University of Waterloo
Undergraduate Calendar
1983-1984
The Undergraduate Calendar

The information in this Calendar applies to the 1983-84 academic session which commences in September 1983.

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 25 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. 2208
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 1983-84

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

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

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

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.

Major
Used by some faculties to refer to the area(s) of academic emphasis selected in either an Honours or a General program.

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

Option
A specified combination of grouping of courses which provides a secondary emphasis in certain programs. The emphasis may be in another academic subject, as in Honours Chemistry (Physics Option), or in a career-oriented area, such as Honours Physics (Business Administration Option), or Honours Mathematics (Teaching Option).

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

Program
A series of courses, a number of which may be mandatory and of a specialized nature, which lead toward a degree. Details of the several types of programs offered such as Honours, General, Pass, 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 — 1983

<table>
<thead>
<tr>
<th>Event/Deadline</th>
<th>Date/Day</th>
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<tbody>
<tr>
<td>Pre-registration Begins - Undergraduate Programs - Fall Term</td>
<td>March 7 Monday</td>
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<tr>
<td>Pre-registration Ends - Undergraduate Programs - Fall Term</td>
<td>March 11 Friday</td>
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<tr>
<td>Meeting - University Senate, 7:30 p.m.</td>
<td>March 21 Monday</td>
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<tr>
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<td>March 22 Tuesday</td>
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<tr>
<td>Lectures End - Winter Term</td>
<td>March 31 Thursday</td>
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<tr>
<td>Good Friday - University Holiday*</td>
<td>April 1 Friday</td>
</tr>
<tr>
<td>Examinations Begin - Winter Term</td>
<td>April 4 Monday</td>
</tr>
<tr>
<td>Meeting - Senate Executive Committee</td>
<td>April 4 Monday</td>
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<tr>
<td>Meeting - Board of Governors, 10:00 a.m.</td>
<td>April 5 Tuesday</td>
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<tr>
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<td>April 22 Friday</td>
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<tr>
<td>Winter Work Term Ends - Co-operative Programs</td>
<td>April 29 Friday</td>
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<tr>
<td>Final Examination Results Due</td>
<td>April 29 Friday</td>
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<tr>
<td>Spring Work Term Begins - Co-operative Programs</td>
<td>May 2 Monday</td>
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<tr>
<td>Registration - Undergraduate Programs - Spring Term</td>
<td>May 2 Monday</td>
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<tr>
<td>Registration - Graduate Studies - Spring Term</td>
<td>May 2 Monday</td>
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<tr>
<td>Meeting - Senate Executive Committee</td>
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<td>Lectures Begin - Spring Term</td>
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<tr>
<td>Start of Late Fees - Spring Term</td>
<td>May 3 Tuesday</td>
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<td>May 7 Saturday</td>
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<td>End of Course Change Period - Spring Term - See Individual Faculty Chapters</td>
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<td>May 26 Thursday</td>
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*Some University Departments may be open for limited service on these days.
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<tr>
<td>Spring Convocation</td>
<td>May 26</td>
<td>Saturday</td>
</tr>
</tbody>
</table>

* Some University Departments may be open for limited service on these days.
## 1984 Continued

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meeting - Senate Executive Committee</td>
<td>June 4</td>
<td>Monday</td>
</tr>
<tr>
<td>Meeting - Board of Governors, 10:00 a.m.</td>
<td>June 5</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Pre-registration Begins - Co-operative Programs - Winter Term</td>
<td>June 6</td>
<td>Wednesday</td>
</tr>
<tr>
<td>Pre-registration Ends - Co-operative Programs - Winter Term</td>
<td>June 8</td>
<td>Friday</td>
</tr>
<tr>
<td>Meeting - University Senate, 7:30 p.m.</td>
<td>June 18</td>
<td>Monday</td>
</tr>
<tr>
<td>Canada Day - University Holiday*</td>
<td>July 2</td>
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<tr>
<td>Registration - Summer Session</td>
<td>July 3</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Lectures Begin - Summer Session</td>
<td>July 3</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Start of Late Fees - Summer Session</td>
<td>July 4</td>
<td>Wednesday</td>
</tr>
<tr>
<td>Lectures End - Spring Term</td>
<td>July 27</td>
<td>Friday</td>
</tr>
<tr>
<td>Examinations Begin - Spring Term</td>
<td>July 30</td>
<td>Monday</td>
</tr>
<tr>
<td>Civic Holiday - University Holiday*</td>
<td>August 6</td>
<td>Monday</td>
</tr>
<tr>
<td>Lectures End - Summer Session</td>
<td>August 10</td>
<td>Friday</td>
</tr>
<tr>
<td>Examinations End - Spring Term</td>
<td>August 11</td>
<td>Saturday</td>
</tr>
<tr>
<td>Examinations - Summer Session</td>
<td>August 11</td>
<td>Saturday</td>
</tr>
<tr>
<td>Examinations, Correspondence - Spring Term</td>
<td>August 11</td>
<td>Saturday</td>
</tr>
<tr>
<td>Final Examination Results Due</td>
<td>August 17</td>
<td>Friday</td>
</tr>
<tr>
<td>Spring Work Term Ends - Co-operative Programs</td>
<td>August 31</td>
<td>Friday</td>
</tr>
<tr>
<td>Fall Work Term Begins - Co-operative Programs</td>
<td>September 5</td>
<td>Wednesday</td>
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*Some University Departments may be open for limited service on these days.*
### 1983

<table>
<thead>
<tr>
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<th>July</th>
<th>October</th>
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<tbody>
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<td>25 26</td>
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### 1984

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<td>26 27 28 29</td>
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<td>30 31</td>
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### 1985

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<td>26 27 28 29 30 31</td>
<td>1 2 3 4</td>
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</tbody>
</table>

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**Note:** The above table represents a calendar for the years 1983, 1984, and 1985, with months listed across the top and weeks of the month listed vertically. Days of the week are labeled from Monday (S) to Sunday (S).
Location of Kitchener-Waterloo

Routes to UW Campus

To reach UW campus from Hwy 401, 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 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 1963-64 academic session which commences in September 1963.

The University

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

The Campus

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

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

University Colours and Coat of Arms

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

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

Motto
Concordia Cum Veritate - In Harmony with Truth

The University Mace

The symbolic theme may be described as follows:

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

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

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

University Jurisdiction

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

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

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

Full-time enrolment for each Faculty including church colleges and off campus students (as of November 1, 1982).

- Faculty of Arts: 2978
- Faculty of Engineering: 3348
- Faculty of Environmental Studies: 1363
- Faculty of Human Kinetics and Leisure Studies: 1165
- Integrated Studies Program: 95
- Faculty of Mathematics: 3728
- Faculty of Science: 2228

Total Undergraduate Enrolment (Full-time): 14895
Graduate Student Enrolment (Full-Time): 1285

The Church Colleges

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

University of St. Jerome's College

The University of St. Jerome's College is a liberal arts college which had been affiliated with the University of Ottawa before entering into federation with the University of Waterloo in July, 1960. 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 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, an auditorium complex, a men's residence accommodating 126 students and a women's residence, Notre Dame College, operated by the School Sisters of Notre Dame, which has room for 128 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 number of courses in Religious Studies, which are available for academic credit to any student enrolled in the University.

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

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

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

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

The University of Waterloo offers the following graduate degrees:

- Master of Arts (MA)
- Master of Applied Science (MASc)
- Master of Mathematics (MMath)
- Master of Philosophy (MPhill)
- 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
By making courses available at times and locations convenient to part-time students and by making courses available through its Correspondence program, the University of Waterloo encourages students to take university credit courses for any purpose they may choose. No academic distinction is made between part-time and full-time students; grading practices and promotion policies are precisely the same. Further, adults may be admitted for degree study under UW's Adult Student Admission Policy. The great majority of mature students are in part-time studies. Tuition is assessed as a fee per course.

Mature Student Services
Mature Student Services, part of the Office of Part-time Studies and Continuing Education, provides special programs and services for students, both full time and part-time, returning to the classroom after a number of years.
Regularly scheduled orientation workshops and talks on careers are offered, as well as special services such as learning skills packages, a newsletter, a buddy system, and a library of tapes on topics of interest to mature students.

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

Part-Time Studies off Campus
More than forty University of Waterloo credit courses are now offered each year in community centres in Kitchener and Waterloo as well as in Stratford, Halton Hills, Walkerton, Orangeville, and Cambridge. 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.

Correspondence Courses
The University of Waterloo operates the largest university-level correspondence program in Canada. More than 280 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 courses and on other special materials that may be required.

Complete details about correspondence courses and application forms are provided in the Correspondence Calendar. Copies may be obtained from:
Correspondence Office
University of Waterloo,
Waterloo, Ontario
N2L 3G1
(519) 885-1211, ext. 3901

B.Sc. N. Program for Registered Nurses
Registered nurses in the Waterloo Region may take certain courses at the University of Waterloo which can be applied toward the Bachelor of Science-Nursing degree at the University of Western Ontario. These courses are available on campus or through correspondence. Further information is available from the Faculty of Nursing, University of Western Ontario, or from the Office of 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 of Waterloo has a variety of other continuing education offerings including the following:
- The Economic Development Program;
- Professional development courses in the School of Optometry;
- The Certificate in Gerontology;
- Certificates in Social Work through Renison College

The University cooperates with a number of outside organizations regarding their program and designations. Certain UW courses count for credit in the following:
- Appraisal Institute of Canada
- Canadian Hospital Association Course in Health Services Management
- Canadian Institute of Certified Administration Managers Program (CAM)
Cross-registration with Wilfrid Laurier University

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

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

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

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

For further details, contact the Registrar's office.

Grading System

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

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

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

<table>
<thead>
<tr>
<th>Assigned Letter Grades</th>
<th>Common Percentage</th>
<th>Assigned Grades</th>
<th>Weighting Factors*</th>
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<td>A</td>
<td>89</td>
<td>85-89</td>
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<tr>
<td>A-</td>
<td>83</td>
<td>80-84</td>
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<tr>
<td>B+</td>
<td>78</td>
<td>77-79</td>
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</tr>
<tr>
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<td>67-69</td>
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<tr>
<td>C</td>
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<td>63-66</td>
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<tr>
<td>F+</td>
<td>46</td>
<td>42-49</td>
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<td>F</td>
<td>38</td>
<td>35-41</td>
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<tr>
<td>F-</td>
<td>32</td>
<td>0-34</td>
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</tbody>
</table>

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

Non-Graded Standings

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

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

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

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

If a student completes an examination, even though he/she is ill, the subsequent grade obtained in the course must normally stand. Subsequent appeals on the grounds of illness may be considered if accompanied by proper medical documentation and submitted as soon as possible after the examination to the course instructor or to the Registrar's Office as required by faculty regulations. The student's Department or Faculty may take the illness into consideration, and possibly alter academic decisions. Whenever 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.

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.

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.
various other less regular publications. More details on each of the Boards and their activities are outlined in the Student Handbook.

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

The Ombudsman deals with situations both academic and non-academic in nature. The Ombudsman's Office is located in the Campus Centre, room 235. Appointments can be made by calling ext. 2402 or by dropping into the Office. All letters and interviews are treated confidentially.

Other services provided by the Federation of Students include the Record Store, Campus Shop, Post Office, Used Books Store and the Bombshelter Pub and Patio.

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, with the assistance of a Student Board advising the Director of Administrative Services, 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
Imprint is the student-funded newspaper with offices located in Campus Centre, room 140. Imprint is a non-profit corporation independent of the Federation of Students. Imprint is published weekly during the fall and winter terms, and bi-weekly during the spring term.

Imprint welcomes volunteers. Training is provided in the areas of writing, photography and graphics. More information is available Monday to Friday, 9:00 a.m. to 4:30 p.m., or by calling ext. 2331 or 885-1660.

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

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

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

Centre for the Arts
Room 161, Hagey Hall of the Humanities
Entertainment is available on campus throughout the fall and winter terms in UW's two attractive theatres, at special discounts for students. The UW Arts Centre offers a season of professional shows including stage, music, dance and student series, children's live theatre, and an international series.

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 drama presentations, free noon hour concerts and various campus events.

In addition, the Centre co-operates with the Federation of Students and other campus organizations in many other university-based theatrical events. The two theatres are also rented from time to time to community organizations such as the Gilbert and Sullivan Society, the Barbershoppers and more. The UW Arts Centre general offices and box office are located in Room 161, Hagey Hall of the Humanities, ext. 2126 or 2127. Free brochures and tickets are available here.

Counselling Services, Room 2080
Needles Hall
Professionally trained counsellors are available to help students with educational and career decisions as well as personal and social concerns. Individual interviews, group counselling and study skills classes are some of the services which Counselling offers to students. Appointments can be made by calling extension 2655 or by dropping into the offices on the second floor of Needles Hall. Hours are 8:30 a.m. to 5:00 p.m., Monday through Friday.
**Dean of Women**  
**Room 224, Modern Languages Building**  
This office serves as a general advisory centre for all students who wish to discuss academic programs, career choices, to sort out personal difficulties, or to find a sounding board for their own ideas. Students are invited to drop by at any time during regular office hours.

**Health Services**  
**Health Services Building**  
Health Services is the Medical clinic centrally located on campus. It provides comprehensive health care to all students and emergency care to anyone on campus. Physicians, nurses and a counsellor are on staff at the clinic which is open Monday to Friday from 8:30 a.m. to 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 act as a centre of communications between granting agencies and faculty, to assist faculty in obtaining grants and contracts for undertaking research, and to provide financial monitoring and reporting to researchers and external sponsors.

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

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

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

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

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

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

**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 toward 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 Braille, Kurzweil reading machine, and four-track tape recorders. The staff will also provide assistance for mobility impaired 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. TDD/TTY users may call 888-6250.

Foreign Student Office
The Foreign Student Office (FSO) located on the second floor of Needles Hall (within Counselling Services) aids foreign students through its special programs. Information is provided on many aspects of living in Canada — immigration regulations, community services, legal problems and cultural adjustment. Programs include Host Families, International Friends, English conversation class, emergency loans, 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 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. 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 Wednesday to provide students with the greatest exposure to lectures, other students, and faculty. Visitors to the campus are invited to phone to make arrangements. The number to call is (519) 885-1211, ext. 3614.
General Information

Applicants seeking admission to undergraduate programs are required to have suitable and adequate preparation to enable them to 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 1983.

Authority to Admit

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

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

The University reserves the right to withdraw the offer of admission made to an Ontario secondary school student if the applicant fails to complete Grade 13 with a minimum overall average of 60% in six Grade 13 credits.

St. Jerome's College

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

Inquiries and correspondence should be directed to:

The Registrar, St. Jerome's College.

Admissions

General Information

General Admission Requirements

Renison College

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

Inquiries and correspondence regarding admissions should be directed to:

The Registrar, Renison College.

General Admission Requirements

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

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

Applicants educated outside of Ontario must submit evidence of having obtained a level of education equivalent to Ontario Grade 13 (see chart on page 30-32) 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 1983, 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.
Applicants - Ontario Grade 13

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

The 1983-84 Admission Requirements for applicants from Ontario Grade 13 Programs are shown in the chart on page 30.

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 with advanced credit for as much as one year of a degree program.

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

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

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

Text continued on page 33.
### Specific Faculty Program Recommendations and Requirements

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Required Grade 13 Subjects and Minimum Averages</th>
<th>Recommendations</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts Regular</td>
<td>60% overall average in 6 Grade 13 credits.</td>
<td>Applicants should include courses such as English, History, Languages (other than English) in their Grade 13 program. English courses, particularly those that stress writing skills, are especially recommended. A Grade 13 Mathematics course is recommended for applicants who are considering social science programs.</td>
<td>In recent years, most students admitted have Grade 13 averages of 70% or better. 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>Co-op (Applied Studies)</td>
<td>70% overall average in 6 Grade 13 credits.</td>
<td>Applicants should take Grade 13 courses such as English, History, Science, Mathematics and a second language.</td>
<td>In recent years, most applicants admitted have had Grade 13 averages of 80% or better. Applicants not admitted to Arts Co-op (Applied Studies) will be considered for the Arts Regular program. Applicants interested in a specific Departmental Co-op program should apply initially to Arts Regular.</td>
</tr>
<tr>
<td>Co-op (Accountancy Studies)</td>
<td>70% overall average in 6 Grade 13 credits.</td>
<td>Applicants should include Grade 13 courses in English (particularly those that stress writing skills) Algebra and Calculus. Students without Algebra and/or Calculus must rectify this deficiency in Year 1.</td>
<td>Applicants with Grade 13 averages over 80% will be given first consideration. Students will register in either Co-op Chartered Accountancy (Economics Option) or Co-op Management Accountancy (Economics Option). Students not admitted to Co-op Accountancy Studies will be considered for the Arts Regular program, and may apply for admission to the Co-op Program after completion of the Fall Term.</td>
</tr>
<tr>
<td>Engineering</td>
<td>Relations &amp; Functions Calculus Algebra Physics Chemistry one additional 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 December (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 720 students. Approximately 90% of these places are filled by Ontario Grade 13 students. In recent years, most students admitted have had Grade 13 averages of 75% or better. However, a number of students with lower averages are admitted when other evidence indicates extensive involvement in extra-curricular activities and an aptitude and interest in Engineering. The University reserves the right to withdraw offers of early admission for students receiving marks below 60% in any of the 6 credits.</td>
</tr>
<tr>
<td>Environmental Studies</td>
<td>Because of the increasing use of statistics and quantitative methods in environmental research, a Grade 13 Mathematics course is recommended for applicants to any Environmental Studies program.</td>
<td></td>
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</tr>
<tr>
<td>Faculty</td>
<td>Required Grade 13 Subjects and Minimum Averages</td>
<td>Recommendations</td>
<td>Comments</td>
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<tr>
<td>Architecture (pre-professional program)</td>
<td>60% overall average in 6 Grade 13 credits including a 60% overall average in Relations &amp; Functions, Calculus, Physics, English (Français).</td>
<td>Selected applicants are normally required to come to the University for an interview as part of the admission process. Selection for the interview is based on Grade 12 and Grade 13 standings. Admission is based on the results of the interview, including a required portfolio, an English precis writing exercise designed to test skills of analysis and expression, and on secondary school achievement. The first year program is limited to 70 students. In recent years, most students admitted have had Grade 13 averages of 75% or better.</td>
<td></td>
</tr>
<tr>
<td>Geography</td>
<td>60% overall average in 6 Grade 13 credits.</td>
<td>Applicants are encouraged to include Geography in their Grade 13 program.</td>
<td>The first year class consists of approximately 70 students.</td>
</tr>
<tr>
<td>Man-Environment Studies</td>
<td>60% overall average in 6 Grade 13 credits.</td>
<td></td>
<td>The first year program is limited to 70 students. Applicants with a Grade 12 average of 70% or better are given first consideration. Selected applicants are normally required to come to the University for an interview as part of the admission process. Selection for the interview is based on Grade 12 and Grade 13 marks. Admission is based on the results of the interview, a test of writing ability and on secondary school achievement.</td>
</tr>
<tr>
<td>Urban and Regional Planning</td>
<td>60% overall average in 6 Grade 13 credits.</td>
<td>Applicants should include one of Grade 13 Algebra, Calculus, Relations and Functions, Good English writing skills are required.</td>
<td></td>
</tr>
<tr>
<td>Human Kinetics &amp; Leisure Studies: Dance</td>
<td>60% overall average in 6 Grade 13 credits.</td>
<td>Applicants to the Honours BSc degree program are encouraged to include Algebra, Biology, Calculus, Functions &amp; Relations, and Physics in their Grade 13 program. Applicants for the BA (Honours or General) degree are encouraged to include English and History in their Grade 13 program.</td>
<td>Applicants living within a reasonable commuting distance of Waterloo should arrange an interview with the Undergraduate Officer regarding admission to the program. Applicants unable to travel to Waterloo should contact the Undergraduate Officer to make other arrangements. Auditions are held at the start of classes for advanced placement in studio courses.</td>
</tr>
<tr>
<td>Health Studies</td>
<td>60% overall average in 6 Grade 13 credits including Biology and Chemistry.</td>
<td></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>Kinesiology</td>
<td>60% overall average in 6 Grade 13 credits, including one Grade 13 Mathematics course (from Algebra, Calculus, Relations &amp; Functions) and two Grade 13 Science courses (from Biology, Chemistry, Physics.)</td>
<td>Applicants should include four Grade 13 courses from Biology, Chemistry, Physics, Relations &amp; Functions, Algebra and Calculus.</td>
<td>The Kinesiology program includes required University courses in Calculus, Biology, Chemistry, Physics and Computer Science.</td>
</tr>
<tr>
<td>Recreation</td>
<td>60% overall average in 6 Grade 13 credits including one Grade 13 Mathematics course (from Algebra, Calculus, Relations &amp; Functions).</td>
<td></td>
<td>Applicants with overall Grade 13 averages above 65% are given first consideration. Applicants may be required to come to the University for an interview as part of the admission process. Admission is based on the results of the interview, if required, a &quot;statement of interest&quot; form, letters of reference and secondary school achievement.</td>
</tr>
</tbody>
</table>
### Admissions Specific Faculty Programs

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<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>
<td></td>
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</tr>
<tr>
<td>Mathematics</td>
<td>Students with high overall academic standing who are missing one of the three required mathematics courses may be considered for admission in exceptional circumstances. Such students should contact the Assistant Registrar for Mathematics as soon as possible to discuss their particular situation. Competition for admission to Mathematics programs has been keen in recent years with the result that most students admitted have had Grade 13 averages in excess of 75%. Students with lower averages may be admitted if there is evidence to indicate an exceptional aptitude and interest in Mathematics. Students not offered admission to the program of their choice are automatically considered for all other Mathematics programs.</td>
<td></td>
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</tr>
<tr>
<td>Science</td>
<td>Applicants to all Science programs are advised to select both Grade 13 Mathematics and Physics courses.</td>
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<td></td>
</tr>
<tr>
<td>Regular</td>
<td>65% overall average in 6 Grade 13 credits, including a 65% overall average in two Science courses (one of which must be Chemistry or Physics), Calculus, and one other Mathematics course (from Relations &amp; Functions or Algebra).</td>
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<tr>
<td>Co-operative Biology</td>
<td>65% overall average in 6 Grade 13 credits including 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>
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</tr>
<tr>
<td>Co-operative Biology and Chemistry</td>
<td>65% overall average in 6 Grade 13 credits including 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></td>
</tr>
<tr>
<td>Co-operative Applied Chemistry</td>
<td>Applicants should include both Relations &amp; Functions and Algebra, in addition to Calculus, in their Grade 13 program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Co-operative Applied Earth Sciences</td>
<td>65% overall average in 6 Grade 13 credits including 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. Applicants to Co-operative Applied Earth Sciences - Geophysics option, are strongly recommended to include Algebra in their Grade 13 program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Co-operative Applied Physics</td>
<td>Applicants with overall averages above 70% are given first consideration.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Integrated Studies**

**Mathematics**

- 60% overall average in 6 Grade 13 credits including Calculus, Algebra, and Relations & Functions with a minimum grade of 60 in each of the three required mathematics courses.

- Students with overall averages in Math 13 of 60% or more are 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.

**Science**

- Applicants to all Science programs are advised to select both Grade 13 Mathematics and Physics courses.

- Regular

  - 65% overall average in 6 Grade 13 credits, including a 65% overall average in two Science courses (one of which must be Chemistry or Physics), Calculus, and one other Mathematics course (from Relations & Functions or Algebra).

- Co-operative Biology

  - 65% overall average in 6 Grade 13 credits including two Science courses (one of which must be Chemistry), Calculus, and one other Mathematics course (from Relations & Functions or Algebra). A 70% average is required in the Mathematics courses and 70% in Chemistry.

- Co-operative Biology and Chemistry

  - 65% overall average in 6 Grade 13 credits including two Science courses (one of which must be Chemistry, Calculus and one other Mathematics course (from Relations & Functions or Algebra). A 70% average is required in the Mathematics courses and 70% in Chemistry.

- Co-operative Applied Chemistry

  - 65% overall average in 6 Grade 13 credits including two Science courses (one of which must be Chemistry, Calculus and one other Mathematics course (from Relations & Functions or Algebra). A 70% average is required in the Mathematics courses and 70% in Chemistry.

- Co-operative Applied Earth Sciences

  - 65% overall average in 6 Grade 13 credits including two Science courses (one of which must be Chemistry, Calculus and one other Mathematics course (from Relations & Functions or Algebra). A 70% average is required in the Mathematics courses and 70% in Chemistry.

- Co-operative Applied Physics

  - 70% overall average in 6 Grade 13 credits including two Science courses (one of which must be Physics), Calculus and at least one other Mathematics course (from Relations & Functions and Algebra). A 75% overall average is required in Physics and the Mathematics courses with a minimum grade of 70% in each of Physics and Calculus.
Admissions
Applicants Other Than Ontario Grade 13

Certificate Equivalent to the Ontario Secondary School Honour Graduation Diploma
All applicants are required to hold the specific subject requirements indicated on pages 30-32 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

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

B) Applicants from Other Countries

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

International Baccalaureate
Passes in at least 6 subjects, 3 higher level and 3 subsidiary level with a grade total not less than 28.

Hong Kong
Hong Kong Certificate of Education (English) and University of Hong Kong Matriculation (Advanced Level) with passes in at least 5 subjects, 2 of which must be at the Advanced Level. (Applicants with 3 or more University of Hong Kong Advanced Level subjects will also be considered.) Chinese University of Hong Kong First Year standing with courses appropriate to program.

Europe
Maturity or Matriculation Certificate

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

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

Countries using French System
Baccalaureate Passable

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

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

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

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

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

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

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

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

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

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

<table>
<thead>
<tr>
<th>Session/Term starting</th>
<th>Last date for application</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 3, 1983</td>
<td>March 1, 1983</td>
</tr>
<tr>
<td>July 4, 1983</td>
<td>June 1, 1983</td>
</tr>
<tr>
<td>*September 5, 1983</td>
<td>July 1, 1983</td>
</tr>
<tr>
<td>January 3, 1984</td>
<td>November 1, 1983</td>
</tr>
</tbody>
</table>

   * Applications and all supporting documentation must be received no later than May 1, 1983 for all Year 1 limited enrolment programs, with the following exceptions:

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

Normally no application will be accepted after the first day of lectures in any specific session/term.
Processing 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 17, 1983, of the status of their application for admission. Grade 13 applicants who do not receive an offer of admission at this time will have their applications deferred until the final Grade 13 marks are received by the University. When these marks have been received, qualified applicants will be admitted until the remaining places are filled. Ontario Grade 13 applicants who complete their studies in the Fall semester will be considered when final grades are received.

Ontario Grade 13 applicants who receive an early offer of admission on June 17, 1983 are encouraged to confirm as soon as possible, but are not required to respond before July 1, 1983.

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

Registration and Fees

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

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

Once admitted to the University, students are advised to 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 41 of this calendar.

Release of Academic Information

The University may, on request from a Secondary School in Ontario, release certain academic data regarding performance about the student. The data will be released only if the student has authorized the release on the application form (OUAC Form 101). Students not wishing to have this information released may indicate their wishes on the application form.
Fees and Registration
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 42)

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.

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 full courses are also assessed Incidental Fees.

Note that if more than one full course equivalent is taken in either half of the session, term incidentals are also assessed.

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 7-10 for appropriate dates. Students must pay or arrange fees by these dates, whether or not a final class schedule has been received.

   For sessional students unable to pay fees in full prior to the first day of lectures in September, the University will allow payment of fees in 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:

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

   (*) For Total Tuition Fees and Unit Course Fee see Schedule of Fees.
B) METHODS

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

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

3. General Information
   i) Fees should be paid with cash, money order or cheque payable to "University of Waterloo".
   ii) Students registered through St. Jerome's College must pay their fees directly to the 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 1983/84 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:
      | Session/Term Starting | Cheque must be dated not later than |
      |-----------------------|-----------------------------------|
      | September 1983        | 26 August 1983                    |
      | January 1984          | 16 December 1983                  |
      | May 1984              | 20 April 1984                     |
   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 1½% 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</th>
</tr>
</thead>
<tbody>
<tr>
<td>(No Limit)</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Session/Term Starting</th>
<th>Last Date to Register</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 1983</td>
<td>30 June 1983</td>
</tr>
<tr>
<td>July 1983</td>
<td>29 July 1983</td>
</tr>
<tr>
<td>September 1983</td>
<td>31 October 1983</td>
</tr>
<tr>
<td>January 1984</td>
<td>27 January 1984</td>
</tr>
<tr>
<td>May 1984</td>
<td>29 June 1984</td>
</tr>
</tbody>
</table>
Withdrawals
(Individual Faculty sections should be consulted for academic penalties for late withdrawal.)
A student who finds it necessary to withdraw from attendance is required to obtain a Notice of Withdrawal from the Registrar. This Notice, when signed by both the Dean and the Registrar, or their delegates, may entitle the student to a refund of tuition fees calculated as follows:

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

b) Students withdrawing in the first 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 and the benefits associated with it will be cancelled. The Health Insurance card must be returned at the time of withdrawal.

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

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

SCHEDULE OF FEES
The Board of Governors reserves the right to make changes in the published schedule of fees without notice. The University does not undertake or accept responsibility to notify all recipients of this Calendar of subsequent changes.
Schedule of Fees - Undergraduate Programs - Tuition & Incidentals for all Years — Canadian Citizens and Permanent Residents.

Foreign Students on Student Authorizations should refer to page 42 for fee information.

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Session/ Term (Note 1) Fee</th>
<th>Basic Fee $</th>
<th>Co-op Fee (Note 2) $</th>
<th>Total Tuition Fees $</th>
<th>Total Incidental Fees $</th>
<th>Total Fees (Note 12) $</th>
<th>Unit Course Fee (Note 3) $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architecture</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Yr 1</td>
<td>Session</td>
<td>1196.00</td>
<td>1196.00</td>
<td>117.74</td>
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<td>- Upper Yr, Co-op</td>
<td>Term</td>
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<tr>
<td>- Regular</td>
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<td>1102.00</td>
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<tr>
<td>- Winter, Spring</td>
<td>Term</td>
<td>551.00</td>
<td>551.00</td>
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<tr>
<td>- Co-op</td>
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<td>551.00</td>
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<td>660.80</td>
<td>59.03</td>
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<tr>
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<td>- Co-op</td>
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<tr>
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<tr>
<td>- Co-op</td>
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<tr>
<td>Human Kinetics &amp; Leisure Studies</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>- Regular</td>
<td>Session</td>
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<td>1102.00</td>
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<tr>
<td>- Winter, Spring</td>
<td>Term</td>
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<td>551.00</td>
<td>53.33</td>
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<tr>
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<tr>
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<td>52.83</td>
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<td>Term</td>
<td>551.00</td>
<td>551.00</td>
<td>54.33</td>
<td>605.33</td>
<td>121.00</td>
<td></td>
</tr>
<tr>
<td>- Co-op</td>
<td>Term</td>
<td>551.00</td>
<td>109.80</td>
<td>660.80</td>
<td>60.53</td>
<td>721.33</td>
<td>121.00</td>
</tr>
<tr>
<td>Summer Session</td>
<td>Half Course</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>121.00</td>
</tr>
<tr>
<td></td>
<td>Full Course</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>242.00</td>
</tr>
</tbody>
</table>

Schedule of fees effective May 1, 1983

Registration in Co-operative programs is available only to students who are Canadian Citizens or Permanent Residents.
Fees for Foreign Students with Student Authorizations
(see also Note 4)
The fees shown are those for the 1982/83 year and will be changed for the 1983/84 year. A revised fee schedule will be included with the student registration information.

An undergraduate student on Student Authorization, registered in a term before September 1982, who had successfully completed in his or her program, work equivalent to at least the normal load for a term of a full-time student in that program, will be subject to fees in the Regular Undergraduate program of $2190.00 per session or $1095.00 per term, plus incidental fees. The Unit Course Fee is $438.00 per Full Course or $219.00 per Term Course.

The following applies to an undergraduate student on Student Authorization registering for the first time in the term beginning September 1982 or one who has not successfully completed in his or her program, work equivalent to at least the normal load for a term of a full-time student in that program prior to September 1982.

a) Registration in an Undergraduate program in Architecture, Engineering or Optometry:
Regular program fees are $4840.00 per session or $2420.00 per term plus incidental fees. The Unit Course Fee is $968.00 per Full Course or $484.00 per Term Course.

b) Registration in any other Undergraduate program:
Regular program fees are $2970.00 per session or $1485.00 per term plus incidental fees. The Unit Course Fee is $594.00 per Full Course or $297.00 per Term Course.

Incidental Fees
The following incidental fees are compulsory:

<table>
<thead>
<tr>
<th>Service</th>
<th>Session</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercollegiate Athletics</td>
<td>$37.00</td>
<td>$18.50</td>
</tr>
<tr>
<td>Recreational Facilities</td>
<td>$10.00</td>
<td>$5.00</td>
</tr>
<tr>
<td>Health Insurance (see Note 5)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>- Regular</td>
<td>$21.24</td>
<td>$7.08</td>
</tr>
<tr>
<td>- Co-op</td>
<td>$—</td>
<td>$13.28</td>
</tr>
</tbody>
</table>

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

Federation of Students
- (see Note 6)
Student Society (see Note 7)
- Architecture
  - Arts
  - Engineering
  - Env. Studies
  - HKLS
  - Int. Studies
  - Mathematics
  - Optometry
  - Science

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

<table>
<thead>
<tr>
<th>Organization</th>
<th>Fee</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>WPIRG (see Note 8)</td>
<td>$5.00</td>
<td>$2.50</td>
</tr>
<tr>
<td>Sandford Fleming Foundation</td>
<td>$—</td>
<td>$2.50</td>
</tr>
<tr>
<td>Radio Waterloo (see Note 10)</td>
<td>$7.00</td>
<td>$3.50</td>
</tr>
<tr>
<td>Imprint (see Note 11)</td>
<td>$4.50</td>
<td>$2.25</td>
</tr>
</tbody>
</table>

Note 1 - Session/Term
Session refers to the eight month (September-April) period of study. Term refers to the four month period of study for students registered in a) Co-operative 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 $230.00 for each full course at a weight of 1.0; at $115.00 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;

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**Fees and Registration**

**Schedule of Fees**

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5. A person admitted to and remaining in Canada who is officially recognized by the Employment and Immigration Commission of Canada as a Convention refugee within the meaning of the Immigration Act, 1976;

6. A person admitted to and remaining in Canada under clauses 10(a) or 10(b) of the Immigration Act, 1976 who is sponsored and financially assisted by the Canadian International Development Agency (including the Commonwealth Scholarships and Fellowships), or by the International Development Research Centre, or by any program of financial assistance to students under an aid program of the United Nations or its agencies provided such a program is recognized and directly or indirectly assisted by the Government of Canada;

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

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

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

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

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

Note 5 - Health Insurance
Effective 1 September 1978, a revised supplementary Student Health Insurance Plan was put into effect at the request of the student body. Student premiums are as shown in the Schedule of Fees. The premium and coverage may be waived if proof of equivalent or better insurance coverage is provided. Dependent (family) coverage may be obtained on request and by payment of a further $9.53 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 7 to 10 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 7 to 10 of this Calendar.

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

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

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

This fee applies to Engineering students only and is voluntary, refundable, and not a requirement for registration. Requests for refunds should be directed to the on-campus Engineering Society office, within three (3) weeks after the start of lectures for the term as indicated on pages 7 to 10 of this Calendar.

Note 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 7 to 10 of this Calendar.

Note 11 - Imprint
The student newspaper.

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

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.

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

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 1983 to 30 April 1984 will be available after 1 March 1984.
Receipts to part-time students and Co-operative program students on work term will be mailed to the home address on record.
Receipts to on-campus students will be available for pick-up at specified location(s) on campus. (Notification of pick-up location(s) will be published in the University of Waterloo Gazette, prior to 1 March 1984).
Scholarships and Prizes, Bursaries and Financial Aid
Scholarships and Prizes, Bursaries and Financial Aid

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

Students requiring information regarding the awards listed below or any other information regarding financial aid are invited to contact the Student Awards Office, Needles Hall, University of Waterloo.

Unless otherwise stated, no application is required for the awards listed below.

Regulations Governing University of Waterloo Undergraduate Scholarships

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

University of Waterloo Entrance Scholarships

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

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

Chemistry Scholarships
Students must write the Chem 13 News 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.

Arts Faculty Scholarships

The Faculty of Arts is offering several entrance scholarships in recognition of academic excellence. Entrance scholarships, awarded on the basis of secondary school performance and recommendations, are valued at $1800 of which $1050 is allocated for first year and an additional $750 for second year, if the student maintains an A average.

J. SAYER MINAS ENTRANCE SCHOLARSHIP
The award, valued at $1500 in the first year and renewable at $1200 for three years to a possible total value of $5100, is given to the most outstanding student entering first year in the Faculty of Arts.

Engineering Faculty Scholarships

The Faculty of Engineering offers numerous entrance scholarships valued at $1500 and several awards each with a total value of up to $4000, 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 University Awards Office.

ALFRED ARMBRUST MEMORIAL SCHOLARSHIP
This $1000 scholarship is awarded annually to an outstanding student entering the Faculty of Engineering.

ASSOCIATION OF PROFESSIONAL ENGINEERS ENTRANCE AWARD
The Association of Professional Engineers of the Province of Ontario provides a $750 Entrance Award to the student who has the highest academic standing in Grade 13 examinations and who is entering an accredited engineering program at the University of Waterloo.
DR. SIDNEY BLAIR SCHOLARSHIP IN GEOLOGICAL ENGINEERING
Dr. Sidney Blair was a prominent Canadian geologist who was awarded an honorary degree from the University of Waterloo. Through a donation from his estate, the Alumni Association is offering an entrance scholarship of $1200 renewable for three years to a total value of $4800. The award will be made as funds permit to an outstanding student entering Geological Engineering.

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

Environmental Studies Faculty Scholarships
Awards are available in varying amounts for one year. All students with a Grade 13 average of 85% or better are considered. No application is required.

Human Kinetics and Leisure Studies Faculty Scholarships
Awards are available in varying amounts for one year. All students with a Grade 13 average of 85% or better are considered. No application is required.

Mathematics Faculty Scholarships
3ÉNE 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.

Science Faculty Scholarships
A limited number of Entrance Scholarships are awarded to students entering General Science.

CHEM 13 NEWS RESEARCH ASSISTANTSHIPS
The Department of Chemistry offers CHEM 13 NEWS Research Assistantships to recognize academic excellence in students proceeding to a degree in Chemistry. The awards are made for one year at a time and are valued at $500 per year. Award holders are required to work with a professor or his research group within the Department. Awards to students entering Year 1 are made on the basis of performance on an examination held in April.

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

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 $2600 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 $2000 and $1500 respectively for one year, with an additional $1950 over three more years as a SIN Assistant. These scholarships may be subject to the condition that no other scholarships are held concurrently.

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 $1000 for Year One and some may be renewed for Year Two.

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: $1200 for Year One and an additional $1200 for Year Two if the recipient maintains first class honours standing.

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.
MR. AND MRS. C.W. SNIDER MEMORIAL SCHOLARSHIPS
A number of Entrance Scholarships are awarded to the top eligible female students graduating from Waterloo County secondary schools. They are awarded in conjunction with Waterloo County Entrance Scholarships.

University of Waterloo Alumni Association Scholarships
Entrance Scholarships with a maximum value of $4800 of which $1200 is allocated in the first year and $1200 may be allocated in each of 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 Upper Year Scholarships

Arts Faculty Scholarships
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. Part-time students may be eligible for awards of $100 after completing at least ten half credits.

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

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

Scholarships and Prizes, Bursaries and Financial Aid
Undergraduate Scholarships

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

Mathematics Faculty Scholarships
RENÉ DESCARTES SCHOLARSHIPS, FELLOWSHIPS, AND BURSARIES
Upper year prizes and fellowships in varying amounts are awarded to students in the Faculty of Mathematics based on outstanding performance in the previous year. No application is required.

Science Faculty Scholarships
A limited number of Scholarships are awarded to students in General Science.

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

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

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

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

SIR ISAAC NEWTON SCHOLARSHIPS
SIN Scholarships are awarded annually to the top four students entering each of second, third, and fourth years in Honours Physics, both Regular and Co-op. Values are $500, $400, $300, $200 in each year. No application is necessary to be considered for the scholarship. (These scholarships may be subject to the condition that no other scholarships are held concurrently).
Undergraduate Scholarships

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

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

Bausch and Lomb Soflens Division Outstanding Achievement Awards
Total value of these awards is $1000. These awards are in recognition of ability and effort in the pursuit and application of knowledge in the contact lens field while a final year student.

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.

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 of Visual Training. The award is made as funds permit.

Bausch and Lomb Clinical Optometry Award
The award is given annually to a senior student for excellence in clinical optometry. The award consists of selected Bausch and Lomb instruments valued at $250.

Bausch and Lomb Freshman Scholarship Award
This award is available each year to a second year Optometry student for outstanding scholastic achievement at the completion of the first year. The award consists of selected Bausch and Lomb instruments valued at $250.

Scholarships and Prizes, Bursaries and Financial Aid
Undergraduate Scholarships

Undergraduate Scholarships

Acres Scholarship
This scholarship will be awarded annually to an Engineering student entering the second year of study. The recipient will be specializing in Civil, Geological, Electrical or Mechanical Engineering.

Aetna Canada Award
Two scholarships of $500 each will be awarded to the outstanding students in the second year of the Actuarial Science program. Applications are available in the Student Awards Office.

Alberta Optometric Association Scholarships
The Alberta Optometric Association presents two scholarships in the amount of $500 to each of two students admitted to the First Professional Year of the School of Optometry. These are awarded on the basis of academic achievement to students who are residents of Alberta.

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. Applications are available in the Student Awards Office and should be submitted during the third year of study.

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 honors, 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.

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

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

Canada Packers 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. Applications are available in the Student Awards Office and should be submitted in January or May.

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.

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 first, second and third 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 first, second and third years.

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

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


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

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.

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

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.
Chevron Standard Limited Scholarship
Two awards of $1000 will be awarded to outstanding undergraduate students entering the final year in engineering. One award of $1000 will be awarded to an outstanding undergraduate student entering third year Earth Sciences. Preference will be given to students who have displayed an indicated interest in the field of petroleum. Scholarships are not awarded on the basis of academic excellence alone; other factors such as personality, initiative, community involvement, will also be considered. Applications are available in the Student Awards Office and should be submitted in June or September.

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.

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. Applications are available in the Student Awards Office.

E.T. Davies Memorial Prizes
In memory of the late Professor E.T. Davies, his colleagues in the Applied Mathematics Department offer annually two prizes of the approximate value of $150 each. One prize is for a first year student, enrolled in Applied Mathematics. The other prize is for the third year Applied Mathematics student who ranks first on the final examinations. No application is necessary.

John Deere Limited Scholarship
An award valued at $1000 available to an outstanding student entering fourth year Mechanical Engineering who has an interest in manufacturing and/or product design. Applications are available in the Student Awards Office and should be submitted in September or January.

Eaton Foundation Scholarship
Two scholarships of $2500 each will be awarded to 2 students entering 4th year Computer Science Information Systems Option. The decision will be based on performance in specific Information Systems Option courses along with work-term performances and work-term report evaluations.

Electrohome 75th Anniversary Scholarship
Established by the Victor Company of Japan Ltd. and Kanematsu-Gosho Ltd., in recognition of the 75th Anniversary of Electrohome Ltd., one scholarship of $2000 will be awarded to an outstanding undergraduate entering the final year of Computer Science. The award will be based on academic performance in several Computer Science Courses.

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

Digital Equipment of Canada Ltd. Award of Merit
A medal and a cash award of $100 will be presented each year to an outstanding third year student in Computer Science or Electrical Engineering. Applications are available in the Student Awards Office and should be submitted in October or January.

Dow Chemical of Canada Scholarship in Chemical Engineering
$900 is awarded to the student and a grant-in-aid of $350 to the department. The scholarship is awarded annually to a student, not otherwise holding a scholarship, entering final year of an undergraduate program in Chemical Engineering who has a sincere interest in the chemical industry and who has demonstrated leadership in extra-curricular activities. Applications are available in the Student Awards Office.

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. Applications are available in the Student Awards Office and should be submitted in September or January.

Eaton Foundation Scholarships, Bursaries and Financial Aid
Undergraduate Scholarships and Prizes
Elgin County Scholarship
Elgin County offers two scholarships of $200 each to the two students from Elgin County attaining the highest academic standing.

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

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

William Feinbloom Low Vision Award
A Low Vision Trial Set is awarded to the final year 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 $3200 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.

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.

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.

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

Sandford Fleming Medal for Academic Achievement
The Sandford Fleming Foundation has established 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.

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

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.

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.

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

General Proficiency Medal
The gift of the 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.

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 at the University of the community. Applications are available in the Student Awards Office and should be submitted in September.

Percy Hermant Centennial Bursary Scholarships
These awards are the gift of Sydney Hermant. The Bursary Scholarships are awarded on the basis of financial need and academic achievement in first year General Science at any Canadian University to a student who is proceeding into Year 1, School of Optometry. Six scholarships are available, each of a
total possible value of $1200, being $300 per year over
the 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.

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.

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

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

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

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

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.

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

Fredrich 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.

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

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

Douglas T. MacPherson Scholarship
AOCO Limited/Limitee presents annually the Douglas
T. MacPherson Scholarship to a Canadian'student
admitted to the first professional year of tbe School of
Optometry. This $1000 award is made on the basis of
academic achievement.

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

Burton McKay Memorial Scholarship
The British Columbia Optometric Association
presents a scholarship in the amount of $500 to a
resident of British Columbia who is admitted to the
first professional year of the School of Optometry. This $1000 award is made on the basis of
academic achievement.

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

J.C. McKegney Memorial Fund
Two awards to the third or fourth year student in the Faculty of Arts who have shown outstanding academic performance and/or extra-curricular interests in the Hispanic Area: one in Peninsular Spanish Studies and one in Spanish American Studies. Applications are available in the Student Awards Office.

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.

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

Murata Erie North America, Inc. Award
Two awards of $500 are given to students entering fourth year Electrical Engineering based on outstanding performance in courses related to analog circuit design and measurement. Applications are available in the Student Awards Office, and should be submitted in September or January.

Norcen Energy Scholarships
Six awards of $2000 each are given to students in Chemical and Mechanical Engineering, Earth Sciences and the Information Systems Option in Computer Science who are entering third year and have an interest in the energy field. The decision will be based on academic performance and an assessment of the applicant's reasons for applying for the award. Applications are available in the Student Awards Office and should be submitted no later than February.

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

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

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

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

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

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

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.

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

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

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.

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.

G.E. Reaman Scholarship
A scholarship valued at $300 is offered each year to a 3rd or 4th year student for study and research in the social history of Upper Canada, from the earliest time to 1818. The award will be made by the Department of History on the basis of a formal Research Paper prepared by the candidate.
Glyn Reesor Prize
A prize of approximately $200 in honour of Dr. Reesor is awarded annually to the third year physics student who obtains the highest mark in electronics.

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

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

Saskatchewan Optometric Association Scholarships
The Saskatchewan Optometric Association presents two scholarships of $500 to each of two students admitted to the First Professional Year of the School of Optometry. These awards are made to students who are residents of Saskatchewan. They are awarded on the basis of academic achievement.

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

3male Fellowship
The award of $300 is based on work in the fourth year (BArch) program, leadership ability and academic and design excellence.

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

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

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

Sun Life of Canada Award
This $500 award will be awarded to an outstanding student who is entering the third year of the Actuarial Science Honours Program. Applications are available in the Student Awards Office.

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

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

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

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

John Weir Scholarships
The John Weir Scholarships of $250 will be awarded to 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.

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

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

M.S. Yolles & Partners Ltd. Scholarship
Two scholarships of $500 each are awarded to students in 3B Civil Engineering who have demonstrated particular interest in structures, and who have obtained a high average in related courses.
Work-Term Report Awards

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

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

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

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

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

**Copolymer Group Award**
Three awards of $100 each to second, third or fourth year Chemical Engineering or Applied Chemistry students.

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

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

**Equitable Life Assurance 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 or fourth year Systems Design students.

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

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

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

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

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

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

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

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

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

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

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

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

Atkinson Charitable Foundation Bursaries

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

Barnes-Hind Canada Bursary

This bursary may be awarded to a student in the Optometry program on the basis of academic excellence and financial need. The recipient must not be receiving any other award in that year. The value is $400.

Bechtel Canada Limited Bursary

Bechtel Canada Limited has made available six bursaries, each in the amount of $500 to be awarded to six 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.

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 $200 and will be awarded to full-time undergraduate students in any faculty of the University who have good academic records and who are in need of financial assistance to enable them to continue their studies.

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.

I.O.D.E. - Tommy Atkins Chapter Bursary

A bursary valued at $150 is awarded annually to a needy full-time undergraduate whose permanent residence is in Kitchener or Waterloo.
Interprovincial Pipe Line Company Bursary
The Company provides $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.

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

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. Application deadline is January 15.

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

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

Procter 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.

Scholarships and Prizes, Bursaries and Financial Aid
Bursaries
Loan Funds

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.

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

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

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.

Arts Student Union Loan Fund
Loans to a maximum of $200 for a period of up to 90 days are available to full-time undergraduates who are members of the Arts Student Union.
Ian Carr Loan Fund
This loan fund has been set up by the parents in memory of their son, a former student at the University of Waterloo.

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

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

Adelaide Detwiler Student Loan Fund
This loan fund has been established by Mr. J.R. Detwiler in memory of his mother, Adelaide Detwiler.

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

Engineering Students Memorial Loan Fund
This memorial loan fund, established by the Sandford Fleming Foundation in 1979, is maintained by the Foundation in order to provide short-term loans, to Engineering undergraduate students confronted with unexpected expenses during their academic terms or their work terms. The loans are normally for $100 or $200 for up to 90 days.

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 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.

Registrar’s Office Student Loan Fund
This fund was established in recognition of the University’s Twenty-Fifth Anniversary by Rose Klein, a retiring employee of the Office.

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.

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.

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 Department of Co-ordination and Placement

Photo courtesy Ontario Hydro
The 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)
J. F. Westlake, BASc, MASc, PhD (Waterloo), PEng

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

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

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

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. In some programs such as Engineering, Mathematics and Science, the class is split into two approximately equal groups, one known as Stream 8, the other as Stream 4. Both groups receive the same total time on campus and at work. Stream 8 has a double academic term at the start of the course; Stream 4 has a double academic term at the end of the course. All other programs shown on the chart are single stream programs where no choice is available in year 1. Variations may be requested due to academic or work situations in upper years. Precise dates for the beginning and end of various terms are shown in the Academic Calendar.
### Work-Study Sequence

#### Program (By Faculty)

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

- Denotes work term
- This 4-month academic term is at Althouse College of Education, London.
- Students seeking admission must have satisfactorily completed two work-terms in another Co-op Math program.
- Teaching Term
- Biology students entering 3B in Sept. 1983 will follow the work-study sequence for Stream 8 in Co-op Biology.
- Admission occurs by January for the 2B term.
- Although the Co-op program begins in 2A, admission is made to the program at the time of the initial application to the university.
- 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, attitude, and potential, will determine whether a student is offered a job. If a student is not placed by the interview process, the Department will attempt to find suitable work experience for that student.

Seeking Employment and Employer Interviews

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

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

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

Co-ordination and Placement

Seeking Employment and Employer Interviews

Work Terms

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 form with the statement: “Failed work term caused by refusal to honour previous agreement”.

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

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

Commitment
Normally, a minimum of 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 these four must be graded as satisfactory or better. Provision is made for students to upgrade unsatisfactory reports or submit new reports. Also provided for are situations where there are less than four work terms available to the students, as well as 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.
**Graduate 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, resume and letter writing. Career talks are held during the academic year and cover many areas of interest to students. These talks are designed to provide students with current information on career opportunities and employment trends.

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

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

**Career Information Centre**

The Career Information Centre contains material which assists students in self-assessment and career choice, resume and letter preparation for interviews. Employer information can be obtained from files and directories. Calendars and educational directories for Canada and abroad assist in exploring educational possibilities. The Centre also has material to assist in planning travel, study and work abroad and a section on self-employment and alternative, non-traditional careers. A bulletin board on the first floor of Needles Hall contains summer jobs from October to April and part-time jobs year round.

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**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.

- A. Niitenberg, (President) Ontario Hydro
- J. M. Belcher, (Vice-President) Federal Ministry of Transport
- G. A. Hooper, (Secretary) Thorne, Riddell & Co.
- D. J. Bernstein (Public Relations) Imperial Oil Ltd.
- C. T. Baumgartner Gandalf Data Communications Ltd.
- D. W. Brown Air Canada
- D. M. Caughey Mitel Corporation
- G. Dipaola-Baranyi Xerox Research Centre of Canada Ltd.
- R. H. Fox Westinghouse Canada
- D. Galloway Harlequin Enterprises Ltd.
- S. Gendron Inco Metals Co.
- C. M. Godfrey University of Toronto
- T. E. Hogan Petro-Canada
- J. E. Hunt Concord Scientific Corp.
- H. S. Kerr Spar Aerospace Ltd.
- A. M. Levine Allan Levine Architect
- J.B. MacDonald Northern Telecom Ltd.
- R. N. Millman The Ontario Paper Co. Ltd.
- F. Ross ADGA Ltd.
- J. Schneider AMCA International Ltd.
- R. E. Secord Ministry of Tourism and Recreation
- G. F. Sekely Canadian Pacific Ltd.
- S. Sharzer The Globe & Mail
- R. C. Steele Proctor & Redfern Ltd.
- J. W. Synan Gulf Canada Ltd.
- R. G. Taylor Data Crown Inc.
Organizations Employing Co-operative Students

The following is a list of employers who participated in Waterloo's co-operative programs in 1982. The list does not acknowledge the many hundreds of individual departments within the organizations who participated.

