the average student will spend, in total, between 45 and 55 hours per week on his/her studies.

Course Descriptions

**SY DE 114 S 3C,1T 0.5**

**Theory and Applications of Probability**


**Course Descriptions**

**SY DE 101/102 F,S 1C 0.0**

**Tutorial**

Systems Design first year students will meet with a faculty member designated as their class professor. Performance in assignments, conceptual difficulties with course work, 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 digital computers; hardware and software organization, basic features of Fortran, examples of efficient algorithms for engineering computations.

**SY DE 122 S 3C,1T 0.5**

**Introduction to Computer Systems**

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 2C,3L,1T 0.5**

**Engineering Economics**

Cost-benefit analysis, critical path methods, interest, project economics, decision making, utility theory, project organizational theory.

**SY DE 142 S 2C,2T 0.5**

**Introduction to Ergonomics**

The man-machine environment complex; the nature of the operational environment; human sensory processes, human information processing, motor function, human work, thermal regulation and metabolism, skill, fatigue; shift work and circadian rhythms, problems of acoustic noise, vibration, heat, cold; needs of ventilation and lighting, information displays and control systems.

**SY DE 161 F 2C,3L,1T 0.5**

**Introduction to Systems Design 1**

Introduction to the ideas and techniques of systems analysis and design. Fundamentals of graphic techniques. The use of graphics as an aid to idea generation in design. Principles of planning, innovation, creation of design solutions, feasibility analysis, solution evaluation and selection. The systems approach to value and utility.
Introduction to Systems Design 2
A continuation of SY DE 161 with emphasis on need analysis and problem definition. Techniques of surveying, market analysis. Generation of design criteria and introduction to decision analysis. A number of open ended problems taken to the stage of solution specification.

Statics

Dynamics

SY DE 201/202 W,F 1C 0.0 Tutorial
Systems Design second year students will meet a faculty member designated as their class professor. Performance in assignments, conceptual difficulties with courses, interrelation of coursework, later work and engineering practice will be discussed. Non-credit courses.

Applicable Mathematics for Systems Design 1
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.

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 function and frequency response, frequency domain analysis of linear systems; sampling theory, stability, and linear filters.

Theory and Applications of Statistics

Physical Systems 1
Component models, interconnection models, systems equations and their rank properties and solutions. These concepts are developed with respect to electrical systems.

Systems Design Workshop 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.

Mechanics of Deformable Solids

Mechanics of Deformable Solids
An introductory course in engineering thermodynamics structured for students in Systems Design. Classical thermodynamics is presented as the systematic study of energy: its use, degradation, and waste. Applications focus on problems of energy and environment. The concepts of statistical thermodynamics are introduced briefly and their connections with information theory are described.

Electricity, Magnetism and Networks
Introduction to the fundamental laws of electricity and magnetism: properties of dielectrics, conductors and 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.

Fluid Mechanics

Systems Design Laboratory 1
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. Flip-flops and arithmetic logic units. An introduction to microprocessor components.

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.
Differential equations are the mathematical models for many physical systems. Numerical methods provide solutions to these equations, and their stability and accuracy are critical to the success of these models. The course will introduce the student to the formulating of problems, and the selection and application of appropriate numerical methods. This course is intended for students in engineering, science, and related fields. The course will cover topics such as finite difference methods, finite element methods, and spectral methods. The emphasis will be on the development of numerical algorithms and their implementation in computer programs.
Course Descriptions
Systems Design Engineering

SY DE 411 F 2C,1T 0.5
Systems Operations 2
A continuation of SY DE 311, with emphasis on stochastic operations research models. Topics will include; decision making under uncertainty, queuing models and related probabilistic techniques, feedback control, probabilistic inventory, competitive strategies and related topics.

SY DE 413 F 2C,1T 0.5
Linear Graph Theory and Applications
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 1
The design process: computer-oriented system models; simulation languages for continuous and discrete systems; man-machine interaction; design of problem-oriented computer languages.