AAF Ltee
Abex Energy Services Ltd.
Ability Centre
Abitibi Price Inc.
Abitibi Price Fine Papers
Abram & Nowski
Acco Canadian Material Handling Systems
Acres Consulting Services Ltd.
ACT Computer Services
Adams Masin & Tilley
The Adams Mine

* Addiction Research Foundation
Adrian Systems Limited
Adult Occupational Centre
Advanced Concrete Services Ltd.
AEL Microtel Ltd.
Aero Irrigation Limited
AES Data Limited
Agnew Associates
Agriculture Canada Harrow Research Station
Air Canada
Air Earth & Oceans Ltd.
Air - Eze Mfg. Ltd.
Ala-Kantti Associates
Alberta Environment
Alberta Hospitals and Medical Care
Alberta Housing & Public Works
Alberta Oil Sands
Alberta Oil Sands Technology & Research Authority
Alberta Power Ltd.
Alberta Research Council
Albert College
Aldon International Ltd.
Kingston Laboratories
Alcan Smelters & Chemicals Ltd.
Alchem Inc.
The Algoma Steel Corp. Ltd.
Lotus A. Allen & Co.
Allinson-Ross Corp'n.
N. M. Allison
Allstate Insurance Company of Canada
Amax Exploration Inc.
Amdahl Limited
American Can. Canada Inc.
Amoco Canada Petroleum Company Ltd.
Amstel Brewery Canada Limited
Anatek Electronics Ltd.
Arthur Andersen & Company
Management Consultants
Andrew Antenna Company Limited
Angelstones Limited
Anthes Industries Inc.
August Apon Associates Limited
Apotex Inc.
Brian D. Appleton Management Consultants Inc.
Applewood Heights Secondary School
Aquiline Inc
Arcop Associates
Arctec Canada Limited
Armco Canada Limited
Armstrong & Molesworth
Arrowhead Metals Limited
Associated Tube Industries Ltd.
Association of Municipal Clerks & Treasures of Ontario
ASW Computer Systems Ltd.
Atkem Inc.
Atlas Steel Company
Atmospheric Environment Metoc Centre
Atomic Energy of Canada Ltd.
Engineering Company
Atomic Energy of Canada Ltd.
Chemical Company
Atomic Energy of Canada Ltd.
White-Shell Nuclear
Atomic Energy of Canada Ltd.
Atomic Energy of Canada Ltd.
Chalk River Nuclear Labs
Ausable-Bayfield
Automotive Hardware Limited
Avco Financial Services
Babcock & Wilcox Canada Ltd.
BAC Systems Inc.
Bahula Clifford
Bailey Hoogovens Canada Inc.
Bailey & Ross Ltd.
Bakelite Thermostes Limited
Balderson Mielke & Co.
Baldard Research Inc.
Balmoral Hall
Brian Bancroft, Architect
Bank of Canada
Bank of Montreal
The Bank of Nova Scotia
W. A. Barclay Exploration Services Ltd.
Bata Limited
Bates Engineering
Bate Chemical Corp. Ltd.
Eddie Bauer Stores
Bausch & Lomb
Bayly Engineering Ltd.
Bayview Wildwood Resorts
B.C. Coal Ltd.
Be Alive Fitness Services
Beallor Beallor & Burns
Beaver Engineering Limited
Beaver Lumber Company Limited
Bechtel Canada Ltd.
Beck Electric Manufacturing Co.
Beckers Lay-Tech Inc.
Beechgrove Childrens Reg. Centre
Bell Canada
Belleville PUC
Bell-Northern Research
G. E. Berti & Associates
Art Benjamin Associates Ltd.
Best Pipe Ltd.
Bethany Hills School
Bick's Multifoods Limited
Glasswoods Division
Bird Construction Co. Ltd.
Bishop Strachan School
Blood Houghton & Hughes
Bloorview Children's Hospital
Blue Hills Farm
Blue Mountain Resorts Limited
Bluewater Centre For The Developmentally Handicapped
BMI Division of Canadian Medical Labs
Boeing of Canada Limited
Amprior Division
Joseph Bogdan
Boise Cascade Canada Ltd.
Boreal Laboratories Ltd.
Borg-Warner (Canada) Ltd.
Borg Warner Chemicals
Borough of Etobicoke
Borough of Etobicoke, Parks & Recreation Department
Borough of North York
Borough of Scarborough
Bouris Wilson Scott & Proctor
Rowinrama Ltd.
BP Canada Limited
BP Oil Limited
Brampton Hydro Electric Commission
Branchton Camp
Brant County Board of Education
Bregman & Hamann
Brewers Warehousing Co. Ltd.
Bristol-Myers Canada Limited
John Brock
Brook Carruthers & Shaw
Brookside School
Brouwer Turf Equipment Limited
Browndale Incorporated
Brunswick Mining & Smelting Corp.
Brunton Browning Day & Partners
Building Products of Canada Ltd.
Bullock Systems
RVB Burgoyne
Robert Burley
R. J. Burnside & Associates Ltd.
Burns Meats Ltd. Meat Packers
Burroughs Business Machines Ltd.
Burtch Correctional Centre
Byfield Langford Architects Ltd.
Cablesystems Engineering Limited,
A Rogers Cablesystems Subsidiary
Cable Telecommunications Research Institute
The Cadillac Fairview Corporation Limited
CAE Electronics Ltd.
Calinek Price & Associates Limited
Cambrian College of Arts and Technology
<table>
<thead>
<tr>
<th>Company Name</th>
<th>City</th>
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<tr>
<td>Canadian Oil Co.</td>
<td>City of Cambridge</td>
</tr>
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<td>Canadian Fine Color Co. Limited</td>
<td>City of Chatham</td>
</tr>
<tr>
<td>Canadian Marconi Company</td>
<td>City of Cornwall</td>
</tr>
<tr>
<td>Canadian Coastguard</td>
<td>City of Edmonton, Planning Department</td>
</tr>
<tr>
<td>Canadian National Railways</td>
<td>City of Kanata</td>
</tr>
<tr>
<td>Canadian Pacific</td>
<td>City of Kitchener</td>
</tr>
<tr>
<td>Canadian Utilities Limited</td>
<td>City of London</td>
</tr>
<tr>
<td>Canadian Worcester Controls Ltd.</td>
<td>City of Mississauga</td>
</tr>
<tr>
<td>Canal Electric, A Div. of Upper Lakes Shipping Ltd.</td>
<td>City of Niagara Falls</td>
</tr>
<tr>
<td>Canadian</td>
<td>City of Port Colbourne</td>
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Co-ordination and Placement
Organizations Employing Co-operative Students

Consumers Glass Co. Ltd.
Continental Bank of Canada
Continental Digital Controls Ltd.
Control Data Canada Limited
J. H. Cook & Associates
The Co-operators
Cooper Construction Co. (Eastern) Ltd.
Cooper & Lybrand
Cooper Tool Group Limited
Corfax Benefit Systems Ltd.
Corporate Foods Ltd.
Cossar Collins Barrow
County Mechanical Contractors
County of Leeds-Grenville Board of Education
County of Lincoln Board of Education
County of Peel Board of Education,
G. W. Finlayson Field Centre
County of Peterborough
E & B Cowan Ltd.
Cox Snowden Scott & Parker
CP Limited Information Systems
CPRI Recreation Services
Victor G. Cragg
Craig Kohler Dickey & Edmundson
Crane Packing Company Limited
Crang & Boake
Creative Centre for Learning Devt.
Creative Solutions Computer Serv.
Creators (Canada) Limited Div.
American Biritime (Can.) Ltd.
Critchley & Delean
Ernest A. Cromarty
Crone Geophysics Ltd.
Ben W. Crow & Associates of Canada Ltd.
Cummer Fitness Centre
G. G. Cunningham & Associates
Curtis Engineering & Testing Ltd.
Curtner & Brown Architects
Cyanamid Canada Inc.
Cyanamid Canada Inc. Niagara Plant
Cyprus Anvil Mining Corp.
Dafco & Dafco Inc.
Dagmar Construction Limited
D’Angelo Sorrenti Canale & Palombo
Datacrown Inc.
Datapoint Canada Inc.
David Computers Incorporated
DCH Consultants Inc.
John Deere Welland Works of John Deere Limited
The De Havilland Aircraft of Canada Limited
Deloitte Haskins & Sells
Deloro Slate
Delphax Systems
Delta-Benco-Cascade Ltd.
Delta Drive Systems Inc.
Delta Enterprises (Sarnia) Ltd.
Dept. of Fisheries & Oceans
Department of National Defence,
DCIEM
Descartes-Ram, A Division of Descartes Systems Grp. Inc.
Design Air Conditioning Ltd.
Designed Power Ltd.
Develcom Electronics Ltd.
Dialectic Computer Services
A. J. Diamond Associates
Diemaco Inc.
Digital Equipment of Canada Ltd.
Digital Video Systems Ltd.
Digital Incorporated
M. M. Dillon Ltd.
Dimitri Dimakopoulos
Diversified Research Laboratories
Dixon Gordon & Company
DMR & Associates
Doane Raymond Chartered Accountants
Dolafasco
Drime Mines Limited
Dome Petroleum Limited
Dominion Bridge Sulzer Inc.
Domtar Inc.
Domtar Chemicals Group Sifton Salt Division
Domtar Construction Materials Ltd.
Domtar Construction Materials Ltd.
Gypsum Division
Domtar Packaging Limited
Domtar Packaging Group
Dover Corporation Canada Ltd.
Turnbull Elevator Division
Dow Chemical Canada Inc.
Dow Employees Recreation Centre
Dowty Equipment of Canada Limited
DSMA Atcon Ltd.
Dufferin Construction Co.
Dunlop Farrow Atken
Dunwoody & Company
Dupont Canada Inc.
Dupont Canada Inc. Kingston Works
Dupont Canada Inc. Whitby Works
Dupont Canada Inc. Maitland Works
Durham Board of Education
Durst Vodden & Bender
Duval International Corporation
Dyer/Brown & Associates
Dynalogic Info-Tech Corp
DY-4 Systems Inc.
Eastern Construction Co. Ltd.
The Easter Seal Society
East York Board of Education
Outdoor Education Centre
The T. Eaton Company Limited
Eaton Yale Limited Suspension Division
E. B. Eddy Forest Products Ltd.
ECE Group
Eckler Brown SegaU & Co. Ltd.
Ecolaire Ltd.
Economical Mutual Insurance Company
Eddy Forest Products Ltd.
Edmund Cachia & Co.
Edmund Percy Scherrer & Hicks
Edwards & Gunn Limited
Eirich Machines Ltd.
Wm. Eisenburg & Company
Eldorado Nuclear Limited
Eldorado Nuclear Limited Beaverlodge Operations
Electrohome Limited
Elgin Middlesex Detention Centre
Eli Lilly Canada Inc.
Elkel Metal Products Ltd.
Elnahrisl’s Four Seasons Resort
Emco Ltd.
Emco-Wheaton Ltd.
Emery Industries Ltd.
EMJ Data Systems Ltd.
The Empire Life Insurance Co.
Energy Mines & Resources Canada Centre for Remote Sensing
Energy Mines & Resources Canada Conservation & Renewable Office
Energy Mines & Resources Geological Survey of Canada
Engineering Interface Limited
Environment Canada
Environment Canada Atmospheric Environment Service
Environment Canada, Canada Centre for Inland Waters
Environment Protection Services
Erco Industries Limited
Arthus Erickson
Erindale Secondary School
Ernst Leitz (Canada) Ltd.
Ernst & Whinney
ESE Limited
Esnsa Limited
Esso Chemical Canada
Esso Minerals Canada
Esso Petroleum Canada
Esso Resources Canada Ltd.
Etobicoke Board of Education
Eton Construction Limited
Ferndale Canada Limited
Eurocelan Canada Inc.
Excelsior Life Insurance Company
Aetna Casualty Company of Canada
Exco Engineering
Execuent Corporation
Exide Canada Inc.
Exolon Company of Canada Ltd.
Export Development Corporation
Facele Company Limited
Falconbridge Limited Sudbury Operations
Falk Canada Inc.
Family Life Assurance Group
Family Service Association
Bolton Camp Division
Family Service Association
Holiday Centre for Senior Citizens
Family Service Association
Illanhe Northwoods Camp
Fanshawe College of Applied Arts & Technology
Federal Pioneer Limited
Fenco Lavalin Inc.
Ferranti-Packard Electronics Ltd.
Ferranti-Packard Transformers Ltd.
<table>
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<th>Organization Name</th>
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<td>Fiberglas Canada Limited Chemical Plant</td>
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<td>Fisher Controls Co. of Canada Ltd.</td>
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<td>J. D. Irving Limited</td>
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<td>IST Inc.</td>
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Co-ordination and Placement
Organizations Employing Co-operative Students

ITC Canada Limited Communications Division
ITT Business Communications Systems Ltd.
Jackson Yves & Associates
William R. Jarrett
Jarvis Clark Company Limited
Rolf Jensen & Associates Ltd.
JNC Limited Electronics
Barry Johns Architect Ltd.
Johnson & Matthey Ltd.
Joy Mfg. Co. (Canada) Ltd.
JS Bell Community School
JSI Systems Engineering
Jung/Branen Associates Inc.
Kaptest Engineering Limited
Kawner Company Canada Limited
Keeprite inc.
John W. Keith-King
Kellerg Salada Canada Inc.
Kemptville Recreation Committee
Kendall Canada
Kemmertail Inc.
Kening Earth Sciences Ltd.
Kerr Addison Mines Limited
Kerr Vayne Systems Ltd.
Kidd Creek Mines Limited
Anton Kikas Limited
Kilborn Engineering Limited
Kimberly-Clark of Canada Limited
Kingston Psychiatric Hospital
J. Michael Kirkland Architects
Klein & Taylor
Erdmann W. Knack
L. Koffman
Kolmar of Canada Limited
Kraftwerk Designs inc.
Labatt Brewing Company
Lackie Bros. Ltd.
Lakefield Dist. Secondary School
Lakehead University
Lake Ontario Cement Ltd.
Lake Ontario Steel Company Ltd.
F. Joseph Lamb Co.
Gail E. Lamb
Lamb Systems Group Ltd.
Lanthorne & Lynch
Laurier Life Insurance
Lavalin Inc.
Lawson Engineering
J. D. Lee Engineering Ltd.
Lee Merrick & Associates Limited
Leigh Engineering & Aerospace Div.
A. E. LePage Ltd.
Lever Detergents Limited
Allan Levine Architect
Levitsky Feldman Wexler & Partners
Limnoterra
Lincoln County Board of Education
Linear Technology Inc.
Lingwood-Roberston
Lilton Systems (Canada) Ltd.
M. Loeb Limited
Lombard North Group
London Board of Education
London Life Insurance Company
London Psychiatric Hospital
Long Lac Mineral Exploration Ltd.
Long Point Conservation Authority
Lobby Construction Limited
Loram International Ltd.
Lorne Park Secondary School
Lower Trent Region Conservation Authority
Luminaers Company Canada Limited
Lutheran Life Insurance Society of Canada
Lyndhurst Hospital
MacDonald Dettwiler & Associates
MacMillan Bloedel & Co.
MacKillican & Associates
A. F. MacLaren & Company
MacLaren Engineers
MacLennan Associates Architects
MacMillan Bloedel Building
Madgett Haar & Partners
Madsen Electronics Canada Ltd.
Malcolm & Boyko Architects
Malcolm Condensing Co. Ltd.
Manalta Coal Ltd.
Mandelbaum Rosenberg
Manitoba Forestry Resources Ltd.
Manitoba Research Council Industrial Technology Centre
Manitoba Telephone Systems
Manufacturers Life Insurance Company
Maplehurst Correctional Centre
Maple Leaf Monarch Company
Maritime Telegraph & Telephone Company Limited
Markham Racquet Club
Marks & Spencer
Marshall Cummings & Associates Ltd.
Marshall Macklin Monaghan Ltd.
Marsh Engineering Ltd.
Martin Feed Mills Ltd.
Massey-Ferguson-Lindustries Ltd.
Mastico Industries Ltd.
Mathews & Haldenby
Maxima Computer Consulting Services Ltd.
J. David McAuley Architect
McCartner Nairne & Partners
McCay Duff & Co.
McColl Turner & Company
P. F. McGaw & Associates
McGregor Hill Ryerson Limited
McMaster University
McPhar Geophysics
MDS Health Group Limited
Meadowvale Secondary School
Meanwell Goodwin & Co.
Mental Health Centre
Mercantile & General Reinsurance Group
Metal Flo Corp. Canada Ltd.
Melfax Instruments Ltd.
Metropolitan Life Insurance Co.
Metropolitan Toronto District Health Council
MFS Limited
MIA Chemical Ltd. Division of Fiberglas Canada
Micronet Limited
Midland Ross (Canada) Limited
Midwestern Regional Centre
Milford Bay Recreation Committee
Millard Rouse & Rosebrugh
Millbrook Correctional Centre
Miller Communications Systems Ltd.
Mill & Ross
Milton District High School
Mineral Recovery Company
Mines Accident Prevention Association of Ontario
Ministry of Industry & Small Business Development
Mira Electronics Microcomputer Systems Division
Mitchell Partnership
Metalf Corporation Semi-Conductor Division
Mobil Corporation
Mobil Chemical Canada Ltd. Coatings Division
Mobil Oil Canada Limited
Mohawk College of Applied Arts & Technology
The Molson Companies Limited
Molson’s Breweries of Canada Ltd.
Motuline Ltd.
Monteith Correctional Centre
Monteith Ingram Engineering Ltd.
Monteith Monteith & Company
Montreal Engineering Co. Ltd.
Rowan
Mosaid Inc.
Motion Picture Video Corporation
Motorola Canada Limited
Moyer Vico
MPS Management Consultants
MTD Products Limited
Muirhead Engineering Ltd.
Multiple Access Computer Group
Multiple Sclerosis Society of Canada/Ont. Div.
Munich Re & Victory Insurance Co.
Municipality of Metro Toronto Traffic Control Centre
Municipality of Metro Toronto Treasury Dept.
Murata Eric North American Inc.
Muskoka Centre
The Mutual Life Assurance Company of Canada
Barton Myers
Nabisco Brands Ltd.
NABU Manufacturing Corporation Commercial Terminal Division
Nacan Products Ltd.
Co-ordination and Placement
Organizations Employing Co-operative Students

Nadler & Company
National Arts Centre
National Hydrology Research Institute
National Life Assc. Co. of Canada
National Research Council
National Testing Laboratories
National Trust Co. Ltd.
Navel Limited
NCR Canada Limited
NELS Inc.
Netron Inc.
New Dundee Creamery Ltd.
New Liskeard Secondary School
Niagara College of Applied Arts & Technology
Ian W. Nicoll Architect
A. C. Nielsen Company of Canada Ltd.
Nightingale & Quigley
Noranda Mines Limited GECO Division
Noranda Mines Limited, The Horne Division
Noranda Mines Limited
Noras Research Centre
Norcene Energy Resources Limited
Norpak Limited
Norr Architects
Nortak Software Ltd.
Nortec Solar Industries Inc.
North American Life Assurance Company
Northern & Central Gas Corporation Limited
Northern Digital Inc.
Northern Dynamics Ltd.
Northern Telecom Cable Division
Northern Telecom Digital Transmission Division
Northern Telecom Ltd. Data Network Division
Northern Telecom Ltd. Semi-Conductor Components Group
Northern Telecom
North West Survey Corporation International Ltd.
Northwest Survey Corp. (Yukon) Ltd.
North York Board of Education Cedar Glen
North York Board of Education Forest Valley Outdoor Ed. Centre
North York Board of Education North York Hydro
Norwest Soil Research Ltd.
Norwich Union Life Insurance Nova, An Alberta Corporation
NSN Options Ltd.
NTT Systems Inc.
Nuinsco, Resources Ltd.
NWT Housing Corporation
Office of the Legislative Assembly
Office of the Ombudsman
Office of the Premier
Michael C.H. Ogus Architect
On-Line Data Corporation
Ontario Association for the Mentally Retarded
Ontario Cancer Foundation Hamilton Clinic
Ontario Cancer Institute
Ontario Cancer Treatment & Research Foundation
Ontario Centre for the Deaf
Ontario Crippled Children's Centre
Ontario Educational Communications Authority
Ontario Educational Services Corp.
Ontario Geological Survey
Ontario Hydro
Ontario Lottery Corporation
Ontario Paper Co.
Ontario Place
Ontario Police College
Ontario Police Commission
Technical Services Branch
Ontario Research Foundation
Ont. Min. of Agriculture & Food
Ont. Min. of Agriculture & Food Horticultural Research
Ont. Min. of Agriculture & Food The Crop Insurance Commission
Ont. Min. of Colleges & Universities
Ont. Min. of Community Social Services Operations Division
Ont. Min. of Community & Social Services
Ont. Min. of Community & Social Services/Durham Centre
Ont. Min. of Community & Social Services Systems Management & Coordination Branch
Ont. Min. of Consumer & Commercial Relations
Ont. Min. of Education
Ont. Min. of Energy
Ont. Min. of the Environment
Ont. Min. of the Environment Air Resources Branch
Ont. Min. of the Environment Lab Services Br./Pesticides Section
Ont. Min. of the Environment Water Resources Branch
Ont. Min. of Environment Project Coordination Branch
Ont. Min. of Government Service
Ont. Min. of Health
Ont. Min. of Industry & Tourism
Ont. Min. of Municipal Affairs & Housing
Ont. Min. Municipal Affairs & Housing/Municipal Management Policy Branch
Ont. Min. of Natural Resources
Ont. Min. of Natural Resources Eastern Region
Ont. Min. of Natural Resources Staff Development Unit
Ont. Min. of Natural Resources North Central Regional Office
Ont. Min. of Natural Resources Ontario Centre for Remote Sensing
Ont. Min. of Northern Affairs
Ont. Min. of Revenue
Ont. Min. of the Solicitor General Public Safety/Fire Marshall
Ont. Min. of Transportation & Comm.
Ont. Min. of Treasury & Economics
Optikon Corp. Ltd.
Orenstein & Partners
Ortho Pharmaceutical (Canada) Limited
Oshawa General Hospital
Otaco Foundry
Ottawa Board of Education
Ottawa Hydro
Oxford Regional Centre
Panouix Porcupine Mines Limited
Panascom Automation
Pan Canadian Petroleum Limited
Papeterie Reed Ltd. Mille Division
Parke Davis & Company Ltd.
Parkin Architects Engineers & Planners
Partec Lavallin Inc.
Participation House Hamilton & District
Pathex Canada Limited
PCL Construction Ltd.
Pearson & Stephen
Pest Marwick Mitchell & Co.
Agnew Peckham & Associates Ltd.
Pedlar Storage Products
People Care Centre Inc.
Peto MacCallum Limited
Petro Canada
Petrosar Limited
Philips Management Information Systems
Philips Cables Limited
Phoenix Geophysics Ltd.
Pigott Construction Co. Ltd.
Pineland's Lodge
Pine Ridge
Pitney Bowes of Canada Limited
Planned Computer System
Planning Initiative
Poetker Communications Ltd.
Polycom Systems Limited
Polyfar Limited
Polysar Resins
Populus Products
Port Weller Dry Dock
Pow Wow Point Lodge Co. Ltd.
PPG Industries Canada Ltd.
Pratt & Whitney Aircraft of Canada Ltd.
Pre Cambrian Shield Resources Ltd.
Precision Electronic Components (1971) Ltd.
Preston Sand & Gravel Co. Ltd.
Price Waterhouse & Co.
Prince Edward Heights Centre Mid Eastern Region
Prince George Pulp & Paper Ltd.
Prochim Limited
Procor Limited
Procter & Gamble Inc.
Procter & Gamble Specialties Ltd.
Proctor & Redfern Group
Pro-Eco Limited
Co-ordination and Placement
Organizations Employing Co-operative Students

Prudential Insurance Co. of America
Propak Systems Ltd.
Protective Plastics
Province of Ontario
Provincial Crane Division Dominion Bridge Co. Limited
Prudential Assurance Co. Ltd.
Prudential Assurance Co. Of America
Prudhomme's Landing
PSC Agriculture Canada
PSC Customs & Excise
PSC Dept. of Environment
PSC Dept. of National Defence
PSC Dept. of Public Works
PSC Energy Mines & Resources
PSC Insurance Dept.
PSC National Energy Board
PSC National Health & Welfare
PSC Royal Canadian Mounted Police
PSC Taxation Canada
PSC Transport Canada
Public Service Commission Alta. & Northwest Territories Reg.
Public Service Commission Ontario Region
Public Service Commission Canada
Public Works Canada
Pulp & Paper Research Institute of Canada
Purolator Limited
Pyke & Richards
QL Systems Ltd.
Quaker Oats Company of Canada Ltd.
Quasar Systems Ltd.
Quantic Chemicals Limited
Queen Street Mental Health Centre
Qupro Data Systems Ltd.
Rafael & Bunka
Ramsay Ramsay Kep & Andrew
Ray Ariss Grein & Nowak
Raytheon Canada Limited
Real Time Datapro Ltd.
J. S. Redpath
Redpath Sugarlands Limited
Red Pine Camp
Regional Municipality of Durham
Regional Municipality of Halton
Reg. Mun. Metro Toronto Housing Authority
Regional Municipality of Niagara
Reg. Mun. of Hamilton Wentworth Wentworth
Regional Municipality of Peel
Regional Municipality of Sudbury
Regional Municipality of Waterford
Reichhold Limited
Reid & Associates Ltd.
F. J. Reinders & Associates Ltd.
Reliance Telecommunications Products Ltd.
Restall Camp

Reuter Stokes Canada Ltd.
RF Communications
Rideau Correctional Centre
Rieder Distillery Ltd.
Rio Algom Limited
Wm. Roberts Electrical & Mechanical Limited
Robinson & Heinrichs
Robinson Lott & Brohman
Rockwell International
Rogers Cablesystems Inc.
Rosenberg Silverberg & Hershoran
Rothmans of Pall Mall Canada Ltd.
Royal Bank of Canada
Royal Bank of Canada Data Centre
Royal Canadian Mint
Royal Canadian Mounted Police
Royal Insurance of Canada
Royal Life Insurance Ltd.
Royal Military College of Canada
Royal Ottawa Hospital
Royal Ottawa Regional Rehabilitation Centre
Royal Trust
Ryan & Lee
Rybak Smith & Ginsler Ltd.
Ryerson Polytechnical Institute
Rygiel Home
Sacda University of Western Ontario
Samson Belair & Partners
Sander Geophysics Ltd.
Samgamo Canada (Div. of Schlumberger Canada Ltd.)
Sankey Partnership
Sarco Canada Limited
Saskatchewan Mining Development Corp.
Saskatchewan Power Corporation
Sault College of Applied Arts & Technology
Sault Ste. Marie Board of Education
Scarborough Board of Education
Scarborough General Hospital
5 & C Electric Canada Limited
Schindler Exploration Consultants Ltd.
Schlumberger of Canada
N. J. Schuller
Seacom
t Marine Research Ltd.
Joseph E. Seagram & Sons Ltd.
Senstar Corp.
Sentrol Systems Limited
G. M. Sernas & Associates Ltd.
Setchell & McKinnon Limited
Shaklee Canada Inc.
I.P. Sharp Associates Ltd.
Shaw Industries Limited
Shawingan Consultants Inc.
Sheldon Valley
Shell Canada Limited Research Centre
Shell Canada Limited Sarnia Refinery
Shell Canada Limited
Shell Canada Resources Ltd.
Sheler-Globe of Canada Limited

The Sheppard Club
Sheridan Nurseries Ltd.
Sherman Mine
Sherritt Gordon Mines Limited
Shore Tlbte Henschel Irwin Peters
J. E. Sieversipiper
Silconex Inc.
Siltronics Ltd.
Silverwood Dairies Ltd. Ice Cream Division
Silverwood Industries Ltd.
Simpson-Sears Limited Albion Distribution Centre
Simpson-Sears Limited
Sinclair Radio Laboratories Ltd.
Sir James Whitney School
Sir Sanford Fleming College
Smith Nixon & Company
Soberman Isenbaum & Colomy
Solaray
Solar Sun Heating
Soldiers Memorial Hospital
Somapro Ltd.
South Central Postal Facility
Southwestern Regional Centre
Spar Aerospace Ltd.
Sparton of Canada Limited
Specialty Chemicals Ltd.
Speryr Univac Development & Manufacturing
Sprucedale School
Spruce Falls Power & Paper Company Limited
Spruce Leigh Farms Div. of Canada Packers Ltd
Stake Technology Ltd.
Standard Brands Canada Ltd.
Standard Industries Ltd.
Stanesdale College
Stark & Temporal
Starplex Ltd.
Start Centre
St. Clair College of Applied Arts & Technology
I. Stecura
The Steel Co. of Canada Ltd. Page Hersey Works
Steel & Stainless Limited
Stelco Inc.
Sterling Limited
Sierr Cohen Weinstein Baines
St. Joe Canada Inc.
St. John Ambulance
St. John's School
St. Joseph's Hospital
St. Lawrence Cement Company
St. Lawrence College of Applied Arts & Technology
The St. Lawrence Seaway Authority
St. Marys Cement Limited
Paul A. Stocks I limited
J. Peter Stokes
Stone Conway Snowbell Kirschner & Swanson Chartered Accountants
Stone & Kohn
Storebrand International
Co-ordination and Placement
Organizations Employing Co-operative Students

Stratford Summer Music Foundation
St. Regis (Alberta) Ltd.
Sudbury & District Health Unit
Sudbury Hydro
Sullivan Strong Scott Inc.
Sulpetro Minerals Ltd.
Summer Adventurers
Suncor Inc. Oil Sands Division
Suncor Inc. Sunoco Group
Sun Life Assurance Co. of Canada
Sunnybrook Medical Centre University of Toronto Clinic
Sunset Home for the Aged
Superior Concrete Accessories (1980) Canada Limited
Sutherland-Schultz Limited
Sybron Canada Ltd. Taylor Instrument Division
Syncrude Canada Limited
Syncrude Canada Ltd. Research Centre
Synifex Industries Inc.
Systemix Services Limited
Systemhouse Limited
Talus Mfg. Limited
Tamwood Lodge
Tandem Computers Canada Limited
Tanzer Industries Inc.
Tax Time Services
Taylor Leibow Lukas & Pomerantz
Technical Service Laboratories
Technicon Consultants
Techno Scientific Inc.
Tectrol Inc.
Teklogix Ltd.
Teleglobe Canada
Teleride Developments Limited
Telestal Canada
Tembec Forest Products Co. Ltd.
Tempo Computer Services
Temptire Industries Limited
Termware Consultants Limited
Terrel Industries Ltd.
TES Limited Engineering Research
Texaco Canada Inc.
Texas Instruments Inc.
Thames Valley Dist. Health Council
Thermo-Electric (Canada) Ltd.
Thistletown Regional Centre
J. E. Thomas Specialties Ltd.
Thompson Berwick Pratt
Thorne Riddell & Company
Thornes Limited
Thorne Stevenson & Kellogg
Management Consultants
Thrush Inc.
TIL Systems Limited
Timbergate Engineering Ltd.
TIW Industries Steel Platework Division
T. L. Kennedy Secondary School
Topaz Project
Toronto Board of Education
Toronto District Christian High School
Toronto Dominion Bank
Toronto General Hospital

Toronto Hydro Electric System
Toronto Mutual Life Insurance Co.
Toronto Stock Exchange
Toronto Transit Commission
Toronto Transit Commission Subway Construction Branch
Torpitt Lodge on Sperraw Lake
Totten Sims Hubicki
Touché Ross & Company
Town of Ajax Recreation Department
Town of Bracebridge Recreation Department
Town of East Gwillimbury
Town of Elliot Lake
Town of Kincardine Recreation-Parks-Arena
Town of Lincoln
Town of Markham
Town of Markham Parks & Recreation Department
Town of Mount Forest Recreation Department
Town of Port Elgin
Town of Richmond Hill
Town of Stoney Creek
Town of Tillsonburg Recreation Department
Town of Wallaceburg
Township of Muskoka Lakes
Township of Nepean
Township of Wilmot
TPK Solar Systems Inc.
Tracor Engineering Limited
Trafalgar Castle School
Tran Communications Ltd.
Transamerica Occidental Life Insurance
Trans Canada Freezers Ltd.
TransCanada Pipelines
Transport Canada Telecom & Electronics
Traugott Construction Ltd.
Trecan Ltd.
Trench Electric Limited
Triangle Truck Equipment Ltd.
TRI Hospital Respiratory Service
Mount Sinai Hospital
TRI Ocean Engineering Ltd.
B. A. Tripp & Associates Ltd.
Trojan Environmental Products Inc.
Trow Ltd.
TRW Canada Ltd.
TRW Canada Limited Thompson Products Division
TRW Data Systems Div. of TRW Canada Limited
TS Manufacturing Ltd.
Peter Turner
TV Ontario
Ultima Wallcoverings Inc.
Umex Corporation Limited Thierry Mine
Underwood McLeLien Ltd.
Unifin Division of Keeprite Products Ltd.
Union Carbide Canada Limited Carbon Division
Union Carbide Canada Limited
Union Gas Limited
Union Gas Limited Northern Division
Uniroyal Limited Research Labs
Uniroyal Limited Tire Division
Uniroyal Chemical Division of Uniroyal Limited
United Co-operatives of Ontario
United Extrusion Limited
Vanier Industries Limited
Universal Industries Ltd.
Uniserve Insulations Co. Limited
University of Guelph
University of Notre Dame Radiation Laboratory
University of Ottawa
University of Toronto Institute of Biomedical Engineering
University of Toronto Computing Services
University of Waterloo
University of Western Ontario
Upper Thames River Conservation Authority
Urban Kinetics Ltd.
Utah Mines Limited
Valcom Limited
Valleyview Home for the Aged
Venbots Construction Corp. Ltd.
Vanier Centre for Women
Varian Canada Ltd.
T. J. Varkony & Associates Ltd.
Consulting Engineers
C. A. Ventin
VIA RAIL CANADA INC.
Victoria & Grey Trust
Vidi Comp Data Services
Vins Plastics Limited
Wabco Ltd.
Wabco Equipment of Canada
Wabush Mines
Walbrook Appointments
BP Walker Associates Ltd.
Walker Brothers Quarries
Wampole Limited
Ward-Beck Systems Ltd.
Ward Mallette
Waterloo County Board of Education
The Waterloo County Board of Education
Waterloo County Roman Catholic Separate School Board
Watsun User Service Facility
Weall & Cullen Nurseries
Jervis B. Webb Co. of Canada Ltd.
Webb Zerafa Menkes Housden
Welch Cybernetics Corporation
Geo. A. Welch & Co.
Welding Institute of Canada
Wellness Hospital
Wellington County Board of Education
Welmet Industries Ltd.
Welsh & Galloway
Wescan Western Controls Inc.
Westclox of General Time of Canada Ltd.
Wested-Rosco Limited
Western Foundry Co. Ltd.
Westinghouse Canada Limited
Nuclear Power Division
Westinghouse Canada Inc.
West Park Hospital
Westroc Industries Limited
Wheatley Hall Farms
Whitby Psychiatric Hospital
White Farm Equipment Canada Limited
Wild Leitz Canada Ltd.
Wilfrid Laurier University School of Business & Economics
Wilk Engineering Limited
Wilkinson & Company
Williams Woodruff Elmes
Wilson Office Specialty Ltd.
Wilson & McLaren
Wirtanen Electric Ltd.
Woodbridge Foam Corp.
Wood Gundy Limited
Woodingford Lodge
Woods Gordon
Woodstock PUC
F. W. Woolworth Co. Ltd.
Workmen's Compensation Board
Hospital Rehabilitation Centre
Workmen's Compensation Board
World's Finest Chocolate Canada Ltd.
World Translation Co. of Canada Ltd.
Worthington Canada Inc.
The Wyatt Company

Xerox Canada Inc.
Xerox Research Centre of Can. Ltd.
Xicom Technologies Corp.
Yamnuska Centre
YMCA Central Region
YMCA Hamilton
YMCA North York Branch
YMCA Orillia
YMCA Scarborough
YM-YWCA Oakville
YM-YWCA Windsor
YM-YWCA Snowdon
York Borough Board of Education
Yorklea Children's Centre
York Ryerson Computing Centre
Yorkville Sound Ltd.
Young & Wright Architects
YWCA Calgary
YWCA Vancouver
YWCA Woodstock
R. S. Zacks
Zymaize Inc.
3M Canada Inc.
The University Library
The University Library

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

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

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

Business Administrator
J. Jorgensen, BA (Toronto)

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

Support Services

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

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

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

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

Serials Department Head
B. Bruder, BA (Waterloo Lutheran)

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

Reader Services

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

Dana Porter Arts Divisional Library

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

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

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

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

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

Orientation Librarian
G. Meek, BA (McMaster), MA, MLS (Western Ontario)

Engineering, Mathematics and Science Divisional Library

Assistant Librarian for the Engineering, Mathematics and Science Divisional Library
Vacancy

Circulation Department Head
C. McDonald, BA (California)

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

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

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

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

The Library is central to the academic programs of the University. Its function is to provide books, journals and other library materials to support these programs. The library staff, aided by the university community, works to make the library a base for teaching, study and research. The University Library is composed of two divisional libraries, the Dana Porter 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 brailler and a 4-track cassette recorder and playback unit are available for the visually handicapped. The Library can also provide access to recorded 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 main 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, eight typing cubicles and a microcomputer room. The second or main floor contains the public catalogue, the circulation counter and the Information Desk. Also on the main floor is the Current Periodical Reading Room, the Interlibrary Loan Office and the Reference Collection. The periodical and newspaper collections and microforms are located on the third floor. Government publications are located on the fifth floor. The upper floors (six through ten) house the circulating book collection and contain seating accommodation for more than 700 library users.

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

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

Department of Computing Services

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

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

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

Computer Communications Networks Group

Director
J. W. Wong, BA, MA, PhD (UCLA)

Arts Computing

Director
P. H. Smith, Jr., 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
J. L. I. Morris, BSc (Leicester), PhD (St. Andrew)

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

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

The Department operates a public terminal room which is open to anyone who has been authorized to use the computer services. Printed and hard-copy graphic output can be retrieved from a large I/O operations room located conveniently nearby. Many users have the use of remotely located terminals which gain access to VM/370 CMS over a sophisticated communications system. Off-campus access to the system is possible over the ordinary telephone system, or through DATAPAC, the digital network operated by Bell Canada.

In addition to the computing facilities and services outlined above, the Department of Computing Services provides several "user services". Programming consultation, non-credit courses and seminars, documentation, computer reference room facilities, and newsletters are provided by the user services personnel of the Department to help make using the computer an easier and more efficient process for all members of the University community.
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 minicomputers for use in graduate and undergraduate courses as well as for research. These include three DEC VAX 11/780's running Berkeley UNIX, a Honeywell Level 6, 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 ongoing research projects and computer graphics courses. This equipment is available to computer science students involved with graphics projects.

Arts Computing Office

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

The office attempts to address the special computing needs of those in the Humanities and Social Sciences. To this end the office is staffed by trained consultants available to help users with problems they may encounter with their projects.

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
- WIDGET - 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 Networks Group (CCNG)

This group was founded in 1971 and is funded through research grants, government contracts and industrial contracts. It consists of approximately eight faculty members, from both Computer Science and Electrical Engineering, 25 graduate students and a few staff members. CCNG is a member of the Institute for Computer Research (ICR).

Research interests at CCNG include distributed processing, local area networking, videotex, network protocols, robust data structures and network performance modelling and simulation. 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.
Faculty of Arts
The Faculty of Arts

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

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

ADMISSION

1. General Requirements
The admission requirements of the Faculty of Arts are the same as the General Admission Requirements of the University for applicants from Ontario Grade 13 and for those not currently registered in Ontario Grade 13. See Chapter 2 for details. Admission requirements for part-time students are the same as for full-time students.

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

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

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

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

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

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

- Accounting
- Anthropology
- Classical Studies
- Drama and Theatre Arts
- Economics
- English
- Fine Arts
- French
- Geography
- German
- History
- Latin
- Medieval Studies
- Music
- Philosophy
- Political Science
- Psychology
- Religious Studies
- Russian
- Slavic Studies
- Social Development
- 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. 93.

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
- 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.

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

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

A minor is available in Italian although there is no major program in that discipline.

INTERDISCIPLINARY OPTIONS
Students in many Honours Programs within Arts may choose an interdisciplinary option or minor which will be designated on the diploma. Students in some General Programs may choose one of several available options. Options are available in:

- Canadian Studies (Option or Minor, see Chapter 15)
- Gerontology (Minor, see Chapter 15)
- Iberoamerican Studies (Option, see Chapter 15)
- Legal Studies (Option, see Chapter 15)
- Management Studies (Joint Honours or Minor, see Chapter 15)
- Peace and Conflict Studies (Option or Minor, see Chapter 15)
- Personnel and Administrative Studies (Minor, see Chapter 15)
- Studies in Personality and Religion (Option or Minor, see Chapter 15)
- Women's Studies (Option, see Chapter 15)
SELECTION OF YEAR 1 PROGRAMS
All Year 1 students are officially classified as being in the General Arts Program, the Arts Co-op Program or the Accounting Co-op Programs. Students in Accounting Co-op programs have a highly specified first year and should refer to the Accounting Program section. Students in General Arts and Arts Co-op do not select a specific major or Honours program until Year 2. The first year is a broad exploratory year, and the student should select a program of courses that keeps as many options as possible open for advanced work. Students admitted to Arts Co-op must select several required courses in Year 1 (see "Applied Studies", Departmental Programs). Students in Year 1 General Arts usually choose 5 term courses in both the fall and winter terms (or a combination of year and term courses equivalent to 5 term courses per term). Students usually select 2 courses from disciplines in Group A and 2 from disciplines in Group B (see Degree Requirements), with 1 or 2 more courses as electives. As well, students are encouraged to select courses in any discipline in which they may hope to major. (Students are advised that a 6-course work load may be quite heavy.) The Faculty of Arts recommends that its students take at least 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.

COURSE AND PROGRAM CHANGES
1. Changes in courses or programs must be submitted for approval to the appropriate Undergraduate Officer.

2. Courses may be added during the first two weeks of the term in which they begin only with the signature of the instructor of the course and the Undergraduate Officer of the student's major department. Courses may be dropped during the first three weeks of the term in which they begin only with the signature of the Undergraduate Officer of the student's major Department.

3. After these times, courses may be added or dropped only with the permission of the Examinations and Standings Committee acting on the recommendation of the instructor of the course and the Undergraduate Officer of the student's major department, and only if the student can support his case with reasons showing that such a change in his program will serve his academic interests.

4. Courses offered during the Summer Session may be added or dropped during the first week in which the course begins only with the signature of the instructor of the course and the Undergraduate Officer of the student's major department, and thereafter only with the permission of the Examinations and Standings Committee.

5. A course that has not been dropped officially (i.e. recorded in the Registrar's Office) will receive a grade and be counted in the student's average. It is important that students settle down in their schedule of courses just as quickly as possible. Students usually find that courses they add late in the second week of classes pose special problems in catching up with the work already covered.

Teacher Certification in Ontario
The Ontario Teacher's Certificate may be granted by the Ministry of Education after the successful completion of a program taken at an approved Ontario Faculty of Education. The Faculties of Education require that applicants hold an acceptable University degree (B.A. or B.Sc. or equivalent, 3- or 4-year General or Honours).

The Honours Specialist Qualification (HSQ) requires:
• An Honours Bachelor's degree or equivalent; and
• A B average in the subject or subjects in which the HSQ is sought; including
• 9 credits in the subject for 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.
Degree Requirements

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

Note

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.

English Language Proficiency Program

Over the past several years the Faculty of Arts has become concerned that some students may experience academic difficulties because they lack the basic writing skills required for university work. In order to help these students the Faculty has introduced an English Language Proficiency Program. This program comprises 1) an English Language Proficiency Examination which all students must write at the beginning of their first year in the Faculty of Arts, and 2) a Writing Clinic where students may receive individual help with their writing problems.

All students whose initial registration in degree programs in the Faculty of Arts was Fall 1977, or thereafter, must demonstrate competence in written English in order to qualify for the Bachelor of Arts degree. Students may fulfill this requirement by achieving a mark of at least 50% on the English Language Proficiency Examination or by demonstrating this competence in their Writing Clinic assignments.

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

English Language Proficiency Program - Off-Campus Students

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

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

Only the subjects listed above will satisfy the Group requirements.

In order to complete the Group A and B requirements an Arts student in either a Major or an Honours Program must complete with passing marks a minimum of six term courses from Group A and a minimum of four term courses from Group B. Of the four term courses used to satisfy the Group B requirement, no more than two may be in the same discipline. The student should note that Group A is further sub-divided into Group A (i), Group A (ii), and Group A (iii). Of the six term courses from Group A, the student must complete with passing marks:
- a minimum of two term courses from Group A (i).
- a minimum of two term courses from Group A (ii).

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 meet the Group A requirements, no more than two may be in the same discipline and similarly no more than two of the four term courses used to meet the Group B requirement may be in the same discipline. A student may take more than two term courses in a specific discipline but only two will be applied, where appropriate, to a Group A or B requirement.

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

Arts
Degree Requirements
Examinations and Standings

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 one of the following courses: FR 291/292, GER 271/272, RUSS 271/272, SPAN 203/204, C CIV 201/202 or ITAL 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 20.

Students should note that the Faculty of Arts operates under a course system in which student progress is measured by courses successfully completed rather than by years. Students who have successfully completed fewer than 10 term courses are considered Year 1 students; those who have successfully completed at least 10 term courses but fewer than 20 will be considered Year 2 students; those with at least 20 but fewer than 30, Year 3, and those with 30 or more, Year 4.

Final Examinations
1. The Faculty constitutes the examining body for all examinations. When a final written examination is required it is normally held at the end of the course. Oral examinations may be required at the discretion of individual departments. The normal time for written examinations is 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 calculating averages, the
   following weights will be assigned to grades
   received in individual courses:
   
<table>
<thead>
<tr>
<th>Letter</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>95</td>
</tr>
<tr>
<td>A</td>
<td>89</td>
</tr>
<tr>
<td>A-</td>
<td>83</td>
</tr>
<tr>
<td>B+</td>
<td>78</td>
</tr>
<tr>
<td>B</td>
<td>75</td>
</tr>
<tr>
<td>B-</td>
<td>72</td>
</tr>
<tr>
<td>C+</td>
<td>68</td>
</tr>
<tr>
<td>C</td>
<td>65</td>
</tr>
<tr>
<td>C-</td>
<td>62</td>
</tr>
<tr>
<td>D+</td>
<td>56</td>
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<tr>
<td>D</td>
<td>55</td>
</tr>
<tr>
<td>D-</td>
<td>52</td>
</tr>
<tr>
<td>F+</td>
<td>46</td>
</tr>
<tr>
<td>F</td>
<td>38</td>
</tr>
<tr>
<td>F-</td>
<td>32</td>
</tr>
</tbody>
</table>

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
   period.

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

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

3. An Incomplete (INC) may be assigned by an
   instructor in exceptional circumstances, with the
   consent of his Department. This extension of
   completion date is granted to students as a
   privilege for a limited and specified time and in
   normal circumstances shall be no longer than
   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 incomplete 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 after the completion of at least ten term courses. Each record is examined again after the completion of a minimum of ten further term courses from the point of any previous considerations. 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 two kinds of Honours programs:

The Honours Accounting degree program is designed to provide a complete academic preparation for students intending to pursue a broad range of careers as professional accountants. In addition, it is designed to prepare students to proceed directly to write final professional certification examinations of the Institute of Chartered Accountants (CA) and the Society of Management Accountants (RIA).

By contrast, the Honours Accountancy Studies Programs (Economics Option) permit students to meet the minimum course requirements for CA and RIA in a four-year program, but do not include either the breadth or depth of the Honours Accounting program.

All students are advised to complete the Honours Accounting program. To do so, students should gain admission to one of Honours Chartered Accountancy Studies (Economics Option) or Honours Management Accountancy Studies (Economics Option) and then transfer to the Honours Accounting Program at the end of Year 2. The recommended program for Years 1 and 2 of the Accountancy Studies programs is also the recommended program for students at the University of Waterloo who intend to apply for admission to the Honours Accounting program at the end of Year 2. Details of the programs are presented below.

Admission to Co-op Programs

A limited number of students will be admitted directly to Year 1 of Co-op Honours Chartered Accountancy Studies (Economics Option) or Co-op Honours Management Accountancy Studies (Economics Option).

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. Students are charged a one-time internship fee in the term preceding the internship.

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. Graduates of this program with the Public Accounting Option are able to write the Chartered Accountants Uniform Final Examination on graduation. It is expected that graduates with the Managerial Accounting Option will receive the maximum credit available toward the RIA designation of the Society of Management Accountants of Ontario.

Honours Chartered Accountancy Studies (Economics Option) and Honours Management Accountancy Studies (Economics Option) are programs which combine a less-extensive preparation in Accounting with studies in Economics and include the minimum courses required to write the final examinations for the CA and RIA certificates.

Both programs may be taken as Co-operative or Regular. Students may apply for direct admission to Year 1 Co-op Accountancy Studies and register in either Co-op Chartered Accountancy (Economics Option) or Co-op Management Accountancy (Economics Option). Enrolment in these programs is limited. If not admitted to the first year of the Co-operative program, students will be considered for admission to the Regular program and may apply for admission to the Co-operative program after completion of their first term of study. These students must contact the Undergraduate Officer by December 15 of the Fall term in Year 1.

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 thirty-two term courses, plus a minimum of eleven courses that must be completed before entry. The thirty-two 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.

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 group of required Core courses and the required completion of one of the three options of Public Accounting, Managerial Accounting and Information Systems, or Taxation. The Core courses, required of all students regardless of option chosen, are the following:

- FCON 201, 202
- PHIL 215
- ENGL 210
- PSYCH 333 or approved equivalent.

Option Requirement
All students must complete one of the three options:

- Managerial Accounting & Information Systems: 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.

Requirements for Admission
Applications for admission to the Accounting Program will be accepted from students who have completed the required pre-admission studies at the University of Waterloo or elsewhere. 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 90).

Further work in the humanities, social sciences or mathematics is recommended to serve as a basis for worthwhile use of the electives available in the Accounting Program. It will normally require two years of study to be properly prepared for admission. Students should note that the Institute of Chartered Accountants of Ontario requires completion of a four-year program of studies in order to qualify to write the Uniform Final Examination on graduation.

Accounting Program

### Pre-admission

<table>
<thead>
<tr>
<th>Minimum Requirement (term courses)</th>
<th>Recommended Courses</th>
<th>Additionally Recommended</th>
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</thead>
<tbody>
<tr>
<td>Accounting (Note 1)</td>
<td>ACC 101, 102</td>
<td>ACC 109</td>
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<tr>
<td>Economics</td>
<td>ECON 101, 102</td>
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<tr>
<td>Computers</td>
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<td>English</td>
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<tr>
<td>Introductory Psychology</td>
<td>PSYCH 101</td>
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<tr>
<td>Statistics (Note 3)</td>
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<tr>
<td>Calculus (Note 4)</td>
<td>MATH 113a</td>
<td>MATH 113b</td>
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<tr>
<td>Linear Algebra (Note 5)</td>
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<tr>
<td>Group A electives</td>
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Further work in the humanities, social sciences or mathematics is recommended to serve as a basis for worthwhile use of the electives available in the Accounting program. It will normally require two years of study to be properly prepared for admission. Students should note that the Institute of Chartered Accountants of Ontario requires completion of a five-year program of studies in order to qualify to write the Uniform Final Examination on graduation.

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

The normal program for a student at the University of Waterloo consists of the first two years of one of the Honours Accountancy Studies programs followed by the Accounting Program. For students not registered in Honours Accountancy Studies, the normal program involves registration in the Faculty of Arts and completing the preregistration studies set out in the example program presented below. Students registered in the Faculty of Mathematics or other Faculties at the University of Waterloo should refer to the brochure entitled "The Accounting Program, Pre-admission Requirements" for information concerning equivalent courses.

### EXAMPLE

#### HONOURS ACCOUNTING DEGREE PROGRAM

<table>
<thead>
<tr>
<th>Pre-admission</th>
<th>Minimum Pre-admission Requirements</th>
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<tbody>
<tr>
<td>Accounting</td>
<td>ACC 101, 102</td>
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<td>Economics</td>
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<td>Statistics</td>
<td>ECON 221</td>
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<tr>
<td>Calculus</td>
<td>MATH 113a</td>
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<td>Linear Algebra</td>
<td>MATH 111b</td>
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<td>Group A electives</td>
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### Accounting Program

#### Accounting Program One

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<tr>
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<tbody>
<tr>
<td>Term AP1A</td>
<td>Term AP1B</td>
<td>Term AP1C</td>
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<tr>
<td>ACC 201</td>
<td>ACC 251</td>
<td>ACC 231</td>
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<td>411</td>
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<td>441 or</td>
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<td>ECON 201</td>
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<td>ENGL 210</td>
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<td>ECON 202</td>
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#### Accounting Program Two

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<tr>
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<tr>
<td>Term AP2A</td>
<td>Term AP3B</td>
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<tr>
<td>ACC 401</td>
<td>ACC 431</td>
<td>ACC 463</td>
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<tr>
<td>491</td>
<td>402</td>
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<tr>
<td>441 or</td>
<td>PSYCH 333</td>
<td>or elective</td>
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<tr>
<td>Operations Analysis</td>
<td>option</td>
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<td>option</td>
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#### Accounting Program Three

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<tr>
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<tbody>
<tr>
<td>Term AP3A</td>
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<td>ACC 463</td>
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<tr>
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<td>441 or</td>
<td>PSYCH 333</td>
<td>or elective</td>
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<td>Operations Analysis</td>
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<tr>
<td>option</td>
<td>elective</td>
<td>elective</td>
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</tbody>
</table>
Note 1
Students are encouraged to take ACC 131, 132.

Note 2
Students may, in Year 2, also take ECON 201 and 202 and eventually substitute elective courses early in the Accounting program. This may be helpful later in structuring a sequence of elective courses.

Note 3
Students may substitute STATS 220 and 221 for ECON 221; STATS 220 and 221 are prerequisites to a number of Mathematics-area electives. (Note that the completion of Math 113b is a prerequisite for STATS 220.)

Note 4
Students who have not completed Grade 13 calculus may be required to do MATH 104 before taking MATH 113a. Students are encouraged to complete 113b; see Note 3 above concerning statistics.

Note 5:
Students who have not completed Grade 13 algebra may be required to complete MATH 103 before taking MATH 111b.

Citizenship
Applications to the Accounting Program or Co-op Honours Accountancy Programs are accepted from candidates who are Canadian citizens or 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.

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:

ECON 101, 102, 201, 202, 211, 221, 231, 301 or 302
Two term courses in ACC or ECON numbered 300 or above
M SCI 44.

Recommended Program

Year 1
ACC 101, 102
ECON 101, 102
CS 112, 115
ENGL 109
Group A elective
Two additional term courses.
MATH 111b, 113a
(Students who have not completed Grade 13 calculus should complete MATH 104 before taking MATH 113a; students who have not completed Grade 13 algebra should complete MATH 103 before taking MATH 111b.)

Year 2A
ACC 231, 281
ECON 201, 221, 231
One additional term course.

Year 2B
ACC 251, 291
ECON 202
PSYCH 101
Two additional term courses.

Year 3A
ACC 411, 412, 461
ECON 301 or 302
One term course.

Year 3B
ACC 292, 371, 381, 462
ENGL 210
One additional term course.

Year 4A
ACC 372, 382, 441
Three additional term courses.

Year 4B
ACC 401, 491
M SCI 44
Two additional term courses.

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 requirement for qualification as a CA 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 CA option.

The following are the required courses:
ECON 101, 102, 201, 202, 211, 221, 231, 301 or 302, 341
and one additional term course in ACC or ECON at the 300 level or above.

**Recommended Program**

**Year 1**
- ACC 101, 102, 131, 132
- ECON 101, 102
- CS 112, 115
- ENGL 109
- Group A elective
- MATH 111b, 113a
  (Students who have not completed Grade 13 calculus should complete MATH 104 before taking MATH 113a; students who have not completed Grade 13 algebra should complete MATH 103 before taking MATH 111b.)

**Year 2A**
- ACC 231, 281
- ECON 201, 221, 231
- One additional term course.

**Year 2B**
- ACC 251, 291
- ECON 202
- PSYCH 101
- Two additional term courses.

**Year 3A**
- ACC 292, 371, 381, 462
- ENGL 210
- One additional term course.

**Year 3B**
- ACC 292, 371, 381, 462
- ENGL 210
- One additional term course.

**Year 4A**
- ACC 372, 382, 441
- ECON 341
- Two additional term courses.

**Year 4B**
- ACC 401, 491
- Three additional term courses.

**Continuation In Program**
All accounting programs in the Faculty of Arts at the University of Waterloo are Honours programs. Students must maintain an Honours average of 75% in all courses designated as required. In addition, students must maintain an average of 70% in all Accounting (ACC) courses in order to continue in the program.

**Arts**
Accounting
Anthropology

**Prerequisite**
Students planning to enter Honours Accountancy Studies (Economics Option) or Honours Accounting should complete a Grade 13 course in English and at least one of Grade 13 calculus or algebra. Students who have not completed both of these mathematics courses will be required to complete equivalent courses 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 ACC 101/102. Any student who scores at least 70% in this test will be exempted, without any credit accumulated, from ACC 101/102 and may register for ACC 291.

**Anthropology**
(Anthropology, Socio-Cultural Anthropology, Physical Anthropology)

Anthropology traditionally includes Archaeology, Physical Anthropology and Linguistics. The University of Waterloo Department of Anthropology stresses Archaeology, Socio-Cultural Anthropology and Physical 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 102A or ANTH 283
- ANTH 102B
- ANTH 201
- ANTH 202
- ANTH 260
- ANTH 330

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

- ANTH 101
- ANTH 102A or ANTH 283
- ANTH 102B
- ANTH 201
- ANTH 202
- ANTH 260
- ANTH 300
- ANTH 330
- ANTH 499

One 400 level term course in Anthropology.

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 283 or ANTH 202
- ANTH 102B
- ANTH 290
- ANTH 280
- ANTH 300
- ANTH 330
- ANTH 499

One 400-level term course in Anthropology.

**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 (Applied Studies Co-op)

Co-op Anthropology students will pursue a normal first year Arts program, taking ANTH 101 and either ANTH 102A or 102B. In the second year and thereafter the student is required to pursue a normal Honours program. It is strongly advised that ANTH 300 be taken in the second year.

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

**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).

### 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**

<table>
<thead>
<tr>
<th>Year 1A</th>
<th>Year 1B</th>
<th>Year 2A</th>
<th>Year 2B</th>
<th>Year 3A</th>
<th>Year 3B</th>
</tr>
</thead>
<tbody>
<tr>
<td>A second language</td>
<td>ACC 131</td>
<td>CS 112 or 115 or 116 or ARTS 198</td>
<td>Proposed Major Subject and Electives (3 term courses)</td>
<td>Proposed Major Subject and Electives (3 term courses)</td>
<td>Proposed Major Subject and Electives (3 term courses)</td>
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<tr>
<td>ACC 132, ENGL 109</td>
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<td>Proposed Major Subject and Electives (3 term courses)</td>
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### 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**

<table>
<thead>
<tr>
<th>Year 1</th>
<th>GRK 100A/100B, or LAT 100A/100B or LAT 203/204</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C CIV 101/102</td>
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<td>Six additional term courses</td>
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</tbody>
</table>

#### Art

**Applied Studies**

**Classical Studies**

<table>
<thead>
<tr>
<th>Year 2</th>
<th>LAT 203/204, or two term courses in Latin at the 200 level, or two term courses in Greek at the 200 level</th>
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<tbody>
<tr>
<td></td>
<td>C CIV 251/252, 265/266 Four additional term courses</td>
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<table>
<thead>
<tr>
<th>Year 3</th>
<th>Two term courses in Greek or Latin at senior level</th>
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<tbody>
<tr>
<td></td>
<td>C CIV 301/302, 351/352 Four additional term courses</td>
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<table>
<thead>
<tr>
<th>Year 4</th>
<th>Four term courses in Classical Civilization</th>
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<tbody>
<tr>
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<td>Six additional term courses</td>
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</table>

**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 97.

**Joint Honours Classical Studies**

**Recommended Program**

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

**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 100A/100B 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 LAT 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 97.

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 LAT 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
   d) DRAMA 371 and DRAMA 372
   e) Six of DRAMA 251, 252, 253, 254, 255, 251, 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
Whether a student does the Senior Seminar (499) or not will depend upon the requirements of other departments. If the other department requires the equivalent of a Senior Seminar of its Joint Honours students the Drama Group would waive the 499 requirement. Instead the student would take any two other Drama classes. If the other department does not have a Senior Seminar requirement then the student may elect to take DRAMA 499 or two other Drama classes. For a description of DRAMA 499, see Course Descriptions.

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

**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.

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

**General Economics**

Students proceeding to a General Arts degree with a major in Economics are required to take as part of their program ECON 101, 102, 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 this 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 ECON 101, 102, 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 ECON 101, 102, 201, 202, 211, 221, 231, 301, 302, 401, 402. In addition students must select one of ECON 241 or 263, and an additional term course in Economics from courses numbered above 300.

**Recommended Program**

**Year 1**

ECON 101, 102

Eight additional term courses*

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

**Year 2**

ECON 201, 202, 231

Three additional term courses in Economics

Four additional 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 97.

**Honours Applied Economics (Co-op)**

Forty-four term courses are required. The required Economics courses are:

ECON 101, 102, 201, 202, 221, 231, 241, 263, 301, 302, 303, 321, 401, 402, 421, 422.

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

**Note**

Students in this program will be required to do a minimum of two term courses in Mathematics above the level of MATH 101, 102 plus STAT 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 95.

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

Joint Honours Programs
The courses in economics for any joint honours program normally are: ECON 101, 102, 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 ECON 221 or ENV S 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
ECON 263 must be taken along with the above core courses.

Note 4
Economics and Mathematics
Substitute ECON 311, 321, for ECON 211, 221. ECON 421, 422 to be included in the above core courses.

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

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

English

General Program
To fulfill the requirements for a General degree in English, students 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. 200A/B (Survey of British Literature) (See Notes 2 and 6)
3. 251A/B (Practice and Theory of Criticism) (See Note 2)
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
English Honours students 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. 200A/B (Survey of British Literature) (See Notes 2 and 6)
3. 251A/B (Practice and Theory of Criticism) (See Note 2)
4. Two term courses from 305A/B, 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 relevant to their careers. Finally, they will have qualified for a University of Waterloo Honours BA Degree in English.

Honours English (Applied Studies Co-op)
Students may combine an Honours English program with Applied Studies Co-op. The requirements in English are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 97.

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

1. 102 or 105A/B (or equivalent) (See Note 1)
2. 200A/B (Survey of British Literature) (See Notes 2 and 6)
3. 251A/B (Practice and Theory of Criticism) (See Note 2)
4. Two term courses from each of the following:
   4a. 305A/B, 373A/B, 375A/B (Language and Early Literature)
   4b. 310A/B, 330A/B, 350A/B, 362, 363, 410A/B (British Literature to 1800)
   4c. 430A/B, 451A/B, 460A/B (British Literature since 1800)
   4d. 313, 314, 315, 316, 343, 344, 345, 346, 347, 415 (North American Literature)
5. 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. 200A/B (Survey of British Literature) (See Notes 2 and 6)
2. 251A/B (Practice and Theory of Criticism) (See Note 2)
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, students may gain English Major credit from the following English courses without formal permission from the Department: 103A/B, 108, 190. Students 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
English Joint Honours students 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. English Honours students 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. 89). The Department of English also recommends CIV 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) 305A/B or 310A/B
   c) 330A/B or 350A/B
   d) four term courses from 410A/B, 430A/B, 451A/B, 460A/B
   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 305A/B, 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 313/314/315/316/415

Note 6
Students who have taken ENGL 101 in 1980/81 or earlier will not be required to take ENGL 200A/B. If taken, it will not count as an English Major credit.
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 252, 255R, 271W and 258W.
Electives - twelve term courses.

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

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

**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 97.

**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 the major program, including:
FINE 110/111, 120/121

**Minor Program (Film Studies Option)**
Ten term Fine Art courses, in addition to the major program, including

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

**Four Year General Program in French**
Students in the Four Year General program must complete sixteen term courses in French of which six must be at the 200 level, and eight at the 300 and 400 levels, including FR 401/402. Forty term course credits in total are required for the degree. A minimum average of 65% must be maintained in the French courses.

**Honours Program in French**
Students in the Honours program in French must complete before graduation forty term courses of which twenty must be in French, with at least twelve term courses at the 300 or 400 levels. One term course must be taken in at least six of the subject areas defined by the Department.

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

Year 1
FR 192 or FR 195/196
Eight additional term courses

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

Year 2
A minimum of FR 251 plus one of FR 207, 208, 252 or 255, 231, 253, 275 plus one of FR 203, 232, 254, 273.
Four additional term courses.

Year 3
Four additional term courses.

Year 4
A minimum of FR 401/402 or their equivalent, FR 421 or 422, FR 409 or 410, plus two additional term courses in French at the 300 or 400 level.
Four additional term courses.

Note 1
With the permission of the department, the student may spend the third year enrolled in the Nantes program in France or in the Laval program in Quebec.

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

Honours French (Applied Studies Co-op)
Students may combine an Honours French program with Applied Studies Co-op. The requirements in French are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 97.

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

- Anthropology
- Economics
- English
- Fine Arts
- Geography
- German
- History
- Latin
- Man-Environment
- Mathematics
- Philosophy
- Political Science
- Psychology
- Sociology
- Spanish

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

Students registered in a Joint Honours Program involving French must complete a total of forty-four term courses of which sixteen must be in French (in the case of Political Science only fourteen are required), with at least eight in French at the 300 or 400 level, including FR 402, and one term course from at least five of the subject areas defined by the department.

Recommended Program

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

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

Year 2
A minimum of FR 251 plus one of FR 207, 208, 252 or 255, 231, 253, 275 plus one of FR 203, 232, 254, 274.

Year 3
A minimum of FR 301/302 or its equivalent, plus two of FR 303, 342 or 363.

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

Note 1
Students in Year 4 must have the permission of the department to enrol in French courses on the 100 or 200 level.

Minor Program in French
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 FR 301/302.

Minor Program in Business French
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 FR 301/302.

Recommended Program

Year 1
FR 192

Year 2
FR 210
FR 255
A minimum of two term courses from FR 203, 205, 206, 207, 208, 251, 252.

Year 3
FR 300
FR 310
The Geography program 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

<table>
<thead>
<tr>
<th>Year</th>
<th>Courses</th>
</tr>
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</table>
| 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. |
| 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  
         ENV S 271 Introduction to Quantitative Research Methods  
         and additional courses so that a student should have completed by the end of second year twenty-two term course equivalents. |
| 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. |
| 4    | GEOG 381 The Nature of Geography  
         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). Courses designated as "Environmental Studies" are included in the calculation of the major average.

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

and one of:
GEOG 260 Introduction to Cartography and Map Analysis
GEOG 275 Introductory Air Photo Analysis and Remote Sensing

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

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

and additional courses.

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. 323).
Note 3
To enter and remain in the Honours program, students must achieve and maintain an overall average of B- (70.0%) and an average of B (75.0%) in Geography and Environmental Studies courses. Courses designated "Environmental Studies" are included in the calculation of the major average.

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

Note 5
Students intending to teach in Secondary Schools are advised to take at least four term courses of Regional Geography.

Note 6
For some courses, participating students may be expected to make a financial contribution to defray heavy equipment/travel costs, e.g. GEOG 391 (Field Research), which is mandatory for all third year regular honours students. Statements on fees, where required, will be found with the course description.

Note 7
No more than three term course equivalents may be taken as reading courses in Geography.

Geography Joint Honours and Minor Programs
(See p. 168.)
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 97.

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

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 those courses, of which:
   a) not more than four term courses may be chosen from courses on the 100 level, and
   b) at least two term courses must be chosen from courses above the 200 level.

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.
Greek
See Classical Studies

History
The Department of History offers the following programs:

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

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 above the 250 level and no more than two at the 100 level. They must maintain a C average (65.0%) in history courses.

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 485 or C CIV 486 (but not both) will be accepted for credit as a year course in History, but will not be accepted as a Senior Seminar in History.  

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 97.

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. They must maintain a B average (75.0%) in history courses.
**Minor Program**

To qualify for a Minor in History, students must complete ten term courses in History, with at least two above the 250 level and no more than two at the 100 level. Students from other departments and faculties who are interested in taking a Minor in History should consult with the Department of History's Undergraduate Officer. They must maintain a C average (65.0%) in history courses.

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**Italian**

**Minor Program**

Students enrolled in Honours Programs in Arts or other faculties may elect a minor in Italian, which requires the successful completion of at least ten term course equivalents with an overall cumulative average of 65% or more in those credits. Students are required to take the following six term courses:

- ITAL 101/102
- ITAL 191/192
- ITAL 251/252

*Note:*

Those students with Grade 13 Italian or whose competency in the language excludes them from ITAL 101/102 must substitute ITAL 291/292 for this requirement.

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

- ITAL 291/292
- ITAL 311/312
- ITAL 321/322
- ITAL 391/393
- ITAL 396/397

*Note:*

ITAL 331, 332 do not qualify for the Minor.

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**Latin**

See Classical Studies

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**Medieval Studies**

Students interested in an interdisciplinary approach to university education and to an examination of the Middle Ages may take either a General or an Honours 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 pursuance of a graduate degree.

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

**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 sixteen term courses from a list of approved courses, including at least two term courses from each of five of the eight subject fields specified.

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

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

A student may combine an Honours Medieval Studies program with Applied Studies Co-op. The requirements in Medieval Studies are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 97.
Arts
Music
Philosophy

Music

General Program
Thirty-two term course equivalents.
Music courses - 16 term course equivalents, including MUSIC 101/102, 150/151, 201/202, 250/251; at least three of 253/254, 353/354; and seven term course electives in Music.

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

Honours Program
Forty-three term course equivalents.
Music courses - 23 term course equivalents, including MUSIC 101/102, 150/151, 201/202, 250/251, 253/254, 301/302, 353/354, 370/371, 490/491, 466/467 or another 300 level course, and 6 term course electives in Music.

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

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 101/102, 201/202, 301/302, 150/151; at least three of 253, 254, 353, 354; at least three of 250, 251, 370, 371; 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 266/267, 366/367.

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

Note
Students electing to take Music Studio must audition before the music faculty. Normally a level of performance equal to the Royal Conservatory of Music Grade 8 is expected for admission to Music Studio. Students must arrange for an audition with the Music Faculty.

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

Students registered at St. Jerome's in Honours Philosophy must take forty term courses, twenty of which must be in Philosophy including:

a) one of 241, 242, 243, or 440A/B
b) 218J or 221, and 322
c) any four of 380 - 386
d) 499J or 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 97.

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 PHIL 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.

Students registered at St. Jerome's in a Philosophy Joint Honours program may substitute St. Jerome's Philosophy Courses in the same way as for the Philosophy Honours program.

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:

P SCI 101/102
ECON 101/102
SOC 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 interests. Requirements for each program are restricted to the completion of a specified number of courses in different fields of the discipline before graduation. For these purposes Political Science courses above the 100 level are numbered according to the field within which they fall.

The key to this scheme is the second digit of the course number as follows:
1 - methodology
2 - normative theory
3 - public administration, public law, and public policy
4 - local and regional politics
5 - comparative politics (more than one country)
6 - comparative politics (specific countries)
7 - the political process
8 - international politics

with the number 9 reserved for special courses which are not regarded as dealing with a particular field of the discipline. P SCI 291 and 292 are non-program courses (see Note, p. 116).

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 79%. 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.

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
2. P SCI 260A (Canadian Government and Politics I)
3. P SCI 260B (Canadian Government and Politics II)
4. P SCI 331 (Public Administration I)
5. P SCI 332 (Public Administration II)
   or
   P SCI 333 (Administrative Law)

In addition to the core courses, students are required to complete:

   1. Four term courses in Political Science beyond the 100 level which have been designated as Administrative Studies courses by the Department of Political Science.
   2. 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 of Political Science.

Total courses in the Option: Fourteen Term Courses.

This program is also available to students in the Joint Honours Program.

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 97. 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. 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.

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.
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 the equivalent of 18 term courses in Psychology including:

- PSYCH 101
- PSYCH 291, 292, and 391
- at least two of PSYCH 203, 206, 207, 261, 271
- at least two of PSYCH 211, 253, 355, 357
- at least two of PSYCH 392, 393, 394, 395, 396, 397, 398
- PSYCH 498 or 499

plus six additional term courses in Psychology.

Note 1
PSYCH 291, 292, 391, and two of the following courses: PSYCH 392, 393, 394, 395, 396, 397, 398 must be completed prior to the beginning of the fourth year of the program.

Note 2
It is recommended that honours students include at least two fourth-year seminars in their program.

Recommended Program

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

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

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

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 97.

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 85% 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, 203 or 207, 211, 212, 213, 291, 292, 311, 312, 322, 323, 341, 391, 392, 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 must complete the equivalent of 14 term courses in Psychology and an Honours thesis in one of the disciplines. Unless other arrangements are approved by the Department, all students must complete the following courses before entering the fourth year:

PSYCH 291, 292, 391 and two courses from each of the following groups:

Group 1: PSYCH 203, 206, 207, 261, 271
Group 2: PSYCH 211, 253, 355, 357
Group 3: PSYCH 392, 393, 394, 395, 396, 397, 398.

In the fourth year, all students must complete PSYCH 498 or 499, or the Honours thesis course in the related discipline. As well, it is recommended that students include at least two fourth-year seminars in their program.

Students are advised that unless they elect to also do their Honours thesis in Psychology, their Psychology component would not be equivalent to the Honours Program normally expected for admission to graduate programs in Psychology.

Joint Honours programs other than those already approved may be arranged by consultation with the Psychology Department and the Department concerned.


Honours Psychology with a BSc Degree

An Honours Psychology degree program is also available in the Faculty of Science. See Chapter 14.

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:

a) RS 100A and one other course from the Religious Studies 100A-K sequence
b) RS 200, 230 and 231
c) two term courses at the 300 or 400 level
d) 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:
   a) RS 100A and one other course from the RS 100A-K sequence
   b) RS 200, 230 and 231
   c) RS 490A and 490B

2. in general:
   a) one term course from each of the five RS areas
   b) 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.

E) 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 97.

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 term courses will normally be forty-four.

The requirements in Joint Honours programs are the same as the Honours program, except the overall number of Religious Studies courses is fourteen, instead of twenty. 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 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 the 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 Russian are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 97.

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:

a) not more than four term courses may be chosen from courses on the 100 level, and
b) 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 cultural traditions and to the study of the development of certain contemporary social problems. Courses in Social Work provide an opportunity to study various types of social intervention. The College assists students to find places as volunteers in a number of local agencies. Through this volunteer work students are given an opportunity to increase the experience which they can bring to their studies and to test and apply their theoretical understanding in practical settings.

These programs stand as a sound liberal and general education. However, they also provide an excellent background for further study in fields such as Social Work, Education, Religion, the Ministry, Journalism, and for work in various helping professions, community organizations, communications and international service organizations.

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:

### Core Area Courses

<table>
<thead>
<tr>
<th>Interdisciplinary</th>
<th>Social Science</th>
<th>Social Work</th>
<th>Sociology</th>
<th>Psychology</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISS 131R</td>
<td>SOCWK 120R</td>
<td>SOC 120R</td>
<td>PSYCH 120R</td>
<td>121R</td>
</tr>
<tr>
<td>150R</td>
<td></td>
<td>121R</td>
<td>121R</td>
<td>121R</td>
</tr>
</tbody>
</table>

| ISS 220R          | SOCWK 220R     | SOC 220R    | PSYCH 220R | 221R       |
| 221R              | 222R           | 225R        | 226R       | 227R       |

| ISS 320R          | SOCWK 320R     | SOC 327R    | PSYCH 322R | 328R       |
| 321R              |                | 328R        | 334(R)     | 323R       |

| 360 (a-f)         | 322R           | 367R        | 334(R)     | 369R       |
| 389R              | 368R           | 369R        | 386R       | 398R       |

| 469R              | 355R           | 398R        | 399R       | 366R       |
| 499R              | 365R           | 367R        | 399R       | 399R       |

**Arts**

**Russian and Slavic Studies**

**Social Development Studies**

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 discipline areas in the core 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 the other Church Colleges or Departments 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.
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, SOCWK 320R, ISS 231R, and SOCWK 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 Honours 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 “Group A and B” requirements of the Faculty of Arts;
3. a minimum of 18 term course equivalents from 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
- PSYCH 220R, 221R
- SOCWK 220R, 221R, 222R
- SOC 220R, 221R

The equivalent of 3 additional term courses.

Year 3
ISS 320R, SOCWK 326R
At least two term courses from among:
- PSYCH 322R, 323R
- SOCWK 320R, 321R, 322R
- SOC 327R, 328R
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.

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, SOC WK 120R;
2. Methodology: ISS 250R, 251R;
3. ISS 320R, plus 5 term course equivalents beyond the first year level from the core area;
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 499R 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 6 may be taken in any one discipline.

Note:
For students who do not have at least one term course in statistics and one term course in research, and especially those considering graduate studies in Social Work, ISS 250R and ISS 251R are strongly recommended.

Sociology

General Sociology
Students who take the three year general 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 (SOC 281)
- 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 SOC 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 260
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 97.

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

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

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.

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. A minimum 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 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 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 97.

Joint Honours in Spanish
The Department of Spanish recognizes combined Honours Programs in Spanish and the following disciplines: Classical Studies, History, English, Latin, French, Sociology, German.

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 Spanish, including 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.
Faculty of Engineering
The Co-operative Engineering Program

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

The engineering curricula at the University of Waterloo provide a sound basis in Mathematics and Pure Science and in Engineering Science and Design. The first year of the program is essentially common for all programs except Chemical and Systems Design Engineering. A substantial part of the work of the first and second years is common to all programs. Students elect one of the six principal divisions of engineering starting with the first year. 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

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 have the same total time on campus and in industry, one group having a double academic term at the start of the program and the other having a double academic term at the end of the program. Precise dates for the beginning and end of the various terms are shown in the academic calendar on pages 7-10.

The program in Systems Design Engineering is not divided into 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 December (for September admission). Applicants will be evaluated and advised on possible courses of action required to meet our specific requirements.

Admission as an Adult Student

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

Admission to Advanced Standing

Because of the co-operative nature of the Engineering program, no student will be admitted above Year 3, term A level. Any student thus admitted will be required to register in the January term and to complete a minimum of 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 on the completion of the work for that course. Upon examination of the student's performance at the end of each term, the Examinations and Promotions Committee assigns an academic decision. The possible decisions and their effects on the student's progress in the program are as follows:

Promoted - proceed to next term
Promoted (Aegrotat) - proceed to next term
*Proced 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 normally be allowed to proceed on probation. Probationary status will be cleared by achieving an unconditional promotion at the end of the probationary term. A student on probation who receives an average over 60% and two or more course grades below 50 will be required to repeat the term.

5. A student with a term average of 50-59% will be required to repeat the term except in 1A when the student will be allowed to proceed on probation.

6. A student on a repeat term who does not achieve an unconditional promotion will be required to withdraw from the program.

7. 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 prior to the commencement of the final exam period.
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.

   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>Letter Grade</th>
<th>A+</th>
<th>B+</th>
<th>C+</th>
<th>D+</th>
<th>F+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>95</td>
<td>78</td>
<td>68</td>
<td>58</td>
<td>46</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>89</td>
<td>75</td>
<td>65</td>
<td>55</td>
<td>38</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>A-</th>
<th>B-</th>
<th>C-</th>
<th>D-</th>
<th>F-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>83</td>
<td>72</td>
<td>62</td>
<td>52</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.)

General Studies Program in Engineering

The Canadian Accreditation Board of the Canadian Council of Professional Engineers has recommended the inclusion of "...a minimum of one-half year of appropriate humanities and social sciences" in Canadian Engineering curricula as a basis for the accreditation of a degree program. The Engineering Faculty Council and the Senate of the University approved the underlying principles of a "General Studies Program" as a response to that requirement.

"General Studies", as an integral component of Engineering at Waterloo, is intended to provide some understanding of the wider human and societal context within which an Engineering career must grow and which it must interact.

Students in the Faculty of Engineering must complete, as a part of the BASc. requirements, a program consisting of courses in humanities and social sciences. The subjects from which the courses may be taken are divided into three groups of disciplines, as follows:

**Group A: SOCIAL SCIENCES**  
i) - Courses offered within the Faculty of Engineering  
  - Management Sciences non-technical courses  
ii) - Courses offered in the Faculty of Arts  
  - Economics  
  - Political Science  
  - Psychology  
  - Sociology

**Group B: HUMANITIES**  
i) - Courses offered within the Faculty of Engineering  
  - General Engineering non-technical courses  
ii) - Courses offered in the Faculty of Arts  
  - English  
  - French  
  - History  
  - Philosophy

**Group C: GENERAL**  
- Anthropology  
- Canadian Studies  
- Classical Civilization  
- Fine Arts  
- Greek  
- Latin  
- Music  
- Peace and Conflict Studies  
- Religious Studies

Students are required to complete at least two courses from one discipline in Group A and at least two courses from one discipline in Group B.

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

Combined Bachelor's - Master's Program in Engineering

**I. INTRODUCTION**

The Faculty of Engineering program offers a combined Bachelor's-Masters' Program. The program is a response to a number of needs among which are:

- recognition of outstanding students and provision of academic enrichment for them;
- provision of an introduction to the postgraduate milieu for good undergraduate students who might otherwise overlook the opportunity of graduate studies;
- provision of a reasonably firm time horizon for the completion of the MASc program.

This program provides a mechanism for the institution of a quicker route to the MASc degree, for outstanding students, on a Faculty-wide basis. The framework is a minimum requirement and departments may add to, but not delete from the requirements of the program.

**II. GENERAL PRINCIPLES OF COMBINED BACHELOR'S-MASTER'S PROGRAMS**

A combined Bachelor's-Master's program is one in which it is deemed academically advantageous to treat the educational process leading through the BASc to the MASc degree as a single continuous integrated 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.

C) Admission to the combined program is on the basis of merit, as is continuance in the program. Students who fail to maintain sufficiently high standing will be required to revert to the regular program, or even if circumstances so warrant, to withdraw from the University.

D) The culmination of the combined program is the Master's degree; this may be attained either through the completion of a Master's degree project or research thesis. A combined program normally functions on the Co-operative basis.

F) Recruitment into a combined Bachelor's-Master's degree program must have the flexibility to satisfy the requirements of individual students; at the same time it must have coherence — each student's program must be addressed toward a well-defined area of specialization.

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

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

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

1. Academic and Administrative Responsibility
Although the Supervisor advises students, all course selections and other academic administrative matters concerning each student are subject to the approval of the Department Associate Chairmen for Undergraduate and Graduate Studies.

B) Course Programs
The courses chosen by the student (with the advice of the Supervisor and approval of the Associate Chairman) in the 4A, 4B, 5A, and 5B terms should form a coherent series which (together with the MASc project or thesis) complete the requirements of the Bachelor's and ultimately, the Master's degree.

In each of the 4A and 4B terms one course (normally 600 level) should be chosen for credit to the MASc degree. In some departments this course may replace one of the technical electives in each of those terms. Technically, it is necessary for students to register for these courses as "extras" in order to avoid counting them towards the requirements of both degrees.

If a student is proceeding to an MASc with a research thesis, the balance of courses (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 to the 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).
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 microbial cell or enzyme systems. The usefulness of these studies is obvious in a world with increasing food and health problems, and for the Canadian economy in which agricultural products play a significant role.

Extractive and Process Metallurgy
This option involves the application of chemical engineering principles to metallurgical processes in order to improve many of the pyrometallurgical, electrolytic and hydrometallurgical processes presently used in Canada. Chemical metallurgy is inter-related with these principles for overall process design and development.

Pollution Control Engineering
This option presents aspects of waste treatment and pollution abatement techniques which are becoming increasingly important for the proper function of technology in a quality conscious society.

Polymer Science and Engineering
This option has a wide scope, but special emphasis is placed on the physics and physical chemistry of polymers, and on the modifications of polymer structure by physical or chemical means. At present, a significant per cent of the Ontario chemical industry is directed to polymers (plastics, elastomers, synthetic fibres).

Transport Processes
This option is a further development of a core area of chemical engineering. Within it, aspects of fluid flow, heat transfer, mass transfer and reaction kinetics, which are important in most chemical and allied industries, are studied.
Mathematical Analysis and Control
This option also deals with the further development of a core area of chemical engineering. It involves studies in optimal control, economic and process optimization, and simulation.

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 Instrumentation 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>2A</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2B</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3A</td>
<td>1</td>
<td>1</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>
</tbody>
</table>
| 4B   | 0  | 4 | 1             *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 terms and the other two courses are normally taken in the 4B term.

1) Transport Process
CH E 510 Prediction of Physico-Chemical Properties
CH E 515 Two-Phase Flow Operations
CH E 517 Performance of Separation Processes

2) Mathematical Analysis and Control
CH E 520 Chemical Engineering Analysis
CH E 521 Process Dynamics and Control 2
CH E 523 Process Control Laboratory
3) Polymer Science and Engineering

CH E 540 Introduction to Polymer Science
CH E 541 Physical Chemistry of Polymers
CH E 543 Polymer Laboratory

4) Extractive and Process Metallurgy

CH E 550 Introduction to Extractive Metallurgy
CH E 551 Metallurgical Chemistry
CH E 553 Principles of High Temperature Extractive Metallurgy

5) Biochemical and Food Engineering

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

6) Pollution Control Engineering

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

7) Research/Design Option

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

Other Research and/or Design Projects

CH E 583 Process Systems Design
CH E 585 Technical Elective Project

Courses not in any Option Group

CH E 501 The Chemical Engineer as an Entrepreneur
CH E 502 Fundamentals of Petroleum Production

A student may acquire a BASc in Chemical Engineering with an option in Management Sciences by taking eight specific M 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.
Civil Engineering

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

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

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

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

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

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

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

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

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

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

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

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

It is difficult to give a simple definition of what a Civil Engineer is and does. Essentially the profession is principally involved with the creation, operation and maintenance of structures associated with water resources, transportation, power generation, and a wide range of industrial, commercial and institutional buildings and complexes including whole urban structures. The activities include investigation, planning, design, construction and evaluation. Vocationally a Civil Engineer may specialize in any of the foregoing. He or she may also specialize in biomechanics, solid mechanics, fracture mechanics, elasticity, building structures, bridges, hydrology, hydraulics, sanitation (public health), industrial wastes, water resource structures, irrigation and drainage, inland waterways, harbours, aerospace, highways (roads and streets), railroads, pipelines, geology, meteorology, soil mechanics, foundations, 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

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

b) Non Credit Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIV E 298</td>
<td>Civil Engineering Seminars</td>
</tr>
<tr>
<td>CIV E 299</td>
<td>Civil Engineering Seminars</td>
</tr>
<tr>
<td>CIV E 398</td>
<td>Civil Engineering Seminars</td>
</tr>
<tr>
<td>CIV E 399</td>
<td>Civil Engineering Seminars</td>
</tr>
<tr>
<td>CIV E 498</td>
<td>Civil Engineering Seminars</td>
</tr>
<tr>
<td>CIV E 499</td>
<td>Civil Engineering Seminars</td>
</tr>
</tbody>
</table>

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

B) Electives

a) Technical Electives

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

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

b) Social Sciences and Humanities Electives

Four courses, together with the general studies course 
in the 1B term, must satisfy the General Studies 
Program requirements described on p. 131.

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

C) Other Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIV E 344†</td>
<td>Urban and Regional Engineering</td>
</tr>
</tbody>
</table>
| CIV E 344† | Civil Engineering students at any level. The offering of this course is 
contingent upon sufficient demand and/or teaching |
| CIV E 344† | resources.                                       |

Academic Program for Each Term

Year 1B (Winter and Spring Terms)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIV E 126</td>
<td>plus other Year 1 courses</td>
</tr>
</tbody>
</table>

Year 2A (Fall and Winter Terms)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIV E 203,</td>
<td>CIV E 204, CIV E 221, CIV E 224, CIV E 265,</td>
</tr>
<tr>
<td>CIV E 292,</td>
<td>CIV E 298, CIV E 291†</td>
</tr>
</tbody>
</table>

Engineering
Civil Engineering
### Electrical Engineering

The curriculum in Electrical Engineering is designed to teach those fundamental physical and engineering sciences which form the basis of the work of electrical engineers. After the 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. With 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 128).

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.

Students must complete the General Studies Program requirements described on p. 131.

### 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 Systems 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 (see page 143) 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 1983/84**

**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>EL E 222</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>
<td></td>
</tr>
</tbody>
</table>

### Term 2B, 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 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>EL E 261</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>
</tbody>
</table>

### Engineering

<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 294</td>
<td>Instrumentation &amp; Measurement 2</td>
<td>1</td>
<td>1</td>
<td>3*</td>
</tr>
<tr>
<td>M E 250</td>
<td>Thermodynamics</td>
<td>3</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</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>1</td>
<td></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>Electronic Devices</td>
<td>2</td>
<td>1</td>
<td>3*</td>
</tr>
<tr>
<td>EL E 351</td>
<td>Energy Conversion</td>
<td>2</td>
<td>1</td>
<td>3*</td>
</tr>
</tbody>
</table>

General Studies Elective.

### Term 3B, 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 302</td>
<td>Seminar</td>
<td>1</td>
<td></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>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

General Studies Elective.

Five Technical Electives from the following:

<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 418</td>
<td>Communication Systems</td>
<td>2</td>
<td>1</td>
<td>1*</td>
</tr>
<tr>
<td>EL E 425</td>
<td>Systems Simulation</td>
<td>2</td>
<td>1</td>
<td>1*</td>
</tr>
<tr>
<td>EL E 427</td>
<td>Digital Systems</td>
<td>2</td>
<td>1</td>
<td>1*</td>
</tr>
<tr>
<td>EL E 435</td>
<td>Semiconductor Devices</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>EL E 446</td>
<td>Linear Systems</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>EL E 454</td>
<td>Nonlinear Electronic Circuits</td>
<td>2</td>
<td>1</td>
<td>1*</td>
</tr>
<tr>
<td>EL E 463</td>
<td>Power Electronics</td>
<td>2</td>
<td>1</td>
<td>1*</td>
</tr>
<tr>
<td>EL E 474</td>
<td>Antenna &amp; Propagation</td>
<td>2</td>
<td>1</td>
<td>1*</td>
</tr>
<tr>
<td>EL E 481</td>
<td>Control Systems</td>
<td>2</td>
<td>1</td>
<td>1*</td>
</tr>
<tr>
<td>EL E 499A</td>
<td>Project</td>
<td>—</td>
<td></td>
<td>9*</td>
</tr>
</tbody>
</table>

### Term 4B, 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 402</td>
<td>Seminar</td>
<td>1</td>
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</tbody>
</table>

General Studies Elective.

Four Technical Electives from the following:

<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 407</td>
<td>Numerical Methods</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>EL E 419</td>
<td>Digital Communications</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EL E 426</td>
<td>Software Engineering</td>
<td>3</td>
<td>1</td>
<td>1*</td>
</tr>
<tr>
<td>EL E 434</td>
<td>Quantum Electronics and Magnetics</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
Any 600-level courses taken by students in 4th year can only be counted toward the BASc. The combined Bachelor's - Master's program in Electrical Engineering has the same number of courses as the BASc program plus the MASc program.

Service Course
M E 3A EL E 32 Electrical Engineering 2
Indicates laboratory every second, every third week, or open lab. See Course Descriptions.
*If general studies electives are taken in 4th year, at least 1 must be a 2nd level course or higher. Students taking courses from group C in the program need the approval of the Undergraduate Officer.
**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 in situ heavy-oil extraction.

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

ACADEMIC PROGRAM

Term 2A, Fall
EARTH 231 Mineralogy
EARTH 235 Stratigraphy
CIV E 203 Statics
CIV E 204 Mechanics of Solids I
CIV E 221 Calculus 2
Social Sciences & Humanities Elective.

Term 2B, Spring
CIV E 222 Differential Equations
CIV E 280 Fluid Mechanics
EARTH 221 Geochemistry 1
EARTH 232 Petrography
EARTH 260 Structural Geology
Social Sciences & Humanities Elective.

Term 3A, Winter
CIV E 353 Geotechnical Engineering I
CIV E 292 Engineering Economics
EARTH 332 Metamorphic Petrology
EARTH 333 Sedimentology
EARTH 370 Economic Geology
EARTH 390 Field Methods
EARTH 438 Engineering Geology

Term 3B, Fall
CIV E 300 Civil Engineering Project I
EARTH 338 Rock Mechanics
CIV E 354 Geotechnical Engineering II
EARTH 331 Igneous Petrology
EARTH 360 Applied Geophysics
CIV E 291 Survey Camp
Social Sciences & Humanities Elective.
Term 4A, Fall
EARTH 439  Groundwater Geology
EARTH 440  Quaternary Geology
CIV E 224  Probability & Statistics
CIV E 400  Geotechnical Project I (2)
EARTH 490  Field Trip
Social Sciences & Humanities Elective.

Term 4B, Winter
CIV E 401  Geotechnical Project II
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 Social Sciences & Humanities elective 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.

The Option in Management Sciences
As mentioned above, arrangements have been made, in terms of scheduling flexibilities (providing adequate positions for electives), for any student in the following departments to complete an Option in Management Sciences:

   Chemical Engineering
   Civil Engineering
   Electrical Engineering
   Mechanical Engineering
   Systems Design
The Option in Management Sciences is structured to provide an understanding of the issues, concepts and techniques related to managerial problems, particularly those concerned with the management of technology. It aims to impart a training that will be useful for problem-solving capability in the long run; so, it lets students acquire certain skills which would 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).

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

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

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

4) 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 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.

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

<table>
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<tr>
<th></th>
<th>2A</th>
<th>2A</th>
<th>2B</th>
<th>2B</th>
<th>3A</th>
<th>3A</th>
<th>3B</th>
<th>3B</th>
<th>4A</th>
<th>4A</th>
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<tr>
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<tr>
<td>CHE A</td>
<td>CHE 220*</td>
<td>MSCI 44</td>
<td>CHE 382†</td>
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<td>CHE 382†</td>
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<td>EIE A</td>
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<td>ME B</td>
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<td>MSCI 23</td>
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<tr>
<td>SYDE B†</td>
<td>SYDE 213*</td>
<td>MSCI 46</td>
<td>SYDE 311</td>
<td>SYDE 333*</td>
<td>MSCI 43</td>
<td>MSCI 47</td>
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</tbody>
</table>

*Equivalent with MSCI 21
†Equivalent with MSCI 23
‡This course may be taken as a substitute for MSCI 32
§SYDE 131 (equivalent with MSCI 23) is taken in 1A

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

The scope of mechanical engineering is so wide and its services so universally needed as a basic part of all kinds of engineering work that the mechanical engineer is in demand in industries throughout Canada. Mechanical engineers are required in the field of power generation, where they deal with steam, diesel or other internal combustion engines, and with hydraulic or gas turbines; in the field of heating, ventilation and refrigeration; in the design, analysis, and production of machines and equipment, for example safety equipment, material handling equipment, automobiles, locomotives, marine vessels, furnaces, boilers, pressure vessels, heat exchangers, motors, generators and machine tools. They are employed in industries whose function is concerned with manufacturing, steel production, mining, transportation, communications, oil refining, chemical manufacture, paper, sugar, textiles, aerospace, nuclear energy, natural gas production and transmission and construction. In the last few years, because of the need to develop 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, casting, welding, cold and hot forming. Nonmetallic materials, including plastics and ceramics. Composites, such as fiberglass and sandwich structures are also considered.

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

f) Mechanical Engineering Core with an Option in Management Sciences
A student may acquire a BASc in Mechanical Engineering with an option in Management Sciences by taking eight specific Management Science courses as electives (see elective course listing under Department of Management Sciences).
### A) Core Program

#### a) Credit Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME201</td>
<td>Advanced Calculus</td>
</tr>
<tr>
<td>ME203</td>
<td>Ordinary Differential Equations</td>
</tr>
<tr>
<td>ME212</td>
<td>Dynamics</td>
</tr>
<tr>
<td>ME215</td>
<td>Structure and Properties of Materials</td>
</tr>
<tr>
<td>ME219</td>
<td>Mechanics of Deformable Solids 1</td>
</tr>
<tr>
<td>ME220</td>
<td>Mechanics of Deformable Solids 2</td>
</tr>
<tr>
<td>ME230</td>
<td>Control of Properties of Materials</td>
</tr>
<tr>
<td>ME250</td>
<td>Thermodynamics</td>
</tr>
<tr>
<td>ME304</td>
<td>Numerical Analysis</td>
</tr>
<tr>
<td>ME305</td>
<td>Partial Differential Equations</td>
</tr>
<tr>
<td>ME321</td>
<td>Kinematics and Dynamics of Machines</td>
</tr>
<tr>
<td>ME322</td>
<td>Mechanical Design 1</td>
</tr>
<tr>
<td>ME340</td>
<td>Manufacturing Processes</td>
</tr>
<tr>
<td>ME351</td>
<td>Fluid Mechanics 1</td>
</tr>
<tr>
<td>ME353</td>
<td>Heat Transfer 1</td>
</tr>
<tr>
<td>ME354</td>
<td>Thermodynamics 2</td>
</tr>
<tr>
<td>ME360</td>
<td>Introduction to Control Systems</td>
</tr>
<tr>
<td>ME362</td>
<td>Fluid Mechanics 2</td>
</tr>
<tr>
<td>ME462</td>
<td>Introduction to Automation</td>
</tr>
<tr>
<td>ME482</td>
<td>Mechanical Engineering Projects</td>
</tr>
<tr>
<td>MSCI21</td>
<td>Probability and Statistics (Equivalent to ME202)</td>
</tr>
<tr>
<td>MSCI23</td>
<td>Managerial and Engineering Economics 1</td>
</tr>
<tr>
<td>EL32</td>
<td>Electrical Engineering 2</td>
</tr>
</tbody>
</table>

#### b) Non Credit Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>M200</td>
<td>Introduction to Mechanical Engineering 1</td>
</tr>
<tr>
<td>M300</td>
<td>Introduction to Mechanical Engineering 2</td>
</tr>
<tr>
<td>M400</td>
<td>Introduction to Mechanical Engineering 3</td>
</tr>
</tbody>
</table>

### 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.

#### a) 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 (ME 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:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>ME452</td>
<td>Energy Transfer in Buildings</td>
</tr>
<tr>
<td>ME456</td>
<td>Heat Transfer 2</td>
</tr>
<tr>
<td>ME459</td>
<td>Energy Conversion</td>
</tr>
<tr>
<td>ME463</td>
<td>Tribology 1</td>
</tr>
<tr>
<td>ME557</td>
<td>Combustion 1</td>
</tr>
<tr>
<td>ME563</td>
<td>Turbomachines</td>
</tr>
<tr>
<td>ME565</td>
<td>Gas Dynamics</td>
</tr>
<tr>
<td>ME566</td>
<td>Fluid Mechanics 3</td>
</tr>
<tr>
<td>ME568</td>
<td>Noise Analysis and Control</td>
</tr>
<tr>
<td>ME569</td>
<td>Fluid Mechanics-Design Topics</td>
</tr>
</tbody>
</table>

#### b) Environmental Fluid Mechanics:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME469</td>
<td>Introduction to the Environmental Sciences</td>
</tr>
<tr>
<td>ME566</td>
<td>Fluid Mechanics 3</td>
</tr>
<tr>
<td>ME568</td>
<td>Noise Analysis and Control</td>
</tr>
<tr>
<td>ME571</td>
<td>Air Pollution 1</td>
</tr>
</tbody>
</table>

#### c) Machine Design and Solid Mechanics Option

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME423</td>
<td>Mechanical Design 2</td>
</tr>
<tr>
<td>ME435</td>
<td>Industrial Metallurgy</td>
</tr>
<tr>
<td>ME463</td>
<td>Tribology 1</td>
</tr>
<tr>
<td>ME524</td>
<td>Advanced Dynamics and Stress Analysis in Design</td>
</tr>
<tr>
<td>ME525</td>
<td>Mechanical Vibrations in Machines</td>
</tr>
<tr>
<td>ME527</td>
<td>Mechanics of Deformable Solids 3</td>
</tr>
<tr>
<td>ME544</td>
<td>Welding</td>
</tr>
<tr>
<td>ME668</td>
<td>Noise Analysis and Control</td>
</tr>
<tr>
<td>ME626</td>
<td>Fatigue and Brittle Fracture</td>
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</table>

(See Graduate Calendar)

#### d) Engineering Materials Option

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>ME432</td>
<td>Physical Metallurgy of Deformation and Fracture</td>
</tr>
<tr>
<td>ME435</td>
<td>Industrial Metallurgy</td>
</tr>
<tr>
<td>ME443</td>
<td>Metal Casting Processes</td>
</tr>
<tr>
<td>ME527</td>
<td>Mechanics of Deformable Solids 3</td>
</tr>
</tbody>
</table>
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 Who Have Entered 1A On or After Fall 1982**

<table>
<thead>
<tr>
<th>Term</th>
<th>Courses</th>
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<tbody>
<tr>
<td></td>
<td>M E 215</td>
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<tr>
<td>2B</td>
<td>M E 203, M E 220, M E 230, M E 250, EL E 32, M SCI 23</td>
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<tr>
<td></td>
<td>M E 360, M E 362, 1 Non-Tech. Elect.*</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 1983 - 84

2A and 2B - See Table A

3A (Spring 1983)
M E 305
M E 321
M E 340
M E 351
M E 354
1 Non-Technical Elective

3A (Winter 1984, Spring 1984) - See Table A

3B (Fall 1983, Winter 1984)
M E 322
M E 353
M E 360
M E 362
E L 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 needs to be aware of the fundamental systems and design aspects of the problem. The rapid growth and complexity of industry have, indeed, created unusual problems; however, underlying the complexities of modern civilization and technology are similarities which make it possible to approach problems in many diverse fields with essentially the same concepts, theories and techniques. Systems science has emerged as a scientific discipline for quantitative analysis, design and control of large classes of problems in engineering and social sciences.

Engineering
Mechanical Engineering
Systems Design Engineering

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:

Associate Chairman for Undergraduate Studies
Department of Systems Design
University of Waterloo
Waterloo, Ontario, N2L 3G1
(519) 885-1211 Ext. 2897

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

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

Employment Opportunities
Graduates of Systems Design Engineering will find employment opportunities in a number of diverse fields. To some extent, the technical 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

<table>
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<tr>
<th>Listing by Terms</th>
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<tbody>
<tr>
<td>1A (Fall Term)</td>
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<tr>
<td>SY DE 101</td>
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<tr>
<td>SY DE 111</td>
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<tr>
<td>SY DE 113</td>
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<tr>
<td>SY DE 121</td>
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<td>SY DE 131</td>
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<tr>
<td>SY DE 161</td>
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<tr>
<td>SY DE 181</td>
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<tr>
<td>1B (Spring Term)</td>
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<tr>
<td>SY DE 102</td>
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<tr>
<td>SY DE 112</td>
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</tbody>
</table>
Technical Options in Systems Design

Each undergraduate student in Systems Design must choose a technical option by the 3A term. At present the department regularly offers option programs in:

- Design & Human Systems
- Socio-Economic Systems
- Physical & Computer Systems

Additionally there are Option programs called Management Sciences and Computer Engineering, offered in conjunction with the Management Sciences and Electrical Engineering Departments, respectively. Students who elect either of these options will receive a final academic transcript from the University with a statement that the Option has been successfully completed.

It is also possible for a student to organize an option to suit his or her own special requirements. This is done by choosing a set of technical elective courses which, if approved by the Associate Chairman of Systems Design, will constitute an individual technical option for that student.

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

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

3B
- 5 mandatory courses
- 2 technical elective courses

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

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

SUMMARY OF THE SYSTEMS DESIGN TECHNICAL OPTIONS

Design and Human Systems Option

The Design and Human Systems option embraces in whole or in part a wide spectrum of "professional" areas known as human factors engineering, human engineering, ergonomics, occupational health and safety, biomedical engineering, and elements of various technical and non-technical disciplines such as aesthetics, perceptual psychology, marketing, mechanics, materials, etc.

However, the concentration within the Systems Design program is on the human problem to be solved...
rather than on one of these professional or discipline areas. Thus, courses will be selected, under supervision, to provide the knowledge and expertise required to define and solve problems arising at the interface between man and machine (artifact), or man and environment.

Problem areas chosen might include:
- design for extreme human environments
- design where anthropometric aspects are dominant
- design 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 modeling, 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 modeling and analysis, control systems, graph theory and computer simulation techniques are given in the earlier years followed by technical electives dealing with such topics as large-scale systems, algorithms for computer-aided-analysis and design in the final years. Students may also take technical courses in specific areas in other departments.

The Department recognizes the tremendous growth and impact of electronic computing systems on technology and society. For those students concerned with the application of computers this option provides several courses and opportunities to learn about computer hardware (structure of digital and analog computers, microcomputers and microprocessors), computer software (algorithmic, simulation and problem-oriented software), and principles of computer-aided design.

**Option in Management Sciences**

The Management 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>
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<tbody>
<tr>
<td>1A F</td>
<td>SY DE 333 Applied Statistics</td>
</tr>
<tr>
<td>1B S</td>
<td>M SCI 43 Managerial &amp;</td>
</tr>
<tr>
<td></td>
<td>Engineering Economics 2</td>
</tr>
<tr>
<td>2A W</td>
<td>SY DE 411 Systems Operations 2</td>
</tr>
<tr>
<td>2B F</td>
<td>M SCI 44 Organizational</td>
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<tr>
<td></td>
<td>Behaviour 1</td>
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<tr>
<td>3A S</td>
<td>1 other technical elective</td>
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<tr>
<td>3B W</td>
<td>2 other technical electives</td>
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<tr>
<td></td>
<td>3 other technical electives</td>
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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.

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<tr>
<th>Academic Term</th>
<th>Option in Computer Engineering</th>
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<td>1B</td>
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<td>3A</td>
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<td>3B</td>
<td>W</td>
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<tr>
<td>4A</td>
<td>F</td>
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<tr>
<td>4B</td>
<td>W</td>
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<tr>
<th></th>
<th>Programming Principles and Languages</th>
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<tbody>
<tr>
<td>1B</td>
<td>SY DE 352</td>
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<tr>
<td>2A</td>
<td>EL E 352</td>
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<tr>
<td>3A</td>
<td>EL E 427</td>
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<tr>
<td>4A</td>
<td>CS 340</td>
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<table>
<thead>
<tr>
<th></th>
<th>Electronic Circuits</th>
<th>Digital Hardware Engineering</th>
<th>Data Structures</th>
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</thead>
<tbody>
<tr>
<td>1B</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>3B</td>
<td>Programming</td>
<td></td>
<td></td>
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<tr>
<td>4A</td>
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<table>
<thead>
<tr>
<th></th>
<th>Principles of Operating Systems</th>
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</thead>
<tbody>
<tr>
<td>3A</td>
<td></td>
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<tr>
<td>4B</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>1 other Technical elective</th>
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</thead>
<tbody>
<tr>
<td>1B</td>
<td></td>
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<tr>
<td>3B</td>
<td></td>
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<tr>
<td>4A</td>
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</table>

**Special Individual Option**

Some Systems Design students may wish to design their own option program which consists of technical courses drawn from the wide variety of subjects taught at the University. Special Individual Options must be organized in conjunction with a faculty advisor in the Department of Systems Design by the 3A term and must be approved by the Associate Chairman for Undergraduate Studies of the Department.

As an example, a student who wishes to study water resources or transportation engineering could take some of the socio-economic courses from Systems Design in conjunction with the appropriate subjects from the Civil Engineering Department.

**Note**

Transitional graduate courses (numbered in the 500's) are available for credit to senior undergraduate students registered in departments other than Systems Design.
Faculty of Environmental Studies

Introduction

The Faculty of Environmental Studies is composed of the Department of Geography, Department of Man-Environment Studies, School of Architecture and School of Urban and Regional Planning. As a whole and within these units, the Faculty concentrates on using diverse knowledge and methods from different disciplines to understand man, and both built and natural environments. The Faculty utilizes the best of traditional teaching methods combined with innovative techniques to explore the many contemporary issues in environmental studies.

Architecture and Urban and Regional Planning are professional schools and, therefore, are vocation oriented. Through the Faculty of Environmental Studies, they are integrated into the mainstream of the University's concern with man and his environment, through the two main thrusts of research and practical applications.

The academic departments, Geography and Man-Environment Studies have the interaction of man with his environment as their core. Both the Man-Environment Studies and Geography Departments are interdisciplinary in nature and interact with many fields of study and research from the Arts, Science, Social Sciences, Mathematics, and Engineering.

One of the innovative aspects of the Faculty of Environmental Studies is the high degree of interaction among its 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.

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).

Environmental Studies
Faculty of Environmental Studies
Degrees

Degrees may be obtained in the following program areas:

- BES Pre-professional Architecture (3-2/3 years), on rotating work/study co-operative scheme.
- BArch Professional Architecture (2-2/3 years), with co-operative work terms following completion of the BES Pre-professional Architecture.
- BES Honours Geography (4 years).
- BES Honours Co-operative Geography (4-2/3 years with rotating work/study terms).
- BES General Geography (3 and 4 years).
- BES Honours Man-Environment Studies (4 years).
- BES Honours Co-operative Man-Environment Studies (4-2/3 years with rotating work/study terms).
- BES Honours Urban and Regional Planning (4 years).
- MA Geography
- MA Regional Planning and Resource Development
- PhD Geography
- PhD Regional Planning and Resource Development

The student should apply to the unit most suited to his/her interests. There is considerable freedom to transfer to other faculties after year 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 Studies.
Admission

The admission requirements and procedures for all programs are outlined in detail in Chapter 2 of this Calendar. The following points emphasize some of the admission requirements which relate specifically to programs in the Faculty of Environmental Studies.

Because of the increasing use of statistics and quantitative methods in environmental research it is recommended, but not required, that students present at least one Grade 13 Mathematics course or equivalent for admission to programs in Environmental Studies; Grade 13 Geography or equivalent is similarly recommended for those applying to the Geography Department. For applicants to the School of Architecture, Functions and Relations, Calculus, Physics and English (Francais) or equivalent at the Ontario Grade 13 level are required.

Interviews

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

Transfer Credit

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

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

English Language Proficiency Program

The Faculty of Environmental Studies expects that students enrolled in any of its programs should be able to demonstrate competence in writing. Accordingly, all students newly admitted to the Faculty are required to write the English Language Proficiency Examination during their first term of registration (normally scheduled during registration week in September.) Students may demonstrate their competence in writing by achieving a passing grade on this Examination as determined by the students' Department/School. If students do not achieve a passing grade on this examination, they must successfully complete the assignments of the University of Waterloo Writing Clinic and/or by completing course work. The English Language Proficiency Program is recorded on students' academic record as Arts 000 Y.

Examinations and Standings

The following regulations govern the practice of the Faculty of Environmental Studies in regard to final examinations, standing, and make-up examinations. These regulations also apply to part-time students and special programs. Further details concerning University Examination Regulations can be found in Chapter 1, page 21.

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 property 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 overall average falls below C- (60.0) or the average in the major subjects 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 BSc 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...
other program; if the reasons for withdrawal include disciplinary problems, a statement should be placed in the student's file.

5. Additional Regulations, School of Architecture Examinations and Promotions
In order to proceed unconditionally from one term* to the next in the BES and BArch 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 those 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".

Notes

1. Cumulative Average
Students who fail to maintain the minimum cumulative overall average requirement but who satisfy the other two requirements will receive the academic decision "May not Proceed". At the discretion of the Promotions Committee such students must raise their cumulative average to a minimum of C- (60.0) by repeating the term or by repeating courses which are detrimental to their average and/or by taking approved elective courses before enrolling in the next higher level core or studio courses. The minimum cumulative average must be attained within the next calendar year. Failing this, the student will be required to withdraw. Failure to maintain the minimum cumulative average of C- (60.0) by the end of the next higher level term will result in the academic decision "Required to Withdraw".

2. Studio Courses
Students who fail a studio course (ARCH 192, 193, 292, 293, 392, 393, 492, 493, 592, 593) but who satisfy the other requirements will receive the academic decision "May not proceed". Such students must repeat and pass the studio course. Failure to pass the studio in question on the second attempt will result in the academic decision "Required to Withdraw". Students may not register in any higher level studio course or core courses until the failed studio course is passed. Credit will be retained for courses passed in a term in which a studio course is failed.

3. Elective Courses
Students who fail more than one half elective course or equivalent in any single term (but who pass studio and maintain the minimum cumulative overall average) will receive the academic decision "Proceed on probation". Failed elective courses or their equivalents must be repeated and passed by the end of the next term of study (which includes the higher level studio and core course(s)). Should the student fail more than one half course or equivalent in the next term, the student will receive the academic decision "Required to Withdraw".

4. Core Courses
Students who fail two or more one term core courses or equivalent in any single term (but who pass studio and maintain the minimum cumulative overall average) will receive the academic decision "May not proceed". The failed core courses or equivalent must be repeated and passed before the student may register in any higher level studio or core courses. Should the student fail two or more one term courses or equivalent in the next term, the student will receive the academic decision "Required to Withdraw".

5. Conditional Status
Notwithstanding the provisions of Notes 1-4, students who have been granted conditional status in a previous term during the course of the BES (Pre-professional) program will be required to withdraw if at any subsequent time they fail to meet any one or more of the three basic requirements for unconditional promotion as stated in 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.

6. Course Loads
Normally students of the School are permitted to take only one 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 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, and before November 1, March 1, and July 1, a student may add or drop courses only with the written permission of the course instructor and the appropriate undergraduate officer and after demonstrating that such a change is in the student's academic interest.

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

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

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

Environmental Studies
Examinations and Standings
Academic Programs

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

Correspondence Courses
Only in exceptional cases would correspondence courses be taken by a student during a term in which he or she was a full-time student on campus.

FACULTY OPTIONS
The Faculty of Environmental Studies offers 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 diploma.

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 255 Planning Surveys and Analysis
- PLAN 307 Social Survey Techniques
- PLAN 319 Economic and Social Techniques for Regional Planning
- GEOG 260 Introduction to Cartography and Analysis
- GEOG 275 Introductory Air Photo Analysis and Remote Sensing
- M ENV 250 Environmental Issues: Methods & Techniques
- M ENV 338 Social Impact Assessment

b) Content Courses
- ENV S 333 Parkland Management
- 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 Dereeliction & Rehabilitation 1
PLAN 156 Introduction to Urban and Regional Planning Concepts
PLAN 256 Principles of Environmental Design
PLAN 370 Land Development Planning
M ENV 218 Canadian Energy Issues
M ENV 316 Soft Energy Paths in Canada
M ENV 337 Environmental Management
M ENV 351 Organizations and Environmental Management
M ENV 416 Energy Research Seminar
ARCH 223 Human Ecology
ARCH 244 History of Gardens of Europe and Western Asia
ARCH 245 Survey of Contemporary Architecture

Other substitute courses can be taken with permission of the co-ordinator or Associate Dean of Undergraduate Studies.

Students must take courses in the three categories outlined above.

A minimum of ten half course credits must be completed and students must achieve an average of "B" in these courses.

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 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 412 Geography of Manufacturing Firms and Industries
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 338 Social Impact Assessment
HIST 201X Canadian Urban History
PLAN 232 Rural Planning and Development
PLAN 333 The Sociology of Regional Planning
PLAN 360 Technology in Urban and Regional Planning
PLAN 430 Social Policy Planning
PLAN 456* Political and Administrative Processes in Urban and Regional Planning
SOC 242 Industrial Sociology
ECON 333 Inter-regional Economics
ECON 335 Economic Development
ECON 343 Urban Economics

*Available to Planning Students only.

Courses in the Natural Resources - Ecology Theme

The following list of courses does not constitute a formal Option. Rather, it indicates possible courses which would allow a student to stress Natural Resources and Ecology in their undergraduate program. Students are encouraged to see the Associate Dean, Undergraduate Studies for further information.

Ecology-Biology
ENV S 200 Field Ecology
ENV S 201 Introduction to Environmental and Planning Law
GEOG/
PLAN 357 Conservation and Resource Management
BIOL 111 Introductory Biology 1
BIOL 112 Introductory Biology 2
BIOL 250 Ecology
ENV S 401 Environmental Law
ENV S 417 Land Use History and Landscape Change 1
ENV S 418 Land Use History and Landscape Change 2

Physical
GEOG 102 Physical Geography
GEOG 201 Physical Geography
GEOG 300 Geomorphology and the Southern Ontario Environment
GEOG 301 Climatology
GEOG 302 Geomorphology
GEOG 303 Water
GEOG 408 Hazards
GEOG 461/462 Land Dereeliction and Rehabilitation
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
ENV S 310 Behavioural Studies
GEOG 414 Resource Management
M ENV 410 Environmental Assessment
ENV S 417 Land Use History and Landscape
   Change 1
ENV S 418 Land Use History and Landscape
   Change 2

In addition are some basic techniques - Surveying and mapping, cartography, statistical analysis, air photo interpretation, computer science, field methods, cost benefit (resources-economics).

Applied Environmental Methods
The Environmental Studies Methods Committee co-ordinates 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, 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

Environmental Studies
Academic Programs

EARTH 121 Introductory Geology 1
EARTH 122 Introductory Geology 2
FARTH 438 Engineering Geology

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.

Legal Studies Option
The Legal Studies Option is open to students in the Faculty of Environmental Studies. While this Option is offered by the Faculty of Arts, certain additional courses are required of ES students if they wish to take the Option. ES students are required to take ENV S 201, ENV S 401, and ENV S 402 in addition to the courses required and suggested in the Legal Studies Option statement on Page 261 of the UG calendar. Students wishing to discuss the Legal Studies Option should contact Prof. Michael McDonald, Department of Philosophy, Faculty of Arts, or Mr. David Estrin, Department of Man-Environment Studies, Faculty of Environmental Studies.

Courses in the Social Sciences
To deal adequately with environmental problems it is becoming increasingly essential that students have some understanding of the data and methods of the social sciences. There is at present no official “social science theme” within the Faculty, since the particular combinations of social science courses will vary from one school or department to another, and will change according to different vocational needs on the part of students. However, a wide range of appropriate courses in the concepts and skills of the social sciences exists both within the Faculty of Environmental Studies and elsewhere in the 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 followed by a two 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 eight months duration, leading to the degree, Bachelor of Architecture (BArch).

Professional Recognition
The Ontario Association of Architects accepts the degree of BArch as fulfilling the academic requirements for registration to practise. Graduates wishing to proceed to registration are required to submit their credentials to the RAIC Certification Board for assessment. For further information concerning mandatory work experience and other requirements for registration contact the Registrar, O.A.A., 50 Park Road, Toronto, Ontario M4W 2N5.

*See Chapter 5.

Non-Architecture Students
Students not enrolled in the School of Architecture may take any architectural course listed in the recommended core program (depending on availability of space) with the exception of courses in the theme area of Design. Prerequisites indicated in the course descriptions are primarily for Architectural students. For Non-Architectural students, prerequisite evaluation must be carried out by the respective instructors.