SY DE 432 W 2C,1T 0.5
Analysis of Large Systems
Topics include macroscopic modelling of large scale resource and societal systems, decomposition techniques, graph-theoretic and computer based methods of analysis, decision and control problems, other problems concerned with complexity, largeness and aggregation.

SY DE 433 F 2C,1T 0.5
Conflict Analysis
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 role in design. Techniques of environmental measurement with respect to noise, vibration, heat, lighting, air sampling, etc., and selected studies in the methods of anthropometry.

SY DE 453 F 2C,1T 0.5
Time Domain Models for Physical Systems
State equations for two-terminal components systems; time varying and non-linear components; analytical solutions for state models, numerical and analogue methods for solution.

SY DE 454 W 2C,1T 0.5
Topics in Physical Systems Theory
This course applies physical systems theory to problems where the physical process is continuously distributed throughout a medium. The course contents include introduction to field and continuum problems, overview of approximate solution methods - including the finite difference method and the finite element method; identification of field variables; spatial discretization; modeling the field characteristics, formulations and computer solutions, applications of multi-terminal representations.

SY DE 458 W 3C,1T 0.5
Large Scale Engineering Systems
The course brings material from the core Systems Design curriculum to bear upon the analysis of large engineering systems, examples from a variety of engineering disciplines such as energy systems, economics, transportation, hydraulics, mechanical, electrical, and structural systems and their combinations; techniques for the analysis of complex systems using digital computers.

SY DE 461 F 1C,5L 0.5
Systems Design Workshop 5

SY DE 462 W 1C,5L 0.5
Systems Design Workshop 6
A continuation of the Systems Design Workshop sequence for fourth year students.

SY DE 466 W 2C,1T 0.5
Technological Innovation and Its Management
Factors influencing technological innovation. The environment for technological innovation in Canada. Technological innovation in the corporations. The role of governments and universities. International comparisons.

SY DE 468 W 3C,1T 0.5
Structures and Design
Structural forms. Structural requirements. Statically determinate and indeterminate structures. Basic theorems of linear elastic structures. Methods of analysis: slope-detection, moment distribution, etc. Application of Graph Theory to the analysis of structural systems.

SY DE 472 W 2C,1T 0.5
Man-Machine Communications
The nature and design of machine-mediated human communication systems. Displays, computer graphics, computer-aided instruction and mass communication media (film, T.V., radio, print). A systems approach will be adopted with special attention to the socio-economic aspects of such systems.
Course Descriptions

Urban and Regional Planning

School of Urban and Regional Planning

Professor, Director
D.W. Hoffman, BSA, MSA (Toronto), PhD (Waterloo), PAg, MCIP

Assistant Professor, Associate Director
N.M. Lazarowich, BA (Saskatchewan), MA, MCP, PhD (Cincinnati), AICP

Professor, Graduate Officer
H.S. Coblentz, BA Hons (Durham), MRP (North Carolina), MCIP, FRTP, AICP, FSS, MIES

Professor, Associate Dean Graduate Studies
L.O. Gertler, BA (Queen's), MA (Toronto), FCIP

Associate Professor, Undergraduate Officer
L.R.G. Martin, BA (Queen's), MA, MRP, PhD (Syracuse), MCIP

Professional Liaison Officer
H.T. Lomon, FCIP

Professors
R.S. Dorney, BSoc, MSc, PhD (Wisconsin), MCIP
K. Izumi, BArch (Manitoba), MCP (MIT), ARCA, FRAIC, CAMAO
C.K. Knappert, BA Hons (Sheffield), PhD (Saskatchewan)
R.R. Krueger4th, BA, MA (Western Ontario), PhD (Indiana)
P.H. Nash5th, BA, MA (UCLA), CE (Grenoble), MCP, MPA, PhD (Harvard), AICP, MCIP
L.H. Russwurm6th, BA, MA (Western Ontario), PhD (Illinois)