Bachelor of Environmental Studies (Pre-Professional Architecture) Program
The purpose of the BES program is to educate future architects to an understanding of the beliefs and needs of the individual and of society, and to a willingness to take an active role in creating and improving the environment; to a clarification of the interaction of seemingly unrelated disciplines, and to know the principles and values that surround the creation of any artifact; to a comprehension of the many forms of creative expression; and to an understanding of the present as part of an historical process. The program aims to build 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 112</td>
<td>ENV S 195A</td>
<td>ARCH 142</td>
<td>ARCH 192</td>
</tr>
<tr>
<td>Fall</td>
<td>Mathematics</td>
<td>Introduction to Environmental Studies</td>
<td>Iconography 1 (1 credit)</td>
<td>Design Fundamentals (1½ credits)</td>
</tr>
<tr>
<td>Sept-Dec</td>
<td>ARCH 172</td>
<td>Building Science</td>
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<td></td>
<td>TOTAL 4 cr.</td>
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<tr>
<td>1-B</td>
<td>CS 116</td>
<td></td>
<td>ARCH 143</td>
<td>ARCH 193</td>
</tr>
<tr>
<td>Winter</td>
<td>Introduction to Computing</td>
<td></td>
<td>Iconography 2 (1 credit)</td>
<td>Design Fundamentals and Studio (1½ credits)</td>
</tr>
<tr>
<td>Jan-Apr</td>
<td>ARCH 163</td>
<td></td>
<td></td>
<td>ARCH 194 or FE</td>
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<td></td>
<td>TOTAL 4 cr.</td>
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</tr>
<tr>
<td>Off-Term</td>
<td>A student is free to use the off-term as he wishes. The Department of Co-ordination does not provide their normal services to arrange employment for students in this term. (See Chapter 5).</td>
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<tr>
<td>Spring</td>
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<tr>
<td>May-Aug</td>
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<tr>
<td>2-A</td>
<td>ARCH 212*</td>
<td>ARCH 244</td>
<td>ARCH 246</td>
<td>ARCH 292</td>
</tr>
<tr>
<td>Fall</td>
<td>Computer Science</td>
<td>History of Gardens of Europe</td>
<td>Foundations of Europe (1 credit)</td>
<td>Design Concepts and Studio (1½ credits)</td>
</tr>
<tr>
<td>Sept-Dec</td>
<td>Simulation or FE</td>
<td>and Western Asia</td>
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<tr>
<td></td>
<td>ARCH 272</td>
<td>or TE</td>
<td></td>
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<tr>
<td></td>
<td>Surveying and Soils</td>
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<td></td>
<td>ARCH 262</td>
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<td></td>
<td>TOTAL 4 cr.</td>
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<tr>
<td></td>
<td>Strength of Materials</td>
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<tr>
<td>Co-op Work Term 1</td>
<td>For all Co-op terms, job interviews are arranged on campus during the preceding study term by the Department of Co-ordination, who maintain liaison with prospective employers. The experience a student may get during the work term may include: introduction to office procedures; assisting in design presentation and model building; minor drafting assignments.</td>
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<tr>
<td>Winter</td>
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<tr>
<td>Jan-Apr</td>
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</tr>
<tr>
<td>2-B</td>
<td>ARCH 213*</td>
<td>ARCH 223**</td>
<td>ARCH 247</td>
<td>ARCH 293</td>
</tr>
<tr>
<td>Spring</td>
<td>Computer Generated</td>
<td>Human Ecology</td>
<td>Renaissance</td>
<td>Design Concepts</td>
</tr>
<tr>
<td>May-Aug</td>
<td>Design or FE</td>
<td>or TE</td>
<td>to Revolution</td>
<td>and Studio</td>
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<tr>
<td></td>
<td>ARCH 263</td>
<td>ARCH 224 An</td>
<td>(1 credit)</td>
<td>(1½ credits)</td>
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<tr>
<td></td>
<td>Theory of Structures 1</td>
<td>Introduction to</td>
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<tr>
<td></td>
<td>ARCH 246</td>
<td>Landscape Design</td>
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<td></td>
<td>TOTAL 4 cr.</td>
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<tr>
<td>Co-op Work Term 2</td>
<td>The type of experience a student may obtain in this term includes assisting in design presentation and model buildings; assisting in preparation and corrections to site plans, floor plans, and elevations, and on-site measurements.</td>
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<tr>
<td>Fall</td>
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<tr>
<td>Sept-Dec</td>
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<tr>
<td>3A</td>
<td>ARCH 372</td>
<td>F.E.*</td>
<td>ARCH 346*</td>
<td>ARCH 392</td>
</tr>
<tr>
<td>Winter</td>
<td>Mechanical Systems 1</td>
<td></td>
<td>Romanticism and 20th Century or FE</td>
<td>Design Concepts and Studio (2 credits)</td>
</tr>
<tr>
<td>Jan-Apr</td>
<td>ARCH 392</td>
<td></td>
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<tr>
<td>TOTAL 3½ cr.</td>
<td>Structural Synthesis 1</td>
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<tr>
<td>Co-op Work Term 3</td>
<td>The type of experience a student may obtain in this term includes design research; detailed design developments; design presentation; assisting in preparation of site plans, floor plans elevations, building cross-sections.</td>
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<tr>
<td>Spring</td>
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<tr>
<td>May-Aug</td>
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### Program for the Degree of Bachelor of Environmental Studies

<table>
<thead>
<tr>
<th>Year/Term</th>
<th>Systems and Measures</th>
<th>Ecology</th>
<th>Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-B</td>
<td>ARCH 313*</td>
<td></td>
<td>ARCH 393</td>
</tr>
<tr>
<td>Fall</td>
<td>Computer Generated</td>
<td></td>
<td>Design Concepts</td>
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<tr>
<td>Sept-Dec</td>
<td>Design or FE</td>
<td></td>
<td>and Studio</td>
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<tr>
<td></td>
<td>ARCH 373</td>
<td></td>
<td>(2 credits)</td>
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<tr>
<td></td>
<td>Mech. Systems 2</td>
<td></td>
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<tr>
<td></td>
<td>ARCH 363</td>
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<tr>
<td>TOTAL 3½ cr.</td>
<td></td>
<td></td>
<td>Structural Synthesis 2</td>
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<tr>
<td>TOTAL 23 credits</td>
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</table>

### Program for the Degree of Bachelor of Architecture

<table>
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<th>Year/Term</th>
<th>Systems and Measures</th>
<th>Ecology</th>
<th>Design</th>
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<tbody>
<tr>
<td>4-A</td>
<td>ARCH 446</td>
<td></td>
<td>ARCH 492</td>
</tr>
<tr>
<td>Fall</td>
<td></td>
<td></td>
<td>Design Studio</td>
</tr>
<tr>
<td>Sept-Dec</td>
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<tr>
<td></td>
<td>ARCH 448</td>
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<tr>
<td></td>
<td>Rome and the Campagna</td>
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<tr>
<td></td>
<td>or TE</td>
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<tr>
<td>TOTAL 3½ cr.</td>
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</tbody>
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<thead>
<tr>
<th>Year/Term</th>
<th>Systems and Measures</th>
<th>Ecology</th>
<th>Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-B</td>
<td>ARCH 455*</td>
<td></td>
<td>ARCH 493</td>
</tr>
<tr>
<td>Winter</td>
<td>Management and</td>
<td></td>
<td>Design Studio</td>
</tr>
<tr>
<td>Jan-Apr</td>
<td>Estimating or FE</td>
<td></td>
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<td></td>
<td>ARCH 452</td>
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<tr>
<td>TOTAL 3½ cr.</td>
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</tbody>
</table>

### Year/Term

**Co-op**
- This period of 8 months may serve many objectives. A student after the first degree program has time in which he may travel and decide about his future goals before returning to the School for the second degree program. During that time a student may continue the Co-op terms wherein he obtains experience in:
- working in a variety of jobs; a student is capable of handling somewhat advanced work in professional offices such as: design research; preparing design schematics and small projects.

**Work Terms**
- 4 & 5: program has time in which he may travel and decide about his future goals before returning to the School for the second degree program.
- Spring and Jan-Aug: the School for the second degree program.

**Winter and Spring and Fall**
- 6 & 7: experience in a variety of jobs; a student is capable of handling somewhat advanced work in professional offices such as: design research; preparing design schematics and small projects.

**Winter**
- Management and Estimating or FE
- ARCH 452

**Co-op Terms**
- 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; preparing design schematics and small projects.

**Winter**
- Development and Financing or FE
- ARCH 554*

**Spring**
- ARCH 555

**Summer**
- ARCH 593

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.

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 considerable freedom to choose supporting electives from across the whole University. Thus, in consultation with professors, students will be able to have a tailor-made program to suit their particular needs, whether they are primarily interested in physical or human geography, regional or systematic topics, or a combination of these. Certain approved options as well as Joint Honours programs with a number of other departments are listed on page 168.

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

Although the Honours programs are broad in scope, students may concentrate their courses in one or more of the six major areas of specialization available in the Department (page 169). Students in the Honours programs may also elect to take one of the Faculty Options (page 158). Students are also free to design a broadly based program in consultation with faculty.

For the Honours Co-operative program, students are admitted only after first year. Since competition occurs for places in the Co-op program, admittance is based on academic standing and interviews. The Co-op program provides for alternate terms of practical work experience and academic study. Co-op Geography students will enter their first work term in the winter of the second year.
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. Inquiries for additional information regarding Co-operative studies should be directed to the Co-op Undergraduate Officer. The Co-op Geography program is not available in the Faculty of Arts. Co-op students may transfer to the regular Honours Geography program provided they are in good standing in the Co-op program at the time of application.

The 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 has been developed to allow a student to complete the three-year General BES or BA in Geography through correspondence. Upon successful completion, students taking the Geography program in the Faculty of Environmental Studies will receive a BES (Bachelor of Environmental Studies) degree and those in the Faculty of Arts will receive a BA (Bachelor of Arts) degree.

In all programs there is emphasis on both the development of theory and methodology and on practical application of geographical concepts to the economic, social and political problems of Canada and other parts of the world. The “applied geography” aspects of the program are enhanced by the availability in the Faculty of elective courses in Architecture, Urban and Regional Planning and Man-Environment Studies. Graduating students acquire a variety of jobs in education, government, industry and planning agencies.

The Department of Geography offers both Master’s (MA) and PhD graduate programs. At the graduate level course work and research are concentrated on a specific subfield of Geography. Areas of research specialization include applied physical geography, air photo interpretation and remote sensing, urban and economic geography, agricultural geography and rural development, regional planning and development, resources management, and Europe.

Bachelor of Environmental Studies

BACHELOR OF ENVIRONMENTAL STUDIES
GENERAL GEOGRAPHY

A) Three Year Program

<table>
<thead>
<tr>
<th>Year 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 101 Introduction to Human Geography</td>
</tr>
<tr>
<td>GEOG 102 Introduction to Physical Geography</td>
</tr>
<tr>
<td>GEOG 110 Introduction to the Field of Geography</td>
</tr>
<tr>
<td>and one of, but not more than two of:</td>
</tr>
<tr>
<td>GEOG 125R Introduction to the Third World</td>
</tr>
<tr>
<td>GEOG 126R Development in the Third World</td>
</tr>
<tr>
<td>GEOG 127 Regional Problems of Europe</td>
</tr>
<tr>
<td>ENV S 195A Introduction to Environmental Studies</td>
</tr>
<tr>
<td>ENV S 195B Introduction to Environmental Problems and additional credits.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENV S 200 Field Ecology</td>
</tr>
<tr>
<td>GEOG 201 Some Basic Topics of Physical Geography</td>
</tr>
<tr>
<td>GEOG 202 Some Basic Topics of Economic and Urban Geography</td>
</tr>
<tr>
<td>one of:</td>
</tr>
<tr>
<td>GEOG 203 Some Basic Topics of Cultural and Regional Geography</td>
</tr>
<tr>
<td>GEOG 204 Soviet Union</td>
</tr>
<tr>
<td>GEOG 205 Africa</td>
</tr>
<tr>
<td>GEOG 220 World Regional Geography</td>
</tr>
<tr>
<td>GEOG 221 The United States</td>
</tr>
<tr>
<td>and additional credits so that a student should have completed by the end of the second year 11 credits.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 381 The Nature of Geography</td>
</tr>
<tr>
<td>Additional credits so that a student will have completed at least 16 credits.</td>
</tr>
</tbody>
</table>

B) Four Year Program

<table>
<thead>
<tr>
<th>Year 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 101 Introduction to Human Geography</td>
</tr>
<tr>
<td>GEOG 102 Introduction to Physical Geography</td>
</tr>
<tr>
<td>GEOG 110 Introduction to the Field of Geography</td>
</tr>
<tr>
<td>and one but not more than two of:</td>
</tr>
<tr>
<td>GEOG 125R Introduction to the Third World</td>
</tr>
<tr>
<td>GEOG 126R Development in the Third World</td>
</tr>
<tr>
<td>GEOG 127 Regional Problems of Europe</td>
</tr>
<tr>
<td>ENV S 195A Introduction to Environmental Studies</td>
</tr>
<tr>
<td>ENV S 195B Introduction to Environmental Problems and additional credits.</td>
</tr>
</tbody>
</table>
## Environmental Studies

### Geography

### Year 2
- **ENVS 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

**Field Ecology**
- Some Basic Topics of Physical Geography
- Some Basic Topics of Economic and Urban Geography
- Some Basic Topics of Cultural and Regional Geography
- Soviet Union
- Africa
- World Regional Geography
- The United States

**Electives**: see below.

### Notes on General Program (3 Year and 4 Year)

#### 1. Minimum Total Required Credits
Sixteen credits for the three year General degree of Bachelor of Environmental Studies; twenty-one credits for the four year General degree.

#### 2. Minimum Required Geography Credits
In the three year program, six credits in Geography, one of which may be designated as Environmental Studies. In the four year program, nine credits in Geography, one and one-half of which may be designated Environmental Studies. Students in both programs may choose additional Geography electives, and are encouraged to do so.

#### 3. Minimum Required Credits in Faculties other than Environmental Studies
Four full credits.

### 4. Grade Requirements
Students must maintain an overall average of C- (60.0) with a major average of C (65.0). Courses designated as "Environmental Studies" are included in the calculation of the major average.

### 5. Other Comments
See notes 5, 6, 7, and 8 on Honours programs.

## 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 of 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

**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
- **ENVS 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.**

## Notes on General Program (3 Year and 4 Year)

### 1. Minimum Total Required Credits
Sixteen credits for the three year General degree of Bachelor of Environmental Studies; twenty-one credits for the four year General degree.

### 2. Minimum Required Geography Credits
In the three year program, six credits in Geography, one of which may be designated as Environmental Studies. In the four year program, nine credits in Geography, one and one-half of which may be designated Environmental Studies. Students in both programs may choose additional Geography electives, and are encouraged to do so.

### 3. Minimum Required Credits in Faculties other than Environmental Studies
Four full credits.

### Environmental Studies

### Geography

### Year 2
- **ENVS 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

**Field Ecology**
- Some Basic Topics of Physical Geography
- Some Basic Topics of Economic and Urban Geography
- Some Basic Topics of Cultural and Regional Geography
- Soviet Union
- Africa
- World Regional Geography
- The United States

**Electives**: see below.

#### Notes on General Program (3 Year and 4 Year)

### 1. Minimum Total Required Credits
Sixteen credits for the three year General degree of Bachelor of Environmental Studies; twenty-one credits for the four year General degree.

### 2. Minimum Required Geography Credits
In the three year program, six credits in Geography, one of which may be designated as Environmental Studies. In the four year program, nine credits in Geography, one and one-half of which may be designated Environmental Studies. Students in both programs may choose additional Geography electives, and are encouraged to do so.

### 3. Minimum Required Credits in Faculties other than Environmental Studies
Four full credits.

### 4. Grade Requirements
Students must maintain an overall average of C- (60.0) with a major average of C (65.0). Courses designated as "Environmental Studies" are included in the calculation of the major average.

### 5. Other Comments
See notes 5, 6, 7, and 8 on Honours programs.

## 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 of 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

**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
- **ENVS 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.**

### Notes on General Program (3 Year and 4 Year)

### 1. Minimum Total Required Credits
Sixteen credits for the three year General degree of Bachelor of Environmental Studies; twenty-one credits for the four year General degree.

### 2. Minimum Required Geography Credits
In the three year program, six credits in Geography, one of which may be designated as Environmental Studies. In the four year program, nine credits in Geography, one and one-half of which may be designated Environmental Studies. Students in both programs may choose additional Geography electives, and are encouraged to do so.

### 3. Minimum Required Credits in Faculties other than Environmental Studies
Four full credits.

### 4. Grade Requirements
Students must maintain an overall average of C- (60.0) with a major average of C (65.0). Courses designated as "Environmental Studies" are included in the calculation of the major average.

### 5. Other Comments
See notes 5, 6, 7, and 8 on Honours programs.

## 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 of 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

**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
- **ENVS 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.**

### Notes on General Program (3 Year and 4 Year)

### 1. Minimum Total Required Credits
Sixteen credits for the three year General degree of Bachelor of Environmental Studies; twenty-one credits for the four year General degree.

### 2. Minimum Required Geography Credits
In the three year program, six credits in Geography, one of which may be designated as Environmental Studies. In the four year program, nine credits in Geography, one and one-half of which may be designated Environmental Studies. Students in both programs may choose additional Geography electives, and are encouraged to do so.

### 3. Minimum Required Credits in Faculties other than Environmental Studies
Four full credits.

### 4. Grade Requirements
Students must maintain an overall average of C- (60.0) with a major average of C (65.0). Courses designated as "Environmental Studies" are included in the calculation of the major average.

### 5. Other Comments
See notes 5, 6, 7, and 8 on Honours programs.
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

Electives: See 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.)

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

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

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

Electives: see below.

Spring Term
Work Term 3

Fall Term 3B Core Course
GEOG 390  Senior Honours Research Essay Proposal

Electives: see below.
Year 4
Winter Term
Work Term 4

Spring Term 4A Core Course
GEOG 490A Senior Honours Research Essay
Electives: see below.

Fall Term
Work Term 5

Winter Term 4B Core Course
GEOG 490B Senior Honours Research Essay
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. See statement on areas of specialization available in the Department on page 169.

Notes on Honours Programs (Regular and Co-op)

1. Minimum Total Required Credits
Twenty-four full credits for the degree Bachelor of Environmental Studies (Honours Geography - Regular and Co-op).

2. Minimum Required Geography Credits
Eleven credits in Geography, two of which may be courses designated as Environmental Studies (p. 169).

3. Minimum Required Credits in Faculties other than Environmental Studies
Five full credits.

4. Grade Requirements
To enter and remain in the Honours programs, students must achieve and maintain an overall average of B- (70.0) and an average of B (75.0) in Geography and Environmental Studies courses. Courses designated as "Environmental Studies" are included in the calculation of the major average.

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

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

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

8. Reading Courses
No more than one and one-half credits may be taken as reading courses in Geography.

Joint Honours Programs
Joint Honours programs have been arranged between Geography and several other disciplines in the University. Detailed programs have been worked out with Anthropology, Economics, English, French, German, History, Man-Environment Studies, Management Studies, Mathematics, Music, Political Science, Recreation, Russian, and Sociology. The programs "Geography with Canadian Studies", "Geography with Biology" and "Geography with Earth Sciences" are not Joint Honours programs but are considered as Options. These programs lead to degrees in the faculty in which the student is registered, providing always that in addition to the requirements of the specific programs the general requirements of the faculty have been met. For the programs already approved, the following degrees may be awarded:

BES or BA Joint Geography with:
Anthropology
Canadian Studies
Economics, English, French
German, History
Man-Environment 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. Further information may be obtained from the office of the Associate Chairman (Undergraduate Studies) in the Department.
Environmental Studies
Geography

Geography Course Requirements for Joint Honours
Students Registered in Other Departments

GEOG 101 Introduction to Human Geography
GEOG 102 Introduction to Physical Geography

and one 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
ENV S 200 Field Ecology
GEOG 201 Some Basic Topics of Physical Geography
GEOG 202 Some Basic Topics of Economic and Urban Geography
GEOG 260 Introduction to Cartography and Map Analysis
GEOG 275 Introductory Air Photo Analysis and Remote Sensing
ENV S 271 Introduction to Quantitative Research Methods

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
GEOG 381 The Nature of Geography
GEOG 390 Senior Honours Research Essay Proposal*
GEOG 490A Senior Honours Research Essay*
GEOG 490B Senior Honours Research Essay*

*Students taking courses comparable to these in their home departments are not expected to take these courses in Geography.

Notes on Joint Honours Programs

1. Number of Credits
The minimum number of credits in Geography for students registered in Joint Honours programs is 7.5.

2. Grade Requirements
Geography students taking Joint Honours with another department must achieve Honours standing as required by the Geography Department (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. Courses designated as "Environmental Studies" are included with Geography courses in the calculation of the Geography average.

3. Canadian Studies
Students choosing the program Geography with Canadian Studies are referred to the regulations of that program. In addition, the Department of Geography recommends that course selections include the following:

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
ECON 363 Contemporary Canadian Problems 1
HIST 102E Canadian History
HIST 201X Canadian Urban History
HIST 203X Modern Quebec
HIST 205X Canadian Business History
HIST 206X History of Canadian Minorities
PLAN 222 Canadian Regional Issues
PSCI 260A Canadian Government and Politics 1
SOC 103 Canadian Society

Areas of Specialization

Listed below are Geography and other relevant courses in the Department's six major areas of specialization. This is not a definitive list; students are encouraged to seek out other courses that meet their needs.

Applied Physical Geography
GEOG 102 Introduction to Physical Geography
GEOG 201 Topics of Physical Geography
GEOG 300 Geomorphology and the Southern Ontario Environment
GEOG 301 Climatology
GEOG 302 Geomorphological Processes
GEOG 303 Physical Basis and Geography of Water
GEOG 400 Climatic and Periglacial Morphology
GEOG 401 Glacial Geomorphology and Contemporary Applications
GEOG 406 Tropical Geomorphology
GEOG 407 Field and Laboratory Techniques in Geomorphology
GEOG 408 Special Topics in Climatology and Natural Hazards
GEOG 409 Energy Balance Climatology
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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</thead>
<tbody>
<tr>
<td>GEOG 451</td>
<td>Soils Geography</td>
</tr>
<tr>
<td>GEOG 461</td>
<td>Land Dereliction and Rehabilitation 1</td>
</tr>
<tr>
<td>GEOG 462</td>
<td>Land Dereliction and Rehabilitation 2</td>
</tr>
<tr>
<td>ARCH 224</td>
<td>An Introduction to Landscape Design</td>
</tr>
<tr>
<td>BIOL 250</td>
<td>Ecology</td>
</tr>
<tr>
<td>BIOL 450</td>
<td>Aquatic Biology</td>
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<tr>
<td>CIV E 353</td>
<td>Soil Mechanics</td>
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<tr>
<td>CIV E 493</td>
<td>Engineering in the Canadian North</td>
</tr>
<tr>
<td>EARTH 260</td>
<td>Structural Geology</td>
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<tr>
<td>EARTH 342</td>
<td>Geomorphology</td>
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<td>EARTH 370</td>
<td>Economic Geology</td>
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<td>EARTH 438</td>
<td>Engineering Geology</td>
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<td>EARTH 439</td>
<td>Hydrogeology</td>
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<tr>
<td>EARTH 440</td>
<td>Quaternary Geology</td>
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<tr>
<td>ENV S 200</td>
<td>Field Ecology</td>
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<td>SCI 220</td>
<td>Chemistry of Pollution</td>
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<td>SCI 249</td>
<td>Continents Adrift</td>
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<td>SCI 250</td>
<td>Environmental Geology</td>
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<tr>
<td>SCI 349</td>
<td>Introductory Pedology</td>
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<tr>
<td>SCI 453</td>
<td>The Seas and Man's Effect Upon Them</td>
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<td>SCI 454</td>
<td>The Inland Waters and Man's Effect Upon Them</td>
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<tr>
<td><strong>Environmental and Resources Management</strong></td>
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<tr>
<td>GEOG 303</td>
<td>Physical Basis and Geography of Water</td>
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<tr>
<td>GEOG 315</td>
<td>Agricultural Geography</td>
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<tr>
<td>GEOG 352</td>
<td>The Rural-Urban Fringe of Canadian Cities</td>
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<td>GEOG 356</td>
<td>Resources Management</td>
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<tr>
<td>GEOG 357</td>
<td>Conservation and Resource Management</td>
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<tr>
<td>GEOG 358</td>
<td>Water Planning and Management</td>
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<tr>
<td>GEOG 359</td>
<td>Geography of Energy</td>
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<tr>
<td>GEOG 408</td>
<td>Special Topics in Climatology and Natural Hazards</td>
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<td>GEOG 410</td>
<td>Recreation Geography</td>
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<td>GEOG 414</td>
<td>Energy Resources Management</td>
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<td>GEOG 452</td>
<td>Problems of Rural Land Use</td>
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<td>GEOG 461</td>
<td>Land Dereliction and Rehabilitation 1</td>
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<td>GEOG 462</td>
<td>Land Dereliction and Rehabilitation 2</td>
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<td>ANTH 330</td>
<td>Cultural Ecology</td>
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<td>CIV E 344</td>
<td>Urban and Regional Engineering</td>
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<td>CIV E 480</td>
<td>Basic Principles of Water Resources</td>
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<td>EARTH 370</td>
<td>Economic Geology</td>
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<td>ECON 241</td>
<td>Cost Benefit Analysis and Project Evaluation</td>
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<td>ECON 355</td>
<td>Economics of Energy and Natural Resources</td>
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<td>ECON 357</td>
<td>Environmental Economics</td>
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<tr>
<td>ECON 451</td>
<td>Advanced Topics in Resource Economics</td>
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<tr>
<td>ENV S 195</td>
<td>Introduction to Environmental Problems</td>
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<tr>
<td>ENV S 201</td>
<td>Introduction to Environmental and Planning Law</td>
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<tr>
<td>ENV S 333</td>
<td>Parkland Management</td>
</tr>
<tr>
<td>ENV S 358</td>
<td>Environmental Pollution and its Control</td>
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<tr>
<td>ENV S 380/381</td>
<td>Environmental Studies Workshop</td>
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<tr>
<td>ENV S 401</td>
<td>Environmental Law</td>
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<tr>
<td>ENV S 402</td>
<td>Planning Law</td>
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<tr>
<td>ENV S 417</td>
<td>History of Landscape Change - 1</td>
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<td>ENV S 418</td>
<td>History of Landscape Change - 2</td>
</tr>
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<td>ENV S 444</td>
<td>Land Evaluation and Resources Management</td>
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<td>ENV S 500</td>
<td>Professional Development in Environmental Management</td>
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<td>M ENV 218</td>
<td>Canadian Energy Issues</td>
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<td>M ENV 318</td>
<td>Soft Energy Paths in Canada</td>
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<td>M ENV 320</td>
<td>Environmental Economics (ECON 357)</td>
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<td>M ENV 351</td>
<td>Organizations and Environmental Management</td>
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<td>M ENV 418</td>
<td>Energy Research Seminar</td>
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<td>PLAN 255</td>
<td>Planning Surveys and Analysis</td>
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<td>PLAN 344</td>
<td>Recreation Planning</td>
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<td>REC 210</td>
<td>Organization and Administration of Recreation Services</td>
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<td>REC 230</td>
<td>Introduction to Outdoor Recreation</td>
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<td>REC 301</td>
<td>Sociology of Leisure</td>
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<td>REC 302</td>
<td>Travel and Tourism</td>
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<tr>
<td>REC 331</td>
<td>Outdoor Education in Recreation</td>
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<td>REC 334</td>
<td>Park Management</td>
</tr>
<tr>
<td>REC 432</td>
<td>Interpretation</td>
</tr>
<tr>
<td>REC 434</td>
<td>Advanced Park Management</td>
</tr>
<tr>
<td>REC 435</td>
<td>Recreation Resource Policy</td>
</tr>
<tr>
<td>SCI 250</td>
<td>Environmental Geology</td>
</tr>
<tr>
<td>SCI 453</td>
<td>The Seas and Man's Effects Upon Them</td>
</tr>
<tr>
<td>SCI 454</td>
<td>The Inland Waters and Man's Effects Upon Them</td>
</tr>
<tr>
<td><strong>Regional Development</strong></td>
<td></td>
</tr>
<tr>
<td>GEOG 311</td>
<td>Regional Industrial Development</td>
</tr>
<tr>
<td>GEOG 315</td>
<td>Agricultural Geography</td>
</tr>
<tr>
<td>GEOG 350</td>
<td>Regional Urban Systems</td>
</tr>
<tr>
<td>GEOG 319</td>
<td>Economic and Social Techniques for Regional Planning</td>
</tr>
<tr>
<td>ECON 333</td>
<td>Interregional Economics</td>
</tr>
<tr>
<td>ECON 335</td>
<td>Economic Development</td>
</tr>
<tr>
<td>ECON 365</td>
<td>Economic Development of Modern Europe</td>
</tr>
<tr>
<td>ECON 241</td>
<td>Cost-Benefit Analysis and Project Evaluation</td>
</tr>
<tr>
<td>MSCI 23</td>
<td>Managerial and Engineering Economics 1</td>
</tr>
<tr>
<td>MSCI 43</td>
<td>Managerial and Engineering Economics 2</td>
</tr>
</tbody>
</table>
PLAN 156  Introduction to Urban and Regional Planning
PLAN 232  Rural Planning and Development
PLAN 259  Regional Planning and Development
PLAN 333  The Sociology of Regional Planning
PLAN 360  Technology in Urban and Regional Planning
PLAN 370  Land Development Planning
P SCI 343  Canadian Municipal Government
P SCI 344  The Politics of Local Government
REC 302  Travel and Tourism
SOC 256  Ethnic and Racial Relations

Regional Geography
GEOG 127  Regional Problems of Europe
GEOG 125R  Introduction to the Third World
GEOG 126R  Development in the Third World
GEOG 225R  Urbanization in the Third World
GEOG 226R  Food and Agriculture, and Integrated Rural Development in the Third World
GEOG 204  Soviet Union
GEOG 205  Africa
GEOG 220  World Regional Geography
GEOG 221  The United States
GEOG 322  Geographical Study of Canada
GEOG 323  Comparative Regional Problems
GEOG 325R  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

Students wishing to concentrate on a particular world region should choose relevant courses from history, other social sciences and the languages. Students concentrating on Canada should consider doing the joint program Geography with Canadian Studies (see p. 168).

Methods and Techniques
GEOG 260  Introduction to Cartography and Map Analysis
GEOG 275  Introductory Air Photo Analysis and Remote Sensing
GEOG 307  Social Survey Techniques
GEOG 316  Multivariate Statistics
GEOG 317  Nonparametric Statistics
GEOG 318  Spatial Analysis
GEOG 319  Economical and Social Techniques for Regional Planning
GEOG 360  Preparation of Maps and Illustrations
GEOG 375  Air Photo Interpretation and Remote Sensing 1
GEOG 391  Field Research
GEOG 403  Advanced Cartography 1
GEOG 404  Advanced Cartography 2
GEOG 407  Lab Techniques in Geomorphology
GEOG 470  Applied Air Photo Interpretation
GEOG 471  Advanced Remote Sensing
ARCH 212  Computer Science Simulation
ECON 321  Introduction to Econometrics
ENV S 271  Introduction to Quantitative Research Methods
ENV S 252  Media Tools for Environmental Studies
ENV S 253  Media Tools for Environmental Studies — Advanced Level
GENE 115  Engineering Concepts 1
PLAN 159  Graphics for Planning
PLAN 255  Planning Surveys and Analysis
SOC 281  Methods 1
SOC 282  Methods 2

Urban-Economic Geography
GEOG 101  Introduction to Human Geography
GEOG 202  Topics of Economic and Urban Geography
GEOG 251  Urban Areas in North America
GEOG 311  Advanced Economic Geography — Manufacturing and Transportation
GEOG 315  Agricultural Geography
GEOG 349  The City as a System 1
GEOG 350  Regional Urban Systems I
GEOG 352  The Rural-Urban Fringe of Canadian Cities
GEOG 359  Geography of Energy
GEOG 412  Geography of Manufacturing Firms and Industries
GEOG 448  Urban Historical Geography
GEOG 450  City and Regional Systems
GEOG 452  Problems of Rural Land Use
CIV E 110  Urban Transport Problems and Prospects
CIV E 342  Transport Engineering 1
CIV E 343  Transport Engineering 2
CIV E 344  Urban and Regional Engineering
CIV E 444  Urban Transport Planning
CIV E 543  Land Use Models
ECON 231  Introduction to International Economics
ECON 333  Interregional Economics
ECON 343  Urban Economics
ECON 345  Industrial Organization
ENV S 201  Introduction to Environmental and Planning Law
ENV S 402  Planning Law
M ENV 247  Urban Anthropology
PHIL 425. Philosophy of the City
PLAN 319 Economic and Social Techniques for Regional Planning
PLAN 330 Urban Social Planning
PLAN 360 Technology in Urban and Regional Planning
PLAN 370 Land Development Planning
PLAN 414 Housing Policies

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 except that another Geography half-credit may be substituted for GEOG 110.

Environmental Studies
Geography
Man-Environment Studies

Department of Man-Environment Studies

Nature of the Program

The Department of Man-Environment Studies offers both an Honours Regular Program and an Honours Co-operative Program.

These 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 natural landscapes and ecosystems
2. management and environmental impacts of energy resources
3. social systems analysis and social change
4. interaction of science, technology, environment and society
5. evaluation of government and private sector policies and programs

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 fortunate in having a multi-disciplinary faculty whose formal education and experience range over a number of disciplines in the natural sciences, social sciences and the fine arts. They bring to the program qualifications in such fields as anthropology, agriculture, biology, resources management, human communication, fine arts, geography, mathematics, planning, political science, psychology, law, economics and sociology, 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.

More information may be obtained from 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 28 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 experiences and interests in environmental studies 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 honours assignment respectively. Arrangements to receive extra credit for project work have been provided for those who learn most effectively through undertaking self-directed work under the guidance of faculty and other advisors. The fourth year also requires participation in a senior honours seminar course which provides the occasion for students to draw together what they have learned and direct it to one of the broad sub-areas within Man-Environment Studies.

The stress given to project-oriented learning within the program reflects the importance attached to having students develop increasingly sophisticated abilities for coping with situations that are inherently complex, value-laden, ambiguous and uncertain. Project-oriented learning provides the occasion to practise skills in problem definition, information and data gathering, analysis and synthesis of material, and presentation of results in a suitable format using the most appropriate communications media. Skills of this nature can be refined, adapted and applied in whatever context or situations students choose during and after their university years. An increasing number of students incorporate work with governmental agencies, community organizations and other groups into projects they select for their third and fourth year project assignments and, in a few cases, well conceived and executed projects have led to employment in a variety of organizations.

Elective courses can be chosen from anywhere in the university and options start from the first year in the program. Faculty will advise on this, but essentially there are 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.

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 overall 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**

| Year 1 | 
| --- | --- |
| ENV S 195A | Introduction to Environmental Studies |
| M ENV 130(F) | Environmental Issues 1 |
| M ENV 131(W) | Environmental Issues 2 |
| M ENV 150(F) | Environmental Methods & Techniques 1 |
| M ENV 151(W) | Environmental Methods & Techniques 2 |
| M ENV 190(F) | Seminar-Workshop |
| M ENV 191(W) | Seminar-Workshop |

plus electives for a total of 3 credits for the Fall term and 3 credits for the Winter term.

**Environmental Studies**

<table>
<thead>
<tr>
<th>Term 2A</th>
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</thead>
<tbody>
<tr>
<td>ENV S 200</td>
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<tr>
<td>M ENV 241</td>
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<tr>
<td>ENV S 271</td>
</tr>
<tr>
<td>M ENV 290, 291</td>
</tr>
<tr>
<td>M ENV 295, 296</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>M ENV 390A, 391A</td>
</tr>
</tbody>
</table>

plus electives for a total of 2.5 credits for the Fall term and 2.5 credits for the Winter term.

**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:

<table>
<thead>
<tr>
<th>Term 2A</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENV S 200</td>
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<tr>
<td>ENV S 271</td>
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<tr>
<td>M ENV 290</td>
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<tr>
<td>M ENV 295</td>
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</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Term 2B</th>
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<tbody>
<tr>
<td>M ENV 291</td>
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</tbody>
</table>

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 1
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 Programs
Joint Honours Programs have been approved between Man-Environment Studies and Anthropology, Biology, Economics, Fine Arts, French, Geography, Germanic and Slavic Languages (for Russian), History, 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 a Joint Honours program with Man-Environment Studies must complete all the required courses in the Man-Environment Studies program, with the exception of those courses in their home program which duplicate those in Man-Environment Studies. Consult the Undergraduate Officer for further details. 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.

Notes:

1. Course Loads
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.

2. Admission to Year 2
It is possible to gain admission to Year 2. To enter Year 2 of the Honours Planning Program, a student must obtain a minimum overall average of 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. Students admitted to Year 2 of the program will normally take PLAN 156 (instead of PLAN 100) in the Fall term.

   Should the student be permitted to continue on the basis of “Conditional due to Average”, and, subsequently, if the required averages are not met this second time, withdrawal from the program is automatic.

3. Joint Honours and Minors
Although the School does not share in Joint Honours programs, Planning student are encouraged to participate in the Minors offered by other Departments. Students choosing Minors in such programs as Canadian Studies, Political Science, and Management Studies are referred to the regulations of those programs.

4. First-year Credits
No more than 8 first year level credits will be allowed toward the 24% required to graduate.

5. Readings and Research Course
A student wishing to register for a readings and research course (Planning 275, 475 and 476) must first make arrangements with a faculty member to provide the necessary supervision and guidance.

6. PLAN 307 may be take in Year 2 or Year 3 provided that the ENV S 271 prerequisite has been met.

7. The School reserves the right to make changes to the curriculum as necessary. Please consult the School prior to registration.

8. Costs
For some courses, participating students may be expected to make a small financial contribution to defray materials/travel costs, e.g. PLAN 159 (Graphics for Planning). PLAN 300 (Seminar/Workshop Project in Urban and Regional Planning), PLAN 357 (Conservation and Resource Management), PLAN 300 (Seminar/Workshop Project in Urban and Regional Planning).

9. Where a student in 2nd year selects 2 of: 232, 259 and 270 and then picks up the third option - that third course will be considered a second year theme elective.

10. Where a student in 3rd year selects 2 of: 301, 357 and 330 and then picks up a third option - that third course will be considered as one of theme elective planning courses required in Year 3.

11. Upper-Year Theme Courses
Regarding 2nd, 3rd, and 4th year theme courses, students are required to have 1 credit from Year 2, 2 credits from Year 3 and 1 credit from Year 4 by graduation. The order of the courses taken may be altered if necessary but not the number of credits.

A variety of items are covered in the Undergraduate Studies Policy Manual available from the undergraduate officer. Policy areas covered include: Admission, Courses, 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.
### Honours Urban and Regional Planning Recommended Program

#### YEAR 1 Required Planning Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>PLAN 100</td>
<td>Introduction to Urban Planning Concepts and Techniques, PLAN 159</td>
</tr>
<tr>
<td>ARTS 000 Y</td>
<td>English Language Proficiency Exam</td>
</tr>
</tbody>
</table>

#### 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.

#### Note

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.

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#### 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. **PSYCHO-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 102D: 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 150J: Philosophy of Discontent
   - P SCI 102F: Political Rights and Obligations
   - R S 110: Religions of Mankind I
   - R S 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 1020: 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 193A: 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
   - GEOG 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
YEAR 2 Required Planning Courses | Theme Elective Courses | Note
--- | --- | ---
ENV S 200 Field Ecology | One full credit from list of Second Year Theme Elective Courses (see below). | Required and Elective Courses together to total 6.5 full credits.
PLAN 256 Principles of Environmental Design, | | |
ENV S 271 Introduction to Quantitative Research Methods | | |
PLAN 231 Citizen Involvement Planning and Social Change | | |
PLAN 255 Planning Surveys and Analyses | | |
and at least two of: PLAN 259 Regional Planning and Development, PLAN 270 Concepts and Ideas in Contemporary Urban Planning, PLAN 232 Rural Planning and Development. | | |

Year 2 Theme Elective Courses

1. URBAN THEME
   - ARCH 212 Computer Science Simulation
   - ARCH 213 Computer Generated Design I
   - ARCH 223 Human Ecology
   - ARCH 244 History of Gardens of Europe and Western Asia
   - ARCH 245 Survey of Contemporary Architecture
   - ARCH 282 Preservation Practice - Background
   - ARCH 283 Preservation Practice - Technology and Technique
   - GEOG 225R Urbanization in the Third World
   - GEOG 251 Cities in Canada
   - HIST 201X Canadian Urban History
   - M ENV 247 Urban Anthropology
   - PLAN 270 Concepts & Ideas in Contemporary Urban Planning

2. REGIONAL THEME
   - CDN ST 201 Social Regionalism
   - GEOG 225R Urbanization in the Third World
   - PLAN 222 Canadian Regional Issues
   - PLAN 230 The Small Group in the Planning Process
   - PLAN 259 Regional Planning and Development

3. RURAL/RESOURCE THEME
   - PLAN 232 Rural Planning and Development
   - PLAN 357 Conservation and Resource Management (see Note 10)
   - GEOG 226R Food and Agriculture and Integrated Rural Development in the Third World
   - M ENV 218 Canadian Energy Issues
   - SCI 250 Environmental Geology

4. ALL THEMES
   - ENV S 201 Introduction to Environmental and Planning Law
   - ENV S 202 Social Science Approaches to Environmental Problems
   - ENV S 252 Media Tools for Environmental Studies
   - ENV S 253 Media Tools for Environmental Studies - Advanced Level
   - ENV S 272 Computer Programming in Environmental Studies
   - ECON 241 Cost-benefit and Project Evaluation
   - ECON 282 Understanding and Using Managerial Accounting Information
   - GEOG 201 Some Basic Topics of Physical Geography
   - GEOG 202 Some Basic Topics of Economic and Urban Geography
   - GEOG 280 Introduction to Cartography and Map Analysis
   - GEOG 275 Introductory Air Photo Analysis and Remote Sensing
   - HLTH 245 Community Health
   - M ENV 241 Social Change
   - PLAN 230 The Small Group in the Planning Process
   - PLAN 275 Readings and Research in Planning
   - PHIL 216 Rational Behaviour and Decision-making
   - PLAN 231 Citizen Involvement, Planning and Social Change
   - P SCI 260 Canadian Government and Politics
   - REC 210 Organization and Administration of Recreation Services
### Year 3 Required Planning Courses

<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>PLAN 300</td>
<td>Seminar/Workshop Project in Urban and Regional</td>
</tr>
<tr>
<td></td>
<td>Planning, PLAN 307 Social Survey Techniques</td>
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</table>

### Year 3 Theme Elective Courses

#### 1. URBAN THEME

<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>ARCH 313</td>
<td>Computer Generated Design 2</td>
</tr>
<tr>
<td>ARCH 345</td>
<td>Architectural Theory 1850-1940</td>
</tr>
<tr>
<td>CIV E 342</td>
<td>Transport Engineering I</td>
</tr>
<tr>
<td>CIV E 375</td>
<td>Sanitary Engineering</td>
</tr>
<tr>
<td>CIV E 383</td>
<td>Water Distribution and Collection</td>
</tr>
<tr>
<td>ECON 343</td>
<td>Urban Economics</td>
</tr>
<tr>
<td>GEOG 349</td>
<td>The City as a System</td>
</tr>
<tr>
<td>PLAN 344</td>
<td>Recreation Planning</td>
</tr>
<tr>
<td>PLAN 360</td>
<td>Technology in Urban and Regional Planning</td>
</tr>
<tr>
<td>PLAN 370</td>
<td>Land Development Planning</td>
</tr>
<tr>
<td>P SCI 343</td>
<td>Canadian Municipal Government</td>
</tr>
<tr>
<td>P SCI 344</td>
<td>The Politics of Local Government</td>
</tr>
<tr>
<td>SOC 366</td>
<td>Urban Sociology</td>
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#### 2. REGIONAL THEME

<table>
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<tr>
<td>CDN ST 301</td>
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<tr>
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<td>GEOG 311</td>
<td>Regional Industrial Development</td>
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<td>GEOG 350</td>
<td>Regional Urban Systems</td>
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<td>PLAN 319</td>
<td>Economic and Social Techniques for Regional Planning</td>
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<td>PLAN 333</td>
<td>The Sociology of Regional Planning</td>
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<tr>
<td>PLAN 360</td>
<td>Technology in Urban and Regional Planning</td>
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<tr>
<td>P SCI 343</td>
<td>Canadian Municipal Government</td>
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#### 3. RURAL/RESOURCE THEME

<table>
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<tr>
<td>CIV E 375</td>
<td>Sanitary Engineering</td>
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<tr>
<td>CIV E 383</td>
<td>Water Distribution and Collection</td>
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#### 4. ALL THEMES

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<td>ANTH 334</td>
<td>Ethnicity and Diversity in Canada</td>
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<tr>
<td>CIV E 343</td>
<td>Transport Engineering 2</td>
</tr>
<tr>
<td>CS 316</td>
<td>Introduction to Statistical Problem Solving by Computer</td>
</tr>
<tr>
<td>CS 330</td>
<td>Computer Application to Business: Introduction</td>
</tr>
<tr>
<td>CS 338</td>
<td>Computer Application in Business: Data Bases and Data Communications</td>
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</table>

#### Note

- Year 3 Required Planning Courses and Theme Elective Courses together total 6 full credits.
- Two full credits from list of Third Year Theme Elective Courses (see below).
- 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 318 Soft Energy Paths in Canada
- M ENV 320 Environmental Economics
- M ENV 351 Organizations and Environmental Management
- SCI 349 Introductory Pedology
- Environmental Workshop
- Environmental Workshop
- Environmental Workshop
- Environmental Workshop
- Environmental Workshop
- Environmental Workshop
- Environmental Workshop
- Environmental Workshop
- Environmental Workshop
### Year 4 Required Planning Courses

- PLAN 456 Political and Administrative Processes in Urban and Regional Planning
- PLAN 480 The Philosophy and Methodology of Urban and Regional Planning
- PLAN 490 Senior Honours Essay (2 full course credits)

### Theme Elective Courses

One full credit from list of Fourth Year Theme Elective Courses (see list below).

### 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 436 Urban Spatial Management
- PLAN 449 Canadian Urban and Regional Planning: Part 1
- 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 434 Planning with Native Peoples
- PLAN 449 Canadian Urban and Regional Planning: Part 1

#### 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
### 4. ALL THEMES

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<tr>
<td>CIV E 496</td>
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<tr>
<td>CS 437</td>
<td>Simulation by Computer</td>
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<tr>
<td>CS 492</td>
<td>The Social Implications of Computers</td>
</tr>
<tr>
<td>ECON 403</td>
<td>Economic Analysis, Forecasting and Public Policy</td>
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<tr>
<td>ENV S 500</td>
<td>Professional Development in Environmental Management</td>
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<tr>
<td>ENV S 402</td>
<td>Planning Law</td>
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<tr>
<td>ENV S 411</td>
<td>Alternative Future Environments 1</td>
</tr>
<tr>
<td>ENV S 412</td>
<td>Alternative Future Environments 2</td>
</tr>
<tr>
<td>ENV S 403</td>
<td>Advanced Cartography 1</td>
</tr>
<tr>
<td>ENV S 404</td>
<td>Advanced Cartography 2</td>
</tr>
<tr>
<td>P SCI 431</td>
<td>Canadian Public Policy</td>
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<td>P SCI 436</td>
<td>Comparative Public Policy</td>
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<td>PLAN 430</td>
<td>Social Policy Planning</td>
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<tr>
<td>PLAN 454</td>
<td>Professional Practice in Planning</td>
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<tr>
<td>PLAN 475</td>
<td>Projects, Problems and Readings in Planning</td>
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<td>PLAN 476</td>
<td>Projects, Problems, and Readings in Planning</td>
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<td>REC 435</td>
<td>Recreation Resource Policy</td>
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<tr>
<td>REC 580</td>
<td>The Dynamics of Tourism</td>
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<tr>
<td>SY DE 433</td>
<td>Conflict Analysis</td>
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<td>SY DE 434</td>
<td>Planning of Facilities</td>
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<tr>
<td>SY DE 535</td>
<td>Selected Topics for Socio-Economic Systems Design</td>
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</table>
Faculty of Human Kinetics and Leisure Studies

The Faculty of Human Kinetics and Leisure Studies was officially formed in the Fall of 1972. This Faculty has gradually evolved from the School of Physical and Health Education (1966-67) and the School of Physical Education and Recreation (1966-72). Within this Faculty, the Department of Health Studies, the Department of Kinesiology, the Department of Recreation, and the Dance Group offer academic programs and conduct research.

The programs of the Faculty have developed rapidly in response to student needs and interests and to the changing needs and demands of society. Ten years ago a Regular stream was added to the Co-operative program to enable students who wanted the programs, but not the Co-operative aspects, to attend the University of Waterloo. At the same time elective courses were introduced into each Department making it possible for students to pursue in some depth 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.

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, Management Studies, Environment Studies, Management Studies and Sociology. A Recreation-Business Option with Wilfrid Laurier University is also offered. Graduates of the Recreation Degree Program are found in diverse settings, including hospitals, private agencies, municipalities, schools, national and provincial parks, youth agencies, and university graduate programs.

Degrees

Health Studies graduates receive an Honours Bachelor of Science degree. Kinesiology graduates receive either an Honours Bachelor of Science degree or a General Bachelor of Science degree. Recreation program graduates are awarded an Honours Bachelor of Arts degree. Those students who graduate from a Dance program receive an Honours Bachelor of Science degree in Dance, an Honours Bachelor of Arts Degree or a General Bachelor of Arts Degree.

Graduates who have pursued their studies in a Co-operative program and who have successfully completed 4 work terms, 4 work reports, and who indeed do finish the co-operative program, will have the words "Co-operative Program" added to their University diploma.
System 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 the Health Studies program are required to select a Grade 13 program which includes Chemistry and Biology.

Applicants to the Kinesiology programs are required to include one of Grade 13 Algebra, Calculus and Relations and Functions and two of Grade 13 Biology, Chemistry and Physics.

Applicants to the Recreation program are required to include one of Grade 13 Algebra, Calculus and Functions and Relations in their program.

Advanced Standing
Normally, students transferring to HKLS programs are granted credit for courses taken elsewhere in which they have received a grade of C- or better. All transfer students will be required to complete at least the equivalent of two years of study at Waterloo (i.e. at least 22 term courses) regardless of the number of courses that are presented for transfer. Grades achieved in courses which are transferred are not used in the calculation of averages.

One term of advanced work experience standing may be granted to students transferring into the third year of Co-operative programs in HKLS. Details are available from the Department of Co-ordination and Placement.

English Language Proficiency Program
The Faculty of Human Kinetics and Leisure Studies feels that a student in any of the programs should be able to demonstrate competency in writing before qualifying for a degree. Therefore, all students entering an H.K.L.S. program must write the English Language Proficiency Examination (scheduled during registration week). A grade of 50% or better on the examination will satisfy the requirement. If a student fails the examination, the requirement can be satisfied by one of the following:

1. Sitting for the examination again and achieving a mark of 50%.
2. Successfully completing the assignments of the UW Writing Clinic.
3. Achieving a passing grade in one of ENGL 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 Chairman, Undergraduate Affairs, of the student’s major department, within one month of publication of the official mark reports.

Additional regulations concerning examinations may be found in Chapter 1.

2. Standing
a) The Faculty has endorsed the letter grade system outlined in Chapter 1 of this Calendar.
b) Overall standing will be determined at the end of each academic year for Regular programs and upon completion of the B term for Co-operative programs by the cumulative average of all courses taken at the University while enrolled in the Faculty (whether passed or failed).

The following cumulative averages are required to proceed in the programs of the Faculty:

<table>
<thead>
<tr>
<th>Cumulative Averages</th>
<th>Overall</th>
<th>Major Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kinesiology Honours</td>
<td>63</td>
<td>67</td>
</tr>
<tr>
<td>Health Studies Honours</td>
<td>63</td>
<td>67</td>
</tr>
<tr>
<td>Kinesiology General</td>
<td>53</td>
<td>60</td>
</tr>
<tr>
<td>Recreation Honours</td>
<td>63</td>
<td>70</td>
</tr>
<tr>
<td>Dance Honours</td>
<td>60</td>
<td>67</td>
</tr>
<tr>
<td>Dance General</td>
<td>60</td>
<td>63</td>
</tr>
</tbody>
</table>

Kinesiology, Health Studies and Dance students who receive a grade report with 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". Recreation students who receive a final grade of INC or NMR in any courses are placed in Conditional Standing. (The designation F takes into account all failing grades, i.e. F-, F, and F+). If a student clears his/her F, INC and DNW grades prior to the next term or session, the decision on his/her grade report may be changed.

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. Honour Roll
To recognize outstanding academic achievement the Faculty has established the Faculty of Human Kinetics and Leisure Studies Honour Roll.

To be included on the Honour Roll, the student must achieve an 80.0% overall average and an 80.0% major average in the academic year in which the designation is given. A student with an INC, DNW, NMR or F on his record will not be included on the list.

4. Submission of Course Material
In situations where a student wishes to submit a body of material to satisfy the requirement of more than 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 November 1 in the Fall term, March 1 in Winter term and July 1 in Spring term. In the event that any of the above dates falls on a holiday or weekend, the final drop day will be the last school day prior to the listed date.

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.

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

Year 1
DANCE 110 DANCE 111
MUSIC 150G MUSIC 151G
MATH 106 CS 118
KIN 102 ANTH 102A
PSYCH 101 Elective
Elective Elective

Year 2
BIOL 230 BIOL 233
KIN 200 PHYS 103
KIN 222 KIN 255
DANCE 241 or 242 DANCE 341 or 342
DANCE 220 one of DANCE 221, 225
Elective Elective

Year 3
KIN 300 KIN 321
DANCE 230 KIN 330
DANCE 364 one of DANCE 231, 233
DANCE 346 Elective
Elective Elective

Year 4
DANCE 410 DANCE 411
DANCE 412 Elective
DANCE 412 Elective
Elective Elective

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
Suggested Course Sequences

Year 1

<table>
<thead>
<tr>
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<tr>
<td>MUSIC 150G</td>
<td>MUSIC 151G</td>
</tr>
<tr>
<td>PSYCH 101</td>
<td>ANTH 102A</td>
</tr>
<tr>
<td>DANCE Elective</td>
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Year 2

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<td>DANCE 231 or 233</td>
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<tr>
<td>KIN 200</td>
<td>one of DANCE 221, 225</td>
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<tr>
<td>DANCE 241 or 242</td>
<td>DANCE 341 or 342</td>
</tr>
<tr>
<td>DANCE 220 or Elective</td>
<td>DANCE Elective</td>
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Year 3

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<tr>
<td>DANCE 220 or Elective</td>
<td>Drama or Fine Arts</td>
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Year 4

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<td>DANCE 412</td>
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</tr>
</thead>
<tbody>
<tr>
<td>DANCE Elective</td>
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</tr>
</tbody>
</table>

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**

i) Required Health Studies Courses: (14)

ii) Required Kinesiology Courses: (4)
    - KIN 200, 222, 317, 330

iii) Required Courses from other departments: (9)
    - BIOL 230, 233, 239
    - CHEM 123, 124 (plus 123L, 124L)
    - CS 316
    - PSYCH 101; SOC 101

iv) Restricted electives: (4)
    - One of: HLTH 407, 410
    - One of: PHIL 226, 258 (recommended for Year 4)
    - Two of: BIOL 211, 240, 241, 330, 441, HLTH 302, 303

v) Free electives:
   - 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>SOC 101</td>
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<tr>
<td>BIOL 230</td>
<td>BIOL 233</td>
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<tr>
<td>CHEM 123</td>
<td>CHEM 124</td>
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<tr>
<td>CHEM 123L</td>
<td>CHEM 124L</td>
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<tr>
<td>1 Elective</td>
<td>1 Elective</td>
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</table>

**Regular Program**

**Year 2**

<table>
<thead>
<tr>
<th>Fall</th>
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</thead>
<tbody>
<tr>
<td>HLTH 245</td>
</tr>
<tr>
<td>KIN 200, 317</td>
</tr>
<tr>
<td>2 Electives</td>
</tr>
<tr>
<td>3 Electives</td>
</tr>
</tbody>
</table>

**Year 3**

| HLTH 340 | HLTH 344 |
| HLTH 349 | HLTH 349 |
| KIN 222 | KIN 330 |
| 3 Electives |
| 2 Electives |

**Co-operative Programs**

**Year 2**

<table>
<thead>
<tr>
<th>2A (Fall)</th>
<th>2B (Spring)</th>
</tr>
</thead>
<tbody>
<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>1 Elective</td>
<td>KIN 330</td>
</tr>
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<td></td>
<td>BIOL 239</td>
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</tbody>
</table>

**Year 3**

<table>
<thead>
<tr>
<th>3A (Winter)</th>
<th>3B (Fall)</th>
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</thead>
<tbody>
<tr>
<td>HLTH 241</td>
<td>HLTH 340</td>
</tr>
<tr>
<td>HLTH 344</td>
<td>HLTH 442</td>
</tr>
<tr>
<td>CS 316</td>
<td>4 Electives</td>
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<tr>
<td>5 Electives</td>
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</table>

**Year 4**

<table>
<thead>
<tr>
<th>4A (Spring)</th>
<th>4B (Winter)</th>
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</thead>
<tbody>
<tr>
<td>HLTH 431</td>
<td>HLTH 432</td>
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<tr>
<td>HLTH 434</td>
<td>HLTH 443</td>
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<tr>
<td>5 Electives</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, 344, 349, 442, 445
   - Outside Required (11):
     - BIOL 230, 233, CHEM 123, 124 (plus 123L, 124L), CS 118 or 316, MATH 106 or 107, PHYS 103, PHYS 105, PSYCH 101, SOC 101
   - Electives (10):
     a) Kinesiology - 4 term courses chosen from those electives available in Kinesiology.
     b) Health Studies - 3 of HLTH 340, 344, 346, 410, 443, 1 of PHIL 226, 258.
     c) Free - 2 term courses chosen from any department within the University.

B. An overall average and major average of 70% is required in the Joint Honours program.
Department of Kinesiology

Listed below are the course combinations leading to the Honours and General degrees in Kinesiology. Students are encouraged to make full use of the advisory system of the Department in planning their programs.

Degree Requirements

Honours Program
Successful completion of 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, CS 116 or 118 or 316, PSYCH 101, and SOC 101.