Associate Professors
S. Herzog, BArch (Toronto), MRAIC
J.T. Horton, BA (Wheaton), MA (Northwestern)
J. Levy6th, BA (Waterloo Lutheran), BPE (Waterloo), MSW (Waterloo Lutheran), PhD (Waterloo)
A.G. McLellan7th, BSc, PhD (Glasgow)
G.G. Mulamoottil, BSc (Mysore), MSc (Bombay), PhD (Delhi) (On Sabbatical Leave 1980-81)
R.T. Newkirk8th, BA, MSc, PhD (Western Ontario) (On Sabbatical Leave 1982-83)
N.E.P. Pressman, BArch (McGill), March, urb des (Cornell), Cert USP (Manchester), MCIP, AICP, AIU
G.B. Pringle9th, BA (Western Ontario), MA, PhD (Clark)
S.G. Rich, MCIP, MRAIC, ARIBA, AICP
W.I. Shalinsky, BA, BSW (McGill), MSc, DSW (Western Reserve) (On Sabbatical Leave 1982-83)
J.B. Theberge10th, BScA (Guelph), MSc (Toronto), PhD (British Columbia)
D.F. Walker11th, BSc (London), MA, PhD (Toronto)
S.M. Weaver12th, BA, MA PhD (Toronto)
D.H. Wood13th, BComm, LLB (Toronto)

Assistant Professors
E. Baxter, BA, MA (British Columbia), PhD (Oregon)
T.J. Downey14th, BA (Waterloo), MA, PhD (Western Ontario)
P. Eagles15th, BSc (Waterloo), MSc (Guelph), PhD (Waterloo)
M.E. Haight16th, BSc, MSc, PhD (McMaster)
R.C. Sutcliffe, BSc Hons (Wales), PhD (Guelph) (On Sabbatical Leave 1982-83)

Adjunct Professors
H.C. Abell, BHSc (Toronto), MS, PhD (Cornell)
A. devos, MSc, PhD (Wisconsin)
M.K. Foster, BA (Toronto), MPhil, PhD (Columbia)

Course DE 525 F, S 3 C 0.5
Computer-Aided Simulation and Design
System modelling and simulation techniques, fundamentals of analogue computation, time and magnitude scaling, continuous system simulation on the digital computer; advantages and disadvantages of digital and analogue simulation techniques; discrete-event system simulation on the digital computer; system simulation; examples and problems.

Course DE 535 F, S 3 C 0.5
Selected Topics for Socio-Economic Systems Design
This course is intended for students who, with little prior background, are interested in enhancing their knowledge of Systems Design. The emphasis is on qualitative methods applicable to the design of engineering systems wherein the criteria concerning social, environmental and economic considerations are important. Both deterministic and probabilistic situations are discussed.

Course DE 543 W 3 C 0.5
Human Engineering
Man-machine systems concepts; functional man-machine interfaces; presentation of required operating information; control/display design parameters; workspace configuration and dimensioning; human engineering analysis and simulation; human performance experimentation and human engineering measurements during systems R&D evaluation.

Course DE 544 F, S 3 C 0.5
Ergonomics
Significance of ergonomics; man-machine-environment complex; physiology of work, human information processing, fatigue, circadian rhythms and the health consequences of shift work; environmental factors in industry; noise, vibration, vision, illumination, heat, cold, toxic chemicals, industrial safety.

Course DE 555 F, S 3 C 0.5
Introduction to Physical Systems
This course introduces students to a unified approach to Physical System Theory, using a graph-theoretical modelling technique. Specific topics include: component modelling, the system graph and its matrices, system modelling by the branch, chord and branch-chord methods, power, energy, Telegan's theorem, multi-terminal representations, piecewise analysis of systems through subsystems, multipport representations, formulation and solutions of state models, introduction to advanced topics.

Course DE 556 W 3 C 0.5
Design Morphology and Organization
Generation of problem statements, system identification, generation of solution sets, feasibility determination. Construction of archetypes, sensitivity, compatibility and stability analysis; behaviour prediction and solution communication.

Course DE 567 F 3 C 0.5
Introduction to Systems Behaviour
The basic aim of this course is to introduce the student to the study and understanding of systems and their general behaviour, to broaden systems concepts and the techniques used in applying these concepts in a variety of fields. The fields chosen cover biological, ecological, social, operational, economic and man-machine systems. A number of case studies are conducted.
### Course Descriptions

#### Urban and Regional Planning

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLAN 100</td>
<td>3.0</td>
<td>Introduction to Urban and Regional Planning Concepts and Techniques</td>
</tr>
<tr>
<td>PLAN 222</td>
<td>2.0</td>
<td>Canadian Regional Issues</td>
</tr>
<tr>
<td>PLAN 230</td>
<td>3.0</td>
<td>The Small Group in the Planning Process</td>
</tr>
<tr>
<td>PLAN 231</td>
<td>3.0</td>
<td>Citizen Involvement, Planning and Social Change</td>
</tr>
<tr>
<td>PLAN 255</td>
<td>2.0</td>
<td>Planning Surveys and Analyses</td>
</tr>
<tr>
<td>PLAN 256</td>
<td>2.0</td>
<td>Environmental Design</td>
</tr>
<tr>
<td>PLAN 259</td>
<td>2.0</td>
<td>Regional Planning and Development</td>
</tr>
</tbody>
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### Faculty Members Holding Joint and/or Cross Appointments as Shown

1. Planning and Biology
2. Planning and Geography
3. Environmental Studies
4. Planning and Man-Environment Studies
5. Planning and Anthropology
6. Planning and Recreation
7. Environmental Studies and Psychology
8. Planning and Political Science
9. Planning, Environmental Studies, Biology and Health Studies

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### Course Descriptions (Environmental Studies course descriptions (ENV S) begin on page 308.)

**PLAN 100 Y 3C.1D 1.0**  
Introduction to Urban and Regional Planning Concepts and Techniques  
An introduction to the regional city; the development of contemporary planning concepts and principles; the nature, purpose and scope of urban planning; the planning process and decision-making in a democratic society.  
Prereq: Planning students only.

**ENV S 111**  
Introduction to the Study of the Future

**PLAN 156 F.W 2C.1D 0.5**  
Introduction to Urban and Regional Planning Concepts  
An introduction to contemporary planning ideas for students whose subsequent work might bring them in contact with professional planners. Planning concepts and principles: the development of contemporary planning ideas; the nature, purpose and scope of urban and regional planning; the planning process and decision-making in a democratic society.  
Prereq: None. (Not available for credit to planning students). Restricted to 1st and 2nd year students in other programs.

**PLAN 159 F.W 2std 0.5**  
Graphics for Planning  
Basic instruction in graphic techniques used in planning. Emphasis will be placed on the use of graphics for the communication of ideas.  
Prereq: Planning students or consent of instructor. Estimated cost to student: $30.

**ENV S 195A**  
Introduction to Environmental Studies

**ENV S 195B**  
Introduction to Environmental Problems

**ENV S 200**  
Field Ecology

**ENV S 201**  
Introduction to Environmental and Planning Law

**ENV S 202**  
Social Science Approaches to Environmental Problems

**PLAN 222 W 2C.1D 0.5**  
Canadian Regional Issues  
Selective study of Canadian development issues pertaining to the use of land, urbanization, regional and resource development; issues will be related to structural and functional forces that are characteristics of the major regions of Canada, e.g., Atlantic Provinces, British Columbia.  
Prereq: None.

**PLAN 230 F 3C.0.5**  
The Small Group in the Planning Process  
The small group and its relevance to the planning process. Focus on work groups such as committees, councils and boards. Various important elements of small groups such as leadership, goal setting, influence, decision-making and interpersonal relationships will be examined and related to planning.  
Prereq: SOC 101 or consent of instructor.

**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.

**ENV S 252**  
Media Tools for Environmental Studies

**ENV S 253**  
Media Tools for Environmental Studies - Advanced Level

**PLAN 255 W 2C.2wkshp 0.5**  
Planning Surveys and Analyses  
Sources of data for planning and their analyses. The course will emphasize the sources, methods of collection and analysis of urban and regional land-use data. Particular attention is paid to the types of land-use information essential to transportation, housing, public facilities and recreation planning. Both lecture and workshop are related to a significant problem of land-use planning in Ontario.  
Prereq: PLAN 100 or consent of instructor.