Note
In the case of PHYS 103 and MATH 106 students may elect to take full year courses in either subject in the appropriate department.

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.

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, CS 116 or 118 or 316, PSYCH 101, SOC 101.

c) Kinesiology Electives (9)
- Nine elective courses in Kinesiology.

Students should choose electives in consultation with their Faculty advisor.

Course Sequence

Honours and General Programs

Year 1
(Common to Regular and Co-operative programs)

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
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</thead>
<tbody>
<tr>
<td>KIN 102</td>
<td>KIN 116 (if necessary)</td>
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<tr>
<td>KIN 103</td>
<td>KIN 255</td>
</tr>
<tr>
<td>BIOL 230</td>
<td>BIOL 233</td>
</tr>
<tr>
<td>MATH 106</td>
<td>PHYS 103</td>
</tr>
<tr>
<td>PSYCH 101</td>
<td>Elective</td>
</tr>
</tbody>
</table>

*Students may choose a computer science course in place of an Elective in Year 1. If a computer science course is not chosen in Year 1 it must be completed by the end of 3A or 3N.

Regular Program

Year 2

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
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</thead>
<tbody>
<tr>
<td>KIN 200</td>
<td>KIN 252</td>
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<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>
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<tr>
<td>Elective</td>
<td>Elective</td>
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</table>

Year 3

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
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</thead>
<tbody>
<tr>
<td>KIN 300</td>
<td>KIN 330</td>
</tr>
<tr>
<td>KIN 317</td>
<td>5 Electives</td>
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4 Electives

Year 4

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
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</thead>
<tbody>
<tr>
<td>KIN 431 or 433</td>
<td>KIN 470</td>
</tr>
<tr>
<td>5 Electives</td>
<td>5 Electives</td>
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</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>KIN 335</td>
</tr>
<tr>
<td>Elective</td>
<td>KIN 330</td>
</tr>
<tr>
<td>KIN 431 or KIN 433</td>
<td>Elective</td>
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</tbody>
</table>

3A Winter

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>KIN 300</td>
<td>KIN 317</td>
</tr>
<tr>
<td>6 Electives</td>
<td>4 Electives</td>
</tr>
</tbody>
</table>

4A Spring

<table>
<thead>
<tr>
<th>4B Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>KIN 431 or KIN 433</td>
</tr>
<tr>
<td>5 Electives</td>
</tr>
</tbody>
</table>

*Note
All students in Year 1 are honours students.
†for Honours students only.
Department of Recreation

 Forty-four term courses of at least 0.5 credits each are required for the Honours degree in Recreation in both the Co-operative and Regular programs. The student begins study in one of the four areas of concentration available in the second year of the program. Joint Honours programs with Geography, Man-Environment Studies, Psychology, Sociology and Kinesiology have been developed. Minors are available in most subject areas. Students should consult with the Undergraduate Officer in the Department concerned for specific academic requirements. A Business Option with Wilfrid Laurier is also offered.

Degree Requirements
A) Recreation courses (22):

  1. Required:
     a) REC 100, 101, 201, 210, 230, 250, 270, 371, 399, 470, 471.
     b) Each student normally must include in his program the five (5) courses listed in one of the following areas of concentration:
        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 Recreation courses.

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 of 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:

Joint Honours Degrees

Joint Honours degrees with Geography, Man-Environment Studies, Psychology, Sociology, and Kinesiology are available. Requirements in the Joint Honours programs vary and students should consult with the Undergraduate Officer in both Departments regarding course sequences, course or credit requirements, minimum averages and required courses.

All students must complete the 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 are available with Business, Legal Studies, Canadian Studies, and Public Administration.

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.
Integrated Studies Program
Integrated Studies

An Opportunity for the Individual to Develop an Independent Program of Study

Integrated Studies, a small Undergraduate Program, was established within the University of Waterloo in 1969 for students who desire to create their own programs of study. While students may apply their studies toward a baccalaureate degree (it is an option, not a requirement), the Program's emphasis is to provide individuals with the opportunity to explore their learning interests.

Integrated Studies is distinctive in that the students are encouraged to engage in independent study and to develop a perspective beyond that of a single discipline. At the same time, the daily life of the Program reflects the broad diversity of the people within it. This community promotes a degree of interaction and sharing seldom found in a university setting, including much spontaneous learning, debates, discussions and plain fun. Finally, the students play the primary role in the operation of the overall Program.

Self Government
The students, in conjunction with the Resource Persons and staff, are responsible for the government of Integrated Studies through their participation in Operations Council. Council normally meets every second week to receive reports and recommendations from its committees, composed of members of the Program, and to decide on all matters affecting the Program's operation, with the exception of the BIS degree. Standing committees are concerned with such items as admission of students, budget development, hiring of personnel, student project assistance and year end reviews.

Through Council, Integrated Studies attempts to foster the students' development by making a wide variety of resources accessible to them. This includes providing financial assistance for individual travel, conference and research expenses, allocating computer time, sponsoring seminars and conferences, and hiring Resource Persons.

Resource Persons
The Program's Resource Persons serve as tutors and advisors in the students' formulation and pursuit of their studies. As the Resource Persons are normally broadly experienced in 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: Scott Arnold, Madeleine Byrnes, Harold Horwood, Maclean Jamieson, Hugh Miller, Samuel Randor, Rachel Vigier.

Approach to Resources
In designing their own studies, the students have access, not only to the Program's resources, but also to those of the community and the University, including its full array of courses. They decide which resources they require and what approach they wish to pursue. The students often work on an individual basis with faculty or graduate students from the many University departments or with people within the Program. They may audit several courses and take some for credit, or perhaps take no courses at all. An interest in community affairs leads some students to involvement in such areas as the court system, mental retardation and development centres, public and alternative schools, and environmental groups, to name but a few. In addition, they are also free to pursue studies privately utilizing the library and other facilities.

The diverse interests and perspectives in the Program's composition continually foster an enthusiastic exchange of information among the students and the Resource Persons. This activity has promoted a variety of seminars (for example, treatment of the nervous system, an examination of narrative structures through philosophy, art, literature and popular history, and women in literature) ongoing meetings such as the Writers' Workshop and the dance group, and special film series.

Year-End Reviews
Students are encouraged to document the structure and pursuit of their studies as their programs develop. They are required to report yearly on this development. It is suggested that they indicate the nature of their studies, resources used (personnel, facilities and materials) provide a critical evaluation of their education year indicating particular achievements and difficulties, and perhaps include examples of their work and evaluation by others.

Length of Registration
Students in good standing may register in the Program for up to eight terms, with a possible further two terms at the discretion of the Academic Board for those completing degree requirements. Registration beyond these terms will be at the discretion of Operations Council in consultation with the Vice-President, Academic.
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.

Current members of the Academic Board are:
S.M. Smith (Biology), Chairperson; P.C. Bowers (Psychology); G.R. Francis (Man-Environment Studies); R.H. Holmes (Philosophy); M.L. Hutchison (Recreation); F. Mavaddat (Computer Science); D.M.R. Taplin (Mechanical Engineering).

Examples of Individual Studies
After completing his second year in the University's Science Faculty, Richard was concerned that his further studies provide him with a solid background for medical school. Integrated Studies allowed him the opportunity to undertake independent research in anatomy, psychology, and sociology. Faculty have responded favorably to his request for assistance with a study of the physiology of the central nervous system and the anatomy and physiology of the cardiovascular system, and he has been assured by the instructor of one of his earlier psychology courses that there is ample opportunity for first-hand research and participation in government and community programs for Down's Syndrome children in the Kitchener-Waterloo area. In addition to these major areas of interest he also intends to continue his studies in Shakespearian literature and music.

Michelle's studies have led her through engineering at both Toronto and Waterloo, and environmental issues, social change, community organization, and the history and philosophy of science and technology while in Integrated Studies. All these and other areas held her interest but none of them seemed appropriate for her degree candidacy. While learning Gaelic this past summer in Cape Breton and recording some traditional Gaelic singers, she put together a program of study, with assistance from people in Celtic studies at St. Francis-Xavier University, which builds upon her lengthy interest in folk music, instrumental training, singing and the Celtic culture. Her studies, which include courses in Toronto, are being supervised by the chairman of Celtic Studies at the University of Toronto and one of Canada's foremost authorities in folklore.

After twelve years in the labour force (eight of them in the field of data processing/information systems), Rick decided that he could benefit greatly by strengthening his specialty skills in geographical information systems and broadening his abilities in the management of automated information systems. At the same time he felt that this would enable him to perform the duties of his current position more competently. His reasons for choosing Integrated Studies were stated succinctly: "It would permit the exploration and blending of disciplines (management sciences, geography, computer science) and the flexibility and freedom available through encouraged independent study."

After completing a degree in psychology at the University of Guelph and three terms in the biomedical stream in Health Studies at this University, Jenny entered Integrated Studies to study the role of nutrition in chronic degenerative disease. She is examining the literature on nutritional elements thought to prevent, control or reverse cancerous conditions. Once she has completed a paper summarizing the literature review, she will undertake a comprehensive review of the research on one particular nutrient. In addition she is taking courses in biochemistry, death and dying, and the disease process, and doing work in dissection.

In a paper he wrote in his first year in the Program (after two years in applied chemistry and general science), Chris concluded that most theories of biological aging do not take into account the genetic basis of most cell maintenance processes. An integration of genetics, molecular biology, biochemistry and cell biology is necessary to an understanding of the mechanisms of aging and development. In designing his own study of aging, he attempted to meet these requirements through courses at the University of Toronto and the University of Waterloo, and a genetically based research project under a degree
The workshop examined understanding emotional and biological urges, issues of choice regarding pregnancy, childbirth and fertility cycles, natural birth control, abortion, single parenting and sensuality. She has had extensive experience as a midwife and prenatal instructor and has undertaken courses at the University and in the community, workshops and a breadth of related reading. She also took examinations for the licensure in natural planning of fertility cycles and continued to explore her interests in nutrition, physiology and education (particularly the Waldorf method).

Feeling that his interests were narrowing more than he desired, Jerry withdrew from an architecture program and spent the next few years at various jobs and projects including an architectural firm in Vancouver, a tutoring program in the Philadelphia inner city, and the Learning Resources Centre in Waterloo. Research for Woolwich Township on the designation of historic buildings led to the primary focus of his study within Integrated Studies — the architectural preservation and rehabilitation of urban industrial buildings in the region of Waterloo. The first part of this study concentrates on the history of these buildings and government attitudes and policies toward them. The second part pursues ways in which these structures can be maintained. In keeping with his wish that his studies be diversified, his program also includes vocal music, language study (Dutch and German), and experience with children with special learning needs.

Dissatisfaction with his initial independent study in mathematics, particularly formal logic and geometry, led Dennis to an investigation of the philosophical issues dealing with perception and cognition. This thematic change was accompanied by a change of study method consisting of a full course load program at the University of Toronto. After a successful year there, he returned to the Program to begin his degree candidacy. Under the supervision of faculty from the University of Toronto's Religious Studies Department and this University's Philosophy Department he has undertaken a study of "the distinction and dialectical tension that inheres between theoretical consciousness and pre-theoretical consciousness, between the world of science and the world of everyday common experience."

Margaret was invited to conduct a workshop at the 1982 meeting of the Canadian Psychological Association on women's changing perceptions on sexuality. The workshop examined understanding emotional and biological urges, issues of choice regarding pregnancy, childbirth and fertility cycles, natural birth control, abortion, single parenting and sensuality. She has had extensive experience as a midwife and prenatal instructor and has undertaken courses at the University and in the community, workshops and a breadth of related reading. She also took examinations for the licensure in natural planning of fertility cycles and continued to explore her interests in nutrition, physiology and education (particularly the Waldorf method).

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Marina pursued her interest in women's studies, focusing particularly on women writers and women in literature, through independent study, work with Program Resource Persons, and participation in discussion groups, the Writers' Workshop and seminars such as the one on feminist literary criticism which she helped organize. During her degree candidacy, under the supervision of professors of English — one from this University and the other from York University, she undertook a comparative study of the key works of Colette and Virginia Woolf as an appropriate focus to her study of modern women writers. In another project dealing with contemporary American writers and their portrayal of women, she concentrated initially on the expatriate literature of the Twenties, moved on through the works of Ernest Hemingway, and concluded with a study of truth and reality in his fiction.

Frank chose to work in the field of artificial intelligence, the branch of computer science attempting to make computers perform tasks that require intelligence. His particular interest is the attempt to enable computers to generate a sequence of actions to solve problems. In preparation for this study he has taken a breadth of computer science courses, worked in a number of computer languages,
completed a variety of work-term projects, and studied directly under the supervision of faculty in artificial intelligence. He is currently working in automatic plan formation concentrating on implementing a hierarchical planner in the Prolog programming language.

Graduate Opportunities

The responsibility that students in this Program must assume for their studies ensures that graduates will possess a high level of organizational skills, self-discipline and motivation combined with their attested academic development. These capabilities have prepared them well for further endeavours and have proven advantageous in their search for employment. Graduates have been remarkably successful in building upon their degree programs to further their formal education. A sizeable number have gained graduate degrees, many on scholarship, from this and other Canadian universities and institutions as diverse as Columbia Teachers' College, Massachusetts Institute of Technology, and the University of Cambridge. In addition many have completed professional training in law, education, medicine, business and other areas. Others have tailored their programs to prepare themselves to meet specific job requirements.

Admission Requirements

Students applying to the Program are required to complete the appropriate formal application form (See Chapter 2 of this Calendar), and submit academic transcripts from previous educational institutions. In addition, they must provide an autobiographical letter indicating:

1. their previous learning experience,
2. their reasons for wishing to enter Integrated Studies, and
3. an indication of the type of exploration proposed.

Candidates are also encouraged to submit letters of reference assessing their ability to pursue their proposed programs.

All applicants residing within a reasonable distance of the University are then interviewed by the Admissions Committee consisting of students and Program staff. Decisions on the remaining applicants are made solely on the submitted material.

Applicants with limited formal education are favourably received if they indicate an ability to handle university-level study.
Faculty of Mathematics
Faculty of Mathematics

Prior to 1967, Honours and General Mathematics programs were offered through the Faculties of Arts and Science. The continued growth and development of these programs led to the formation of the Faculty of Mathematics as a separate faculty in January, 1967. The Faculty consists of the departments of Applied Mathematics, Combinatorics and Optimization, Computer Science, Pure Mathematics, and Statistics and 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 programs are available in both the Regular (i.e. conventional September to April academic year) and Co-operative (i.e. alternating four-month academic and work terms) systems of study. The Co-operative system is described in detail in Chapter 5. The Pass and General programs are not available in the Co-operative system. Students may also register in Mathematics programs through St. Jerome's College.

The Faculty also offers graduate programs leading to the following degrees: Master of Mathematics (MMath), Master of Philosophy (MPhil) and Doctor of Philosophy (PhD). Detailed information is contained in the University of Waterloo Graduate Studies Calendar.

Brochures
The Faculty of Mathematics publishes a brochure specifically designed for Ontario high school students, as well as a number of pamphlets describing the Faculty's individual programs. Copies of these are available in school guidance offices, or on request from either the Mathematics Undergraduate Office or the Assistant Registrar, Faculty of Mathematics.

Admission

General admission requirements and procedures are outlined in detail in Chapter 2. The following policies relate specifically to the Faculty of Mathematics.

Admission as an Adult Student
Any student who has been away from formal education for more than two years and who does not possess the minimum requirements for admission may apply as an adult student. However, as a minimum, applicants should have covered the material in the 3 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. 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 60% has been obtained in a non-mathematics University of Waterloo course or in a University of Waterloo mathematics course specifically designed for mathematics students. A mark of 50-59% in a mathematics course equivalent to a course required for a BMath degree could give the student exemption from that requirement but not a credit toward the degree.

A transfer failure will normally be assigned if a mark is less than 50%.

Credit might not be granted for a course covering only part of the material contained in a corresponding UW course which is required of students registered in the Faculty of Mathematics.

A maximum of 12 transfer half-credits per academic year previously taken will normally be given. Students admitted with a previous Bachelor's degree will normally be given a maximum of 12 elective (non-math) half-credits, with a possibility of exemptions in certain math courses.

Note
Students transferring from other post-secondary institutions or other University of Waterloo faculties must successfully complete at least 12 University of Waterloo mathematics half-credits chosen from those courses which may be taken for credit by a student in the Faculty of Mathematics.

2. Cumulative Averages
Grades in courses taken at the University of Waterloo prior to a student's admission to the Faculty of Mathematics will normally be included in overall and mathematics cumulative averages if the courses are ones that a student registered in the Math Faculty might take for credit toward a BMath degree. Otherwise, the grades are considered only for transfer credit purposes and not included in averages.

Grades in courses taken at other institutions prior to a student's admission to the Math Faculty will not be included in cumulative averages.

3. Co-operative Programs
It is normally not possible to transfer into a Co-operative program beyond the second-year level. Students applying for transfer at the second-year level should have credit in courses equivalent to the first-year Calculus, Algebra, and Computer Science courses required of University of Waterloo mathematics students. Past experience has indicated that very few places in Co-operative programs are
available at the second-year level for students applying from other institutions. Applicants in this category who cannot be admitted to a Co-operative program will be considered automatically for the Regular program.

Part-time Studies
Students wishing to work toward a BMath degree on a part-time basis must meet the regular admission requirements. 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/post-degree part-time students at the discretion of the Admissions Committee. Admission as a non-degree/post-degree student does not carry any commitment from the University beyond permitting entry to the course(s) and term(s) specified at the time admission is granted. There is no guarantee of admission for subsequent terms, although repeat applications on a non-degree/post-degree basis are always considered and have rarely been refused in the past (especially applications to take UW correspondence courses where limited on-campus space is not a factor).

After completing some courses on a non-degree (or post-degree) basis, usually first-year Calculus and Algebra in the UW Correspondence Program, a student may re-apply for admission as a BMath degree candidate. No special application form is required; simply write to the Assistant Registrar, Faculty of Mathematics, in Needles Hall. The Admissions Committee will then review the applicant's past academic history, including performance in UW courses taken on a non-degree/post-degree basis, to make its decision. If the admission decision is favourable, any relevant courses taken on a non-degree/post-degree basis will be counted toward the BMath degree. Furthermore, any previous academic work completed prior to commencing UW studies will be assessed for possible transfer credit.

Admission to Specific Programs in Mathematics
There are three admission categories for the Faculty of Mathematics: Co-op Mathematics (Chartered Accountancy Option), Co-op Mathematics (except C.A.), and Regular Mathematics. Clearly, students admitted in the first of these categories are associated with a particular Honours program beginning in Year 1. Students admitted in the other two categories, however, identify with a specific program in the Faculty commencing at different year levels, depending upon admission category and program of interest.

In most instances, the Faculty is able to accommodate student preferences for particular programs. At the appropriate entry point for the specific program of interest, students merely pre-register for the program in question and admission is automatic. This is not true, however, for all programs in the Faculty. All Computer Science Major programs involve formal admission, normally to year 2 and based upon academic performance in Year 1 (see page 206). The Co-op Math/Teaching Option also involves a formal admission process after Year 1, based upon academic performance and individual interviews (see page 213). Applicants who are refused admission to their first-choice program will be able to apply for their second-choice program at the appropriate time.

Academic Programs/Degree Requirements

General Remarks
The Faculty of Mathematics offers undergraduate programs leading to the following Bachelor of Mathematics degrees: BMath Honours, BMath General, BMath Pass. The Honours program is designed for students who wish to concentrate their studies 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 specialization of the Honours program. The Pass program is a relatively non-specialized course of study intended primarily for students who wish to pursue a more general education and include a larger proportion of non-math electives in their programs. It could also be chosen by those wishing to take a substantial number of mathematics courses but who, for one reason or another, wish to complete their degrees in three years. The Pass and General programs are available only to students in the Regular system of study.

The Honours Program is more demanding than either the General or Pass program. In addition to requiring that the Honours (or Advanced Honours) versions of Faculty core courses be taken, the 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 higher graduating averages than the BMath General and Pass programs.

The common mathematics curriculum in the first two years of study permits considerable flexibility for students to change from one academic program to
another within the Faculty of Mathematics. In fact, if non-mathematics electives are judiciously chosen, this flexibility extends to many programs in other faculties as well.

The following tables and accompanying descriptions outline in detail the degree requirements and typical course load for each year (i.e. two four-month academic terms) of all undergraduate programs in the Faculty of Mathematics. Except where noted, Honours programs may be taken in either the Regular or Co-operative system of study. The Pass and General programs, however, are available only in the Regular system. The academic requirements of corresponding Co-operative and Regular programs are identical.

Additional requirements for Co-op students are summarized in a booklet 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 students to be aware of all regulations pertaining to their 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</td>
<td>30 math half-credits</td>
<td>24 math half-credits</td>
<td>12 math half-credits</td>
</tr>
<tr>
<td>Required 1, 2</td>
<td>12 elective half-credits</td>
<td>12 elective half-credits</td>
<td>12 elective half-credits</td>
</tr>
<tr>
<td>Minimum Graduating</td>
<td>65% on 30 math half-credits</td>
<td>60% on 24 math half-credits</td>
<td>60% on 12 math half-credits</td>
</tr>
<tr>
<td>Math Average</td>
<td>65%</td>
<td>60%</td>
<td>60%</td>
</tr>
<tr>
<td>Overall Average</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum Course Attempts (or equivalent)</td>
<td>60 half-credits</td>
<td>54 half-credits</td>
<td>44 half credits</td>
</tr>
<tr>
<td>Maximum Failures</td>
<td>6 half-credits</td>
<td>8 half-credits</td>
<td>8 half-credits</td>
</tr>
<tr>
<td>Minimum Complete</td>
<td>4</td>
<td>2</td>
<td>none</td>
</tr>
<tr>
<td>Terms Required</td>
<td></td>
<td></td>
<td></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 MTHEOL. A two-term (i.e. eight-month) course is equivalent to two one-term (i.e. four-month) courses.

2. Most Honours Math programs require a minimum of 30 math half-credits. However, Joint Honours programs with other faculties, and Options such as Math/Business Administration, Chartered Accountancy and Management Accountancy, require only 24. All Honours programs require a minimum total of 48 half-credits. See detailed program descriptions on the following pages.

Note that students transferring from other post-secondary institutions or other U of W faculties must successfully complete at least 12 University of Waterloo mathematics half-credits chosen from those courses which may be taken for credit by a student in the Faculty of Mathematics.

3. i) The Graduating Math Average is based on the specified minimum number of successfully completed math half-credits (12 for Pass, 24 for General, 24 or 30 for Honours). All Faculty and Departmental courses required for a particular program are included in this average.

ii) The Graduating Overall Average is based on the specified minimum number of successfully completed half-credits (48 for Honours, 42 for General and 32 for Pass) submitted for the particular degree. It includes all the math courses on which the Graduating Math Average is based and all required electives.

iii) Both averages in (i) and (ii) exclude failures. If a passed course is repeated, only the better mark is considered. If a student successfully completes more than the minimum number of credits, the 'excess' ones with the lowest grades are excluded.

iv) For the Honours Math/Accounting Options, students must also achieve an average of at least 70% in all courses with prefix ACC which are required for their program.

4. Normally, the last day to ADD a course is 2 weeks after the official beginning of lectures. The last day to DROP a course for students carrying a 'normal' course load (9 for Pass or General, and 6 for Honours), is 4 weeks after the beginning of lectures. Students carrying more than a 'normal' course load may not DROP any courses later than 2 weeks after the beginning of lectures. (These deadline dates apply only to Math Faculty students.) All exceptions to these deadlines must be approved by the Standings and Promotions Committee.

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, a two-term course registration cancelled between drop deadlines (see 4 above) constitutes an unsuccessfully completed half-credit course attempt, hence a half-credit failure.

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
BMath degree candidates with an initial registration in the Faculty of Mathematics of Fall/82 or later must satisfy a Writing Skills Requirement, namely:
“A grade of 60% or better on the UW English Language Proficiency Exam, or a half-credit with a mark of C- or better in a term-course chosen from a list, approved by the Undergraduate Affairs Committee, and maintained by the Math Undergraduate Office. (The current list includes the following English courses: ENGL 108K, 109, 128R, 150 and 210.)

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; 2 of CS 140, 180, 234, 235, 280; 6 elective half-credits.</td>
<td>MATH 130a/b; MATH 134a/b; 2 of CS 140, 180, 234, 235; 6 elective half-credits.</td>
<td>MATH 130a/b; MATH 134a/b; See Note 4; 2 of CS 140, 180; 234, 235; 6 elective half-credits.</td>
</tr>
<tr>
<td>Year 2</td>
<td>MATH 230a/b; MATH 234a/b; STAT 230, 231; 2 math half-credits; 2 elective half-credits; 2 elective or math half-credits.</td>
<td>MATH 220a/b; MATH 224a/b; STAT 220/221; 2 elective half-credits; 2 elective or math half-credits.</td>
<td>4 math half-credits; 3 elective half-credits; 3 elective or math half-credits.</td>
</tr>
<tr>
<td>Year 3</td>
<td>6 math half-credits; 2 elective half-credits; 2 elective or math half-credits.</td>
<td>6 math half-credits; 2 elective half-credits; 2 elective or math half-credits.</td>
<td>4 math half-credits; 3 elective half-credits; 3 elective or math half-credits.</td>
</tr>
<tr>
<td>Year 4</td>
<td>8 math half-credits; 2 elective half-credits; 2 elective or math half-credits.</td>
<td>6 math half-credits; 2 elective half-credits; 2 elective or math half-credits.</td>
<td>not applicable.</td>
</tr>
</tbody>
</table>

Footnotes to Table 1 (b)

1. Table (b) describes the general framework and required Year 1 and 2 Faculty core courses applicable to all programs in the Faculty of Mathematics. Further degree requirements and recommendations, which depend on a particular program, are described beginning on the next page.

2. The term 'math half-credit' includes courses with abbreviations ACTSC (Actuarial Science), AM (Applied Mathematics), C&O (Combinatorics and Optimization), CS (Computer Science), MATH (non-departmental faculty courses), PMATH (Pure Mathematics), and STAT (Statistics). The term 'elective half-credit' refers to courses offered by other faculties as well as those with the abbreviation MTHEL. A two-term (i.e. eight-month) course is equivalent to two one-term (i.e. four-month) courses.

3. All Honours BMaAt programs require a minimum total of 48 half-credits and most require a minimum of 30 math half-credits. However, Joint Honours programs with other faculties, and Options such as Math/Business Administration, Chartered Accountancy and Management Accountancy, require only 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. On-campus students in the Pass program normally take MATH 130a/b, 134a/b. However, in exceptional circumstances (for example, in the Correspondence program) Pass students may take MATH 113a/b (or 115a/b) in place of 130a/b and Math 111a/b in place of 134a/b.

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. See Section 4.1 in Mathematics Faculty Policies.
Departmental Honours Programs: Requirements and Recommendations

Except where noted Honours programs may be taken on either the Regular or Co-operative system of study.

Actuarial Science

The Department of Statistics and Actuarial Science offers courses and programs in Actuarial Science, which is the application of mathematics and statistics to financial problems with particular emphasis on Life Insurance and Employee Benefit Programs. The courses offered provide theoretical preparation for the first five examinations of the Society of Actuaries, and include studies of such subject areas as Mathematics of Finance, Life Contingencies, Theory of Risks, and Demography.

By carefully selecting their electives, students can also gain valuable background knowledge in economics, finance, administration, and law.

Honours Actuarial Science

Faculty core requirements as outlined in Table 1(b) on page 203 (with CS 140, 180 recommended in Year 1) and:

- ACTSC 231, 232, 331, 332, 431, 432;
- MTHEL 305a;
- 4 of MATH 332 (or PMATH 351a), MATH 332b (or PMATH 352a), MATH 334 (or PMATH 344), STAT 330, 331, AM 381, CS 332, 333, C&O 370;
- 4 additional fourth year math half-credits including at least 2 of ACTSC 451, 452, 453, 454, 455, 456, 458, 463.

MTHEL 305a/b is recommended for Co-op students in Year 1 and for Regular students in Year 1 or 2.

Honours students in another department in the Faculty of Mathematics wishing a "double major" or a "minor" in Actuarial Science should consult the section "Combination Honours Programs within the Faculty of Mathematics" which begins on page 209.

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

Faculty core requirements as outlined in Table 1(b) on page 203 (with CS 140 required in Year 1) and:

- 1 of MATH 332a, CS 332, 333, PMATH 351a; MATH 332b or PMATH 352a;
- A minimum of 8 Applied Math half-credits at the 300 or 400 level, at least 2 of which must be at the 400 level.
- AM 260, 270 recommended.
- MATH 334 or PMATH 344 recommended.

Recommended elective courses for Honours Applied Mathematics with Physics Minor are: PHYS 121/122, 253/254, 263, 354, 363, 358/359, 441 and

CHEM 123/124.
Joint Honours Applied Mathematics with Computer Science
Faculty core requirements as outlined in Table 1 (b) on page 203 (with CS 140 required in Year 1) and:

AM 371, 381, 391;
1 of CS 235, 250;
CS 240, 340, 354, 360;
C&O 230;
MATH 332b or PMATH 352a;
Either CS 375 and 2 of CS 350, 369, 472, 473, 474, 476, 478, 487;
or CS 332, 333 and 1 of CS 350, 369, 472, 473, 474, 476, 478, 487;
4 additional Applied Mathematics half-credits at the 300 or 400 level, at least 2 of which must be at the 400 level;
1 additional half-credit chosen from Applied Mathematics labelled 300 or higher, or from Computer Science labelled 440 or higher.

PHYS 121/122 recommended in Year 1.
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) on page 203 (with CS 140, 235 required in Year 1) and:

AM 260, 270, 371, 381, 391, MATH 332b (or PMATH 352a);
4 of AM 340, 362, 365, CS 332; 333, 340, C&O 350, 370, 371, STAT 333, 334, MATH 332a (or PMATH 351a), 334 (or PMATH 344), 380a, 380b;
A minimum of 8 Applied Mathematics half-credits at the 300 or 400 level with at least 2 at the 400 level.

Electives required include PHYS 121/122 in Year 1 and 2 half-credits each year (one each term) beyond Year 1 from groups A, B, C, D, E or F.

Group A
M E 219, 220, CIV E 303, 304, M E 527 and/or M E 525;
1 or more of CIV E 518, 522, 526, M E 626.

Group B
SV DE 282, 555, SV DE 281 and/or 543;
3 or more of SV DE 352, 372, 434, 442, 468, 535, 544, 565, 567.

Group C
M E 219, 250, 351;
3 or more of M E 353, 354, 452, 456, 459, 469, 557, 563.

Group D
EL E 2/3, 2/3, and/or 241;
4 or more of EL E 342, 351, 352, 372, 418, 419, 434, 435, 436, 453, 454.

Group E
EL E 241, 261, 362, 380;
2 or more of EL E 342, 372, 463, 464, 465, 481, 482.

Group F
Optional courses: CH E 232, 330, 332; CHEM 26, 36.

Mathematics
Applied Mathematics
Combinatorics and Optimization

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 209.

Combinatorics and Optimization
Combinatorics is the mathematics of discretely structured problems. Although its boundaries are not easily defined, Combinatorics includes the theories of graphs, enumeration, designs, and polyhedra. It is a very old subject which in the past was studied principally for its aesthetic appeal. Today's modern technology, with its vital concern for the discrete, has given Combinatorics new challenges and a new seriousness of purpose. In particular, since computers require discrete formulations of problems, Combinatorics has become indispensable to modern Computer Science.

Optimization, or mathematical programming, is the study of maximizing and minimizing functions subject to specified boundary conditions or constraints. The functions to be optimized arise in engineering, the physical and management sciences, and in various branches of mathematics. With the emergence of the computer age, Optimization experienced a dramatic growth as a mathematical theory, enhancing both Combinatorics and classical analysis. In its applications to the management and engineering sciences, Optimization forms an important part of the discipline Operations Research.

Both Combinatorics and Optimization have long been special interests of Canadian Mathematicians. Indeed, Waterloo was the first university in the world to have a Department of Combinatorics and Optimization, and it continues to be a leading centre for teaching and research in the theories and applications of these disciplines.

Honours Combinatorics and Optimization
Faculty core requirements as outlined in Table 1 (b) on page 203 and:

1 of MATH 332a, CS 332, 333, PMATH 351a; MATH 332b or PMATH 352a;
MATH 334 or PMATH 344;
C&O 230, 250;
1 of C&O 330, 342;
1 of C&O 351, 367;
3 of C&O 330, 331, 342, 343, 351, 367, 430 through 466;
At least 3 additional 300 or 400 level math half-credits, which must include at least 2 half-credits with a prefix other than C&O.
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 209.

Computer Science

Computer Science is centred around the study of information. It is concerned with the nature and properties of information, its structure and classification, its storage and retrieval, and the various types of processing to which it can be subjected. It is also concerned with the physical machines that perform these operations, with the elemental units of which these machines are composed, with the organization of these units into efficient information processing systems, and with the exploration of the limits of the abilities of these machines.

Computer Science is well recognized as an independent discipline with an inherently mathematical nature. Its activity ranges from theoretical areas such as the theory of automata, system organization and logic design, formal languages and computability theory to applied areas such as scientific computing, programming languages, software management and computer systems.

The advent of the computer has led to a systems approach to solving many problems in science, business and industry. There is currently a great demand for information analysts to define how systems will perform these functions and for programmers to implement production systems on computers.

The Computer Science program at Waterloo is designed to prepare students for the challenges of a career in this rapidly evolving technological environment. Considerable emphasis is placed on learning fundamental principles throughout the program. As well, students have the opportunity to explore the ways in which these principles are exploited in both current practice and likely future developments.

Admission to Computer Science Major Programs

Students interested in Computer Science Major programs will normally be admitted to these programs at the beginning of their second year, based upon their academic performance in 12 half-courses from Year 1, with particular emphasis on their performance in MATH 130a/b, 134a/b, and CS 140. In this context, Computer Science Major programs include Honours Computer Science, Honours Co-op Computer Science with Electrical Engineering Electives, Honours Co-op Computer Science-Information Systems Option, and all Joint and Double Honours BMath programs involving Computer Science as one of the majors. Once admitted to a specific Computer Science Major program, a student may subsequently select a different Computer Science Major program (except possibly Computer Science with Electrical Engineering Electives where enrolment is also limited by Engineering) or apply to transfer to another program in the Faculty of Mathematics.

Notes

1. Application Procedure

Students will apply for the Computer Science Major program of their choice when they pre-register for their 2A term. Normally, only students whose all-inclusive math and overall averages from Year 1 are both at least 65% will be given serious consideration for admission. Because of resource limitations, however, fulfillment of the minimum 65% entrance average requirements will not guarantee students admission to the program of their choice, or indeed to any Computer Science Major program. If there are more applicants who meet the minimum 65% average requirements than there are positions available for Computer Science Major students, selection will be made on a competitive basis, according to criteria described above.

2. Late Admission

The possibility of admission to Computer Science Major programs at a level beyond 2A will not be completely eliminated. However, it is anticipated that such admissions will be relatively rare, and usually only when unexpectedly high attrition allows for new students in the programs.

3. Exclusions

Students who have formally registered in Year 2 in the Faculty of Mathematics prior to the Spring 1983 term are not affected by this admission procedure.

Honours Computer Science

Faculty core requirements as outlined in Table 1 (b) on page 203 (with CS 140 required in Year 1) and:

- CS 340, 350, 354, 360, 369, 375;
- 4 additional CS half-credits from those labelled CS 440 or higher;
- C&O 230;
- At least 4 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 5 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 2 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) on page 203 (with CS 140, 180 required in Year 1) and:

- CS 240, 250, 340, 354, 360, 375, 448, 482;
- 2 additional CS half-credits from those labelled CS 440 or higher;
- C&O 230;
- At least 4 half-credits chosen from the following list:
  - CS 350, 369, C&O 342, 350, 370, 371, STAT 331, 332, 333

**Or any 300 or 400 level honours mathematics half-credit, with prefix other than CS, which requires 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 School of Business and Economics. 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.

Joint Honours Statistics with Computer Science

This program is described with Statistics 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 209.

Operations Research

Operations research is the field of mathematics that deals with the problems of management in business and government. It involves constructing mathematical models of complex real world situations and then applying sophisticated techniques to these models in order to make optimal or near optimal, decisions. The three major components of the discipline of operations research are optimization, statistics and computer science.

The Honours Program in Operations Research, which is administered by the Department of Combinatorics and Optimization, combines a solid foundation in mathematics with special sequences of elective courses in economics, business and management science. The mathematics portion of the program includes linear programming, modelling, scheduling, game theory, forecasting, decision theory and computer simulation.

In Canada, employers of Operations Research graduates are found in manufacturing, distribution and retail companies, mining, transportation, banking, health services, education, and government agencies. Students proceeding to a Master's of Business Administration degree (MBA) will find that a degree in mathematics, emphasizing operations research, together with relevant work term experience, is an excellent preparation for a rewarding career.

Honours Operations Research

Faculty core requirements as outlined in Table 1 (b) on page 203 (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 234, 332, 437;
- STAT 331, 333, 443;
- 4 of C&O 342, 367, 450 through 466, CS 340, 482, STAT 332, 334, 430, 442.

The 30 math half-credits required in this program must include at least 4 at the 400 level.

Of the 12 elective half-credits required by the Faculty, students must include the following:

- 2 of ACC 121, 122, ECON 101, 102, M SCI 43;
- 2 of M SCI 44, 53, PSYCH 101, 333, SOC 101, 242;

(BUS 352W is offered by Wilfrid Laurier's School of Business and Economics. 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.

Honours Pure Mathematics

Faculty core requirements as outlined in Table 1 (b) on page 203 and:
- C&O 230;
- PMATH 344, with MATH 244b strongly recommended;
- PMATH 351a/b, 352a/b, 367;
- 8 400-level math half-credits, at least 4 of which must be Pure Mathematics.

Joint Honours Pure Mathematics with Computer Science

Faculty core requirements as outlined in Table 1 (b) on page 203 (with CS 140 required in Year 1) and:
- PMATH 344, with MATH 244b strongly recommended;
- PMATH 351a/b, 352a;
- CS 240, 250, 340, 350, 354, 360, 369, 375;
- C&O 230;
- 1 half-credit from PMATH 352b, 367, C&O 342, MATH 380a/b;
- 4 half-credits (at least 2 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) on page 203 and:
- PMATH 344, with MATH 244b strongly recommended;
- PMATH 351a/b, 352a;
- STAT 330, 331, 333, 430, 454;
- STAT 334 or 450;
- 3 half-credits from PMATH 352b, 367, 443, 451a/b, MATH 380a/b, 1 of which must be at the 400 level;
- 3 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 209.

Statistics

Statistics is the branch of modern applied mathematics which deals with the collection and analysis of data. Statistical methods are extensively used in Biology, Medicine, Health Sciences, Agriculture, Business, Economics, Engineering, and many other fields. Claims based on statistical arguments appear daily in the press, and it is difficult to assess these intelligently without some knowledge of statistical methods.

The statistician’s first job is to determine what numbers to collect, and how to collect them so that they will be without biases and distortion. These problems are dealt with in the Design of Experiments and Sample Surveys. Statistical Inference is concerned with inferring what the population is like on the basis of a small amount of data (the sample). The link between population and sample is provided by Probability Theory, which forms an important part of the Statistics curriculum. Often the purpose of collecting data is to assist in reaching a decision, so the field of Decision Theory is also a part of Statistics.

Many other areas of pure and applied mathematics find applications in Statistics. Calculus and linear algebra are used extensively in the undergraduate program; abstract algebra, combinatorics, difference and differential equations, analysis, and measure theory are required in more advanced work. Most statistical analyses involve the computer, so a good background in Computer Science is highly desirable.
Honours Statistics
Faculty core requirements as outlined in Table 1 (b) on page 203 and:

- STAT 330, 331, 333, 430, 450, 454;
- 4 of AM 371, 381, C&O 330, CS 332, 333, MATH 332a (or PMATH 351a), PMATH 351b, MATH 332b (or PMATH 352a), PMATH 352b, MATH 334 (or PMATH 344);
- 2 additional STAT half-credits at the 300 or 400 level;
- At least 4 additional 300 or 400 level math half-credits.

Joint Honours Statistics with Computer Science
Faculty core requirements as outlined in Table 1 (b) on page 203 (with CS 140 required in Year 1) and:

- STAT 330, 331, 333, 430, 454;
- C&O 230;
- CS 240, 250, 340, 354, 360, 375;
- 1 of AM 371, 381, C&O 330, MATH 332a, 332b, 334, PMATH 344, 351a, 352a;
- 5 additional half-credits, including at least 2 CS and 2 STAT half-credits, from the following: CS 350, 369, CS courses numbered 440 and higher, STAT courses at the 300 or 400 level.

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

Double Honours 'X' and 'Y' Programs
All Honours requirements for both areas 'X' and 'Y' must be satisfied. 'X' and 'Y' refer to any two of Actuarial Science, Applied Mathematics, Combinatorics and Optimization, Computer Science, Operations Research, Pure Mathematics, and Statistics (with the exception that the combination Combinatorics and Optimization and Operations Research is not an officially recognized Double-Honours Program).

Honours 'X' with 'Y' Minor Programs
All Honours requirements for area 'X' and the specific requirements designated below for area 'Y' must be satisfied. 'X' refers to any one of Actuarial Science, Applied Mathematics, Combinatorics and Optimization, Computer Science, Operations Research, Pure Mathematics, and Statistics (with the exception that, if 'X' is Operations Research, then 'Y' cannot be any one of Combinatorics and Optimization, Computer Science, and Statistics).

'Y' Minor Requirements

Actuarial Science:
ACTSC 231, 232, 331, 332, MTHEL 305a;
1 of ACTSC 431, 433;
ACTSC 337 or 1 400 level ACTSC half-credit.

Applied Mathematics:
AM 270, 365, 371, 381, 391;
2 additional 300 or 400 level AM half-credits.

Combinatorics & Optimization:
C&O 230, 350;
1 of C&O 330, 342;
2 of C&O 330, 331, 342, 343, 351, 367, 430 through 466.

Computer Science:
4 of CS 332, 333, 340, 360, 360, 369;
3 additional CS half-credits in addition to the Faculty core.
(Note: 2 of CS 140, 180, 234, 235 are included in the Faculty core.)

Pure Mathematics:
PMATH 344, 351a, 351b, 352a;
3 additional 300 or 400 level PMATH half-credits, at least 2 of which are 400 level.

Statistics:
STAT 331, 333;
1 of STAT 332, 454;
2 additional 300 or 400 level STAT half-credits.
Combination Honours Programs with other faculties leading to the BMATH Degree

In the descriptions below, 'X' refers to any one of Actuarial Science, Applied Mathematics, Combinatorics & Optimization, Computer Science, Operations Research, Pure Mathematics, Statistics. 'Z' refers to a discipline in a faculty other than Mathematics.

Joint Honours Programs 'X' and 'Z'
All Honours requirements for area 'X' and the set of requirements for area 'Z' designated below must be satisfied. Note that the number of math half-credits required may be reduced from 30 to 24, provided that such a reduction does not make it impossible to satisfy all Honours requirements of 'X'. In addition to meeting Graduating Average requirements of 'X', students in these programs must also satisfy the Honours average requirements specified by 'Z'.

Anthropology
14 half-credits in Anthropology, 12 of which must be at the 200-level or above; these must include 1 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 2 half-credits in anthropological theory (400-level theory oriented courses). ANTH 103 or ANTH 104 meet the linguistics portion of these requirements.

Economics
101, 102, 201, 202, 231, 301, 302, 311, 321, 401, 402, 421, 422, 1 additional Economics half-credit.

English
16 English Major half-credits as outlined under "Joint Honours Programs" on page 103.

French
192 or 195/196, 14 additional half-credits in French with 6 at the second-year level, 4 at the third-year level, and 4 at the fourth-year level.

Geography
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 195A or 195B.

German
A minimum of 16 half-credits in German. 1 of the following pairs 101/102, 105/106, 111/112, 121/122, 151/152 in Year 1; and 4 half-credits in German in each of Years 2, 3, 4.

Music
A minimum of 19 half-credits in music as follows: MUSIC 101/102, 201/202, 301/302, 150/151; at least 3 of 253/254, 353/354; at least 3 of 250/251, 370/371; plus 8 additional term courses of which at least 6 must be above the 100 level. These 8 term courses are selected in consultation with the chairman of the Music Department. An honours seminar in Music or a senior honours essay in the other discipline is required. In addition, students must demonstrate competence on one instrument (or voice) equal to Grade 10 standing at the Royal Conservatory of Music of Toronto. Normally this is attained through taking Music Studio courses - MUSIC 266/267, 366/367.

Philosophy
221, 258, 322, 359, 380, 381, 384, 385, 440; 4 additional half-credits in Philosophy.

Psychology
Students must complete the equivalent of 14 term courses in Psychology, and an Honours thesis in one of the disciplines. The required course selection is detailed for Joint Honours Programs in the Psychology Program section of the Calendar.

Russian
A minimum of 16 half-credits in Russian. RUSS 101/102 in Year 1 and 4 half-credits in Russian in each of Years 2, 3, 4.

Sociology
101, 320, 321, 322, 425, 426, 481, 499; 7 additional half-credits in Sociology.

Honours 'X' with 'Z' Minor
All Honours requirements for area 'X' ('X' as defined earlier in this section) and a set of 10 half-credits prescribed by discipline 'Z' (where 'Z' can be any departmental area, not necessarily restricted to the disciplines mentioned above) in a faculty other than Mathematics which chooses to make a 'Minor' designation available to Math Faculty students, must be satisfied. The minimum average required in these 10 half-credits is determined by 'Z'.

Note
BMATH transcripts include no more than two areas of study.

Combination Honours Programs leading to a degree in another faculty (i.e. not BMath) are described on page 213.
Mathematics
Faculty General and Pass Programs
Faculty Options

Non-Departmental Honours, General and Pass Programs: Requirements and Recommendations

Except where noted, Honours Programs may be taken on either the Regular or Co-operative system of study. Pass and General Programs are available only in the Regular system.

Faculty General and Pass Programs:

General Mathematics (Regular Only)
Students enrolled in the General Math/Business Administration, Chartered Accountancy, and Management Accountancy Options are not covered by the degree requirements described in this section. Requirements and recommendations for these options follow this section.

The degree requirements outlined below apply only to students who entered Year 2 in the Faculty of Mathematics in September, 1981 or later. Students who entered Year 2 prior to this time should consult the Mathematics Undergraduate Office if they need clarification as to which degree requirements apply to them.

Faculty core requirements as outlined in Table 1 (b) on page 203 and:

- MATH 322b, 324;
- 1 of MATH 322a, CS 333;
- 1 of CS 332, C&O 370, AM 444;
- 8 additional math half-credits to include at most 2 with the same prefix (ACTSC, AM, CS, C&O, MATH, PMATH, STAT).

Note
Students are advised to select these 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, 332, 333, 338, 432, 437
- MATH 322a, 380a/b
- PMATH 340, 360, 430a/b
- STAT 320, 321, 332, 430, 440, 442, 443.

Pass Mathematics (Regular Only)
Faculty core requirements as outlined in Table 1 (b) on page 203.

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 cooperation 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 at the Honours level in both the Regular and Co-operative Systems of study. General level options are also available in all three areas, but only in the Regular system of study.

The Chartered Accountancy and Management Accountancy options are offered in cooperation 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 School of Business and Economics. These courses are:

- BUS 111W - Introduction to Business Organization
- BUS 121W - Functional Areas of the Organization
- BUS 352W - Introduction to Marketing
- BUS 362W - Marketing Functions
- BUS 454W - Personnel Management
- BUS 481W - Business Policy
- BUS 491W - Management Policy
The WLU Academic Calendar should be consulted for complete course descriptions and prerequisites.

Honours Mathematics/Business Administration, Chartered Accountancy, Management Accountancy Options

Faculty core requirements as outlined in Table 1 (b) on page 203 (with CS 140, 180 required in Year 1) and one of the packages listed below.

a) Information Systems Package
   CS 234, 330, STAT 331;
   4 additional 300 or 400 level CS half-credits including CS 338 or (CS 340 and CS 448);
   CS 432 or CS 434 or (CS 340 and CS 482*);
   2 of C&O 350, 367, 370, 454, MATH 380a;
   1 of STAT 332, 333, 442, 466;
   2 additional math half-credits.
   (*Credit may be granted for only one of CS 338, 448 and only one of CS 432, 434, 482.)

b) Optimization Package
   C&O 350, 351, 370, 454, CS 330, 338, STAT 331;
   2 of C&O 367, 456, 459;
   1 of STAT 332, 333, 442, 466;
   2 additional math half-credits.

c) Statistics Package
   STAT 330, 331, 332, 442, 466, CS 330, 338;
   2 of C&O 350, 367, 370, 371, 454;
   1 additional 300 or 400 level STAT half-credit chosen in consultation with the Statistics Undergraduate Officer;
   2 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 term 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 Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>ACC 121, ECON 101</td>
<td>ACC 101, ECON 101</td>
</tr>
<tr>
<td></td>
<td>BUS 111W</td>
<td>BUS 111W</td>
</tr>
<tr>
<td>1B</td>
<td>ACC 122, ECON 102</td>
<td>ACC 102, ECON 102</td>
</tr>
<tr>
<td></td>
<td>BUS 121W</td>
<td>BUS 121W</td>
</tr>
<tr>
<td>2A</td>
<td>BUS 352W, MTHEL 100</td>
<td>ACC 281, MTHEL 100</td>
</tr>
<tr>
<td>2B</td>
<td>BUS 362W</td>
<td>ACC 251, ACC 291</td>
</tr>
<tr>
<td>3A</td>
<td>ACC 371, M SCI 44</td>
<td>ACC 292, 371, 381</td>
</tr>
<tr>
<td>3B</td>
<td>ACC 372, M SCI 53</td>
<td>ACC 372, 461</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M SCI 44 (Note 3)</td>
</tr>
<tr>
<td>4A</td>
<td>BUS 481W, 454W</td>
<td>ACC 491</td>
</tr>
<tr>
<td>4B</td>
<td>BUS 491W, M SCI 48</td>
<td>ACC 462</td>
</tr>
</tbody>
</table>

(Mathematics Faculty Options

(ACC 382, 401, 485 are strongly recommended in terms 4A/B of the Accountancy Options.)

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) on page 203.

Note 2
In addition to the 65% math and overall average requirements for an Honours BMath degree, students in the Honours Math/Accounting Options must also achieve an average of at least 70% in all of the courses with the prefix ACC which are required for their program.

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.

General Mathematics/Business Administration, Chartered Accountancy and Management Accountancy Options

These programs are available only in the Regular system of study.

Faculty core requirements as outlined in Table 1 (b) on page 203 (with CS 140, 180 required in Year 1) and:

2 of CS 235, 330, 338;
2 of ACTSC 221, STAT 320, 321 (see Note 2), 332, 333;

The non-math elective half-credits required (together with the term in which these courses are normally taken) are stated in the table in the preceding section for Honours students.

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.

<table>
<thead>
<tr>
<th>Year</th>
<th>Math/Bus Admin. Option</th>
<th>Math/Accountancy Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>3A</td>
<td>ACC 371, M SCI 44</td>
<td>ACC 292, 371, 381</td>
</tr>
<tr>
<td>3B</td>
<td>ACC 372, M SCI 53</td>
<td>ACC 372, 461</td>
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<td></td>
<td></td>
<td>M SCI 44 (Note 3)</td>
</tr>
<tr>
<td>4A</td>
<td>BUS 481W, 454W</td>
<td>ACC 491</td>
</tr>
<tr>
<td>4B</td>
<td>BUS 491W, M SCI 48</td>
<td>ACC 462</td>
</tr>
</tbody>
</table>
Mathematics/Teaching Option

The Co-operative Mathematics Teaching Option is an integrated program offered jointly by the Faculty of Mathematics at the University of Waterloo and the Faculty of Education at the University of Western Ontario. This program combines an academic program in mathematics, teaching experience in secondary schools, and professional training, with the graduate fully qualified as a secondary school mathematics teacher in Ontario.

Students interested in the program should enrol in any one of the Mathematics Faculty's non-teaching Co-operative Programs in Year 1, and will be considered for admission to the Teaching Option in Year 2 on the basis of two interviews and satisfactory academic and work-term performance.

There are various recommended courses which are of special interest to persons interested in a career in teaching. A selection of these may be made in consultation with an Academic Advisor as the student progresses.

Work term arrangements in this option differ from other Co-operative programs because of the nature of the program. Details concerning this and the Faculty of Education component are outlined in a separate brochure available upon request.

Honours Mathematics Teaching Option
(Co-operative only)

Faculty core requirements as outlined in Table 1(b) on page 203 and:

- MATH 334 or PMATH 344;
- MATH 332b or PMATH 352a;
- 1 of MATH 332a, CS 333, PMATH 351a;
- At least 5 of ACTSC 221 (or 231), 222 (or 232),
  C&O 230, 270, 380, 382, 480, 481, PMATH 360;
- A total of at least 14 300 or 400 level math half-credits, at least 6 of which must be at the 400 level.
- MTHEL 206a;
- SOC 207G, PHIL 311.

Recommended electives include PSYCH 212, 213, PHIL 312, and MTHEL 102.

Notes

1. The Bachelor of Education requirements are completed during a four-month academic term at the Faculty of Education in London. This term occurs after all other components of the program have been completed.

2. The selection of courses required to satisfy the BMath Teaching Option must include at least 4 half-credits in one of the following subject disciplines: Biology, Chemistry, Computer Science, Environmental Studies, General Science, Physical Education, or Physics. These four half-credits will fulfill the Ministry of Education's requirement for a second teaching subject.

Centre for Information Theory

The Centre for Information Theory was created by the Senate of the University of Waterloo on September 15, 1980. It consists of members of the Engineering, Mathematics, and Science Faculties who are teaching and doing research in Information Theory.

Members of the Centre work on the algebraic, combinatorial, non-probabilistic, probabilistic and mixed theories of information and their applications to coding, economics, engineering, forecasting, optimization, physics, pattern recognition, picture processing, and system designs. The Centre organizes a Seminar and Lecture Series on Information Theory and publishes Research Reports.

There are several graduate and undergraduate courses on Information Theory and Coding taught by members of the Centre in the areas mentioned above. The specific courses are listed in the Calendar under the appropriate Departments.
Faculty Policies

1. UNDERGRADUATE STANDINGS & PROMOTIONS COMMITTEE

Membership, Duties, Operating Procedure
The Committee consists of the Dean, Associate Deans for Undergraduate Studies, the Assistant Registrar, Faculty of Mathematics (who serves as the Committee’s Secretary), the Academic Advisors for each of the Faculty’s undergraduate programs, a representative of St. Jerome’s College, the Director of Undergraduate Affairs, the Mathematics Program Administrator of the Department of Co-ordination and Placement and other non-voting persons.

The main purposes of the Committee are to administer the rules and regulations pertaining to undergraduate studies in the faculty, to make recommendations on student performance before end-of-term grade reports are issued to students by the Registrar and to consider all requests for special consideration or appeals in matters within its jurisdiction.

Exceptions to normal faculty policies under the jurisdiction of the Standings & Promotions Committee may be authorized only by that Committee. All such requests must be made in writing to the Assistant Registrar, Faculty of Mathematics, Needles Hall. At its meetings the Committee carefully deliberates all petitions and requests, and when special circumstances justify making an exception to existing rules, the Committee grants the request. It is often useful for a student to discuss his/her circumstances with an Undergraduate Advisor before making a formal request to the Committee. Committee meetings are normally scheduled every other week.

2. PROMOTIONAL POLICIES

2.1 Required Withdrawal from Co-op
Students will be required to withdraw from a Co-operative Mathematics program if they fall into one or more of the following categories:

i) They have been required to withdraw from an Honours Mathematics program.

ii) They have failed to meet minimum requirements on work terms and/or work reports.

2.2 Required Withdrawal from Honours
Students will normally be required to withdraw from an Honours Mathematics program if they fall into one or more of the following categories:

i) They have accumulated more than 6 half-credit failures.

ii) At the end of their first 2 full-time terms of registration (or by the time they have accumulated 12 half-course attempts, whichever comes first), they have failed to complete successfully 8 half-credits, with an average on these 8 half-credits of at least 60%.

iii) They have accumulated 4 or more half-credit failures during any 2 consecutive full-time academic terms (including failures obtained in any part-time terms interspersed between the 2 full-time terms in question).

Students who have been required to withdraw as Honours BMath degree candidates will be permitted to register in a BMath Pass or General program, provided their records do not meet any of the criteria for 'Required Withdrawal from Mathematics'. Students allowed to continue their studies in Pass or General will not normally be permitted to take an Honours-level mathematics course when there is a corresponding General-level course available (e.g. MATH 220A rather than MATH 230A).

2.3 Required Withdrawal from Mathematics
Students will normally be required to withdraw from the Faculty of Mathematics if they fall into one or more of the following categories:

i) They have accumulated more than 8 half-credit failures.

ii) They have accumulated 6 or more half-credit failures during any 2 consecutive full-time academic terms (including failures obtained in any part-time terms interspersed between the 2 full-time terms in question).

iii) They have failed to satisfy all requirements for a BMath Pass degree by the end of the first term in which they have accumulated 44 or more half-course attempts.

iv) In the opinion of the Standings and Promotions Committee, they are unlikely to profit from further study in the Faculty of Mathematics.

Students who have been required to withdraw from the Faculty of Mathematics will not normally be 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 zeros in the calculation of averages.)

3.2 Grade Appeals
Any student wishing to appeal a grade may do so by contacting the Assistant Registrar, Faculty of Mathematics, in Needles Hall. Such an appeal must (i) be made in writing, normally within one month of the official release of that term’s grades, (ii) specify the course(s), instructor(s) and grade(s) involved together with reasons why the appeal is being made, (iii) include $5.00 per grade appealed (which is refunded if the grade is raised). Please note, however, that a grade may be lowered if a re-examination leads to the discovery of an earlier error in the student’s favour.