**PLAN 256 Y 2C.2std 1.0**  
Environmental Design  
Design concepts in Urban and Regional Planning illustrated by recent work. Individual and group projects in planning design in urban and regional settings, using graphic, model and verbal presentations.  
Prereq: Second year Planning or Environmental Studies students with consent of instructor.

**PLAN 259 E 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-centered, 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
PLAN 270 W 2C 0.5
Concepts and Ideas in Contemporary Urban Planning
An overview of the modern movements and philosophical roots underlying urban planning and civic design. Philosophies and contributions of those who have significantly influenced modern historical thought. Development of planning trends and ideas in North America and abroad emphasizing relevance to contemporary concerns.
Prereq: Planning students or consent of instructor.

ENV S 271
Introduction to Quantitative Research Methods

ENV S 272
Computer Programming in Environmental Studies

PLAN 275 F.W 3S 0.5
Readings and Research in Planning
Special readings and research on planning topics chosen in consultation with an instructor. This course gives the opportunity for supervised individual reading and study of planning or related topics in which the student is particularly interested.
Prereq: PLAN 100 or consent of instructor. Prior to registering for this course students must arrange with a faculty member to serve as advisor.

PLAN 275A W 3C 0.5
Rural Planning
Advanced analysis of the process followed for rural planning in Canada and other selected countries. Problems and their solutions as noted in various jurisdictions are presented. Emphasis is placed on government and non-government approaches to planning the Ontario countryside.

PLAN 300 Y 3wkshp 1.0
Seminar/Workshop Project in Urban and Regional Planning
An integrated approach to the comprehensive analysis and design of communities: identification and synthesis of factors relating to function; structure, environmental context, regional framework etc., in the preparation of comprehensive development programs. A major project undertaken in small project groups.
Prereq: Third year Planning students only.

PLAN 303 F.W 3std 0.5
Planning Design
A study of a particular design aspect of planning through a series of individual and group projects. The topic varies each term.
Prereq: Planning students or consent of instructor.

PLAN 307 F.W 2C.1D 0.5
Social Survey Techniques
Social research and the planning process; interview and self-administered surveys; questionnaire design; profile data; data processing, sampling, non-survey and data collection techniques; practical applications. Cross-listed as GEOG 307.
Prereq: Second or third year Planning students with ENV S 271; other ENV S students with consent of instructor.

ENV S 310
Behavioural Studies

PLAN 316 W 3S 0.5
Multivariate Statistics
The theory and application of multivariate statistics, with particular emphasis upon the use of the computer. Cross-listed as GEOG 316.
Prereq: ENV S 271 or consent of instructor.

PLAN 317 W 2C.1L 0.5
Nonparametric Statistics
The theory and application of non-parametric statistics with emphasis upon social science problems. Cross-listed as GEOG 317.
Prereq: ENV S 271 or consent of instructor.

PLAN 318 F 3C 0.5
Spatial Analysis
Advanced quantitative analysis of spatial patterns and interactions. Focus on a selection of techniques from gravity models, linear programming, nearest neighbour analysis, Markov chain analysis, graph theory, simulation and trend surface analysis. Cross-listed as GEOG 318.
Prereq: ENV S 271 or consent of instructor.

PLAN 319 F 2C.1L 0.5
Economic and Social Techniques for Regional Planning
Study and critical appraisal of a selection of descriptive and evaluative regional analysis techniques in common use. Reliability and applicability will be reviewed. Emphasis given to economic considerations of regional development. Discussion of input-output analysis; cost-benefit analysis, planning, programming and budgeting systems; and social area analysis. Cross-listed as GEOG 319.
Prereq: SOC 101, or instructor's consent.

PLAN 330 W 2C.1S 0.5
Urban Social Planning
This course looks at social planning as a way of attacking urban social problems. Will examine the different types of social planning and the relationship between physical and social planning.
Prereq: ECON 101, 102 or instructor's consent.

PLAN 332 W 2C.1S 0.5
The Sociology of Rural Development
Basic concepts of sociology; occupational and concomitant social adjustments of rural society in response to forces of urbanization and industrialization; social movements generated within the farm population. Case studies in Canadian rural development.
Prereq: SOC 101 or consent of instructor.