4. POLICIES RE: COURSES

4.1 Corresponding Advanced/Honours/General Level Courses
All new admissions to the Faculty of Mathematics take first-year Calculus and Algebra at the Honours level (MATH 130a/b, MATH 134a/b), or at the Advanced Honours level (MATH 140a/b, MATH 144a/b). The Advanced Honours level courses are intended for exceptionally gifted students in an Honours program. A student pursuing an Honours degree may substitute the corresponding Advanced Honours level course(s) for any required Honours level course(s).

After completing first year, a student pursuing a Pass or General degree may substitute the corresponding Honours level course(s) for any required General level course(s), unless the student has been required by the Standings and Promotions Committee to switch from an Honours program to General or Pass. In this case, the student must enrol in General Courses.

4.2 Course Upgrading
A student who takes the General version of a course instead of the Honours version (e.g. Math 220a instead of 230a), but later decides to pursue an Honours degree, may petition the Standings and Promotions Committee for special consideration. In the past, in a few rare instances where the academic record of the student in question was of very high calibre, the Committee has permitted the student to count the General course toward an Honours degree. In other cases, the Committee may permit the student to write a special final examination in the Honours course without submitting all the written work normally required during the term. In such cases the grade obtained will be treated in the same manner as if the student had registered in the Honours course and obtained that final mark. Otherwise, the student must formally take the Honours course.

4.3 Failed Courses
The minimum passing mark in all courses is 50%. If a student fails a course, he/she may either retake the same course (and this will be the case if the course is required for the degree being sought) or replace it by another course. The failed course remains a permanent part of the student’s record at the university, regardless of whether he/she passes the same course on a subsequent attempt, and it is included in course-attempt and failure counts. However, the failing grade will not be included in the Graduating Averages required for the degree in question. Note that supplemental examinations are not available for students in the Math Faculty.

4.4 Repeated Courses
A student may not normally retake a passed course more than once in an attempt to improve the grade. Both attempts will be included in the student’s quota of course attempts, but the course will be included only once in credit counts and may be counted at most once in the Graduating Averages required for the degree in question.

4.5 No Credit/Overlap Courses
Some courses offered within the University may not normally be taken for credit toward a BMATH degree. The mathematical content of such courses has usually been designed with the academic needs and background of students in faculties other than Mathematics in mind.

Other courses offered by various departments throughout the University sometimes deal with similar subject matter. In such instances, at most one entry from a group of ‘overlapping’ courses may count for credit toward a BMATH degree. Lists of such courses are published annually by the Mathematics Undergraduate Office. It is the student’s responsibility to be aware of the contents of these lists.
4.6 Correspondence Courses
The Correspondence Program at the University of Waterloo offers a large variety of courses each term for part-time students. The Mathematics Faculty feels that the Correspondence Program should normally be restricted to part-time students who are not able to attend classes on campus. Concurrent registration by full-time BMath degree candidates in on-campus and Correspondence courses will not normally be permitted.

Correspondence courses offered in the fall term do not generally begin until late October and normally (i.e. assuming no postal service problems, for example) have their final exams toward the beginning of the following February. In this regard, the Mathematics Faculty has adopted a policy whereby a student with less than a 70% overall average in his/her most recent complete academic term may not normally take a Correspondence course on a part-time basis during the fall term if he/she will be registered full-time during the winter term. This policy is intended to limit this type of situation to students who should be able to cope with the overlap involved with studying for, and writing final examinations in, fall-term Correspondence courses while simultaneously carrying a full-time load of on-campus winter courses.

Correspondence courses may not normally be used to satisfy explicitly stated course requirements for an Honours 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, unless they have written support from their employers to take two half-credit courses.) 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 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 to be counted toward a BMath degree, will be recorded on Math Faculty Student Examination Reports with a grade of 'CR' (credit) or 'NCR' (no credit) as appropriate. As a result, the grades for such courses will be excluded from the calculation of averages used to determine eligibility for graduation with a BMath degree. Note that, while on a work-term, Co-op students are normally limited to one half-credit course, unless they have written support from their employers to take two half-credit courses.

Care should be exercised in the selection of courses to be taken on a letter of permission to eliminate unnecessary duplication in course material covered and to ensure adequate preparation for subsequent courses the student is planning to take in future years at the University of Waterloo.

Once the Faculty has approved a request to take a course on a letter of permission, the student will be held responsible for it. It will be his/her responsibility to ensure that an official transcript from the host institution is sent to the UW Registrar's Office within two months of the completion of the course. Otherwise, a grade of NCR (which counts as a failure) will be automatically submitted. Any changes a student wishes to make to an authorized letter of permission must be approved by the Standings and Promotions Committee.

4.8 Dropping/Adding Courses
Normally, the last day to ADD a course is 2 weeks after the official beginning of lectures. The last day to DROP a course for students carrying a 'normal' course load (5 for Pass or General, and 6 for Honours), is 4 weeks after the beginning of lectures. Students carrying more than a 'normal' course load may not DROP any courses later than 2 weeks after
the beginning of lectures. (These deadline dates apply only to Math Faculty students.) All exceptions to these deadlines must be approved by the Standings and Promotions Committee.

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.

Co-op mathematics students, who have not completed their Honours degree requirements at the termination of their approved academic/work-term sequence, will be eligible for a Regular BMath General (or Pass) degree if they have satisfied the appropriate degree requirements. Being granted such a degree will not disqualify these students from being able to upgrade to an Honours (or General) degree. However, if they wish to obtain a Co-op degree, they will normally have to satisfy the appropriate Honours degree requirements within one further calendar year after the termination of their approved academic/work-term sequence. After one year, they will be eligible only for a Regular degree.

ii) Re-arranging Academic/Work-term Sequences

Student requests to re-arrange academic/work-term sequences must be directed to the Standings and Promotions Committee on special forms available from the Registrar’s Office, Department of Coordination, 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. While on a work term, Co-op students are normally limited to 1 half-credit course, unless they have written support from their employers to take 2 half-credit courses.

5.2 Course Load, Part/Full-Time

Beginning in Year 2, all Pass and General students are restricted to pre-registering for a maximum of 5 courses per term; Honours students are restricted to pre-registering for a maximum of 6 courses per term. With permission from a Faculty Advisor, students may add extra courses during the ADD period.

During their first term of registration in the Faculty of Mathematics, only students with exceptional academic backgrounds are eligible to take extra courses.

In subsequent terms, addition of extra courses will normally be restricted to students with both overall and math averages at least 75% during the student’s most recent complete term. In cases where the student was registered in extra courses in the previous term and had both averages at least 70% in
those courses, he/she will be permitted to register in the same number of courses in the subsequent term.

The burden of proof is left to the student when seeking approval to take extra courses (i.e. the student should have his/her most recent mark report when seeking approval and not expect the Faculty Advisor to supply the necessary verification).

In all cases a student's "year" will be determined by the number of half-credits (N) achieved to date according to the scheme below:

<table>
<thead>
<tr>
<th>Year</th>
<th>Courses (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>first Year</td>
<td>0 ≤ N &lt; 10</td>
</tr>
<tr>
<td>second Year</td>
<td>10 ≤ N &lt; 20</td>
</tr>
<tr>
<td>third Year</td>
<td>20 ≤ N &lt; 32</td>
</tr>
<tr>
<td>fourth Year</td>
<td>32 ≤ N</td>
</tr>
</tbody>
</table>

A student registering for one or two courses per term is considered to be part-time and fees are assessed exclusively on a per-course basis. A student registering for more than two courses is considered to be full-time and fees include extra provisions for an incidental fee (student federation membership, athletics, etc.) and a Co-op fee (for students in Co-operative programs).

### 5.3 Registration of Regular Students

**In Spring Terms**

Students in the Regular program normally take courses during the Fall and Winter terms. They may also register, on a part-time or full-time basis during the Spring (May-August) or Summer (July-August) term. However, there are no Math Faculty course offerings in the Summer term and those in the Spring term are planned primarily for Co-op students.

Because of resource limitations, it may not always be possible to allow Regular students universal access to Math Faculty course offerings in the Spring term. First priority for access to particular courses in the Spring term will always be given to Co-op students.

Co-op students normally pre-register for Spring courses at the beginning of the preceding November. Regular students may pre-register in early February. By that time, the extent of the demand by Co-op students for Spring courses will be known and departments will be in a better position to determine which courses will be available to Regular students. (A list of such courses will be available for February pre-registration.) If subsequent pre-registration requests from Regular students should exceed the space available in the non-restricted courses, it may not be possible to accommodate all Regular students in the courses in question.

### 5.4 Course Prerequisites

At any time prior to the completion of lectures, if it is discovered that a student is taking a course offered by the Faculty of Mathematics without having previously successfully completed all the course pre-requisites stated in the University Undergraduate Calendar, the student is subject to having his/her pre-registration/registration in that course purged from University records. Such purging may be done at the request of the course instructor, the department offering the course, and/or the Faculty of Mathematics, but not without the consent of the instructor.

### 5.5 Illness or Incapacity

Normally, failure to write a required final examination in any course in which a student is officially registered, or failure to complete such a course for some other reason, will result in a DNW, NMR or INC grade being recorded for the course. All of these grades are considered as failures for the purpose of course-attempt and failure counts and count as zeros in average calculations.

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

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

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

### 5.6 Voluntary Withdrawal

A student may withdraw from the Faculty of Mathematics within the first four 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 on course, upon the date of withdrawal.
5.7 'Inactive' Status/Re-Admission
A BMath degree candidate who has been ‘inactive’ for more than four consecutive academic terms must apply for re-admission by writing to the Assistant Registrar, Faculty of Mathematics, in Needles Hall. A resume covering the ‘inactive’ period, including official transcripts from any post-secondary institutions attended, must accompany the letter requesting re-admission. If the student is re-admitted, he/she will 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 Honour List” will have their names displayed in gold in the Math Faculty Colloquium Room (MC 5158).

An Alumni Gold Medal is presented annually (usually at the Spring Convocation) to recognize the academic excellence of our top undergraduate.

7. ENGLISH WRITING SKILLS
BMath degree candidates with an initial registration in the Faculty of Mathematics of Fall/82 or later must satisfy a WRITING SKILLS REQUIREMENT, namely:
“A grade of 60% or better on the UW English Language Proficiency Exam or a half-credit with a mark of C- or better in a term-course chosen from a list approved by the Undergraduate Affairs Committee and maintained by the Math Undergraduate Office.
(The current list includes the following English courses: ENGL 108K, 109, 129R, 150 and 210.)”

8. "AREAS OF STUDY" ON TRANSCRIPTS
BMath transcripts include no more than two areas of study.
Faculty of Science
Faculty of Science

Introduction
The first students were enrolled in the Faculty of Science in the autumn of 1959. There are now approximately 2,000 full-time students including approximately 200 graduate students, taking programs within the Faculty.

The Faculty of Science has 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.

A program leading to an Honours BSc in Psychology is also available.

The Associate Dean and Department Chairmen will be pleased to receive inquiries about the programs in this Faculty.

Degrees
The degree of Bachelor of Science (BSc) is awarded by the University on the successful completion of any of the undergraduate programs involving Biology, Chemistry, Earth Sciences, Physics and Psychology which are discussed under Academic Programs. The ordinary or pass-level BSc will be awarded on completion of the 3 year General Science Program. The Honours degree, BSc (Honours), will be awarded on completion of any of the honours programs. MSc and PhD degrees are discussed in the Graduate Calendar.

Upgrading of BSc Degree
Normally a student may not upgrade a General BSc or its equivalent to a Waterloo Honours BSc. However, from time to time such conversion privileges may be allowed in exceptional cases on the recommendation of the Department(s) concerned and with the approval of the Examinations and Standings Committee.

Rulings of the Committee in any particular case on the conditions to be met for such conversion may include time limits.

Admission

The admission requirements and procedures for all programs are outlined in Chapter 2 of this Calendar. 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 at least 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% overall average including a 75% average in Physics and Mathematics with a minimum grade of 70% in each of Physics and Calculus. Co-op Chemistry, and Co-op Biology and Chemistry require 70% in Chemistry and in Math.

Co-operative Students
Students applying to co-operative programs in the Faculty of Science will not normally be admitted above the Year 2 Term B level.

Transfer Students
Students may be accepted for transfer from other programs in the University or from other universities. Their programs will be evaluated in terms of the number of credits allowed and the number remaining for a degree. Normally students will be required to complete 50% of the course content while registered in the Faculty of Science. Credits will be transferred without a cumulative average and only for relevant courses with a 60% or better mark.

Admission as an Adult Student
Applicants are normally required to obtain standing in at least 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 progress 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.

   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).

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. 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 or better is necessary to pass and receive credit for a course. For Science students, the lowest mark to be recorded and averaged will be 32, equivalent to the weighting factor for the F- on the common system.

Grade Appeals
Any student wishing to appeal a course grade should submit a formal written appeal either through the Registrar's Office or the Science Undergraduate Affairs Office. Appeal forms are available in both locations.

Normally a formal appeal must be submitted within one month of the official release of the term's grades.

Conditional Standing
A student who marginally fails to meet the required standards of any program will be placed on conditional standing for one term only. During this period the student must regain standing in that program or withdraw from it. Conditional standing will be granted only once.

Required to Withdraw
Students will normally be required to withdraw if they do not fulfill the academic requirements of the program they are enrolled in or if they are unlikely to profit from further study in the opinion of the Examinations and Standings Committee.

Students who have been "required to withdraw" from the Faculty of Science may not apply for readmission for at least 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 (aegrotat - signifying the student's work or examination was incomplete for some acceptable reason (such as illness) and the instructor felt the student should receive credit for the course but a numerical mark could not be set). A course for which the grade designation INC has been given must be completed within two terms of taking the course or the INC automatically becomes a mark of 32. If a graduating student has an INC, it will be recorded as 32 on the transcript. Students should not re-register in an INC course. They should see the instructor to arrange completion of the course. 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. 226)

General Programs - 3 Year General and 4 Year General (Major) Requirements (see p. 248)
As of September 1983 no new applicants will be admitted to the 4-Year General programs. Students currently in these programs in good academic standing may continue to completion.

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. A 60% cumulative average in the major field courses must also be obtained in the 4-year General program. 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 5.0 failed credits 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 5.0 failed credits will be allowed.

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 at least a 60% overall average as well as 60% or better in the field of specialization. Honours Biology and Earth Sciences require a 65% cumulative average in the field of specialization.
Enrolment may be subject to limitations.
To be eligible for an Honours degree a student must have been enrolled full-time in 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. 247)
(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 in conditional standing 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 5 failed credits will be allowed.

b) Honours Major Programs (see also p. 230)
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 or Geophysics)
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, 65% cumulative average in the Earth Sciences courses, and a cumulative average of 60% in the other courses.

In the Honours Psychology program a cumulative average of 75% must be maintained in the Psychology courses and a cumulative average of 60% in the Faculty of Science courses.

A student who fails one of the courses in the field of specialization may be placed in conditional standing in order to clear that requirement. Failure of more than one such course will result in requirement to withdraw from that program. No more than 5 failed credits 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. All Biology Honours programs require a 65% average in all Biology courses.

c) Minors

A minor in each of the four disciplines, Biology, Chemistry, Earth Sciences and Physics is available to Honours students in another faculty.

Biology - To obtain a minor in Biology, students must complete 10 Biology term courses, at least 5 of which must be at the third or fourth year level. A minimum average of 65% is required in the 10 term courses.

Chemistry - To obtain a minor in Chemistry a student is required to take - CHEM 123-124 plus labs; 2.0 lecture credits taken from Year 2 Honours. Chemistry courses; 2.0 lecture credits taken from third of fourth year Honours Chemistry courses. A minimum cumulative average of 60% is required in these credits.

Earth Sciences - A minor in Earth Sciences consists of 10 term courses in Earth Sciences (5.0 credits). A cumulative average of 65% must be maintained in Earth courses.

Year 1  EARTH 121-122  
Year 2  Four term courses from EARTH 221, 231, 232, 235, 236, 260  
Year 3  Three or two term courses from EARTH 331, 332, 333, 336, 342, 345, 355, 368, 369, 370.  
Year 4  One or two term courses from EARTH 421, 432, 433, 434, 435, 438, 439, 440, 470.

Note:

Prerequisite and antirequisite regulations in the Course Descriptions in the Calendar must be followed.

Physics - A minor in Physics consists of at least 4.5 lecture credits and 1.0 lab credit. The lecture credits must include: PHYS 121-122; PHYS 243 (or 253); PHYS 226-246 (or 256); PHYS 324-325 (or 263-354). The lab credits must include PHYS 121L-122L and 0.5 credits of Year 2 labs. A minimum average of 60% must be obtained in all Physics credits attempted (whether passed or failed). First year Calculus is implied by above.

Academic Program Selection

Students entering first year in the Faculty of Science are essentially enrolled in a common year. Students in Year 1 Co-operative Biology, Biology and Chemistry, Chemistry, Earth Sciences and Physics are labelled as such but all other students are officially in Year 1 General Science. Essentially the same courses are available to all first year students and students may enter Year 2 programs in Science provided they have taken the necessary courses in Year 1, and have achieved the necessary passing average, and enrolment restrictions allow it.

1. First Year Programs (Regular and Co-operative)

The normal minimum course load for a full-time student in Year 1 Science is 5.0 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). Prior to graduation all students in the Faculty of Science must complete at least 1.0 credit of approved Mathematics courses.

Courses should be chosen either with a specific Year 2 goal in mind or to cover many year 2 programs. The required and recommended Year 1 selections for various Year 2 Honours programs can be found in the table on page 226.

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 students in a term in which they are full-time students. Regular and co-op students during their terms off-campus may take correspondence courses on a part-time basis. Only in exceptional cases can Honours students take a core-course by Correspondence and they cannot take a Correspondence course in order to reduce course-load in a term in which they are a full-time student.

4. Letters of Permission

Students in good academic standing and whose total number of transfer credits is less than the maximum permitted may be allowed to take an elective course at another university during a term off-campus to count as credit towards their degree.

A student wishing to do so must complete the Letter of Permission form available at the Science Undergraduate Office or the Registrar's Office and have it authorized by the Associate Dean or an appropriate Undergraduate Officer.

A course taken on a letter of permission will be given credit with no grade assigned as long as the mark obtained is 60% or better.

5. Audit

The Faculty of Science does not record or recognize audits for students in Science or any other Faculty.

6. Enrolment in a Graduate Course

A student may obtain credit toward a graduate degree in the Faculty of Science for normally not more than a one term graduate course taken during the fourth year of an undergraduate program provided this course is not used for credit toward his undergraduate degree. Prior approval of the Faculty Graduate Studies Committee must be obtained for students wishing to do so.

Credit for the graduate course toward a graduate degree will not be given unless the student attains an "A" average in his/her major subjects in the fourth year.

7. Reduced program

Only in exceptional circumstances may an Honours program be taken on a completely part-time or reduced program basis; at least 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 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 Notes 6 and 7)</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 113a-113b, EARTH 121-122, and a computer course.</td>
</tr>
<tr>
<td>Biology and Chemistry (see Note 6)</td>
<td>Two 200 level term courses in BIOL, CHEM 123-124 and 123L-124L, a first year Physics credit 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, two term courses in M ENV, CHEM 123-124 and 123L-124L, CS 118 or 119.</td>
<td></td>
</tr>
<tr>
<td>Chemistry (see Note 2)</td>
<td>CHEM 123-124 and 123L-124L, MATH 113a-113b, PHYS 121-122 and 121L-122L, CS 118.</td>
<td></td>
</tr>
<tr>
<td>Chemistry (Environmental Studies Option) (See Notes 2 &amp; 5)</td>
<td>CHEM 123-124 and 123L-124L, MATH 113a-113b, PHYS 121-122 and 121L-122L, CS 118.</td>
<td>BIOS 111-112, 111L-112L or two 200 level term courses in Biology, EARTH 121-122, ENV 5 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, MATH 111a-134b, CS 118.</td>
<td></td>
</tr>
<tr>
<td>Chemistry (Physics Option) (see Note 2)</td>
<td>CHEM 123-124 and 123L-124L, MATH 113a-113b, PHYS 121-122, and 121L-122L, CS 118, MATH 111a-134b.</td>
<td></td>
</tr>
<tr>
<td>Earth Sciences (see Note 4)</td>
<td>EARTH 121-122, CHEM 123-124 and 123L-124L, PHYS 121-122 and PHYS 121L-122L, CS 118, MATH 113a-113b, or MATH 115a-115b, one unrestricted term course.</td>
<td>BIOS 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, CHEM 123-124 and 123L-124L, GEOG 101 and GEOG 102, CS 118. Either PHYS 111-112 and 111L-112L or BIOL 111-112 and 111L-112L or equivalent elective.</td>
<td></td>
</tr>
</tbody>
</table>
### Science

#### Academic Programs

### Year 1 Science Program Selections Leading to Year 2 Honours 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 113a-113b, BIOL 230 and 211, PHYS 121-122 and 121L-122L, PSYCH 101.</td>
<td>CHEM 123-124 and 123L-124L, PSYCH 102(a-g) or SOC 101.</td>
</tr>
<tr>
<td>Physics (see Note 1)</td>
<td>MATH 115a-115b or MATH 113a-113b, MATH 134a-134B, PHYS 121-122, PHYS 121L-122L.</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 113a-113b, PSYCH 101-102(a-g)</td>
<td></td>
</tr>
<tr>
<td>General Science &amp; Honours Science non-major</td>
<td>2.0 Science lecture-credits from the courses offered to Year 1 students in Biology, Chemistry, Earth Sciences &amp; Physics.</td>
<td>MATH 113a-113b; a computer course.</td>
</tr>
</tbody>
</table>

#### Co-operative Programs

<table>
<thead>
<tr>
<th>Major Field of Study</th>
<th>Required Courses in Year 1</th>
<th>Recommended Electives in Year 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Chemistry (see Note 2 and 5)</td>
<td>CHEM 123-124 and 123L-124L, MATH 115a-115b, PHYS 121-122 and 121L-122L, CS 118.</td>
<td>A Computer Course, CHEM 123-124 and 123L-124L.</td>
</tr>
<tr>
<td>Applied Physics (see Note 1 and 5)</td>
<td>MATH 115a-115b, MATH 134a-134B, PHYS 121-122, PHYS 121L-122L.</td>
<td></td>
</tr>
<tr>
<td>Applied Physics (Geophysics Option)</td>
<td>MATH 114, 115a-115b, PHYS 121-122 and 121L-122L, 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, PHYS 121-122 and 121L-122L, CS 118.</td>
<td>One elective</td>
</tr>
<tr>
<td>Applied Earth Sciences (Geotechnical Option) (see Note 8)</td>
<td>EARTH 121-122, MATH 113a-113b, or MATH 115a-115b, PHYS 121-122 and 121L-122L, CHEM 123-124 and 123L-124L, CS 118 (or 140), MATH 114 or 118.</td>
<td></td>
</tr>
<tr>
<td>Co-operative Biology (see Notes 5, 6, and 7)</td>
<td>Two 200 level term courses in Biology, CHEM 123-124 and 123L-124L.</td>
<td>PHYS 111-112, AM 101-111, EARTH 121-122 and a computer course.</td>
</tr>
<tr>
<td>Co-operative Biology and Chemistry (see Notes 5 and 6)</td>
<td>Two or three 200 level term courses in BIOL CHEM 123-124 and 123L-124L, MATH 115a-115b, a first year Physics credit with labs, CS 118.</td>
<td></td>
</tr>
</tbody>
</table>
Note 1
Co-op Physics students and those planning to enroll in Honours Physics in Year 2 are advised to select MATH 130a-130b instead of MATH 113a-113b or 115a-115b if they have more than an 80% average and may select MATH 111 instead of MATH 134 if they have less than an 80% average in Grade 13 Mathematics and Physics.

Students wishing a Biophysics option with the Honours Physics program are advised to include BIOL 111-112, 111L-112L in their program.

Students wishing a geophysics option with the Honours Physics program are advised to include EARTH 121-122 and CHEM 123-124 in Year 1.

Students wishing any of the Business Administration options with the Honours Physics program are advised to select ECON 101-102.

Students wishing an elective program with ECON 215 (Fall term) and CS 176.

Students wishing to proceed in a Theoretical Physics program are advised to take a computing course in Year 1.

Note 2
The Year 2 Honours Chemistry programs (including Co-op Applied Chemistry and Honours Biology and Chemistry) are normally limited to the 150 best qualified students. Those who have failed core courses should not expect to proceed in any Honours Chemistry program.

Note 3
Students planning to apply for admission to Year 1 Optometry should have a sound background in Chemistry. CHEM 123-124 and 123L-124L is strongly recommended. Students without Grade 13 Physics must take Physics 111-112 and 111L-112L instead of PHYS 121-122 and 121L-122L.

Note 4
MATH 113a-113b, Calculus, (except for Geophysics option students) and CS 118. Enrolment is limited to approximately 45 students in Year 2 of all Earth Sciences programs. Selection is made on the basis of academic standing in Year 1, including standing in EARTH 121 and 122.

Note 5
Students in the Co-operative Biology and Chemistry, Chemistry and Physics programs have two methods of taking Year 1: (a) two terms in a row "B-stream" (September-April) or (b) fall term on campus "A-stream" (September-December), winter term at work (January-April) and spring term on campus (April-August).

Any students in Co-op programs taking CS 118 must do so in the Fall term.

Note 6
The Department of Biology offers ten introductory courses which provide a thorough and broadly based foundation in biology. Areas of biology that are covered include Botany (220-221), Cell Biology (230), Ecology (250), Genetics (259), Microbiology (260-261), Physiology (253) and Zoology (210-211). First-year students must take any two of these courses (and may take three), along with Year 1 Chemistry, as prerequisites for entering Year 2 of a Biology-Major program.

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 16.

Note 7
By the end of Year 2, all honours Biology majors must have completed an introductory course in computer programming equivalent to CS 116 or CS 118.

Note 8
The Geotechnical option offered by Earth Sciences has been closed and replaced by the Engineering Geology program.

Academic Program Descriptions

1. Honours Majors Programs

Honours Biology

Year 1
(For complete discussion of Year 1, see page 228.)
(Course weight is shown in parentheses.)

Students entering Year 2 must take the remaining 8 (or 7) Biology courses from the following list of 10.

Year 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>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<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>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 202</td>
<td>Elementary Statistics for Biologists</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Note:
By the end of Year 2, all Honours Biology majors must have completed an introductory course in computer programming equivalent to CS 116 or CS 118.

Year 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 310</td>
<td>Botany 1</td>
<td>0.5</td>
</tr>
<tr>
<td>BIOL 311</td>
<td>Vertebrate Zoology</td>
<td>0.5</td>
</tr>
<tr>
<td>BIOL 315</td>
<td>Invertebrate Zoology</td>
<td>0.5</td>
</tr>
<tr>
<td>BIOL 316</td>
<td>Arthropod Zoology</td>
<td>0.5</td>
</tr>
<tr>
<td>BIOL 323</td>
<td>Plant Anatomy &amp; Morphogenesis</td>
<td>0.5</td>
</tr>
<tr>
<td>BIOL 324</td>
<td>The Flowering Plants</td>
<td>0.5</td>
</tr>
<tr>
<td>BIOL 327</td>
<td>Mycology</td>
<td>0.5</td>
</tr>
<tr>
<td>BIOL 330</td>
<td>Molecular Biology</td>
<td>0.5</td>
</tr>
<tr>
<td>BIOL 331</td>
<td>Cell Physiology</td>
<td>0.5</td>
</tr>
<tr>
<td>BIOL 333</td>
<td>Histology &amp; Cytology</td>
<td>0.5</td>
</tr>
<tr>
<td>BIOL 335</td>
<td>Plant Physiology</td>
<td>0.5</td>
</tr>
<tr>
<td>BIOL 336</td>
<td>Embryology</td>
<td>0.5</td>
</tr>
<tr>
<td>BIOL 337</td>
<td>Comparative Animal Physiology 1</td>
<td>0.5</td>
</tr>
<tr>
<td>BIOL 338</td>
<td>Comparative Animal Physiology 2</td>
<td>0.5</td>
</tr>
<tr>
<td>BIOL 342</td>
<td>Microbial Biotechnology</td>
<td>0.5</td>
</tr>
<tr>
<td>BIOL 344</td>
<td>Microorganisms in Foods</td>
<td>0.5</td>
</tr>
<tr>
<td>BIOL 350</td>
<td>Environmental Toxicology</td>
<td>0.5</td>
</tr>
<tr>
<td>BIOL 356</td>
<td>Population Ecology</td>
<td>0.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electives</td>
<td>Four term courses</td>
<td></td>
</tr>
</tbody>
</table>

Note:
Four term courses. (Chemistry courses and PHYS 301 (0.5) or PHYS 302 (0.5) are recommended.)
In order to graduate in the Honours Biology program a student must take at least 1 term of Biochemistry (CHEM 237 & 237L) and 1 term of Organic Chemistry beyond Year 1.

Students who plan to specialize in areas of Biology with a substantial biochemical component should plan to take Biochemistry in Years 3 and 4. They are advised to take Organic Chemistry, CHEM 267, in their second year and to select the Biochemistry courses, CHEM 237 & 237L and 333 & 333L in their third year, and other Biochemistry courses in their fourth year. (Alternatively, they may take CHEM 237 and 237L along with CHEM 267 in their second year, and then CHEM 332 and 332L and CHEM 333 & 333L in their third year, and other Biochemistry courses in their fourth year).

Year 4††
10 term courses of which at least 6 must be BIOL 400-level courses. This year is designed to be the specialist year. The course selection should reflect this and must form an integrated group around a particular area of interest. (CHEM 432-433 is recommended.)

††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 or Psychology should also be considered.

Honours Co-operative Biology
The University of Waterloo offers a co-operative Biology program designed to equip the graduating student with two years of work-related experience as well as a degree in Honours Biology. Applicants for Co-op Biology must fulfill the normal admission requirements for the Faculty of Science. The program has academic and work-terms scheduled as shown in Chapter 5.

During the work terms, students are assessed on their performance and are also required to write work reports. The program is aimed at making the student competitive in the job market without precluding entry into graduate school.

Note to All 1B Students:
By the end of Year 2B, students must have completed the ten introductory Biology courses at the 200-level and a computer course. Selection of Biology courses in both the Winter and Spring Terms must be made in consultation with the Undergraduate Officers in Biology. Students should be aware that BIOL 239 and 239 must be taken during either the Winter or Spring Terms in even-numbered years and BIOL 211, 221 and 241 must be taken during either the Winter or Spring Terms in odd-numbered years.

Stream 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>BIOL One 200-level term course.</td>
<td>BIOL Two or three 200-level term courses.</td>
</tr>
<tr>
<td>CHEM 123, 123L</td>
<td>Electives Three term courses.</td>
<td>CHEM 124, 124L Electives One or two term courses.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2A</th>
<th>Work Term</th>
<th>Year 2B</th>
<th>Work Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL Four 200-level term courses.</td>
<td>Electives Two term courses.</td>
<td>BIOL Two or three 200-level term courses.</td>
<td>CHEM 228</td>
</tr>
<tr>
<td>CHEM 266, 266L STAT 202</td>
<td>CHEM 237, 237L Electives One or two term courses.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Work Term</th>
<th>Year 3A</th>
<th>Work Term</th>
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</thead>
<tbody>
<tr>
<td>BIOL Four 300-level term courses. Electives Two term courses.</td>
<td>Biocology courses are recommended.</td>
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<td>BIOL Four 300-level term courses. Electives Two term courses. (Biochemistry courses are recommended.)</td>
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Stream 4
(Students who take Year 1B during Spring Term)

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<th>Spring</th>
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<tbody>
<tr>
<td>Year 1A</td>
<td>BIOL One 200-level term course.</td>
<td>BIOL Two or three 200-level term courses.</td>
</tr>
<tr>
<td>CHEM 123, 123L</td>
<td>Electives Three term courses.</td>
<td>CHEM 124, 124L Electives One or two term courses.</td>
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### Stream 8

(Students who take Year 1B during Winter Term)

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<td>Year 1B</td>
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<td>BIOL 230</td>
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<td>CHEM 124, 124L</td>
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<tr>
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<td>PHYS 121, 121L</td>
<td>PHYS 122, 122L</td>
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<tr>
<td>CS 118</td>
<td>or PHYS 111, 111L</td>
<td>or PHYS 112, 112L</td>
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<thead>
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<th>Year 2A</th>
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</tr>
</thead>
<tbody>
<tr>
<td>BIOL 240</td>
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<td>Term course.</td>
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<tr>
<td>CHEM 212</td>
<td>CHEM 221, 221L</td>
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<tr>
<td>CHEM 220, 220L</td>
<td>CHEM 237, 237L</td>
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<tr>
<td>CHEM 264</td>
<td>CHEM 265, 265L</td>
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</tr>
<tr>
<td>STAT 202</td>
<td>Elective</td>
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<th>Year 3A</th>
<th>Work Term</th>
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</thead>
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<tr>
<td>BIOL 331</td>
<td>BIOL 332, 332L</td>
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<tr>
<td>CHEM 333</td>
<td>BIOL 350</td>
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<td>CHEM 357</td>
<td>CHEM 366, 366L</td>
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<td>CHEM 368, 368L</td>
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### Stream 4 and Stream 8

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<th>Year 1B</th>
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<td>Term course.</td>
</tr>
<tr>
<td>CHEM 123, 123L</td>
<td>CHEM 124, 124L</td>
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<tr>
<td>MATH 115A</td>
<td>PHYS 121, 121L</td>
<td>PHYS 122, 122L</td>
</tr>
<tr>
<td>CS 118</td>
<td>or PHYS 111, 111L</td>
<td>or PHYS 112, 112L</td>
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<table>
<thead>
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<th>Year 2A</th>
<th>Work Term</th>
<th>Year 2B</th>
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</thead>
<tbody>
<tr>
<td>BIOL 240</td>
<td>BIOL One 200-level</td>
<td>Term course.</td>
</tr>
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<td>CHEM 212</td>
<td>CHEM 221, 221L</td>
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<td>CHEM 220, 220L</td>
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<tr>
<td>CHEM 264</td>
<td>CHEM 265, 265L</td>
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</tr>
<tr>
<td>STAT 202</td>
<td>Elective</td>
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</table>

### Honours Co-operative Biology and Chemistry

In the Co-operative format the curriculum provides courses that allow specialization in either biochemistry with a chemical emphasis or biochemistry with a physiological or microbiological emphasis. The program continues to be offered in the regular four-year format.

Program Advisors: Dr. L.J. Brubacher, Chemistry and Dr. J.C. Carlson, Biology.

### Professional Standing

The program in Biology and Chemistry fulfills the academic requirements for professional membership in the Chemical Institute of Canada.

### Note:

By the end of Year 2B, students must have completed BIOL 230, 233, 239, 240 and 241. Selection of Biology courses in both the Winter and Spring Terms must be made in consultation with the Undergraduate Officers in Biology. Students should be aware that BIOL 233 and 239 must be taken during either the Winter or Spring Terms in even-numbered years and BIOL 241 must be taken during either the Winter or Spring Terms in odd-numbered years.

Students with Grade 13 Physics are advised to take PHYS 121-122 and 121L-122L.
### Streams 4 and 8

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Work Term</strong></td>
<td><strong>Work Term</strong></td>
<td><strong>Year 3B</strong></td>
</tr>
<tr>
<td>BIOL 331</td>
<td>BIOL One 300-level term course.</td>
<td>CHEM 333, 333L, CHEM 357, CHEM 356L, 357L</td>
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<tr>
<td><strong>Year 4A</strong></td>
<td><strong>Year 4B</strong></td>
<td><strong>Year 3</strong></td>
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<tr>
<td>CHEM 312</td>
<td>Any four of:</td>
<td>Courses from:</td>
</tr>
<tr>
<td>CHEM 464</td>
<td>BIOL 431</td>
<td>BIOL 315 (0.5)</td>
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<td>Any three of:</td>
<td>BIOL 433</td>
<td>BIOL 316 (0.5)</td>
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<td>BIOL 430</td>
<td>BIOL 434</td>
<td>BIOL 324 (0.5)</td>
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<td>BIOL 432</td>
<td>BIOL 438</td>
<td>BIOL 327 (0.5)</td>
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<td>BIOL 435</td>
<td>BIOL 439</td>
<td>BIOL 330 (0.5)</td>
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<td>BIOL 441</td>
<td>BIOL 442</td>
<td>BIOL 333 (0.5)</td>
</tr>
<tr>
<td>BIOL 443</td>
<td>BIOL 444</td>
<td>BIOL 336 (0.5)</td>
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<tr>
<td>BIOL 446</td>
<td>BIOL 447</td>
<td>BIOL 337 (0.5)</td>
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<td>BIOL 448*</td>
<td>BIOL 449</td>
<td>BIOL 342 (0.5)</td>
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<td>BIOL 455</td>
<td>BIOL 461</td>
<td>BIOL 350 (0.5)</td>
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<tr>
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</tr>
<tr>
<td>CHEM 432</td>
<td>CHEM 419</td>
<td>CHEM 332 (0.5)</td>
</tr>
<tr>
<td>CHEM 452</td>
<td>CHEM 433</td>
<td>CHEM 332L (0.25)</td>
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<tr>
<td>CHEM 492 or</td>
<td>CHEM 434</td>
<td>CHEM 356 (0.5)</td>
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<tr>
<td>BIOL 499</td>
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<td>CHEM 357 (0.5)</td>
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<td>Elective</td>
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<td>Biology, CHEM 432, 435, 452 or 492</td>
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<td></td>
<td>CHEM 312 (0.5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CHEM 464 (0.5)</td>
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</tbody>
</table>

### Honours Biology and Chemistry (Regular Program)

#### Professional Standing

The program in Biology and Chemistry fulfills the academic requirements for professional membership in the Chemical Institute of Canada.

#### Year 1

Normal Year 1 Science (see page 228) in which CHEM 123-124, 123L-124L, two 200-level term courses in Biology (see Note 6 on page 230), PHYS 121-122 and 121L-122L or 111-112 and 111L-112L, CS 118 and MATH 113a-113b are required; (course weight is shown in parentheses).

#### Year 2

<table>
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<tr>
<th>Fall</th>
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<td>One Biology term</td>
<td>Two Biology term</td>
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<tr>
<td>course from:</td>
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<td>BIOL 210 (0.5)</td>
<td>BIOL 211 (0.5)</td>
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<td>BIOL 220 (0.5)</td>
<td>BIOL 221 (0.5)</td>
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<td>BIOL 233 (0.5)</td>
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<td>BIOL 240 (0.5)</td>
<td>BIOL 239 (0.5)</td>
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<td>BIOL 250 (0.5)</td>
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<td>plus</td>
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<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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</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 65% average in all Biology courses.

#### Year 1

(For a complete discussion of Year 1, see page 228.)

(Course weight is shown in parenthesis.)

In order to graduate in Honours Biology and Man Environment students must complete 15 term courses in Biology, 12 term courses in Man Environment or equivalent, STAT 202, CHEM 266-266L, 237-237L beyond year one. Contact the Undergraduate Officers in both Departments for further details.
Honours Chemistry Program

General Information
As well as the Honours Biology and Chemistry program (Regular or Co-operative) previously described, students may take:

1) Co-operative Applied Chemistry (Honours) - p. 236
2) Honours Chemistry - p. 236
3) Honours Chemistry (Environmental Studies Option) - p. 236-237.

4) Honours Chemistry (Mathematics Option)
Program Adviser: Professor R.J. LeRoy
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. The program is also available in the Co-op system.

5) Honours Chemistry (Physics Option)
Program Adviser: Professor G. Scopes
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. The program is also available in the Co-op system.

(There is also a 4-year Honours Science degree (Program 3) which offers less intensive specialization in chemistry, described later in this chapter of the calendar.)

General Program Courses
Honours Chemistry Students (all programs) may not take General program courses for degree credit.

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>1983 FALL</th>
<th>1984 WINTER</th>
<th>SPRING</th>
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</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

**Environment**
- M ENV 320

**Management Science**
- M SCI 44

**Economics**
- ECON 101, 102, 201, 202

**Computing**
- CS 210, GE 121

**Writing**
- P SCI 291, 292, ENV S 201, ACC 231

**Law**
- RU 352, 352, 382, 383

**Business (WLU)**
- ACC 121, 122

**Accounting**
- EL E 222, 323, 427, PHYS 353

**Microprocessors**
- PHIIL 145
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

Year 1
(For a complete discussion of Year 1, see page 228.)

Stream 8
(students who took 1B term in the winter).

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 2A</td>
<td>Work Term</td>
<td>Year 2B</td>
</tr>
<tr>
<td>CHEM 10, 212, 220, 220L, 254, 264</td>
<td>CHEM 10, 221, 221L, 265, 265L, 265L</td>
<td>CHEM 254, 254L, CHEM 264, 264L</td>
</tr>
<tr>
<td>MATH 215</td>
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<td>PHYS 243, 243L, One elective</td>
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Work Term

<table>
<thead>
<tr>
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<th>Year 3B</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 10, 312, 314L, 355, 355L, 368, 368L, Two electives</td>
<td>CHEM 10, 312L, 315L, 358, 358L</td>
<td>Three electives</td>
</tr>
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</table>

Stream 4
(students who took 1B term in the spring).

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
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</thead>
<tbody>
<tr>
<td>Work Term</td>
<td>Year 2A</td>
<td>Work Term</td>
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<td>MATH 215</td>
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</tbody>
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Work Term

<table>
<thead>
<tr>
<th>Year 2B</th>
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<th>Year 3A</th>
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<tbody>
<tr>
<td>CHEM 10, 221, 221L, 255, 265, 265L, PHYS 243, 243L, One elective</td>
<td>CHEM 10, 312, 314L, 355, 355L, 368, 368L</td>
<td>Two electives</td>
</tr>
</tbody>
</table>

Work Term

<table>
<thead>
<tr>
<th>Year 3B</th>
<th>Work Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 10, 312, 315L, 358, 358L</td>
<td>Three electives</td>
</tr>
</tbody>
</table>

Both Stream 4 and Stream 8

Year 4 (Fall and Winter)
CHEM 10
Eight electives*
CHEM 492

*In Years 3 and 4, at least 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.

Honours Chemistry
Program Adviser: Professor G.E. Toogood

Year 1
(For a complete discussion of Year 1, see page 228.)

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 211 (0.5)</td>
</tr>
<tr>
<td>CHEM 220 (0.5)</td>
<td>CHEM 221L (0.5)</td>
</tr>
<tr>
<td>CHEM 220L (0.25)</td>
<td>CHEM 255 (0.5)</td>
</tr>
<tr>
<td>CHEM 254 (0.5)</td>
<td>CHEM 265 (0.5)</td>
</tr>
<tr>
<td>CHEM 264 (0.5)</td>
<td>CHEM 265L (0.25)</td>
</tr>
<tr>
<td>MATH 215 (0.5)</td>
<td>PHYS 243 (0.5)</td>
</tr>
<tr>
<td></td>
<td>PHYS 243L (0.25)</td>
</tr>
</tbody>
</table>

| Elective (0.5) |

Year 3

<table>
<thead>
<tr>
<th>Fall Term</th>
<th>Winter Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 10</td>
<td>CHEM 10</td>
</tr>
<tr>
<td>CHEM 312 (0.5)</td>
<td>CHEM 313 (0.5)</td>
</tr>
<tr>
<td>CHEM 314L (0.25)</td>
<td>CHEM 315L (0.5)</td>
</tr>
<tr>
<td>CHEM 355 (0.5)</td>
<td>CHEM 358 (0.5)</td>
</tr>
<tr>
<td>CHEM 355L (0.25)</td>
<td>CHEM 358L (0.5)</td>
</tr>
<tr>
<td>CHEM 368 (0.5)</td>
<td>Three electives† (1.5)</td>
</tr>
<tr>
<td>CHEM 368L (0.5)</td>
<td>Two Electives (1.0)</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>Eight electives† (4.0)</td>
</tr>
</tbody>
</table>

†In Years 3 and 4, in addition to the required chemistry core courses, students must choose four 400-level term courses and two term courses at any level from the list of Technical Electives with Chemistry Content.

Honours Chemistry (Environment Studies Option)
Program Adviser: Professor J.G. Smith

This program supplements the Honours Chemistry core courses to familiarize the student with legal, economic and social aspects of environmental control and resource management.
**Science**  
**Academic Programs**

---

### Year 1

*For a complete discussion of Year 1 see page 228.*

#### Fall Term
- CHEM 10
- CHEM 212 (0.5)
- CHEM 220 (0.5)
- CHEM 220L (0.25)
- CHEM 254 (0.5)
- MATH 215 (0.5)

#### Winter Term
- CHEM 10
- CHEM 221 (0.5)
- CHEM 221L (0.5)
- CHEM 255 (0.5)
- CHEM 265 (0.5)
- PHYS 243 (0.5)
- PHYS 243L (0.25)
- Electives* (0.5)

---

### Year 2

#### Fall Term
- CHEM 10
- CHEM 316 (0.5)
- CHEM 316L (0.25)
- CHEM 356L (0.25)
- CHEM 368 (0.5)
- CHEM 368L (0.5)
- STAT 204 (0.5)

#### Winter Term
- CHEM 10
- CHEM 313 (0.5)
- CHEM 357 (0.5)
- CHEM 357L (0.25)
- STAT 205 (0.5)
- Two electives* (1.0)

---

### Year 3

#### Fall Term
- CHEM 10
- CHEM 310 (0.5)
- CHEM 311 (1.5)
- ENV S 201 (0.5)

#### Winter Term
- CHEM 10
- CHEM 310 (0.5)
- CHEM 311 (1.5)
- ENV S 201 (0.5)

#### Fall and Winter Terms
- Four CHEM courses† (2.0)
- Four electives* (2.0)

---

### Year 4

#### Fall and Winter Terms
- CHEM 10
- CHEM 419 (0.5)
- CHEM 492 (1.5)
- ENV S 201 (0.5)

#### Fall Term
- Four CHEM courses† (2.0)

#### Winter Term
- 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

### Honours Earth Sciences Programs

#### General Information

Within Earth Sciences, students may select from five Honours programs as follows:

- Co-op Applied Earth Sciences/Geology Option
- Co-op Applied Earth Sciences/Geophysics Option
- Honours Earth Sciences/Geology Option (Regular)
- Honours Earth Sciences/Geography Option (Regular)
- Honours Science - Program 4 (with specialization in Earth Sciences)

The first four programs provide academic preparation for students intending to pursue careers as professional geologists. Honours Science - Program 4 provides a less intense specialization in Earth Sciences and is intended primarily for those wanting a geological background for careers in other areas, e.g., teaching, business management, civic administration, finance, specialized sales, agriculture, etc. (This program is described later in this chapter under Honours Science Programs).

All programs require the satisfactory completion of 21 lecture-credits or equivalent, the total credit requirements vary from program to program and even within programs due to varying credit weightings for elective courses. There are limitations on the size of upper year classes. Meeting the minimum entrance requirements is not a guarantee that places will be available in the Year 2 program.

A breakdown of course-type groupings for each program is provided below. Course requirements are listed in the Year 1 Sciences Program Selection Table (p. 228).
4. Unrestricted Electives

1.5 lecture credits are totally unrestricted as to source. The good student wanting to take extra courses beyond the minimum program requirements will find it easy to do so in Years 2 and 4.
Total Credits: 1.5 C

Honours Earth Sciences (Geology Option)

Year 1
(For a complete discussion of Year 1, see page 228.)

Year 2
EARTH 221 Geochemistry 1 (0.5)
EARTH 231 Mineralogy (0.5)
EARTH 232 Petrography (0.5)
EARTH 235 Stratigraphy (0.5)
EARTH 236 Principles of Paleontology (0.5)
EARTH 238 Introductory Structural Geology (0.5)
EARTH 260 Applied Geophysics 1 (0.5)
ENGL 210 Report Writing (0.5)
Electives Two term courses, normally from courses in Science and/or Mathematics.

Year 3
EARTH 331 Igneous Petrology (0.5)
EARTH 332 Metamorphic Petrology (0.5)
EARTH 333 Sedimentology (0.5)
EARTH 336 Paleontology (0.5)
EARTH 342 Geomorphology (0.5)
EARTH 345 Historical Geology (0.5)
EARTH 355 Statistical Methods in Geology (0.5)
EARTH 370 Economic Geology (0.5)
EARTH 390 Methods in Geological Mapping
Electives Two credits, normally one from courses in Science and/or Mathematics, and one from Arts.

Year 4
EARTH 427 Crustal Evolution (0.5)
EARTH 490 Field Trip
Seven half-credits from:
EARTH 338 Rock Mechanics (0.5)
EARTH 421 Geochemistry 2 (0.5)
EARTH 432 Precambrian Geology (0.5)
EARTH 433 Applied Sedimentology (0.5)
EARTH 434 Biostratigraphy (0.5)
EARTH 435 Advanced Structural Geology (0.5)
EARTH 436 Thesis (1.0)
EARTH 438 Engineering Geology (0.5)
EARTH 439 Hydrogeology (0.5)
EARTH 440 Quaternary Geology (0.5)
EARTH 456 Numerical Methods in Geoscience (0.5)
EARTH 461 Applied Geophysics 2 (0.5)
EARTH 470 Metallic Mineral Deposits (0.5)
Electives One credit, not from Earth Sciences.
Upon program approval by the Undergraduate Officer, a student may take 6.5 half-credits from the above list to allow freedom to take courses in the faculties of Engineering, Mathematics or Science.

Students who plan to do graduate work in hydrogeology are advised to take MATH 213a-213b or ZIV E 221 during their fourth year.

Recommended electives: CHEM 218, Development of Chemical Bonding and Structure; CHEM 219, Chemistry of non-Transition Metals; CHEM 356-357, General Physical Chemistry; BIOL 111-112, introduction to Biology; 200 level term courses in Biology; PHYS 259-259L, Crystallography and X-ray diffraction; PHYS 250, The Solar System; PHYS 251, The Stellar System; MATH 213a-213b, Calculus; MATH 226, Elementary Differential Equations; MATH 218, Differential Equations; MATH 230, Advanced Calculus; or courses relevant to Industrial Employment (see page 235, Table B). PHYS 368-369 are considered as unrestricted electives.

Note
The Department of Earth Sciences is prepared to work out Honours programs with students who wish to use their electives to specialize in a particular discipline; e.g. Mathematics, Biology, Chemistry, Physics.

Honours Earth Sciences (Geography Option)
This program combines the basic courses of Honours Earth Sciences with Geography.

Minimum total credits for this program are 23.0, comprised of 42 term courses plus two field courses. The program breaks down as 21 EARTH courses, 2 EARTH Field courses, 10 Geography/Environmental Studies courses, 5 Science/Math core courses, 1 Arts core course, 2 Arts electives, 3 unrestricted electives.

In selecting 200-, 300-, and 400-level Geography options, students should select courses from one or more of the following sequences in Note 1.

Students must maintain a 75% average in all Geography courses, a 65% average in Earth Sciences courses and a 60% average in all other courses.

Note 1
Electives:
5 term courses from one or more of following sequence:
Cartography Sequence
GEOG 200 Introduction to Cartography and Map Analysis (0.75)
GEOG 360 Preparation of Maps and Illustrations (0.5)
GEOG 403 Advanced Cartography (0.5)
GEOG 404 Advanced Cartography 2 (0.5)

Air Photo/Remote Sensing Sequence
GEOG 275 Introduction to Air Photo Analysis and Remote Sensing (0.75)
GEOG 375 Air Photo Interpretation (0.75)
GEOG 376 Environmental Remote Sensing (0.75)
GEOG 470 Applied Air Photo Interpretation (0.75)
GEOG 471 Applied Remote Sensing (0.75)

Resource Management Sequence
GEOG 303 Physical Basis and the Geography of Water (0.75)
GEOG 356 Resources Management (0.5)
GEOG 357 Conservation and Resource Management (0.5)
GEOG 358 Water Planning and Management: Strategies and Experiences (0.75)
GEOG 359 Geography of Energy (0.5)
GEOG 414 Energy Resources Management (0.5)
GEOG 461 Land Dereliction and Rehabilitation 1 (0.5)

Year 1
(For a complete discussion of Year 1, see page 228.)

Year 2
EARTH 221 Geochemistry 1 (0.5)
EARTH 231 Mineralogy (0.5)
EARTH 232 Petrography (0.5)
EARTH 235 Stratigraphy (0.5)
EARTH 236 Principles of Paleontology (0.5)
EARTH 238 Introductory Structural Geology (0.5)
ENV S 200 Field Ecology (0.75)
GEOG 201 Some Basic Topics of Physical Geography (0.75)
GEOG 202 Some Basic Topics of Economic and Urban Geography (0.5)

Year 3
EARTH 331 Igneous Petrology (0.5)
EARTH 332 Metamorphic Petrology (0.5)
EARTH 333 Sedimentology (0.5)
EARTH 336 Paleontology (0.5)
EARTH 342 Geomorphology (0.5)
EARTH 345 Historical Geology (0.5)
EARTH 370 Economic Geology (0.5)
FARTH 390 Field Camp
ENGL 210 Report Writing (0.5)
GEOG Electives Two one-term equivalents (1.0)
(See Note 1)
Elective One credit (1.0)
Co-operative Applied Earth Sciences

Both Co-operative programs in Earth Sciences are Honours programs. In addition to good academic training, the graduating geologist will have gained considerable practical experience, thus satisfying the requirements of many potential employers. In the first year, students take the Year 1 Science program as described on page 228. 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 honours program will be permitted if all requirements of the Co-op program have been met up to the time of the transfer.

General features and conditions of the Co-operative plan at the University of Waterloo are given in Chapter 5.

The normal progress of a student entering Co-operative Earth Sciences in the Fall of 1983 is shown in the Co-op chart in Chapter 5. There are two programs available: Geology and Geophysics. Students contemplating careers in Engineering Geology should consult the program outlined in the Geological Engineering Section.

Geology Option

Students should refer to Notes 1-4 under Regular Honours Earth Sciences program (page 238). A list of recommended Science and Mathematics electives is given on page 239.

Year 1
(For a complete discussion of Year 1, see page 228.)

Year 2A
EARTH 231 Mineralogy (0.5)
EARTH 235 Stratigraphy (0.5)
EARTH 236 Principles of Paleontology (0.5)
EARTH 260 Applied Geophysics (1.0)
Electives One elective (0.5)

Year 2B
EARTH 221 Geochemistry 1 (0.5)
EARTH 232 Petrography (0.5)
EARTH 238 Introductory Structural Geology (0.5)
ENGL 210 Report Writing (0.5)
Electives One elective (0.5)

Year 3A
EARTH 332 Metamorphic Petrology (0.5)
EARTH 333 Sedimentology (0.5)
EARTH 345 Historical Geology (0.5)
EARTH 370 Economic Geology (0.5)
EARTH 390 Methods in Geological Mapping (0.5)
Electives Two half credits, normally one from Science or Mathematics and one from Arts. (1.0)

Year 3B
EARTH 331 Igneous Petrology (0.5)
EARTH 336 Paleontology (0.5)
EARTH 342 Geomorphology (0.5)
EARTH 355 Statistical Methods in Geology (0.5)
Electives Two half credits, normally one from Science or Mathematics and one from Arts.

Year 4A, 4B
Identical to regular program in Honours Earth Sciences (See p. 237).

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) and on the fourth year field trip (EARTH 490).

Year 1
(For a complete discussion of Year 1, see page 228.)

Year 2A
EARTH 231 Mineralogy (0.5)
EARTH 235 Stratigraphy (0.5)
EARTH 260 Applied Geophysics 1 (0.5)
MATH 213a Calculus 2 (0.5)
ENGL 210 Report Writing (0.5)
One of PHYS 226-226L or PHYS 256-256L (0.5)

Year 2B
EARTH 221 Geochemistry 1 (0.5)
EARTH 232 Petrography (0.5)
EARTH 238 Introductory Structural Geology (0.5)
MATH 213b Calculus 2 (0.5)
One of PHYS 243-243L or PHYS 253-253L (0.5)
Elective (0.5)
Science
Academic Programs

Year 3A
EARTH 332 Metamorphic Petrology (0.5)
EARTH 333 Introductory Sedimentology (0.5)
EARTH 370 Economic Geology (0.5)
EARTH 390 Methods in Geological Mapping (0.5)
PHYS 369 Geophysics 2 (0.5)
Elective (0.5)

Year 3B
EARTH 236 Principles of Paleontology (0.5)
EARTH 331 Igneous Petrology (0.5)
EARTH 355 Statistical Methods in Geology (0.5)
PHYS 368 Geophysics 1 (0.5)
PHYS 254 Properties of matter (0.5)
MATH 216 Differential Equations (0.5)

Year 4
EARTH 427 Crustal Evolution (0.5)
EARTH 460 Applied Geophysics 2 (0.5)
EARTH 461 Applied Geophysics 3 (0.5)
EARTH 490 Field Trip
CIV E 200 Civil Engineering Project (0.5)
CIV E 354 Foundation Engineering (0.5)
EARTH 331 Igneous Petrology (0.5)
EARTH 260 Applied Geophysics (0.5)
EARTH 438 Engineering Geology (0.5)
EARTH 439 Hydrogeology (0.5)
CIV E 291 Survey Camp (0.5)

Geotechnical Option
This program is no longer available. Students interested in this option should seek admission to the Geological Engineering degree program.

Students who are still in the Geotechnical Option follow the courses outlined below.

Year 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 238 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 Methods in Geological Mapping

Honours Physics
The Honours program is in the form of a core of required courses, plus appropriate electives. The elective courses may be chosen from a wide range of courses offered by the Physics Department and by other departments of the University. By careful selection of electives, students can deepen their knowledge of experimental or theoretical physics, or obtain a background in another subject (e.g. Astronomy, Geophysics, Chemistry, Mathematics, Computing, Business Administration). The choice of electives must be made to fit the student’s timetable, and must be approved by the Undergraduate Officer of the Department of Physics. The required courses which constitute the core are listed below. Examples of possible elective programs are available in the office of the undergraduate advisors. Detailed descriptions of the courses start in Chapter 16.

Year 1
(For a complete discussion of Year 1, see page 228).
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>
<tr>
<td>Elective</td>
<td></td>
<td></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>Electives</td>
<td></td>
<td>1.0</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 Lab</td>
<td></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 Lab</td>
<td></td>
<td>0.25</td>
</tr>
</tbody>
</table>

Note

†Both PHYS 360A and 360B may be taken in the same term.

Year 4

<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</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</td>
<td>1.0</td>
</tr>
<tr>
<td>PHYS 437a</td>
<td>Theoretical Physics Project</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Electives to make up total of five credits in Year 4 of which (0.5) must be in Physics

Note

PHYS 454 is strongly recommended for students intending to do graduate work, and PHYS 443 is strongly recommended for students intending to do graduate work or intending to work as industrial physicists.

Elective Programs

The "Core plus elective" structure of the Honours Physics Program allows a great many combinations of courses to be taken. Commonly taken combinations of courses which emphasize various aspects of physics such as experimental physics, theoretical physics, biophysics, astrophysics, as well as physics in combination with such studies as Business Administration, Computing, Electrical Engineering, are kept on file in the office of the undergraduate advisor. Students may obtain a copy on request. All such programs are subject to timetable restrictions.

Co-operative Applied Physics (Honours)

Applied Physics is an Honours program in the form of a core of required courses plus appropriate electives. The electives available in the second, third, and fourth years allow students to strengthen complementary areas of interest whether in some specific field in physics or in some other subject area.

Through the Co-operative part of the program Applied Physics students have the opportunity of exposure to practical research and development situations in Government and Industry. Work opportunities, which are available on a competitive basis, are co-ordinated to complement the student's course work and interest where possible. Many work term experiences, especially in the upper years, provide the student with a deeper insight into the meaning and methods of research as well as an incentive to develop course work. Such experience provides a contribution to the development of a scientist which cannot be learned in lecture courses, and helps prepare an individual to apply a fundamental physics background to the solution of practical problems.

Further information about the Co-operative work terms and the Co-ordination Department can be found in Chapter 5.

Options

There are 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
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

#### Year 1

(For a complete discussion of Year 1, see page 228.)

<table>
<thead>
<tr>
<th>Term</th>
<th>Courses</th>
</tr>
</thead>
</table>
| **A term for Stream 4 (Winter)** | PHYS 253 Electromagnetism (0.5)  
PHYS 253L Electromagnetism Lab (0.25)  
PHYS 263 Classical Mechanics and Special Relativity (0.5)  
Elective (0.5) |

<table>
<thead>
<tr>
<th>Term</th>
<th>Courses</th>
</tr>
</thead>
</table>
| **B term for Stream 4 (Fall)** | PHYS 253 Introductory Physics 1 (0.5)  
PHYS 253L Introductory Physics 1 Lab (0.25)  
CHEM 123 Chemical Reactions, Equilibria and Kinetics (0.5)  
CHEM 123L Chemical Reaction Lab 1 (0.25)  
EARTH 121 Introductory Geology 1 (0.5)  
MATH 114 Algebra and Vector Geometry (0.625)  
MATH 114A Calculus (0.5) |

### Honours Co-op Applied Physics (Geophysics Option)

(Terms follow scheme of Co-op Earth Science)

#### Year 1

<table>
<thead>
<tr>
<th>Term</th>
<th>Courses</th>
</tr>
</thead>
</table>
| **A Term** | PHYS 121 Introductory Physics 1 (0.5)  
PHYS 121L Introductory Physics 1 Lab (0.25)  
CHEM 123 Chemical Reactions, Equilibria and Kinetics (0.5)  
CHEM 123L Chemical Reaction Lab 1 (0.25)  
EARTH 121 Introductory Geology 1 (0.5)  
MATH 114 Algebra and Vector Geometry (0.625)  
MATH 114A Calculus (0.5) |

<table>
<thead>
<tr>
<th>Term</th>
<th>Courses</th>
</tr>
</thead>
</table>
| **B Term** | PHYS 122 Introductory Physics 2 (0.5)  
PHYS 122L Introductory Physics 2 Lab (0.25)  
CHEM 124 Organic Chemistry 1 (0.5)  
CHEM 124L Chemical Reaction Lab 2 (0.25)  
EARTH 122 Introductory Geology 2 (0.5) |
### Science

#### Academic Programs

<table>
<thead>
<tr>
<th>Year 2A (Fall)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 115b Calculus (0.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHYS 10</td>
<td>Physics Seminar (0.0)</td>
<td></td>
</tr>
<tr>
<td>PHYS 254</td>
<td>Thermal Physics and Properties of Matter (0.5)</td>
<td></td>
</tr>
<tr>
<td>PHYS 256</td>
<td>Wave Motion and Optics (0.5)</td>
<td></td>
</tr>
<tr>
<td>PHYS 256L</td>
<td>Physical Optics Lab (0.25)</td>
<td></td>
</tr>
<tr>
<td>MATH 213a</td>
<td>Advanced Calculus (0.5)</td>
<td></td>
</tr>
<tr>
<td>MATH 216</td>
<td>Differential Equations (0.5)</td>
<td></td>
</tr>
<tr>
<td>EARTH 231</td>
<td>Mineralogy and Crystallography (0.5)</td>
<td></td>
</tr>
<tr>
<td>EARTH 260</td>
<td>Applied Geophysics 1 (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.

#### Year 1

*(For a complete discussion of Year 1, see page 228.)*

#### Year 2

| PSYCH 291 | Basic Research Methods (0.5) |
| PSYCH 292 | Basic Data Analysis (0.5)   |
| Electives PSYCH (1.0) |
| Electives* Science (2.0) |
| Elective Unspecified (1.0) |

#### Year 3

| PSYCH 391 | Advanced Data Analysis (0.5) |
| Electives PSYCH (1.0) |
| Electives* Science (2.0) |
| Elective Unspecified (1.0) |

#### Year 4

| PSYCH 499 | Senior Honours Essay (1.0) |
| Electives PSYCH (1.0) |
| Electives* Science (1.0) |
| Elective Unspecified (2.0) |

*No more than 2.0 credits offered under the “Science” label may be included in the total Science elective credits.

Also, of the 5.0 Science credits required in Years 2, 3, and 4, at least 2.0 of these must be at the 300- or 400-level, exclusive of the “Science” labelled courses.
Optometry Program

The School of Optometry of the Faculty of Science offers a 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 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 practice.

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; BIOL 202, 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 113a,b, Calculus. Laboratory courses must be completed where given with the above course. To complete the pre-professional program, additional courses in the behavioural sciences, social sciences and the humanities are recommended.

The Admissions Committee will also consider applications from superior students who have completed other academic programs. In the event that applications from such students are successful, they may be expected to remedy specific deficiencies either during the summer preceding admission or during the regular professional program.

Selection Factors
All applicants should note that enrolment in the first professional year is limited to sixty and that in 1982 there were approximately three hundred and fifty applications for those places. Consequently, neither acceptance to nor successful completion of the pre-professional program can guarantee admission to the first professional year. Applicants are selected on a competitive basis considering scholarship, interest, motivation, general qualifications for the profession and recommendations.

While admissions of well qualified applicants are made from all the provinces, prospective students are advised that some preferential consideration must be given to Ontario residents. Preferential consideration is also given to applicants completing their pre-professional program at the University of Waterloo, but applicants to Year 1 Regular Science of the University of Waterloo who have completed their secondary school education in provinces other than Ontario should consult with the Science Undergraduate Officer to ensure that their background in Science and Mathematics has prepared them for Year 1 Regular Science as given at the University of Waterloo.

The provinces of Alberta, Manitoba, New Brunswick, Prince Edward Island and Saskatchewan have entered into an agreement with the province of Ontario and the University of Waterloo regarding admission of applicants to the School of Optometry from those provinces. The agreement provides that no more than 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 completing an application for internal transfer form. Graduates of the University of Waterloo or persons who were at one time registered at the University of Waterloo in any type of program also apply by completing this form. In the Winter term an interview with the admissions committee will be arranged for the student. Students who have completed the pre-professional program at another university must apply through the Ontario Universities Application Centre (OUAC). Such applicants should obtain the appropriate OUAC application form from the Registrar of the University of Waterloo. These forms will not ordinarily be available from the Registrar prior to September 15, 1982. The completed OUAC form should reach the Registrar at Waterloo by the deadline of February 28. After the OUAC form has been processed the applicant will receive a supplementary application package from the Registrar of the University of Waterloo due March 7. 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 practise optometry in their country of origin may in certain instances be admitted to a more advanced level in a program leading to the O.D. degree. For more information write: The Admissions Officer, School of Optometry.

Note
Interviews with the Admissions Officer of the School are required in the case of applicants in certain categories before any application can be processed. 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.
Year 4: Fourth Professional Year. First offered 1983-1984

Fall Term
OPTOM 441 Optometry Research Project (0.5)
or
PSYCH 357 Psychopathology (0.5)
OPTOM 442 Advanced Contact Lens Practice (0.5)
OPTOM 448 Optometry Clinic (0.5, fall term)
OPTOM 449 Community Health Optometry (0.5)
OPTOM 468 Vision Care Projects (0.0)
OPTOM 480 Senior Seminar (0.5)

Winter Term
OPTOM 448 Optometry Clinic (0.5, winter term)
OPTOM 451 Optometry Research Project (0.5)
or
Elective (0.5)
OPTOM 452 Learning Difficulties and Visual
Gerontology (0.5)
OPTOM 459 Environmental Vision (0.5)
OPTOM 490 Senior Seminar (0.5)
OPTOM 499 (A-E) Comprehensive Examinations

Note
Students with a particular interest in and an aptitude
for research in physiological optics may substitute
OPTOM 441-451 for PSYCH 357 and the winter term
elective. A student is required to complete one or the
other of these alternatives. PSYCH 201 or equivalent is
recommended as a prerequisite for OPTOM 441-451.

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 some-
what broader background in the Sciences might find
this program more suitable than the more traditional
specialized programs. However, students contem-
plating 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 Chemistry and Physics, and a 65% for
Biology and Earth Sciences programs. This is the
same as for all Honours programs in the Science
Faculty.

All programs require the successful completion of
22 or more credits, the number depending on the
respective program. Of the total credits, 20 must be
lecture credits. At least 14 of the total credits must be
Faculty of Science credits.

Science
Optometry
Honours Science Programs

No more than 5.0 failed credits are permitted.
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

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. At least 1.0
credit in Math must be included in the total credits
required.

Program (2)
Honours Science (with specialization in Biology)

Year 1
(For a complete discussion of Year 1, see page 228.)

Year 2
3 credits from BIOL 210, 211, 220, 231, 230, 233, 239,
240, 241, 250.
CHEM 266-266L and either 267 and 237-237L.
2 other credits (STAT 202 is recommended.)

Year 3
3 credits from BIOL 311, 315, 316, 323, 324, 327, 330,
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.
Honours Science Programs

Program (3)
Honours Science (with specialization in Chemistry)

Year 1
Five lecture credits plus related lab credits. CHEM 123-124 and 123L-124L, PHYS 111-112 or 121-122 and PHYS 111L-112L or 121L-122L, MATH 113a-113b must be included.

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.

Year 3
3 Chemistry credits at the 300-level or higher. 1 lecture credit to be chosen from Physics, Biology or Earth Sciences. (Not Science-labelled courses.)
2 Elective credits
CHEM 10, Chemistry Seminar (0.0) is also required.

Year 4
2 Chemistry credits at the 300-level or higher. At least 1.0 must be at the 400-level.
2 lecture credits chosen from Physics, Biology, Chemistry or Earth Sciences. (Not Science-labelled courses.)
1 Elective credit
CHEM 10, Chemistry Seminar (0.0) is also required.

†Before graduation a student must obtain lab credit for CHEM 123L and 124L, plus, at least 0.5 lab credit and one lecture credit in each of the following areas of Chemistry: Analytical, Inorganic, Organic, Physical. Wherever possible, the laboratory chosen should accompany the appropriate lecture-course.

Program (4)
Honours Science (with specialization in Earth Sciences)
The program consists of 21.0 lecture credits, i.e. 42 term courses of which 10 credits are from EARTH Sciences, at least 4 lecture credits are from other Science courses, at least 1.5 credits are from Mathematics, at least 1.5 credits are from Arts and 4.0 credits are unrestricted. SCI-labelled courses count as unrestricted electives and may not be used to satisfy the Science course requirements. A year-by-year breakdown of courses follows below. Standards for this program are 65% cumulative major average and 60% cumulative overall average.

Year 1
EARTH 121-122, CHEM 123-124, 123L-124L, PHYS 111-112, 111L-112L or two 100- or 200-level Biology term courses with labs, MATH 113a-113b, CS 118.
1 unrestricted term course
(The years 1, 2 and 4 programs should consist of 10 term courses each year.)

Year 2
EARTH 221, 231, 232, 235, 236, 238
2 other Science term courses
ENGL 210
One other unrestricted term course.

Year 3
6 or 8 term courses from EARTH 331, 332, 333, 336, 345, 355, 260, 370
2 other Science term courses
2 or 1 other Arts term courses
(The Year 3 program should consist of a total of 12 term courses.)

Year 4
3 to 5 term courses from EARTH 300- or 400-level courses
EARTH 427
6 to 4 other term courses to balance overall program requirements.

Program (5)
Honours Science (with specialization in Physics)
This program is designed to allow a student the broadest possible selection of courses consistent with specialization in Physics. A total of 22 credits are required, 14.0 of which must be Faculty of Science credits.
The following Honours Courses from Physics and Mathematics should be included:

Year 1
(For a complete discussion of Year 1, see page 228.)

Year 2
PHYS 253, 253L, 254, 256, 256L, 263. MATH 213a-213b, 216.
**3. General Science Programs**

As of September 1983, the 3-Year General Science program will be available to new applicants. The 4-Year General program will be discontinued. Students currently in 4-Year General programs in good academic standing may continue to completion. Students may specialize in a particular subject area in the 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. Students wishing to major should consider the 4-Year Honours Programs.

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.

**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.

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, 220-227, one of PHYS 111-112, 121-122, 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*


*(General Science (non-Major) students may not take Honours Core Chemistry courses. Nor may they take 400-level courses, and certain 300-level courses, without the consent of the instructor.)*

Science
General Science Programs

(No more than 3 credits may be selected from the courses under the "Science" label).


Mathematics courses recommended
MATH 113a, 113b, 111a, 111b, 215 or 216; CS 115, 118, 210; AM 101, 111; STAT 204, 205, but not MATH 103, 104.

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
As of September 1983, no new applicants will be admitted to any of the 4-Year General programs. Students currently in these programs in good academic standing may continue to completion.

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.

No more than 5.0 failed credits are permitted. 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

<table>
<thead>
<tr>
<th>Year</th>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Two or three credits from BIOL 311, 315, 316, 323, 324, 327, 330, 331, 333, 335, 336, 337, 338, 342, 344, 350, 356.</td>
</tr>
<tr>
<td>4</td>
<td>Three or two non-Biology credits.</td>
</tr>
</tbody>
</table>

Year 4
Five credits at least two of which are 400-level Biology courses or from the above list of 300-level Biology courses.

†In order to graduate in the Biology Major program a student must take at least 1 term of biochemistry (CHEM 237 and 237L) and 1 term of organic chemistry beyond Year 1. Students who plan to specialize in areas of Biology with a substantial biochemical component should plan to take biochemistry in Years 3 and 4. They are advised to take CHEM 267 (Organic Chemistry) in their second year and to select, as electives, CHEM 332, 333, 332L, 333L (Biochemistry) in their third year and other Biochemistry courses in fourth year. Other students are advised to take CHEM 237-237L in their second year.

††Students wishing to apply for the Ontario Department of Education Honour Specialist Qualification must choose three credits in Biology in Year 3 or take a third Biology credit as an extra course. In Year 4, three Biology credits should be selected.

Note
Some possible electives are shown in the list under the three-year program. These courses would be suitable choices here. (PHYS 301-302 are especially recommended.)
Chemistry Major

Year 3
CHEM 10, 316-316L, 356-357, 356L-357L, 366-366L
2 Elective credits\footnote{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. General Science, Chemistry Major students may not take Honours Core course but must take the General program equivalents.}

Year 4
Five elective credits to complete the requirements for the degree.

Earth Science Major

Year 3
Two or three credits from:
EARTH 331, 332, 333, 336, 342, 345, 360, 370
Two or one course-credits from Science or Mathematics
Arts elective: One credit.

Year 4
Two or three credits from:
EARTH 421, 427, 432, 433, 434, 436, 439, 440, 456, 461, 470
Three or two credits from non-Earth Sciences courses.

Physics Major (a minimum of 20.0 credits required.)

Year 3
PHYS 324-325
One or two of: PHYS 250-251, 352 and 352L, 353 and 353L, 358-359, 364-365, 368-369, 380-381.
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

As of September 1983, no new applicants will be accepted into this program. Students in good standing in the program may continue to completion.

In the near future General Science and Business may be replaced by an Honours Science and Business program. Meanwhile, students interested in this area might consider a Management Studies minor (see Chapter 15 of this Calendar).

The program is made up of at least 21 credits with 10 required in Science (including at least 4 at the 300-level or higher) and the remainder in Mathematics, Economics and Business Administration. The Business courses are given at Wilfrid Laurier University and may be taken by University of Waterloo students through co-operation between the two Universities; Economics and Accounting courses are offered by the Department of Economics and Accounting respectively, University of Waterloo. Because courses for this option are given by several faculties at both 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 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 (1.0)
ECON 201-202 (1.0)

Plus at Year 3
STAT 204-205 (1.0)
Accounting Elective (1.0)
M SCI 44 (0.5)
M SCI 46 (0.5)

plus at Year 4
3 credits from:
BUS 352-362 (WLU); BUS 454-464 (WLU); BUS 481-491 (WLU); M SCI 47, M SCI 53.

Note
Students interested in Science with Business may also wish to consider a Joint Honours program between Science and Management Studies, or an Honours program in Science with a Management Studies Minor. See Chapter 15.
Interdisciplinary Options
Interdisciplinary Options

Students in many General or Honours programs may select a specified group of courses from a number of disciplines to form an Interdisciplinary Option or Minor which will be designated on the diploma. Interdisciplinary Options or Minors are composed of courses selected from different disciplines which have a common focus on a particular theme or area of study.

For example, a student enrolled in Honours French might select courses in the Canadian Studies Option, or a student in Honours Biology might wish to take the Gerontology Minor.

Students should note that, in most cases, courses for an Option would be selected after Year 1. The nine Interdisciplinary Options now available are described below:

- Canadian Studies
- Gerontology
- Iberoamerican Studies
- Legal Studies
- Management Studies
- Peace and Conflict Studies
- Personnel and Administrative Studies
- Studies in Personality and Religion
- Women's Studies
Canadian Studies
(Participating Faculty members are listed in Chapter 16.)

The Option in Canadian Studies

The Canadian Studies option allows students to gain a broad insight into the nature of Canadian culture and society in 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 1
At Waterloo, students declare their area of study in the second year and therefore there are no Canadian Studies requirements in the first year. However, it is recommended that students who intend to take the Canadian Studies option, take a course in French language and CDN ST 101 in the first year. Otherwise, students should proceed with the usual first year program set out by their Faculty.

Once students have declared their home discipline among 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 2
CDN ST 201/202 given at the Canadian Studies Program Centre at St. Paul's College.
1 full or 2 half-courses in the home discipline chosen from courses dealing specifically with Canada.
1 full or 2 half-courses chosen from outside your home discipline. These courses deal specifically with Canada and are to be selected from the list of approved courses which follows.
The equivalent of 2 full courses chosen to meet the Honours requirement in the home discipline.

Year 3
CDN ST 301/302 given at the Canadian Studies Program Centre at St. Paul's College.
1 full or 2 half-courses in the home discipline chosen from courses dealing specifically with Canada.
1 full or 2 half-courses chosen from outside the home discipline. These courses deal specifically with Canada and are to be selected from the list of approved courses which follows.

General degree students will graduate at the end of this third year with a degree in their home discipline with the Canadian Studies option shown on their diploma.

Year 4
CDN ST 400 given at the Canadian Studies Program Centre at St. Paul's College.
1 full or 2 half courses chosen from outside the home discipline. These courses deal specifically with Canada and are to be selected from the list of approved courses which follows.
The equivalent of 2 full courses chosen to meet the Honours requirements in the home discipline.

Double Honours and Canadian Studies
It is possible to do a double Honours program and also take the Canadian Studies option. In this case, students take 1 full course of 2 half-courses in each of the Honours areas and take the core Canadian Studies courses. They do not need to take the courses listed outside of their Honours areas in other departments.

The Minor in Canadian Studies
Honours students may minor in Canadian Studies regardless of their faculty or department. To do so, they must put together a package equivalent of 5 full courses. Students take the CDN ST core courses 201/202 and 301/302. They also take the equivalent of 3 full courses from the approved list of courses which follows. (Canadian Studies courses (CDN ST) are described fully in Chapter 16.)
## Principal Canadian Content Courses Offered by the Participating Departments

(These courses are described fully in Chapter 16.)

### Anthropology
- **ANTH 102A** Introduction to Social and Cultural Anthropology
- **ANTH 203** Prehistoric Man in North America
- **ANTH 230** Indians of Canada
- **ANTH 241** The Contemporary Canadian Indian Scene
- **ANTH 322** Prehistoric Man in the Great Lakes Area
- **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 102** Introduction to Macro-economics
- **ECON 241** Cost-Benefit Analysis and Project Evaluation
- **ECON 263** Economic History of Canada
- **ECON 333** Interregional Economics
- **ECON 341** Public Finance
- **ECON 343** Urban Economics
- **ECON 345** Industrial Organization
- **ECON 351** Labour Economics
- **ECON 353** Population Economics
- **ECON 355** Economics of Energy and National Resources
- **ECON 363** Contemporary Canadian Problems
- **ECON 364** Contemporary Canadian Problems

### English
- **ENGL 205R** The Canadian Short Story
- **ENGL 214** Themes in Canadian Literature
- **ENGL 215** Canadian Regional Literature
- **ENGL 313** Canadian Literature to 1920
- **ENGL 314** Canadian Poetry Since 1920
- **ENGL 315** Canadian Prose Since 1920
- **ENGL 316** Canadian Drama
- **ENGL 415** Major Canadian Writers
- **ENGL 495** Senior Honours Essay Canadian Literature Option

### Environmental Studies
- **ENV S 195A** Introduction to Environmental Studies
- **ENV S 195B** Introduction to Environmental Studies
- **ENV S 201** Introduction to Environmental and Planning Law

### French
- **FR 151** Basic French (For students who have not passed the equivalent of Grade 13 French)
- **FR 152** Basic French (For students who have not passed the equivalent of Grade 13 French)
- **FR 155** Intensive Review of French
- **FR 192** French Language
- **FR 195** French Literature 1
- **FR 196** French Literature 2
- **FR 205** Spoken French
- **FR 206** Spoken French
- **FR 207** Spoken French
- **FR 208** Spoken French
- **FR 251** Intensive Language Training
- **FR 252** Français Pratique
- **FR 275** Contemporary French-Canadian Novel
- **FR 301/302** Advanced Instruction in Written French
- **FR 371** French-Canadian Poetry
- **FR 401** Advanced Language Study
- **FR 402** Advanced Language Study
- **FR 471** French-Canadian Poetry
- **FR 501** Problems of French Language
- **FR 502** Problems of French Language

### Geography
- **GEOG 251** Cities in Canada
- **GEOG 300** Geomorphology and the Southern Ontario Environment
- **GEOG 322** Geographical Study of Canada
- **GEOG 341** Historical Geography of Canada 1
- **GEOG 342** Historical Geography of Canada 2
- **GEOG 352** The Rural-Urban Fringe of Canadian Cities
- **GEOG 422** Canada

### History
- **HIST 102E** Canadian History
- **HIST 201X** Canadian Urban History
- **HIST 203X** Modern Quebec
- **HIST 205X** Canadian Business History
- **HIST 206X** History of Canadian Minorities
- **HIST 223** Canadian Culture and Society to 1900
- **HIST 224** Canadian Culture and Society in the Twentieth Century

### Interdisciplinary Options

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENV S 333</td>
<td>Parkland Management</td>
</tr>
<tr>
<td>ENV S 401</td>
<td>Environmental Law</td>
</tr>
<tr>
<td>ENV S 402</td>
<td>Planning Law</td>
</tr>
<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>ENGL 205R</td>
<td>The Canadian Short Story</td>
</tr>
<tr>
<td>ENGL 214</td>
<td>Themes in Canadian Literature</td>
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<tr>
<td>ENGL 215</td>
<td>Canadian Regional Literature</td>
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<tr>
<td>ENGL 313</td>
<td>Canadian Literature to 1920</td>
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<td>Major Canadian Writers</td>
</tr>
<tr>
<td>ENGL 495</td>
<td>Senior Honours Essay Canadian Literature Option</td>
</tr>
</tbody>
</table>

*These courses are described fully in Chapter 16.*
HIST 245 Religious and Cultural Minorities in Canada
HIST 253X Canadian History: 1760-1900
HIST 254X Canadian History: 1969-1979
HIST 322 History of Canadian-American Relations Since 1914
HIST 325 History of Canadian Indians to 1870's
HIST 386 Ontario History to Confederation
HIST 387 Ontario History Since Confederation
HIST 403X Senior Seminar: Canadian History

Man-Environment Studies
M ENV 338 Social Impact Assessment
M ENV 351 Organizations and Environmental Management
M ENV 385 Technology/Lifestyles for a Conserver Society
M ENV 400 Senior Honours Seminar
(See also ENV S 195B, 201, 333, 401).

Political Science
P SCI 102C Politics in Action
P SCI 102H Citizen Participation in Canada
P SCI 102M Contemporary Issues in Canadian Public Policy
P SCI 260A/ Canadian Government and 260B Politics 1/2
P SCI 291 The Canadian Legal Process
P SCI 292 Issues in Canadian Criminal Law
P SCI 331 Public Administration 1
P SCI 332 Public Administration 2
P SCI 333 Administrative Law
P SCI 342 Politics in Quebec
P SCI 343 Canadian Municipal Government
P SCI 344 The Politics of Local Government
P SCI 351 Comparative Federal Systems
P SCI 352 Comparative Legislative Systems
P SCI 363 Canadian Constitutional Law
P SCI 428 The State and Economic Life
P SCI 431 Canadian Public Policy
P SCI 435 The Politics of Canadian Resource Development
P SCI 442 Politics in Ontario
P SCI 461 Problems in Canadian Politics 1
P SCI 462 Problems in Canadian Politics 2
P SCI 473 Voting Behaviour
P SCI 475 Political Socialization
P SCI 476 Research Seminar in Political Behaviour
P SCI 486 Middle Powers and World Politics

Sociology
SOC 101 Introduction to Sociology
SOC 102 Social Problems
SOC 103 Canadian Society
SOC 120R Fundamentals of Sociology
SOC 200 Marriage and the Family
SOC 206 Sex Roles
SOC 209 Family Origin & Personal Identity
SOC 214 Social Inequality
SOC 223 Deviance: Perspectives and Processes
SOC 224 Law and Order
SOC 227 Crime and Society
SOC 242 Industrial Sociology
SOC 248 Health, Illness and Society
SOC 253 Population in Canadian Society
SOC 256 Ethnic and Racial Relations
SOC 267 Sociology of the Contemporary University
SOC 327R Canadian Ethnic and Cultural Minorities
SOC 342 Sociology of Industrial Relations
SOC 343 Sociology of Health Care

Urban and Regional Planning
PLAN 156 Introduction to Urban and Regional Planning Concepts
PLAN 222 Canadian Regional Issues
PLAN 231 Citizen Involvement, Planning and Social Change
PLAN 255 Planning Surveys and Analysis
PLAN 330 Urban Social Planning
PLAN 333 The Sociology of Regional Planning
PLAN 344 Principles of Recreation Planning
PLAN 370 Land Development Planning
ENV S 201 Introduction to Environmental and Planning Law
ENV S 401 Environmental Law
ENV S 402 Planning Law
ENV S 417 Land Use History and Landscape Change 1
ENV S 418 Land Use History and Landscape Change 2
PLAN 414 Housing Policies
PLAN 430 Social Policy Planning

Principal Canadian Content Courses Offered by Other Arts Departments

Fine Arts
FINE 316 Canadian Art
FINE 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
Gerontology

The Area of Gerontology

In recent years there has been an increased interest in the older person and in the aging process. An important reason for this interest is the recent growth in the proportion of older people in the population of many countries, including Canada. A host of concerns has been raised by the changing age structure of the Canadian population, which can be addressed properly only by examining carefully the aging process and the circumstances of the older person—the field of study known as Gerontology.

Gerontology involves a number of disciplines. Biologists investigate, for example, the changes at the molecular, cellular and organismal level that take place over time, with a view to possible modification. Gerontologists trained in fields such as Psychology, Sociology, Health Studies and Environmental Studies focus on other age-related changes in individual and population aging. To illustrate, Psychologists examine the changes with age in psychological functions (perception, thinking, learning) whereas Sociologists are interested in reciprocal relationships between the aging person and society. Similarly, those with a background in Environmental Studies direct their attention to the impact of the environment on aging.

The University of Waterloo Program in Gerontology

The introduction of a multidisciplinary Gerontology program is intended to provide a focus to aging studies at Waterloo. The program of courses offered has two components: a Minor in Gerontology and a Certificate in Gerontology. The latter component may be of particular interest to part-time, mature students. In addition, some graduate studies and research are carried out within the Program.

The Minor and the Certificate represent multidisciplinary programs, combining courses from a variety of departments such as Biology, Psychology, Sociology and Statistics. These programs are intended to enhance students' understanding of aging processes and to prepare students for careers in those professions which deal with the care of the elderly or in other relevant professions. The programs provide professional development to those already working in these areas, and raise the awareness of the non-specialist for this important, emerging area of study and concern.

The Minor program is open to students pursuing an Honours degree at the University of Waterloo in any discipline who wish to obtain some specialization in Gerontology. The Certificate program is available to those who would like some training in Gerontology but are not interested in completing all the requirements of an undergraduate degree. It is also available to those who have already completed an undergraduate degree but would like to obtain a better understanding of aging phenomena.

The program of study for the Minor and for the Certificate consists of a selection of 5 required and 5 optional courses.

Academic Requirements for the Minor

1. Students must be in an Honours Program at the University of Waterloo.
2. Successful completion of 5 core courses, including the Multidisciplinary Seminar and, in addition, successful completion of 5 courses selected with the approval of the program committee from a list of optional courses.
3. An overall minimum average of 65% in the 10 academic courses.

(The courses listed below are described fully in Chapter 16.)

Core Courses (5 to be completed)

- GERON 200 Multidisciplinary Seminar on Aging
- PSYCH 217 Aging and Basic Psychological Processes
- PSYCH 218 Aging, Death and Dying
- KIN 352/362 Exercise and Aging
- SOC 344 Sociology of Aging
- MTHEL 402B Epidemiology of Aging
- SOC 247 Sociology of Death and Dying
- SCI 255 The Biology of Aging

Optional Courses

- ECON 353 Population Economics
- PHIL 203 Philosophical Perspectives on Death
- PHIL 226 Ethics and the Life Sciences
- SOC 248 Health, Illness and Society
Further Information

Enquiries are encouraged and additional information can be obtained by writing or calling:

- The Director (W.F. Forbes)
- The University of Waterloo Program in Gerontology
- MC Building: Room 6151
- Ext. 3468

or any members of the Committee

Science: J.C. Carlson, Biology
- B2-252A (ext. 2664)
Arts: N.H. Charness, Psychology
- PAS 4055 (ext. 3313)
Env. Studies: M.E. Haight
- ES1-105A (ext. 3027)
HKLS: B.D. McPherson, Kinesiology
- MC-6056 (ext. 3950)
Church Colleges: P. Naus
- St. Jerome’s College
  - 884-8110

Interdisciplinary Options
Gerontology

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>SOC 343</td>
<td>Sociology of Health Care</td>
</tr>
<tr>
<td>ISS 350D</td>
<td>Adult Life Crises and Events</td>
</tr>
<tr>
<td>REC 361</td>
<td>Aging and Leisure</td>
</tr>
<tr>
<td>BIOL 433</td>
<td>Stress Physiology and Aging in Plants</td>
</tr>
<tr>
<td>OPTOM 509</td>
<td>Community Health Optometry</td>
</tr>
<tr>
<td>OPTOM 512</td>
<td>Visual Gerontology</td>
</tr>
<tr>
<td>PHYS 480</td>
<td>Radiation Biophysics</td>
</tr>
<tr>
<td>R S 271</td>
<td>Personality and Religion</td>
</tr>
<tr>
<td>ANTH 404</td>
<td>Human Development in a Cross-Cultural Perspective: Human Development, Aging and Death</td>
</tr>
<tr>
<td>PLAN 420</td>
<td>Health, Environment and Planning</td>
</tr>
<tr>
<td>HLTH 245</td>
<td>Community Health</td>
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</tbody>
</table>

An approved course in Statistics.
Iberoamerican Studies

Assistant Professor, Acting Co-ordinator of Iberoamerican Studies
B. Thalman, BA (DePauw), MA, PhD (Ohio State)

Members of the Iberoamerican Studies Advisory Committee

Professors
D. Kubat, MA (Kansas), PhD (L. Maximilian, Munich)

Associate Professors
T.S. Abler, BA (Northwestern), MS (Wisconsin-Milwaukee), PhD (Toronto)
P.S. Smith, MA (Toronto), PhD (New Mexico)

Assistant Professors
J.E. Cuenca, LIC (Madrid), MA (Western Michigan), PhD (Toronto)
J.A. Teichman, BA, MA, PhD (Toronto)
B. Thalman, BA (DePauw), MA, PhD (Ohio State)

The Iberoamerican Studies Option is an Interdisciplinary program designed for students in any faculty of the University who have an interest in the Spanish- and Portuguese-speaking world, both in Latin America and in the mother countries, Spain and Portugal. The courses listed below are taught by instructors with research in the area or by those whose interests are in or moving towards that direction. The Iberoamerican content may be total or partial depending on the discipline and instructor. All courses are regular 0.5 credit courses and count towards fulfillment of requirements for graduation.

Requirements
Students must complete 10 term courses from those listed below, of which at least 6 term courses must be selected from disciplines other than the student's Honours program. To graduate with the Iberoamerican Studies Option indicated on the diploma, students must have an overall average of 65% in the Iberoamerican Studies Option courses.

Courses
(These courses are described fully in Chapter 16.)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>ANTH 203</td>
<td>Prehistoric Man in North America</td>
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<tr>
<td>ANTH 223</td>
<td>New World Civilizations</td>
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<tr>
<td>ANTH 377</td>
<td>Early Man in the New World</td>
</tr>
<tr>
<td>ANTH 388</td>
<td>Applied Anthropology</td>
</tr>
<tr>
<td>ANTH 420</td>
<td>Social and Cultural Change</td>
</tr>
<tr>
<td>HIST 214X</td>
<td>Empires and Missionaries</td>
</tr>
<tr>
<td>HIST 230</td>
<td>Church and State in Modern Latin America</td>
</tr>
<tr>
<td>HIST 231</td>
<td>Oil and Politics in Latin America</td>
</tr>
<tr>
<td>HIST 232</td>
<td>Revolutions in Latin America</td>
</tr>
<tr>
<td>HIST 233</td>
<td>Civil-Military Relations in Latin America</td>
</tr>
<tr>
<td>P SCI 102F</td>
<td>Populist Politics in the Third World</td>
</tr>
<tr>
<td>P SCI 350A</td>
<td>Politics of the Developing Areas 1</td>
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<tr>
<td>P SCI 350B</td>
<td>Politics of the Developing Areas 2</td>
</tr>
<tr>
<td>P SCI 453</td>
<td>Comparative Politics of Latin America</td>
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<tr>
<td>P SCI 454</td>
<td>Comparative Politics II</td>
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<tr>
<td>SOC 225R</td>
<td>Race and Culture in the Third World 1</td>
</tr>
<tr>
<td>SOC 226R</td>
<td>Race and Culture in the Third World 2</td>
</tr>
<tr>
<td>SOC 252</td>
<td>Migration and Society</td>
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<tr>
<td>SOC 255</td>
<td>Third World Development</td>
</tr>
<tr>
<td>SOC 265</td>
<td>Political Sociology</td>
</tr>
<tr>
<td>SOC 325G</td>
<td>Issues in Third-World Development</td>
</tr>
<tr>
<td>SOC 354</td>
<td>World Population Problems</td>
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<tr>
<td>SOC 364</td>
<td>Social Change</td>
</tr>
<tr>
<td>SOC 440S</td>
<td>Directed Readings in Developing Nations</td>
</tr>
<tr>
<td>SPAN 217</td>
<td>Spanish American Civilization 1</td>
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<td>SPAN 218</td>
<td>Spanish American Civilization 2</td>
</tr>
<tr>
<td>SPAN 227</td>
<td>Survey of Spanish American Literature 1</td>
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<tr>
<td>SPAN 228</td>
<td>Survey of Spanish American Literature 2</td>
</tr>
<tr>
<td>SPAN 101</td>
<td>Language</td>
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<td>SPAN 351A</td>
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<tr>
<td>SPAN 351B</td>
<td>Language</td>
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</tbody>
</table>
Legal Studies

The Legal Studies Committee

Associate Professor, Committee Chairman and
Undergraduate Advisor
M.F. McDonald, BA, (Toronto), MA, PhD
(Pittsburgh)

Professors
D.W. Hoffman, BSA, MSA (Toronto), PhD (Waterloo),
PAg, MGIP
D.C. Mackenzie, BA, MA, PhD (Princeton)

Associate Professors
C.G. Brunk, BA (Wheaton), MA, PhD (Northwestern)
D. Estrin, BA, LLB (Alberta)
J.A. Wahl, CR, BA (Western Ontario), MA, PhD
(St. Louis) J

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R.P. Woolstencroft, BA, PhD (Alberta)

Lecturer
S.P. Gunz, BA, LLB (Sydney), MBA (Manchester)

Legal Studies is an Interdisciplinary option that focuses on law primarily from a multidisciplinary perspective. Given the centrality of law to most human institutions and values, a great deal of attention has been paid to law by scholars working in a wide variety of disciplines including 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 (4 term courses) in this section. In the second section the courses are in general more advanced and concerned with particular aspects of the law. Students must select 4 term courses from this section. In the third section the courses are less central to the area of legal studies, but serve to bridge the gap between legal studies and particular disciplines.

Students will choose 2 term courses from courses in this section that fit their General or Honours program. Students are strongly urged to consult the Legal Studies Undergraduate Advisor in making their course selections from Sections Two and Three.

The Legal Studies option is open to students in General or Honours programs. Students must complete 5 year-course equivalents of designated Legal Studies courses from the appropriate sections. An overall average of 65% in these courses is necessary to graduate with the Legal Studies Option.

Courses
(The courses listed below are described fully in Chapter 16.)

Section 1
Students are required to complete successfully all of the following courses:

HIST 210 History of Law, 0.5
PHIL 327A Philosophy of Law - Part 1, 0.5
P SCI 292 Aspects of Canadian Law, 0.5
SOC 370G Sociology of Law, 0.5

Total credits in Section 1: 2.0.

Section 2
Students are required to complete successfully 2 year-course equivalents from the following courses. Students in the Faculty of Environmental Studies must take ENV S 201, 401, and 402 plus one other course in Section 2.

ACC 231 Taxation 1, 0.5
ENV S 201 Introduction to Environmental & Planning Law, 0.75
ENV S 401 Environmental Law, 0.75
ENV S 402 Planning Law, 0.75
HIST 329 The History of Anglo-American Law, 0.5.
PHIL 327B Philosophy of Law - Part 2, 0.5
P SCI 291 The Canadian Legal Process, 0.5
P SCI 333 Administrative Law (in 1980/81 offered as P SCI 392), 0.5
P SCI 363 Canadian Constitutional Law (in 1980/81 offered as P SCI 392), 0.5
SOC 224 Law and Order: Regulating Deviance, 0.5
SOC 227 Crime and Society, 0.5

Total credits in Section 2: 2.0.

Section 3
Students are required to complete successfully 1 year-course equivalent from the following courses:

ACC 461 Taxation 1, 0.5
ACC 462 Taxation 2, 0.5
HIST 211 British History to 1603, 0.5
HIST 212 British History Since 1603, 0.5
PACS 202 Peace & Conflict Studies 2, 0.5
PHIL 215 Professional Ethics, 0.5
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 Math 113A, Math 111B, CS 115 and STAT 210 are recommended as a sufficient body of knowledge as corequisites and prerequisites, alternative sequences of courses in some Faculties may be substituted according to the following table. It should be noted that the alternative sequences are most applicable in the case of the Minor.

<table>
<thead>
<tr>
<th>Home Faculty</th>
<th>ARTS</th>
<th>ENV S</th>
<th>HKLS</th>
<th>SCIENCE</th>
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<td>MATH 111B</td>
<td>MATH 103</td>
<td>MATH 103</td>
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<td>ENV S 272</td>
<td>CS 115 or CS 118</td>
<td>CS 118</td>
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<tr>
<td>STAT 210</td>
<td>ECON 221</td>
<td>ENV S 271</td>
<td>REG 270</td>
<td>STAT 210</td>
</tr>
</tbody>
</table>

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 20 half credits:

- ACC 101/102 or 121/122;
- ACC 131/132 or BUS 111W/121W;
- ECON 101;
- M SCI 43 or ECON 241;
- M SCI 31; M SCI 46;
- M SCI 47 or 48;
- M SCI 44, 53 or PSYCH 333, SOC 340; CS 330, 338; PHIL 216;
- ENGL 210 or SCI 209 plus an oral report on a written paper.
- One of ACC 301, ES 201, P SCI 291, 292;
- Plus 2 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, 401, 491
- Management Information Control Systems
- ACC 301, 302, 441, 481
- Financial Management and Investments
- ACC 371, 372, 381, 471
- Econometrics
- ECON 102, 321, 421, 422
- Taxation
- ACC 291, 392, 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.

Honours 'y' with a Management Studies Minor
(Where 'y' is any departmental area which chooses to make a Minor designation in Management Studies available to its Honours students.)

In addition to the Honours requirements of 'y', a minimum average of 70% must be achieved on the following 10 half credits:

Environmental Management
- PLAN 357, ENV S 400
- Public Administration
- P SCI 331, 332
- Financial Reporting
- ACC 291, 292, 401, 491
- Management Information Control Systems
- ACC 301, 302, 441, 481
- Financial Management and Investments
- ACC 371, 372, 381, 471
- Econometrics
- ECON 102, 321, 421, 422
- Taxation
- ACC 291, 392, 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.
Peace and Conflict Studies

(Participating Faculty members are listed in Chapter 16.)

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

Program Options

There are three different Options open to students participating in the PACS program: 1) General Program, 2) Honours, and 3) Minor. Successful completion of either of the first two permits the student to add the subtitle (Peace and Conflict Studies) to the name of the degree earned.

All students in the PACS program will take the PACS Core Courses (described fully in Chapter 16) as well as a specified number of "PACS Content Courses" (listed on p. 264) offered by their own and other departments. In every case students must fulfill all the requirements for the major in their own department

1. The General Arts Degree (Peace and Conflict Studies)

In addition to fulfilling the requirements for the major (normally including at least 10 term courses in the major field), the general arts student must meet the following PACS requirements:

a) PACS 201, 202, 301, and 302.

b) 6 term courses chosen from the PACS Content Courses offered by either the department in which the student majors, or any other departments (see p. 264).

The General Arts degree Option in Peace and Conflict Studies is available to those majoring in any department in the Faculty of Arts, including non-participating Departments.

2. Honours Program (Peace and Conflict Studies)

Students may choose straight or joint honours in any of the participating departments. Students are granted, upon completion of a 44 term-course program (46 term courses if joint honours), an Honours BA or BES in their subject areas with the subtitle Peace and Conflict Studies.

In addition to fulfilling the degree requirements in the Major Department, students must meet the following PACS requirements in their 4-year period of study:

a) PACS Core Courses 201, 202, 301, 302, 498, 499.

b) 6 term courses chosen from among the PACS Content Courses offered by the student's department (8 term courses if joint honours). These courses may also be used to meet the department's honours requirements if approved as such by the department.

c) 3 term courses chosen from among the PACS Content Courses offered in any department.

(Students should use their first year to take lower-level prerequisites for PACS Content Courses in those Departments where they have special interests).

3. Honours Minor in Peace and Conflict Studies

A Minor in PACS is available to students pursuing an Honours degree in any faculty (including non-Arts faculties). The Minor consists of 10 term courses chosen from among the courses approved for PACS credit in any department, and must include PACS 201, 202, 301, and 302.
**Peace and Conflict Studies Content Courses Offered by Participating Departments**

The following PACS-related courses are offered by the participating departments under their own designations. Many of the 300 and 400 level courses have specific prerequisites. Students planning to pursue study in these upper level courses should use their electives wisely to ensure that the prerequisites for these courses are met. Additions or deletions may occur following the suggestion of the departments concerned and approval by the PACS Faculty Group. Full course descriptions are found in Chapter 16.

### History

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>HIST 102C</td>
<td>The Origins of Wars in the 20th Century</td>
</tr>
<tr>
<td>HIST 102D</td>
<td>From Nationalism to Totalitarianism</td>
</tr>
<tr>
<td>HIST 102E</td>
<td>Canada and War in the 20th Century</td>
</tr>
<tr>
<td>HIST 208</td>
<td>The Cold War: American-Russian Relations Since November, 1917</td>
</tr>
<tr>
<td>HIST 217</td>
<td>Irish History: The Nineteenth and Twentieth Century</td>
</tr>
<tr>
<td>HIST 225</td>
<td>History of Modern Revolutions</td>
</tr>
<tr>
<td>HIST 226</td>
<td>The Middle East Conflict</td>
</tr>
<tr>
<td>HIST 245</td>
<td>Ethnic and Cultural Minorities in Canada</td>
</tr>
<tr>
<td>HIST 247</td>
<td>Mennonite History</td>
</tr>
<tr>
<td>HIST 346</td>
<td>Mennonite History: Canadian Issues</td>
</tr>
<tr>
<td>HIST 348</td>
<td>Radical Reformation</td>
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### Man-Environment Studies

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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</thead>
<tbody>
<tr>
<td>M ENV 241</td>
<td>Social Change</td>
</tr>
<tr>
<td>M ENV 331</td>
<td>Environmental Issues in Global Perspective</td>
</tr>
<tr>
<td>M ENV 337</td>
<td>Environmental Impact Assessment</td>
</tr>
<tr>
<td>M ENV 338</td>
<td>Social Impact Assessment</td>
</tr>
<tr>
<td>M ENV 375Z</td>
<td>Politics of the Environment</td>
</tr>
<tr>
<td>M ENV 400</td>
<td>Senior Honours Seminar in Environmental Management</td>
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<tr>
<td>ENV S 401</td>
<td>Environmental Law</td>
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### Philosophy

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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHIL 216</td>
<td>Rational Behaviour and Decision-Making</td>
</tr>
<tr>
<td>PHIL 225</td>
<td>Social and Political Philosophy: Canadian Problems</td>
</tr>
<tr>
<td>PHIL 243</td>
<td>Conflict, Contract and Choice</td>
</tr>
<tr>
<td>PHIL 327A</td>
<td>Philosophy of Law 1</td>
</tr>
<tr>
<td>PHIL 327B</td>
<td>Philosophy of Law 2</td>
</tr>
<tr>
<td>PHIL 328</td>
<td>The Philosophy of Karl Marx</td>
</tr>
<tr>
<td>PHIL 329</td>
<td>War, Peace, and Justice</td>
</tr>
<tr>
<td>PHIL 422</td>
<td>Political Philosophy 1</td>
</tr>
<tr>
<td>PHIL 423</td>
<td>Political Philosophy 2</td>
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### Political Science

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>P SCI 101</td>
<td>Introduction to Politics</td>
</tr>
<tr>
<td>P SCI 102A</td>
<td>Imperialism and International Relations</td>
</tr>
<tr>
<td>P SCI 102K</td>
<td>Mass Political Violence</td>
</tr>
<tr>
<td>P SCI 225</td>
<td>Political Theory 1</td>
</tr>
<tr>
<td>P SCI 226</td>
<td>Political Theory 2</td>
</tr>
<tr>
<td>P SCI 281</td>
<td>International Politics 1</td>
</tr>
<tr>
<td>P SCI 282</td>
<td>Foreign Policy</td>
</tr>
<tr>
<td>P SCI 321</td>
<td>Marxist Theory</td>
</tr>
<tr>
<td>P SCI 322</td>
<td>Marxism and Revolution after Marx</td>
</tr>
<tr>
<td>P SCI 350A</td>
<td>The Politics of Developing Areas 1</td>
</tr>
<tr>
<td>P SCI 350B</td>
<td>The Politics of Developing Areas 2</td>
</tr>
<tr>
<td>P SCI 380A</td>
<td>World Politics 1</td>
</tr>
<tr>
<td>P SCI 380B</td>
<td>World Politics 2</td>
</tr>
<tr>
<td>P SCI 479</td>
<td>Violence in the Political Process</td>
</tr>
<tr>
<td>P SCI 481</td>
<td>Research Seminar on World Politics</td>
</tr>
<tr>
<td>P SCI 483</td>
<td>Power Politics and World Order Studies</td>
</tr>
<tr>
<td>P SCI 484</td>
<td>Contemporary Foreign Relations Theories and Politics</td>
</tr>
<tr>
<td>P SCI 486</td>
<td>Middle Powers and World Politics</td>
</tr>
</tbody>
</table>

### Psychology

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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</thead>
<tbody>
<tr>
<td>PSYCH 254</td>
<td>Interpersonal Relations</td>
</tr>
<tr>
<td>PSYCH 316</td>
<td>Moral Development</td>
</tr>
<tr>
<td>PSYCH 333</td>
<td>Industrial Psychology</td>
</tr>
<tr>
<td>PSYCH 353</td>
<td>Aggression and Social Conflict</td>
</tr>
<tr>
<td>PSYCH 354</td>
<td>Interpersonal Processes in Critical Situations</td>
</tr>
</tbody>
</table>

### Religious Studies

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>R S 253</td>
<td>Biblical Foundations of Christian Pacifism</td>
</tr>
<tr>
<td>R S 254</td>
<td>War and Peace in Christian Theology</td>
</tr>
<tr>
<td>R S 263</td>
<td>Religion and Politics</td>
</tr>
<tr>
<td>R S 274</td>
<td>Religious Approaches to Personal Crises</td>
</tr>
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</table>

### Social Development Studies

<table>
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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>PSYCH 221R</td>
<td>Interpersonal Interaction</td>
</tr>
<tr>
<td>SOC 221R</td>
<td>Master Trends in Modern Society</td>
</tr>
<tr>
<td>SOC 228R</td>
<td>Race and Culture and the Third World 1</td>
</tr>
<tr>
<td>SOC 228R</td>
<td>Race and Culture and the Third World 2</td>
</tr>
<tr>
<td>SOC 327R</td>
<td>Canadian Ethnic and Cultural Minorities</td>
</tr>
<tr>
<td>SOC 328R</td>
<td>Canadian Ethnic and Cultural Minorities</td>
</tr>
</tbody>
</table>

### Sociology

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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</thead>
<tbody>
<tr>
<td>SOC 108</td>
<td>Collective Behaviour</td>
</tr>
<tr>
<td>SOC 190G</td>
<td>Sociology of Dissent</td>
</tr>
<tr>
<td>SOC 222</td>
<td>Juvenile Delinquency</td>
</tr>
<tr>
<td>SOC 227</td>
<td>Crime and Society</td>
</tr>
<tr>
<td>SOC 233</td>
<td>Social Psychology of Beliefs and Attitudes</td>
</tr>
</tbody>
</table>
Personnel and Administrative Studies

Personnel and Administrative Studies (PAS) is a Minor Program that can be taken in conjunction with many existing Honours Majors. The program is designed to provide a broad interdisciplinary 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 12 half-course credits that may be completed at any point in the four-year term.

The courses encompass several central themes. First, analytical techniques are stressed. These "functional" tools of management have become increasingly important in administrative and business settings. Second, there is a strong emphasis on human resources. This focus is provided by courses in Political Science, Psychology, Management Science and Sociology. The third content area is concerned with the application of economic theory to the administrative role. Finally, there are 2 "core" courses in Personnel Administration. Students are encouraged to enrol in these courses in their second and third years of study. The 2 courses have a practical orientation and provide an integrative perspective on the topic area.

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

Program

(The courses listed below are described fully in Chapter 16.)

A. Analytical Techniques

- Computer Science: One of CS 112, 115, 116.
- Statistics: MTHEL 102 or equivalent course within the student’s Honours Program.
- Accounting: ACC 121.

B. Human Resources

- Public Administration: P SCI 331, 332.
- Personnel and Industrial Psychology: PSYCH 339, and PSYCH 333 or M SCI 44
- Industrial Sociology: SOC 242 or 342 or 340 or M SCI 53.

C. Economic Factors

- Microeconomics: ECON 101
- Management: ACC 131, 132.

D. PAS Core Courses

- Personnel Administration: PAS 200
- Issues in Personnel Administration: PAS 300

More information on this program is available from the Course Director, E.S. Lucy, at ext. 2473.
Studies in Personality and Religion (SIPAR)

Chairman & Director of the Program
A.L. Evans, BA (Toronto), BD (Emmanuel), STM (McGill), DMin (Andover-Newton)

Members of the SIPAR Advisory Committee

Professor
H.J. Fallding, BA, BSc, MA (Sydney), PhD (Australian National), FRCS

Associate Professors
D.M. Amoroso, BA, MA (Toronto), PhD (Waterloo)
J.M. Cornell, BA, MS, PhD (Washington)
F.C. Gérard, MA (College St. Dominique, France), BD, STM (McGill), PhD (Hartford Seminary Foundation)
J.H. Horne, BA, MA (Western Ontario), BTh (Huron), PhD (Columbia)
R.D. Legge, BA (Transylvania), STB (Harvard), PhD (McMaster)

Studies in Personality and Religion (SIPAR) is an interdisciplinary program which may be chosen by students in conjunction with a major in any department. It provides a course of study for those who have a special interest in the processes of religious growth and human development. The SIPAR option is also appropriate for those considering careers in the ministry or other service oriented vocations. The program is administered by St. Paul's College, in 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 4 term courses in the core program:
- Psychology of Religion in Historical Perspective (ARTS 202P) provides an historical survey of theories on the relationship between personality and religion;
- Psychology of Religion (RS 270) examines the variety of religious experience from a psychological point of view;
- Personality and Religion (RS 271) examines personality theory and its relationship to religious development and growth; Seminar on Selected Topics in Personality and Religion (ARTS 302P) involves the study of how the disciplines of philosophy, sociology, and religious studies have come to know and understand human behaviour. These courses are described fully in Chapter 16.

Options

There are two different options open to students participating in the SIPAR program. The first is open to students in a General program; the second, to students in an Honours program only.

1. General Program

A SIPAR option may be earned by students in a General program. These courses are to include ARTS 202P, RS 270 and RS 271 plus 3 other SIPAR designated courses. The subtitle "Studies in Personality and Religion" would be designated on the degree. In every case, students must fulfill all the requirements for the major in their own departments.

2. Honours Minor in Personality and Religion

A minor in SIPAR is available to students pursuing an honours degree in any faculty (including non-Arts faculties). This minor consists of 10 term courses chosen from among the courses approved for SIPAR credit in any participating department, and must include the SIPAR Core Courses, ARTS 202P, RS 270, RS 271, ARTS 302P.

Note:

Each of the participating departments has designated certain course offerings as Studies in Personality and Religion content courses. Many of the 300- and 400-level courses have specific prerequisites. Students planning to pursue studies in these upper-level courses should use their elective courses wisely to ensure that the prerequisites for these courses are met.

Core Courses

(These courses are described fully in Chapter 16.)

ARTS 202P 0.5
Psychology of Religion in Historical Perspective

RS 270 0.5
Psychology of Religion

RS 271 0.5
Personality and Religion

ARTS 302P 0.5
Seminar on Selected Topics in Personality and Religion
Courses Selected from Participating Departments  
(These courses are described fully in Chapter 16.)  
A further understanding of this subject may be  
developed through the study of selected courses  
offered by participating departments, which will either  
broaden the student's comprehension of the field or  
permit a deeper understanding of some particular  
aspect of Studies in Personality and Religion.  

The actual combination of courses selected by a  
student is subject to the approval of the SIPAR  
advisor.

Religious Studies  
RS 274  Religious Approaches to Personal  
Crisis, 0.5  
RS 275  Religion and Psychotherapy, 0.5  
RS 370  Dream in the Religious Experience  
of Mankind, 0.5  
RS 371  Religion and Self-Destructive  
Behaviour, 0.5

Psychology  
PSYCH 101  Introductory Psychology, 0.5  
PSYCH 211  Developmental Psychology, 0.5  
PSYCH 214  Psychology of Adolescence, 0.5  
PSYCH 231  Psychology of Religious  
Experience, 0.5  
PSYCH 254  Interpersonal Relations, 0.5  
PSYCH 258  Principles and Evolution of  
Psychoanalytic Thought, 0.5  
PSYCH 334  Theories in Counselling  
Psychology, 0.5  
PSYCH 355  Personality Theory, 0.5  
PSYCH 357  Psychopathology, 0.5

Philosophy  
PHIL 102C  Philosophy of Life, 0.5  
PHIL 102D  Introduction to Philosophy of  
Religion, 0.5  
PHIL 201  Love, 0.5  
PHIL 203  Philosophical Perspectives on  
Death, 0.5  
PHIL 236  Philosophy of Religion: The  
Occult, 0.5  
PHIL 335  Philosophy of Religion, 0.5  
PHIL 470  Phenomenology, 0.5

Sociology  
SOC 101  Introduction to Sociology, 0.5  
SOC 102  Social Problems, 0.5  
SOC 105  Perennial Themes in Social  
Thought, 0.5  
SOC 206  Sex Roles, 0.5  
SOC 209  Family Origin and Personal  
Identity, 0.5  
SOC 233  Social Psychology of Beliefs and  
Attitudes, 0.5  
SOC 247  Sociology of Death and Dying, 0.5  
SOC 264  Sociology of Religion, 0.5  
SOC 274  Religious Approaches to Personal  
Crisis, 0.5  
SOC 275  Religion and Psychotherapy, 0.5  
SOC 370  Dream in the Religious Experience  
of Mankind, 0.5  
SOC 371  Religion and Self-Destructive  
Behaviour, 0.5  
SOC 220R  The Individual, Society and  
Religion, 0.5

Social Development Studies  
SOC 220R  The Individual, Society and  
Religion, 0.5

Women’s Studies  
(Participating Faculty members are listed in  
Chapter 16.)  