ENV S 333
Parkland Management

PLAN 333 F 3C 0.5
The Sociology of Regional Planning
Power structures, basic social institutions, attitudes and values related to the implementation of regional plans; regional development of human natural resources in Canada and abroad.
Prereq: SOC 101 or consent of instructor.

PLAN 342 F 3C 0.5
Urban and Regional Planning: (Part 1)
Urban planning as a method of obtaining command over the major tools for problem identification, analysis and resolution. Planning types and practice, processes and achievements, determinants of physical urban structure and supporting systems, case studies and examples. Emphasis on urban development and responses to dilemmas of the built environment.
Prereq: None. (Not available for credit to Planning students.) Restricted to 3rd and 4th year students.
Course Descriptions

Urban and Regional Planning

PLAN 343 W 3C 0.5
Urban and Regional Planning: (Part 2)
The role of the public and private sectors in regional development and their relationship to the planning process, current urban and regional issues and plans.
Prereq: PLAN 342 or consent of instructor. (Not available for credit to Planning students.)

PLAN 344 W 2CJS 0.5
Recreation Planning
An examination 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 planning issues.

PLAN 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. This course is the same as GEOG 357.
Prereq: ENV S 200.
Estimated cost to student: $10.

ENV S 358
Environmental Pollution and Its Control

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. Cross-listed as CIV E 190.
Prereq: PLAN 256 or consent of instructor.

PLAN 370 W 3C 0.5
Land Development Planning
An examination of planning issues related to the economics and financing of public and private development projects including shopping plazas, residential subdivisions, and new towns. The course focuses on sources of financing, financial programming, effects of planning decisions on land values, and techniques of project evaluation.
Prereq: PLAN 255 or consent of instructor.

ENV S 360/381
Environmental Studies Workshop

PLAN 391 W Fldlab 0.5
Field Research Methods and Projects
Selected field trip experience directly related to the theme content of PLAN 300, including assignments, follow-up discussion, and presentation of research papers. The School covers part of the cost of travel and accommodations for field trips. Approximately $60.00 will cover the remainder of transportation and accommodation costs on a one week field trip. Students are responsible for the cost of their meals.
Prereq: Enrollment in PLAN 300.

ENV S 401
Environmental Law

ENV S 402
Planning Law

ENV S 411
Alternative Future Environments 1

ENV S 412
Alternative Future Environments 2

PLAN 414 F 3C 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 counties.
Prereq: PLAN 256 or consent of instructor.

ENV S 417
Land Use History and Landscape Change 1

ENV S 418
Land Use History and Landscape Change 2

PLAN 420 W 2C 0.5
Health, Environment, and Planning
A seminar course on the environmental sources and causes of disease and illness, the concepts of health, e.g., medical, scientific, economic, political, etc., the health services and facilities and related technologies and the role and responsibility of (urban and regional) planners in the creation of a more "healthful" environment.
Prereq: Third and fourth year planning students or consent of instructor.

PLAN 430 F 3C 0.5
Social Policy Planning
This course develops a reasoned systems approach to understand change and develop strategies for change through an integration of social goals, policy and programs. Institutional performance criteria are identified in time and space at the level of system, subsystems and their components.
Identification of measures of quality and change strategies are attempted for the components for peaceful and fundamental social change through the development of enlightened social policy.

ENV S 444
Land Evaluation and Resource Management

PLAN 449 Y 1.0
Canadian Urban and Regional Planning: (Part 1)
An overview of the evaluation of Canadian urban and regional planning covering the Canadian Planner's heritage, colonial planning, growth stages of post colonial planning, planning principles with an indepth examination of comprehensive planning and zoning, and the scope of planning education especially in our School.
Prereq: Consent of School.

PLAN 450 Y 1.0
Canadian Urban and Regional Planning: (Part 2)
A review of Canadian urban literature focusing on major themes. The literature will be examined through subject areas such as housing, land policy, redevelopment and urban politics.
Prereq: Consent of School.

PLAN 454 W 2S 0.5
Professional Practice in Planning
This course is intended for undergraduate planning students in their
final year who will be starting professional practice on graduation. The course discusses professional responsibility, administrative tools and methods, office organization and similar topics. Concepts and techniques in other courses will be dealt with from the point of view of the practitioner.

Prereq: Fourth year planning students or consent of instructor.

PLAN 466 Y 2C 1.0
Political and Administrative Processes in Urban and Regional Planning
The formulation of urban/regional policy, including planning legislation, in an inter-governmental setting: federal, provincial and municipal; the study of both the process and substance of urban policy-making, planning and implementation in Canada.
Prereq: Fourth year Planning students or fourth year Environmental Studies students with consent of instructor.

PLAN 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.

PLAN 476 Y 3Q 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.

PLAN 480 Y 3S 1.0
The Philosophy and Methodology of Urban and Regional Planning
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.

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H. Marsden, BA (Randolph-Macon), MA (Waterloo)

Library
S. Bellingham, BA (Waterloo Lutheran), MLS (Western Ontario)

Integrated Studies
D. Smith

It is the policy of the University of Waterloo that the study of women's issues as well as the history of women's accomplishments be incorporated into the regular course offerings of all faculties. In the courses listed below, the student interested in studying women in the context of a variety of disciplines will find appropriate material. A proportion of each course, which may vary according to the discipline and the instructor, focuses on the study of women. All courses are regular credit courses, counting like any other course toward the fulfillment of requirements for majors and honours in their respective discipline.

The Arts Library has one of the largest special collections on women in Canada. It is being constantly expanded and contains considerable unique archival material.

The additional resources of nearby Wilfrid Laurier University, which offers a number of complementary Women's Studies courses, make the Waterloo area an excellent centre for the study of women.

Students who are interested in Women's Studies will find complete course descriptions in the appropriate departmental sections of this Calendar. They are urged to discuss the content of a particular course with the instructor or to contact the Co-ordinator of Women's Studies for further information.
Course Descriptions
Women's Studies

Principal Women's Studies Content Courses

ANTH 350  Sex Roles in Anthropology
DIOL 447  History of Biology
C CIV 201  Ancient Greek Society
C CIV 202  Ancient Roman Society
CS 492  The Social Implications of Computing
DANCE 110  Introduction to the World of Dance
DANCE 233  A History of Modern Dance
ENGL 108E  Women in Literature
ENGL 208E  Women Writers of the 20th Century
ENGL 211  The Novel 1
ENGL 212  The Novel 2
ENGL 316  Canadian Drama
ENGL 335  Creative Writing
ENGL 415  Major Canadian Writers
FINE 248R  Film as Social Criticism
FINE 316  Canadian Native Art
FR 273  Aspects of Quebec
FR 391  French Women Writers
HIST 202X  The Individual and the Family in History
HIST 252X  Europe in the Nineteenth Century
HIST 254X  Canadian History: The National Period
ITAL 396J  Special Topics/Directed Readings
M ENV 241  Social Change
PHIL 201  Love
PHIL 202  Philosophy of Women
PHIL 220  Moral Issues
PHIL 302  Modern Feminism
P SCI 272  Political Behaviour 2
P SCI 344  The Politics of Local Government
P SCI 475  Political Socialization
P SCI 476  Research Seminar in Political Behaviour
PSYCH 214  Psychology of Adolescence
PSYCH 236  A Psychological Analysis of Human Sexuality
PSYCH 253  Social Psychology
PSYCH 311  Behaviour and Development of Human Infants
PSYCH 316  Moral Development
PSYCH 331  Individual Differences
PSYCH 364F  Sex, Evolution and Social Behaviour

Course Descriptions
Cross-Cultural
Psychology
Human Sexuality and Christian Morality
Current Ethical Issues
Women and the Great Religions
Biological and Society
The History of Science 1
The History of Science 2
Sex Roles
Occupational Sociology
Women in Contemporary Spanish American Theatre
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University Chancellor Dr. Josef Kates and other President’s Committee members attending a MICROWAT demonstration
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