In the last fifteen years women have been the focus of  
major research projects, particularly in the humanities  
and social sciences. Questions on topics such as  
social expectations for women, medical, philosophical  
and religious assumptions of female capacities,  
women’s self-perception, women’s biological-role and  
vocational place have been raised and the many  
answers have been intensely debated.  

Because this relatively recent focus in research  
has become such an important component of  
contemporary scholarship, the University of Waterloo  
and Wilfrid Laurier University co-operate in the  
staffing and teaching of courses in this field of study.  
Students may take courses at either University to  
fulfill requirements for the Option. However, if a  
course at one institution is substantially the same as  
that at the other credit will be allowed for only one of  
the two courses. All such courses are identified by an  
asterisk in the following list.

Students will normally enter the program in their  
second year, although appropriate courses taken  
during year one can be applied to the Women’s  
Studies Option. Before pre-registration each spring,  
students should consult with the Women’s Studies  
Co-ordinator and with the Department involved to  
determine which courses will be available in the  
coming academic year.

Requirements  
1. This Option may be taken in combination with any  
General or Honours program.  
2. Ten term courses are required for this Option. They  
are to be distributed as follows:  
   a) W S 200  
   b) W S 300 (prerequisite: W S 200 or permission of  
the Co-ordinator)  
   c) At least 3 courses from the core list of  
courses.  
   d) At least 5 courses from the approved list of  
Women’s Studies courses. When a Department  
offers a special topics course which is relevant  
to the Women’s Studies program, it may be  
counted toward the Option. Students should  
consult the Co-ordinator of Women’s Studies  

Interdisciplinary Options  
Studies in Personality and Religion  
Women’s Studies
before preregistering to ascertain what special topics courses will be offered and to ensure that they are meeting the requirements for the Option.

3. To meet the graduation requirements a student must have a minimum average of 65% in all courses in the Option.

### Women's Studies Core Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>English 108E (UW) or English 225 (WLU)</td>
<td>English 108E (UW) or English 225 (WLU)</td>
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<tr>
<td>History 248 (WLU)</td>
<td>History 248 (WLU)</td>
</tr>
<tr>
<td>Philosophy 202 (UW)</td>
<td>Philosophy 202 (UW)</td>
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<tr>
<td>Psychology 363H (UW)</td>
<td>Psychology 363H (UW)</td>
</tr>
<tr>
<td>Sociology 233 (WLU)</td>
<td>Sociology 233 (WLU)</td>
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### Women's Studies Approved Courses

#### University of Waterloo

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<tbody>
<tr>
<td>Anthropology 350</td>
<td>Sex Roles in Anthropology</td>
</tr>
<tr>
<td>Classical Civilization 282*</td>
<td>Social Problems in Antiquity (equivalent to WLU Classics 217)</td>
</tr>
<tr>
<td>Economics 353</td>
<td>Population Economics</td>
</tr>
<tr>
<td>English 108E*</td>
<td>Women in Literature</td>
</tr>
<tr>
<td>English 208E</td>
<td>Women Writers of the 20th Century</td>
</tr>
<tr>
<td>French 391</td>
<td>French Women Writers</td>
</tr>
<tr>
<td>History 202X</td>
<td>The Individual and the Family in History</td>
</tr>
<tr>
<td>Philosophy 201</td>
<td>Love</td>
</tr>
<tr>
<td>Philosophy 202</td>
<td>Philosophy of Women</td>
</tr>
<tr>
<td>Philosophy 220</td>
<td>Moral Issues</td>
</tr>
<tr>
<td>Philosophy 302</td>
<td>Modern Feminism</td>
</tr>
<tr>
<td>Political Science 476</td>
<td>Research Seminar in Political Behaviour</td>
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<tr>
<td>Psychology 236</td>
<td>A Psychological Analysis of Human Sexuality</td>
</tr>
<tr>
<td>Psychology 363H</td>
<td>Scientific Perspectives on Gender &amp; Sex</td>
</tr>
<tr>
<td>Religious Studies 261</td>
<td>Women and the Great Religions</td>
</tr>
<tr>
<td>Religious Studies 236</td>
<td>Human Sexuality and Christian Morality</td>
</tr>
<tr>
<td>Sociology 206*</td>
<td>Sex Roles (equivalent to WLU Sociology 234)</td>
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<tr>
<td>Spanish 387</td>
<td>Women in Spanish American Literature</td>
</tr>
<tr>
<td>Special Topics</td>
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</tr>
</tbody>
</table>

(The above courses are described fully in Chapter 16.)

### Interdisciplinary Studies

**Women's Studies**

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<tbody>
<tr>
<td>Wilfrid Laurier University</td>
<td>Psychological Anthropology</td>
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<tr>
<td>Classics 205</td>
<td>Greek and Roman Mythology</td>
</tr>
<tr>
<td>Classics 217*</td>
<td>Women in Greece and Rome (equivalent to UW C CIV 292)</td>
</tr>
<tr>
<td>English 225*</td>
<td>The Woman Writer: Theory and Practice (equivalent to UW English 108E)</td>
</tr>
<tr>
<td>English 226</td>
<td>Women in Fiction</td>
</tr>
<tr>
<td>History 248</td>
<td>History of the Sexes up to the Industrial Revolution</td>
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<tr>
<td>History 249</td>
<td>History of the Sexes from the Industrial Revolution to the Present</td>
</tr>
<tr>
<td>Philosophy 249</td>
<td>Philosophy of Consciousness: Feminine/Masculine</td>
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<td>Religion and Culture 226</td>
<td>Love and Its Myths</td>
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<td>Religion and Culture 227</td>
<td>Evil and Its Symbols</td>
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<td>Religion and Culture 346</td>
<td>Religion and the Crisis of Daily Life</td>
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<td>Religion and Culture 348</td>
<td>Dynamic Psychology of Religion</td>
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<td>Social Welfare 200</td>
<td>Canadian Social Welfare Programs</td>
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<td>Sociology 201</td>
<td>Sociology of the Family</td>
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<tr>
<td>Sociology 233</td>
<td>Sociology of Women</td>
</tr>
<tr>
<td>Sociology 234*</td>
<td>Sociology of Sex Roles (equivalent to UW Sociology 206)</td>
</tr>
<tr>
<td>Special Topics</td>
<td>To be announced</td>
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</table>

### Other Women's Studies Content Courses

(These courses are not available for credit toward the Women's Studies Option.)

- BIOL 447 History of Biology
- C CIV 201 Ancient Greek Society
- C CIV 202 Ancient Roman Society
- CS 492 The Social Implications of Computing
- DANCE 110 Introduction to the World of Dance
- DANCE 231 History of Ballet in the 20th Century
- ECON 351 Labour Economics
- ENGL 211 The Novel 1
- ENGL 212 The Novel 2
- ENGL 316 Canadian Drama
- ENGL 335 Creative Writing
- ENGL 415 Major Canadian Writers
- FINE 316 Canadian Native Art
- FR 273 Aspects of Quebec
- HIST 252X Europe in the Nineteenth Century
- HIST 254X Canadian History: The National Period
- ITAL 396 Special Topics/Directed Readings
- M ENV 241 Social Change
- P SCI 272 Political Behaviour 2
- P SCI 344 The Politics of Local Government
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<tr>
<td>P SCI 475</td>
<td>Political Socialization</td>
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<tr>
<td>PSYCH 214</td>
<td>Psychology of Adolescence</td>
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<td>PSYCH 253</td>
<td>Social Psychology</td>
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<tr>
<td>PSYCH 311</td>
<td>Behaviour and Development of Human Infants</td>
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<td>PSYCH 316</td>
<td>Moral Development</td>
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<td>PSYCH 331</td>
<td>Individual Differences</td>
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<td>PSYCH 364F</td>
<td>Sex, Evolution and Social Behaviour</td>
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<tr>
<td>PSYCH 370</td>
<td>Cross-Cultural Psychology</td>
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<td>R S 256</td>
<td>Current Ethical Issues</td>
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<td>SCI 252</td>
<td>Biology and Society</td>
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<td>SCI 400A</td>
<td>The History of Science 1</td>
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<td>SCI 400B</td>
<td>The History of Science 2</td>
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<td>SOC 243</td>
<td>Occupational Sociology</td>
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</table>
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>
<th>Credit weight</th>
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Course Name — Applied Probability

Course Description


Extra information about course requirements

Prereq: STAT 230 or STAT 220/221.

Terminology

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<th>Terms Offered</th>
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<tr>
<td>F</td>
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<td>S</td>
<td>Spring term</td>
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<tr>
<td>W</td>
<td>Winter term</td>
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<tr>
<td>J</td>
<td>Summer, first half, July</td>
</tr>
<tr>
<td>A</td>
<td>Summer, second half, August</td>
</tr>
<tr>
<td>M</td>
<td>Summer, both terms, July, August</td>
</tr>
<tr>
<td>Y</td>
<td>September - April—8 month session</td>
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<table>
<thead>
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## Course Abbreviations

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<tr>
<td>Accounting</td>
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<td>Interdisciplinary Social Science</td>
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<td>Anthropology</td>
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<td>Peace and Conflict Studies</td>
<td>PACS</td>
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<td>SY DE</td>
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<td>Health Studies</td>
<td>HLTH</td>
<td>Women's Studies</td>
<td>WS</td>
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</tbody>
</table>
Course Descriptions

Accounting

Adjunct Faculty
A.H. Headlam, MBA (Wilfrid Laurier), FCA
W.D. Jenkins, BA, LLB (Western Ontario), MA (Waterloo)
R.F. Kilimnik, BA (Waterloo), MBA (McMaster), GFA
R.W. Kingston, BMath (Waterloo), CA
M.R. Longworth, BA (Western Ontario), CA
K.A. Tambling, BSc (McGill), MBA (Western Ontario)

Faculty members holding cross appointments to Accounting from:
'1Economics

Course Descriptions

ACC 101 F.W 3C,1L 0.5
Introductory Accounting I
An introduction to the principles and practices underlying the historical-cost income determination model. Restricted to students required by their program to take ACC 101, or to students registered in ECON 101, ACC 131, and CS 112 or 140.

ACC 102 F.W.S 3C,1L 0.5
Introductory Accounting II
A continuation of Accounting 101. Restricted to students who have obtained at least a "C-" in ACC 101.

ACC 121 F 3C,1L 0.5
Understanding and Using Financial Accounting Information
This course is designed for non-accounting majors to help them understand and analyze financial statements.

ACC 122 W 3C,1L 0.5
Understanding and Using Managerial Accounting Information
This course is designed for non-accounting majors. The use of accounting information to assist in planning, control and managerial decision-making will be examined.

ACC 131/132 F.W 3C 0.5/0.5
Management 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.

ACC 231 F.W 3C 0.5
Business Law
Particular attention is given to the law relating to contracts and business organizations. Other areas of study include sources of law, the judicial process, real and personal property, torts, agency, credit, and negotiable instruments.

ACC 251 F.W 3C 0.5
Auditing I
An examination of the standards developed by the accounting profession which guide professional accountants in performing the attest function. Elements of effective control structures and the concept of audit evidence are examined.
Prereq: ACC 291

ACC 281 F,W,S 3C 0.5
Introductory Managerial Accounting
An introduction to the principles and practices of managerial accounting.
Prereq: ACC 102

ACC 291 F.W 3C 0.5
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 281

ACC 292 F,W,S 3C,1L 0.5
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
ACC 371 F,W,S 3C,1L 0.5  
**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, 221 and ACC 291

ACC 372 F,W,S 3C,1L 0.5  
**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

ACC 381 F,W,S 3C,1L 0.5  
**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.

ACC 382 F,W,S 3C,1L 0.5  
**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

ACC 401 W 3C 0.5  
**Accounting Theory**  
A review of accounting theory as a background for applying underlying concepts to current accounting problems. Emphasis is on current literature, with a major term paper required.  
**Prereq:** ACC 371 and 491

ACC 402 W 3C 0.5  
**Research**  
An introduction to research methodology and current research in accounting.  
**Prereq:** Registration in AP 3 and ACC 401

ACC 411 F 3C,1L 0.5  
**Statistical Methods for Accountants**  
An introduction to the statistical tools most useful to the accountant; linear and non-linear regression, sampling and time-series analysis. Available software analysis packages will be paid.  
**Prereq:** Registration in Year 3 of any Faculty of Arts Accounting program.

ACC 412 F 3C,1L 0.5  
**Computer Applications in Business**  
An introduction to the operation of mainframe and microcomputer systems. Emphasis will be placed on software packages that have particular application to accounting transaction processing and financial planning.  
**Prereq:** Registration in Year 3 of any Faculty of Arts Accounting program

ACC 414-419 0.5  
**Special Topics**  
Admission by consent of instructor.

ACC 431 W 3C 0.5  
**Management 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.

ACC 441 F,W 3C 0.5  
**Accounting Information Systems**  
Investigates the concepts and principles of management information systems. Concentration is on the role of accounting information in the planning/decision-making process and the design and implementation of accounting information systems.  
**Prereq:** ACC 382.

ACC 451 F 3C 0.5  
**Auditing I**  
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.

ACC 452 W 3C 0.5  
**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.

ACC 453 W 3C 0.5  
**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.

ACC 454 W,S 3C 0.5  
**Operational Auditing**  
An extension of the basic audit to include the appraisal and establishment of administrative and operational controls; and the evaluation of the efficiency of individual business functions.  
**Prereq:** Registration in AP 3.

ACC 461 F 3C 0.5  
**Taxation I**  
A course in the interpretation in application of the major provisions of the Income Tax Act through an analysis of court decisions, Revenue Canada's publications, and practical problem situations.  
**Prereq:** Completion of or registration in ACC 102.

ACC 462 W 3C 0.5  
**Taxation II**  
A continuation of ACC 461.  
**Prereq:** ACC 461.

ACC 463 S 3C 0.5  
**Taxation III**  
A course which integrates the topics covered in ACC 461 and 462 for individual and corporate tax planning through a study of trusts, partnerships, corporate reorganizations and estate planning.  
**Prereq:** ACC 462 and registration in Honours Accounting.

ACC 464 3C 0.5  
**Taxation: Business and Property Income**  
An in-depth study of the computation of business and property income with an emphasis on the case law that has developed in this area.  
**Prereq:** Registration in AP 3 and ACC 463.

ACC 465 3C 0.5  
**Taxation: Corporate Reorganizations**  
An in-depth study of the provisions of the Income Tax Act relating to corporate reorganizations including share exchanges, amalgamations, and winding up a corporation.  
**Prereq:** Registration AP 3 and ACC 463.
Course Descriptions

Accounting

ACC 466 3C 0.5
Taxation: Partnerships and Trusts
An examination of tax legislation pertaining to the taxation of partnerships and their members, and trusts and their beneficiaries.
Prereq: Registration in AP 3 and ACC 463

ACC 467 3C 0.5
International Taxation
An examination of topics including shareholders of non-resident corporations and tax on Canadian income of non-residents. The course will also examine the effects on Canadian residents of the United States' tax legislation.
Prereq: Registration in AP 3 and ACC 463

ACC 468 3C 0.5
Taxation: Estate Planning
A comprehensive review of Canadian income tax legislation with a focus on techniques and consequences of estate planning.
Prereq: Registration in AP 3 and ACC 463

ACC 482 3C 0.5
Advanced Topics in Managerial Accounting
An extension of basic managerial accounting concepts. Course includes the assignment of a broad range of articles designed to expose the student to theoretical and practical applications of managerial and cost accounting.
Prereq: Registration in AP 3 and ACC 382.

ACC 491 F,S 3C 0.5
Financial Accounting III
An advanced accounting course considering specific problems of accounting for the corporate entity, such as business combinations, intercorporate investments, consolidated financial statements, accounting for foreign operations and foreign currency transactions, segment reporting.
Prereq: ACC 292

ACC 494 W 3C 0.5
External Reporting
A case course integrating accounting, taxation, corporate and securities law, and report formulation.
Prereq: Registration in AP 3 and ACC 491.

Anthropology

Department of Anthropology

Associate Professor, Chairman of the Department
T.S. Abler, BA (Northwestern), MS (Wisconsin-Milwaukee), PhD (Toronto)

Professor
S.M. Weaver1, 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 Professors
M.H. Hill, BA (Washington), MA (Washington State), PhD (Southern Illinois)
A.C. Zeller, BSc (Trent), MA (Toronto), PhD (Toronto)

Adjunct Faculty
M.C. Rodman, BA (Goucher College) MA, PhD (McMaster)

Faculty Members of Anthropology holding cross and/or joint appointments to:

1Urban Regional Planning

Faculty Members holding cross and/or joint appointments to Anthropology from:

2Sociology (St. Jerome's)

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes
ANTH 101 courses introduce physical anthropology and archaeology. ANTH 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. ANTH 101, ANTH 102A or 102B, or ANTH 103 may be taken first and any combination may be taken together.
<table>
<thead>
<tr>
<th>Course Description</th>
<th>Anthropology</th>
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<tr>
<td><strong>ANTH 101</strong> F,W 3C 0.5</td>
<td><strong>ANTH 202</strong> W 3C 0.5</td>
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<tr>
<td>Human and Cultural Evolution</td>
<td>Principles of Social Organization</td>
</tr>
<tr>
<td>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.</td>
<td>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.</td>
</tr>
<tr>
<td><strong>ANTH 102A</strong> F,W 3C 0.5</td>
<td><strong>ANTH 203</strong> F 3C 0.5</td>
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<tr>
<td>Introduction to Social and Cultural Anthropology</td>
<td>Prehistoric Man in North America</td>
</tr>
<tr>
<td>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.</td>
<td>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.</td>
</tr>
<tr>
<td><strong>ANTH 102B</strong> F 3C 0.5</td>
<td><strong>ANTH 204</strong> F 3C 0.5</td>
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<tr>
<td>Anthropology Through Science Fiction</td>
<td>Prehistoric Archaeology: Old World II</td>
</tr>
<tr>
<td>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.</td>
<td>Examination of the transition to an economy based on food production, the spread of food producing economies, the rise of civilization. Areas and periods of emphasis will vary from year to year. Not acceptable for Honours Anthropology credit.</td>
</tr>
<tr>
<td><strong>ANTH 103</strong> W 3C 0.5</td>
<td><strong>ANTH 205</strong> F 3C 0.5</td>
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<tr>
<td>The Nature of Language</td>
<td>Peoples of the Pacific</td>
</tr>
<tr>
<td>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 ANTH 103, ANTH 283, or ANTH 290.</td>
<td>A comparative ethnological survey of selected indigenous societies in the Pacific Region.</td>
</tr>
<tr>
<td><strong>ANTH 206</strong> W 3C 0.5</td>
<td><strong>ANTH 207</strong> W 3C 0.5</td>
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<tr>
<td>Language and Culture</td>
<td>Primates</td>
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<tr>
<td>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 and Majors in Anthropology are required to take ANTH 103, ANTH 283, or ANTH 290.</td>
<td>An introduction to the behaviour of non-human primates and its relevance to human development. Topics will include social organization, role of behaviour, and communication patterns, as well as the history of primate studies.</td>
</tr>
</tbody>
</table>
ANTH 300 F 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.

ANTH 311 W 3C 0.5
Magic, Witchcraft and Religion
An introduction to the way in which anthropologists study the system of behaviour and belief known as religion.

ANTH 321 W 3C 0.5
Recent Prehistory in the Old World
Cultural development from the agricultural revolution to the rise of literacy. Special attention to the development of agriculture as a means of subsistence and to the rise of early civilization. Areas and periods of emphasis will vary from year to year.
Prereq: ANTH 201 or permission of the instructor.
Primarily for Honours Anthropology students.

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 chiefdoms, pastoral tribes and agricultural peasantry.
Prereq: Full credit in Anthropology or consent of the instructor.
Required for all Anthropology Honours students and Majors.

ANTH 345 F.W.S 0.5
Special Problems in Anthropology
Directed independent research.
Prereq: Permission of instructor.

ANTH 347 F.W.S 0.5
Special Problems Topic
Directed independent research.
Prereq: Permission of instructor.

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 and ANTH 351.

ANTH 370 W 3C 0.5
Ethnographic Field Methods
The techniques and problems of ethnographic field work will be explored. Emphasis will be on field work in contemporary society. Students will be expected to complete a field project of their own.
Prereq: ANTH 202 or consent of the instructor.

ANTH 373 F 3C 0.5
Archaeological Reporting
Various ways of processing archaeological data will be demonstrated and discussed. The major emphasis will be on writing up archaeological reports. Primarily for Honours Anthropology students.
Prereq: Permission of the instructor.

ANTH 376 F.W.S 0.5
Reading in Anthropology
Guided reading in a selected portion of the anthropological literature.
Prereq: Anthropology Major or Honours student and permission of the instructor.

ANTH 391/393 F,W,S 0.5
Reading in Anthropology
Guided reading in a selected portion of the anthropological literature.
Prereq: Anthropology Major or Honours student and permission of the instructor.

ANTH 395/397 F,W,S 0.5
Reading in Anthropology
Guided reading in a selected portion of the anthropological literature.
Prereq: Anthropology Major or Honours student and permission of the instructor.

ANTH 492 Y 1.0
Honours Essay
Directed reading and research in a selected area of anthropology inquiry. Required for all Anthropology Honours students.

Not Offered 1983-1984

ANTH 204 Language Learning
ANTH 220 Prehistoric Archaeology:
Old World I
ANTH 222 Prehistoric Man in the
Great Lakes Area - A Survey
ANTH 223 New World Civilizations
ANTH 250 Regional Studies in
Archaeology
ANTH 270 Archaeological Method and
Technique
ANTH 271 Archaeological Field
Methods
ANTH 283 Phonology for Non-Linguists
ANTH 285 Descriptive Grammar 1 - Morphology
ANTH 286 Descriptive Grammar 2 - Syntax
ANTH 320 Pleistocene Prehistory in
the Old World
ANTH 334 Ethnicity and Ethnic
Diversity in Canada
ANTH 365 Fossil Man
ANTH 372 Archaeological Research
ANTH 377 Early Man in the New World
School of Architecture

Associate Professor, Director
L.W. Richards, BArch (Miami), MArch (Yale), MRAIC.

Associate Professor, Undergraduate Office:
A. Banerji, BArch (Calcutta), MArch (North Dakota State)

Professors
L.A. Cummings¹, AB (Washington), AM (Missouri), PhD (Washington), Recipient of the OCUFA (Ontario) Teaching Award
C.K. Knapper², BA (Sheffield), PhD (Saskatchewan)
P.H. Nash³, BA, MA (UCLA), CE (Grenoble), MCP, MPA, PhD (Harvard), MCIP, AICP
R.H. Sims, AADip (London), RIBA
F.H. Watts, AADip (London), MLA (Harvard), RIBA, MRAIC

Associate Professor
M. Elmitt, National Diploma in Design (High Wycombe)
B.R. Hunt, AADip (London), RIBA, MRAIC
D.B. McIntyre, BArch (Toronto), MRAIC
R.M. Schuster⁴, BS, MS (North Dakota State), PhD (Iowa State), PEng
J.C. Somfay, BArch (N.S.W. Sydney), MArch (Toronto), MRAIC
F. Thompson, BArch, MArch (Toronto), MRAIC

Assistant Professors
D. Dutt, BA ( Punjab), BSc (London), MS (Wisconsin), PhD (Waterloo), PEng
E.R. Haldenby, BES, BArch (Waterloo), Recipient of the Distinguished Teacher Award
D. McKay, BArch (Toronto)
R. Wiljer, BA (Waterloo), MA (Ottawa)

Adjunct Faculty
S. Arnold, BA (Southern Illinois)
M. Daraness, BArch (Paris), MArch (Toronto)
B. Boigon, BArch (Toronto)
E. Gustave, BArch, MArch (Toronto), MRAIC
W. Lamb, BArch (McGill), MRAIC
H. Plumb, BArch, MArch (Toronto), MRAIC
P.J. Stokes, MArch, LLD (Toronto), FRAIC
F. Urban, AB (Merrimack), MA (Boston), BFA (Nova Scotia)
J. Zvina

Lecturers
G. Consiglio, BArch (Toronto), MRAIC
L. Pignatti, MArch (Toronto)

Visiting Professional Critics
Internationally known practitioners and educators augment the program annually.

Faculty Members of Architecture holding cross and/or joint appointments to:
1. English
2. Civil Engineering

Faculty Members holding cross and/or joint appointments to Architecture from:
3. Environmental Studies and Psychology
4. Environmental Studies

Course Descriptions

Courses for Bachelor of Environmental Studies (Pre-Professional Architecture)

For Recommended Program, see page 162.
For Elective Course Requirements, see page 284.

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 qualities of materials and structural behaviour; to propose alternatives in structural engineering; and to perform independent mathematical checks on simple, statically determinate and indeterminate structures.

Architectural Designd Language
An overview of design logic and computer system requirement currently used for architectural design.

Strength of Materials
Concept of simple stress and strain; statically indeterminate axially loaded members; thermal stresses, torsion, shear and bending moments in simple beam; shear and moment diagrams.
qualitative deflected shapes, flexural and shearing stresses, deflection calculations; combined stresses, beams of different materials, compression members, Euler’s formula.

Prereq: ARCH 163

ARCH 263 S 2C,2L 0.5
Theory of Structures 1
Study of loading conditions as per building code; stability of structural systems; geometric instability; analysis of statically determinate structures, beams, arches, cables, trusses, frames; approximate analysis of rigid frames; influence lines; deflections by conjugate beams; introduction to indeterminate structures.

Prereq: ARCH 262

ARCH 265 S 1C,2L 0.5
Structural Morphogenesis

Prereq: Architecture students should have completed first year; other students require consent of instructor.

ENV S 271
Introduction to Quantitative Research Methods

ARCH 272 F 2C,3L 0.5
Surveying and Soils
Surveying types, instruments and measurements. Plotting of areas and contours; layout of buildings and underground systems. Types of soils, their identification and investigation; mechanics of strength, suitability of soils for various types of foundations.

ENV S 272
Computer Programming in Environmental Studies

ARCH 283 W 3C,Fieldtrip 0.5
Preservation Practice-Technology and Technique
An introduction to the field of preservation of older buildings, particularly in Canada; dealing mainly with older building technology, typical problems in the preservation field and indicated steps toward solution.

ARCH 313 F,W 4C 0.5
Computer Generated Design 2
Architectural Design 2
Input from various other courses is formulated into comprehensive data structures and simulated behaviour patterns; methods of synthesis problem-solving techniques, analysis of thought processes and protocol analyses. Course is project oriented.

Prereq: ARCH 213

ARCH 362 W 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 382 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 371 W 2C,1wkshop 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 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; 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 323.

ENV S 111
Introduction to the Study of the Future

ENV S 195A
Introduction to Environmental Studies

ENV S 195R
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 perceptions, 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, 292 or consent of instructor.

ENV S 252
Media Tools for Environmental Studies

ENV S 253
Medial Tools for Environmental Studies - Advanced Level

ENV S 310
Behavioural Studies

ENV S 333
Parkland Management

ENV S 380/381
Environmental Studies Workshop

ENV S 401
Environmental Law

ENV S 402
Planning Law

ENV S 411
Alternative Future Environments 1

ENV S 412
Alternative Future Environments 2

ENV S 417
Land Use History and Landscape Change 1

ENV S 418
Land Use History and Landscape Change 2

ENV S 444
Land Evaluation and Resources Management

ENV S 500
Professional Development in Environmental Management

Course Descriptions
Architecture

Design

The courses in design studio combine design fundamentals and design concepts, along with the opportunity to involve analysis and synthesis, professional and scientific insights, application of tools and methods for designing artifacts for man, and an awareness of the inherent physical characteristics and limitations of media and materials. The objectives of the studio are: (1) to guide the student in observing aspects of the physical and social environment; to find, categorize and associate the information into fundamental structures and patterns of relationships; (2) to apply theories generated in the lecture courses to situations in the physical environment, implementing by categorizing the courses into behaviour materials, structures and mechanical systems, behaviour of man, and communications; (3) to provide the student with an opportunity to develop skill in using different “techniques” for analyzing and synthesizing problems in the physical environment; (4) to establish a relationship between faculty and students; (5) to provide a vehicle for persons from faculties of different disciplines and from outside of the university to discuss with students their problems and projects from different points of view.

ARCH 192 F IT,IS,14Std 1.5
Design Fundamentals and Workshop
Design Studio
Development of the means to appreciate art and science of building; introduction to a history of architecture; introduction to the study of theories of architecture; development of skills in graphic communication; introduction to a study of building structure, construction, and materials; promotion and encouragement of the theory and practice of design. Field trip (1 week).
Prereq: Architecture students only.

ARCH 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 192 F IT,IS,14Std 1.5
Design Fundamentals and Studio
Reinforcement and development of the ARCH 192 program, but with emphasis upon the application of design method and practice to specific architectural problems.
Prereq: Architecture students only.

ARCH 193 W IT,IS,14Std 1.5
Design Fundamentals and Studio
Reinforcement and development of the ARCH 192 program, but with emphasis upon the application of design method and practice to specific architectural problems.
Prereq: Architecture students only.

ARCH 199 W 2C,0.5
Visual Interdisciplinary Language
Theory and practice of visual form based on formative processes and hierarchical structures. Propositions: form follows process, rotation is a universal form-generating process, symmetric form is a result of an asymmetric process and freedom is the single organizing principle.
Prereq: Consent of instructor.

ARCH 252 F,W 0.5
Creative Problem Solving
Development of creative skills through group behaviour in problem solving sessions by: (1) developing a clear understanding of each participant's own creative thought processes; (2) increasing his/her ability to consciously and deliberately make use of his/her own creative potential; (3) engendering an awareness of the capacity to use himself/herself and the people he/she works with to produce better solutions to the problems identified by the group.
Prereq: Consent of instructor

ARCH 274/275
Experimental Courses
These courses offer a vehicle for introducing additional electives to the program on a short term basis, and for developing future permanent courses.
Prereq: Consent of instructor

ARCH 284, 285 F,W 3C 0.5
Architectural Research
This offers a student an opportunity for independent research into architectural problems not offered in the regular curriculum; guided exploration of specific architectural problem areas, of appropriate complexity to the particular term.
Prereq: Approval of (in house) UGAC

ARCH 292 F 3C,11std 1.5
Design Concepts and Studio
To develop in each student the ability to design on a small, personal scale and explore design as a thinking process. Small space design exercises where the student is required to define and analyze a problem and generate an architectural solution. Solutions are refined through a series of evaluations.
Prereq: 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, 385 F, W, R 0.5
Architectural Research
This offers a student an opportunity for independent research into architectural problems not offered in the regular curriculum. It allows guided exploration of a specific architectural problem area, of appropriate complexity to the particular term.
Prereq: Approval of (in house) UGAC

ARCH 392 W 4C, 17std 2.0
Design Concepts and Studio
Design of complex environments; the effect of legal and administrative controls on the design of process and form; the influence of mechanical, structural and industrial building components on design process and architectural form. Projects will involve co-ordination of the design task with other disciplines involved in such projects.
Prereq: Architecture students only.

ARCH 393 F 3C, 18std 2.0
Design Concepts and Studio
The analysis and exploration of relationships between physical, social, political and economic systems that influence the physical environment; techniques for defining systems that influence the physical environment; techniques for defining the patterns of interaction and predicting the influence on physical form involving other disciplines; projects to explore the techniques and design with others at the city or community scale.
Prereq: Architecture students only.

Culture
Courses in cultural history give the student a critical and creative understanding of the basic ingredients of all creative work, recognizing the seemingly unrelated forces for change in the cultural history of man, and comprehending the present as a part of the historical past. Open to any University student upon consent of instructor. No prerequisites are required for these courses except for Architecture students.

ARCH 142 F 4C, 2L 1.0
Iconography 1
Conventions
Selected schemes of order, such as fate, providence, natural law, the human will, as expressed in plays, poems, and fiction from various ages: selected conventions in literature, cinema, and the visual arts; the development of one or two archetypal symbols in literature and the visual arts; directed to lead into more detailed studies of symbolic patterns in Iconography 2.
Prereq: Consent of instructor

ARCH 143 W 4C, 2L 1.0
Iconography 2
A survey of the symbolic Nature of the Environment
A study centred on ancient life to initiate the student into the stream of cultural history and the complex problems of what the artist is, the quality of human existence, culture, environment, as well as the working of the icon from raw state of perceived image to its function as an expressive symbol in poetry, music, dance, architecture and other works of art; a study of modern work in comparison to an ancient achievement.
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.

ARCH 245 W, S 1C, 2L 0.5
Survey of Contemporary Architecture
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, Baroque, the Rococo, the Neoclassical; investigation of the course of man'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, f1dtrip 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
Depiction of "modern" culture as one i 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 will. 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 345 or consent of instructor.

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 163). 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 science.
Prereq: Registration in ARCH 492 or consent of instructor.

ARCH 448 F(Rome) 2C.2S 0.5
Rome and the Campagna
History of settlement and building in Rome and the surrounding area from antiquity to the present. Acts of design in architecture, urban form and landscape related to political, cultural and spiritual authority of Rome. Comparison drawn between the image of the city, represented in literature and art, and the material facts of the place. Field trips, lectures.

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; sub-contractors; 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) UGAC.

ARCH 492,493 F,W 3C,18std 2.0 each
Design Studio
The intent of these courses is to develop skills and gain experience in architectural design through the application of design and analysis techniques to complex building types. This is approached through a series of design projects aimed at the exploration of generative factors in the definition of built form. Projects are related to existing contexts and respond to current concerns of architectural theory and practice. Both individual and group work are included. Term held in Rome or Waterloo.
Prereq: Architecture students only.

ARCH 554 W 3C 0.5
Development and Financing
Introduction to the important determinants of the development, growth and re-planning of the various man environments, including development law, land use development, land use planning, appraisal, mortgage lending and accounting.
Prereq: Arch 455.

ARCH 555 S 2C 0.5
Architectural Practice
The profession
Discussion of the legal and ethical aspects of architectural practice in Canada and in Ontario in particular, contracts, bonds and insurance, mechanics' liens, by-laws and regulations, architectural partnership. The legal background, client-architect relations, partial services, professional problems.
Prereq: BES standing.

ARCH 563 W 3C 0.5
Suspended and Space Structures
State-of-the-art review of cable-suspended construction. Analysis of
cable networks, basic equations. Effect of live loads on cables; dynamic considerations. Double cable systems; synclastics and anticlastic surfaces. Cable-stayed systems; analysis of space structures; space frames and roof systems; one and two-way design. 

Prereq: 4B architecture standing or equivalent.

ARCH 574/575 Experimental Courses
These courses offer a vehicle for introducing additional electives to the 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) UGAC

ARCH 592,593 W,S 3C 3.0 each Design Studio
The course provides an opportunity for the student to select an area of concentration for study and design in depth. A thesis topic is to be submitted and approved during term 8 (4b) and all research work completed by the end of the 8 month co-op work term 5. Terms 9 and 10 (5a and 5b) will be spent developing the thesis for presentation during term 10. The thesis is to be a vehicle for thinking and design at an innovative level. Thus considerable emphasis is placed on both theory and development of design solutions.

Prereq: Architecture students only.

Electives
Students are permitted to study courses given by the University at large which are in the area of the student's individual interest, with the aim of providing better orientation and more interdisciplinary 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 6th academic term.

Each student pursuing a BArch degree must have one half course credit in the theme area of Planning by or before his/her 10th academic term.

(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

Professors
P.H. Smith, Jr., BA (Harvard), PhD (Pennsylvania)

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes
Courses designated "Arts", those listed below, usually cover some topics and themes of general interest to several disciplines and their presentation is often made with this interdisciplinary perspective in view. Arts courses are elective courses in General and Honours programs and do not satisfy either the Group A or Group B requirements.

ARTS 122/123 F,W 2C,1D 0.5
Quest for Meaning in the 20th Century 1 and 2
Against the background of rapidly shifting values in western culture, this course asks the student to examine his or her perspective and then face the resources of others in answering the question of Who am I? What is my obligation to society? What is my relationship to the natural world? Is there an ultimate meaning to life? Teaching methods include personal statements, thematic and biographical books and films.

Each term is unique. ARTS 122 is not a prerequisite for ARTS 123. Offered by Conrad Grebel College.

ARTS 198 F 0.5
Introduction to Computer Technology
A general introduction to the fundamental ideas of computers. Topics treated will include the use of an interactive computing system; word processing; and the beginnings of program writing. The course will examine the history of computing, and will consider the social and economic impact of the use of computers. No previous knowledge of computing is assumed.

ARTS 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,W 0.5/0.5
Computing Techniques in Language and Literature
An introduction to non-mathematical computer programming, with special emphasis on the manipulation of language data. The programming language used will be PL/1. ARTS 211 will concentrate on gaining skill in computer programming. ARTS 212 will stress file management, advanced text formatting, and the use of system program utilities. Applications will include word indexes, text concordances, methods of computer-aided text comparison.

Prereq: ARTS 211 presupposes ARTS 198 or equivalent; 212 presupposes 211 or permission of the instructor.

ARTS 215 Y 3C 1.0
Man in Crisis (Literary Views)
A critical study of such themes as freedom vs. happiness, nihilism, collectivism vs. individualism, old tablets vs. utopias, alienation, earthbound fragmentation vs. the transcendental in the artistic writings of Kafka, Brecht, Hesse, Nietzsche, Solzhenitsyn, Dostoevsky, Zamatin, Camus, and others. Taught in English.

ARTS 215A F 3C 0.5
Man in Crisis 1 (Literary Views)
A critical study of Dostoevsky's The Grand Inquisitor, Nietzsche's Thus Spake Zarathustra, Tolstoy's What Men Live By, and works by Aldous Huxley, Zamatin, Turgenev, and Andree. The two major themes are Utopia, the yearning for and the shape of perfectibility, and Nihilism, the denial and/or destruction of "Old Tablets" or "God is dead."
ARTS 2158 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 Salinger. Themes are totalitarianism and Alienation, the divided self in exile, or the inability to give and to accept love.

ARTS 225R W 3C 0.5
Mennonite Authors and Artists
An examination of Mennonite cultural expression in literature (fiction, poetry, drama, children's literature) and the visual arts (especially painting and film) during the past century. Offered by Conrad Grebel College.

ARTS 249J 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,J 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 349J Y 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.

ARTS 350J Y,A 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. Prerequisite: ARTS 250J.

Not offered 1983-1984:
ARTS 220R Chinese Thought and Culture 1
ARTS 221R Chinese Thought and Culture 2
ARTS 320R/ Special Topics in Chinese 321R

Department of Biology

Professor, Chairman of Department
J.E. Thompson, BSc (Toronto), PhD (Alberta)

Professor, Associate Chairman of the Department
R.G.H. Downer, BSc, MSc (Queen's Belfast), PhD (Western Ontario)
Recipient of the Distinguished Teacher Award

Associate Professor, Graduate Officer
S.M. Smith, BSc, MSc (McMaster), PhD (Manitoba) Recipient of the Distinguished Teacher Award

Assistant Professor, Graduate Officer
N.C. Bolis, BSc (Simon Fraser), MSc (British Columbia), PhD (Toronto)

Associate Professor, Undergraduate Officer
J.C. Carlson, BSc, MSc, PhD (Massachusetts)

Assistant Professor, Undergraduate Officer
W.R. Hawthorn, BSc, MSc (McMaster), PhD (Western Ontario)

Associate Professor, Undergraduate Officer
C.A. Peterson, BSc, MSc (Alberta), PhD (California, Davis)

Professors
E.B. Dumbroff, BSc, MForestry, PhD (Georgia)
C.H. Fernando, BSc (Ceylon), DPhil (Oxford)
A.D. Harrison, BSc, MSc, BEd, PhD (Cape Town)
H.B.N. Hynes, BSc, PhD, DSc (London), ARCS, FRSC
W.E. Inniss, BSA, MSA (Toronto), PhD (Michigan State)
W.B. Kendrick, BSc, PhD, DSc, (Liverpool) FRSC
J. Kruuv, BSc, MSc (Waterloo), PhD (Western Ontario)
J.K. Morton, BSc, PhD (Durham), FLS
J.J. Fasternak, BA, MA, BSc (Guelph), MSc (Toronto), PhD (Indiana)
G. Power, BSc (Durham), PhD (McGill)
J. Sivak, LLB (Toronto), MSc (Montreal), MS (Indiana), PhD (Carnegie)
J.B. Theberge, BScA (Guelph), MSc (Toronto), PhD (British Columbia)
Course Descriptions
Biology

Course Descriptions
Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes
All Honours Biology students who have completed their third year are required to participate in an off-campus field course (BIOL 497 or 498) before entering Year 4. These courses are held either in early Spring or the following September (after Labour Day). The cost of most trips will range from $100 to $500 per student.

The Huntsman Marine Laboratory, St. Andrews, New Brunswick offers a summer course “Introduction to Marine Biology”. This course will be accepted as 0.50 transfer credit towards a BSc if taken by students of the University of Waterloo.

BIOL 10 F,W,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, evolution and plant biology. Open to students other than those intending to major in Biology or to enter the School of Optometry.

BIOL 111L F 3L 0.25 Introductory Biology 1 Laboratory
A laboratory course only for students taking Biology 111. Take-home problems and/or assignments will alternate with in-house labs. Open to students other than those intending to major in Biology or to enter the School of Optometry.

BIOL 112 W 2C 0.5 Introductory Biology 2
An introduction to the basic principles of zoology and ecology with reference to man as a biological organism. Open to students other than those intending to major in Biology or to enter the School of Optometry.

BIOL 112L W 3L 0.25 Introductory Biology 2 Laboratory
A laboratory course only for students taking Biology 112. Labs on alternate weeks.

Open to students other than those intending to major in Biology or to enter the School of Optometry.

BIOL 201 F 2C,3L 0.5 Human Anatomy
Basic anatomical features of the skeletal, muscular, nervous and cardiovascular systems of the human. Open to students other than those intending to major in Biology.

BIOL 202 W 2C,3L 0.5 Embryology & Histology
Fundamental developmental processes in vertebrates, including man; the development of the early embryo; morphogenesis of tissues and the major organ systems. Structure of human cells and tissues at the light-microscope level; epidermis, connective, muscular and nervous tissues and the major organ systems. Open to students other than those intending to major in Biology.

BIOL 210 F 2C,3L 0.5 Introductory Invertebrate Zoology
A study of the functional morphology of selected invertebrate types with special emphasis on the various grades of organization and development in the different phyla.

BIOL 211 W,S 2C,3L 0.5 Introductory Vertebrate Zoology
An introduction to the structure, evolution and development of vertebrate organ systems. Offered during the Spring term in odd-numbered years.

BIOL 220 F 2C,3L 0.5 Plant Biology I - The Living Plant
An introduction to the structure, function and physiology of plants with emphasis on flowering plants.

BIOL 221 W,S 2C,3L 0.5 Plant Biology 2 - The Diversity of Plants
A comparative survey of the morphology and life histories of the different kinds of plants and fungi important to man and an introduction to their evolution. Offered during the Spring term in odd-numbered years.

BIOL 222 F T 0.5 Non-Vascular Plants
An introductory course which will survey the evolution, morphology,
ecology and importance to man of the fungi, algae, and bryophytes. 3y correspondence only for 1983-84.

BIOL 230 F 2C.3L 0.5
Introductory Cell Biology
An introduction to the concepts of cell biology with emphasis on (i) the structural organization of the cell and its constituent organelles and (ii) the function of critical molecular processes that are characteristic of living organisms.
When taking this course the lab must be designated separately. The lab is compulsory, but does not have any credit weight.

BIOL 233 W,S 2C.3L 0.5
Human Physiology
The physiology of the major organ systems including the nervous, muscular, circulatory, respiratory, urinary, digestive, endocrine and reproductive systems.
When taking this course the lab must be designated separately. The lab is compulsory, but does not have any credit weight.

BIOL 236 F 2C.3L 0.5
Introductory Microbiology
Introduction to fundamental theories, principles and methods of microbiology. Structure, methods of cultivation, growth, effects of physical factors, and inhibition and killing of microorganisms will be studied.

BIOL 245 F 2C.3L 0.5
General Microbiology I
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 II
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/3lidlab 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 310 F 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 311

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 311

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 315

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 316

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
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 I
Fungal taxonomy and ecology; medical mycology; plant pathology; industrial applications; food and food processing; toxins and hallucinogens; biological control, fungi as coprophiles, predators, and symbionts with plants and animals.
Prereq: BIOL 221

BIOL 330 F 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 W 2C,3L 0.5
Cell Physiology
The functional organization of cells with particular reference to cell-cell interaction, the structure, function and development of organelles and the biological roles of cellular membranes.
Prereq: BIOL 230

BIOL 333 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
A study of the principal physiological mechanisms that govern the water economy, mineral nutrition, transport processes and metabolism of plants.

BIOL 336 F 2C,3L 0.5
Embryology
Fundamental processes and concepts in embryonic development including the acquisition of multicellularity, organi
BIOL 337 F 2C,3L 0.5
Comparative Animal Physiology 1
The comparative physiology of animals with particular emphasis on homeostatic principles as demonstrated by water balance, excretion, nutrition, digestion and the endocrine system.
BIOL 338 W 2C,3L 0.5
Comparative Animal Physiology 2
A comparative study of the cardiovascular, nervous, muscular, respiratory and reproductive systems.

BIOL 342 F 2C,3L 0.5
Microbial Biotechnology
The role of microorganisms in biotechnology. Topics examined will include the isolation, selection, and development of microorganisms important in biotechnology, and specialized techniques for their cultivation and maintenance. Processes studied will include biomass conversions, fermentations, bioproduction of compounds, nitrogen fixation, treatment and utilization of wastes and mineral leaching.
Prereq: BIOL 240-241 or permission of instructor.

BIOL 344 W 2C,3L 0.5
Microorganisms in Foods
Food preservation, spoilage, poisoning and modern concepts in quality assurance programs are studied. The aim is to understand factors governing microbial changes in foods. Problem solving in the food industry is emphasized. Laboratory work will reflect current practices in quality control and testing.
Prereq: BIOL 240-241 or permission of instructor.

BIOL 350 F 2C,3L 0.5
Environmental Toxicology 1
An introduction to the basic theories, principles and techniques of environmental toxicology. A comparative study of the effects of specific groups of toxicants on ecosystems; biodegradation and cycling.

BIOL 356 W 2C,1T 0.5
Population Ecology 1
The ecology of populations. Topics include: demographic parameters and their estimation; population growth and regulation; competitive and predator-prey interactions; population genetics and evolution; applied population biology.
Prereq: BIOL 250 and STAT 202

BIOL 418 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
Physiology
The taxonomy and ecology of freshwater and marine algae. Algal cytology, morphology, and life histories; biology of planktonic and attached algae; culturing of algae; experimental phycolgy; economic aspects of algae.
Prereq: BIOL 220 or 221

BIOL 427 W 2S,3L 0.5
Mycology 2
The growth of mycological knowledge will be traced, and current developments analyzed. Extensive literature surveys, active class participation, and a lab project will be required.
Prereq: BIOL 327

BIOL 430 F 2C,3L 0.5
Comparative Animal Physiology 1
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 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 436.

BIOL 435 F 2C,3L 0.5
Developmental Biology
Analysis of embryonic development of selected organisms with emphasis on growth and the processes of subcellular, cellular and organ differentiation stressing recent experimental methodology.

BIOL 438 W 3C/S 0.5
Advanced Molecular Biology
An examination of the current major issues in molecular biology with emphasis on the technical and conceptual advances. Current research literature will be reviewed.
Prereq: BIOL 330. Offered every other year. Alternates with BIOL 434.

BIOL 439 W 3C 0.5
Biochemistry of Natural Products
The chemistry, functions and distribution of natural products including alkaloids, isoprenoids, amines, phenolics, 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
B I O L 4 4 3  F  2 C, 3 L  0 . 5
Microorganisms of Industrial Importance
A study of the role of microorganisms in industrial processes of biosynthesis and degradation.
Prereq: BIOL 344

B I O L 4 4 4  W  2 C, 3 L  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

B I O L 4 4 6  F  2 C, 3 L  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.

B I O L 4 4 7  W  2 C, 3 L  0 . 5
Environmental Microbiology
A study of the environmental impact of microorganisms. Aspects of pollution, waste treatment, biodegradation of environmental contaminants, and nutrient cycling will be examined.
Prereq: BIOL 240-241, 446 or permission of instructor.

B I O L 4 4 8  F  2 C, 3 L  0 . 5
Microbial Physiology 1
A study of the physiology of microorganisms including multiphasic and synchronous growth, cell permeation, nutrition, physical and chemical environmental factors and metabolic mechanisms as elucidated by radioactively labelled tracers.
Prereq: BIOL 240-241, or permission of instructor.

B I O L 4 4 9  W  2 C, 3 L  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.

B I O L 4 5 0  F  2 C, 3 S/fldlab  0 . 5
Aquatic Biology
An introduction to the physics, chemistry and biology of the marine and freshwater environments.
Prereq: BIOL 315 or 316, 497
N.B. Limited to 24; priority will be given to Honours students.

B I O L 4 5 2  F  2 C, 3 L  0 . 5
Introduction to Fisheries Biology
The practices of fisheries biology; fish classification, life history, production, harvest and management.

B I O L 4 5 5  F  2 C, 3 L  0 . 5
Environmental Toxicology 2
Cellular, developmental and physiological effects of toxicants on multicellular organisms.
Prereq: BIOL 350

B I O L 4 5 6  W  2 C, 3 S/fldlab/T  0 . 5
Population Ecology 2
The analysis of the structure and dynamics of plant and animal populations. Theoretical, mathematical and experimental approaches to the study of population ecology. Evolutionary processes in population biology.
Prereq: BIOL 356

B I O L 4 5 7  F  2 C, 3 S/fldlab/T  0 . 5
The Analysis of Communities
Sampling procedures to estimate abundance and distribution of organisms in time and space. Methods to analyze success. 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

B I O L 4 5 8  F  2 C, 3 L  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.

B I O L 4 6 0  F  3 C  0 . 5
Statistical Procedures for Biologists 1
An introduction to biometrical analysis. Measures of central tendency, dispersion and variability; the normal distribution; one-sample hypotheses; parametric and non-parametric two-sample and paired-sample hypotheses; correlation; goodness-of-fit tests; chi-square and G-tests for contingency tables; the Poisson and Binomial distributions. Throughout, the emphasis is on biological examples and problems from the student's own research area.

B I O L 4 6 1  W  3 C  0 . 5
Statistical Procedures for Biologists 2
Design and analysis of experiments with an emphasis on the application of statistics to the student's area of research. Topics will include: analysis of variance; experimental designs: factorial experiments; models; missing data; transformations; a priori and a posteriori comparisons among means; regression analysis; analysis of covariance.

B I O L 4 7 3  W  3 C/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

B I O L 4 7 4  W  3 C  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.

B I O L 4 8 0  W  3 C  0 . 5
Biotechnology
Biotechnology is an interdisciplinary science which entails understanding how biological processes can be developed for large scale practical use. The topics examined include (1) genetic engineering (2) enzymes for industrial and pharmaceutical use and (3) plant and animal cell culture systems.
Prereq: BIOL 240-241 and CHEM 237 or permission of the instructor.

B I O L 4 9 7  F,W,S  fldlab  0 . 5
Field Course 1
This intensive field course of two weeks duration may be one of several arranged or approved by the Department and is usually taken after completion of third year.

B I O L 4 9 8  F,W  fldlab  0 . 2 5
Field Course 2
Required of all honours biologists except those who take BIOL 497. This general interest field course usually of one week duration may be one of several arranged or approved by the Department and is usually taken after completion of third year.
Canadian Studies

Assistant Professor, Acting Chairman of the Canadian Studies Program Board
D.J. Horton, BA (Waterloo Lutheran), MA (Waterloo), PhD (McGill)

Assistant Professor, Director of the Program
S.E. McMullin, BA, MA (Carleton), PhD (Dalhousie)

Members of the Canadian Studies Program Board

Professors
G.R. Francis, BA (Toronto), BA (McGill), MA (British Columbia), PhD (Michigan)
R.R. Krueger, BA, MA (Western Ontario), PhD (Indiana)
D.W. Hoffman, BSA, MSA (Toronto), PhD (Waterloo)

Associate Professors
T.S. Atler, BA (Northwestern), MS (Wisconsin-Milwaukee), PhD (Toronto)
K.M. Bennett, BA, MA (Queen's), PhD (McGill)
F.C. Gerard, MA (College St. Dominique, France), BD (McGill), STM (McGill), PhD (Harvard, Conn P)
A. Hunter, BA (British Columbia), MA, PhD (Columbia)
R.D. Legge, BA (Transylvania), STB (Harvard), PhD (McMaster)
W.R. MacNaughton, BA (Toronto), MA, PhD (Wisconsin)
W.D. Wilson, MA, PhD (Trinity College Dublin)

Assistant Professors
S.D. Burt, BA, MA (Waterloo), PhD (York)
D.J. Horton, BA (Waterloo Lutheran), MA (Waterloo), PhD (McGill)

Course Descriptions

Canadian Studies

Course Descriptions

Canadian Studies

BIOL 499 Y 1.0
Senior Honours Project
A senior-year research project. Normally, only students attaining a 70% cumulative major average will be accepted into this course. Students are referred to the co-ordinator for BIOL 499 for further details.

Not Offered 1983-1984
BIOL 433 Stress Physiology and Aging in Plants

Participating Faculty 1982-83
Professor
R.R. Krueger, BA, MA (Western Ontario), PhD (Indiana)

Associate Professors
J.R. English, BA (Waterloo), AM, PhD (Harvard)
K.M. McLaughlin, BA (Waterloo), MA (Dalhousie), PhD (Toronto)
W.R. Needham, BComm (Carleton), MA, PhD (Queen's)
W.R. Thirsk, BA, MA (British Columbia), PhD (York)
S.M. Weaver, BA, MA, PhD (Toronto)

Assistant Professors
S.D. Burt, BA, MA (Waterloo), PhD (York)
D.J. Horton, BA (Waterloo Lutheran), MA (Waterloo), PhD (McGill)
S.E. McMullin, BA, MA (Carleton), PhD (Dalhousie)
P. Socken, BA (Toronto), MA (Iowa), PhD (Toronto)

Core Courses

CDN ST 101 F 2C,1S 0.5
Landforms and Mindscapes
An introduction to the Canadian landscape and its early impact upon the creative imagination of Canadians. The course sets out to provide a basis for dealing with contemporary Canadian culture.

CDN ST 201 F 2C,1S 0.5
Social Regionalism
Lecturers in Geography, Political Science, Sociology and History discuss the roles which economic disparities, social elites, federal/provincial relations and political parties play in defining Canadian regionalism. Particular attention is paid to Quebec's desire for separate status.

CDN ST 202 W 2C,1S 0.5
Cultural Regionalism
Lecturers discuss the contribution made by literature, film, drama, and fine arts in defining distinctive regional identities in Canada. Particular attention is paid to the emergence of a distinctive Ontario culture.
Course Descriptions
Chemical Engineering

Department of Chemical Engineering

Professor, Chairman of Department
E. Rhodes, BSc Tech, MSc Tech, PhD (Manchester), PEng

Professor, Associate Chairman (Graduate Studies)
T. Z. Fahidy, BSc, MSc (Queen's), PhD (Illinois), PEng

Associate Professor, Associate Chairman (Undergraduate Studies)
G.S. Mueller, BASc (Waterloo), MSc, PhD (Manchester), PEng

Professor, Associate Dean, Graduate Studies
D.S. Scott, BSc, MSc (Alberta), PhD (Illinois), PEng

Professors
J.J. Byerley, BASc, MASc (Toronto), PhD (British Columbia)
K.S. Chang, BS (Hayang Inst. Tech., Seoul), MSc, PhD (Northwestern)
A. Dullien, Dipl Ing (Budapest Technical University) MASc, PhD (British Columbia), PEng
R. Y.-M. Huang, BSc (National Taiwan University), MASc, PhD (Toronto), PEng
R.R. Hudgins, UE, BASc, 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 (McGill)
P.M. Reilly, BASc (Toronto), DIC, PhD (London), PEng
G.L. Rempel, BSc, PhD (British Columbia)
C.W. Robinson, BASc (British Columbia), PhD (UC Berkeley)
A. Rudin, BSc (Alberta), PhD (Northwestern)
P.L. Silveston, BS, MS (MIT), Dr Ing (Munich), PEng
D.R. Spink, BS (Mich), MS (Rochester), PhD (Iowa State), PEng
G.A. Turner, BSc (London), PhD (Manchester)
B.M.E. van der Hoff, Ing (Amsterdam), Ir (Delft)

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. Gall, BASc, MSc (Queen's), PhD (Minn.), PEng
I.F. Macdonald, BEng (NSTC), PhD (Wisconsin)
J.R. Wynnyckyj, BEng (McGill), MASc, PhD (Toronto)

Assistant Professors
I. Chatzis, BASc, MASc, PhD (Waterloo), (DuPont - NSERC Assistant Professor)
J.M. Scharer, BSc, PhD (Pennsylvania)
G.R. Sullivan, BASc (Waterloo), DIC, PhD (London), PEng (DuPont - NSERC Assistant Professor)

Adjunct Faculty
T.L. Batke, BASc, MASc, PhD (Toronto), LL.D (Waterloo)
B.A. Jacobson, BSc, MSc (Alberta), PEng
P. Reaydoughy, BSc (McMaster)

Faculty Members of Chemical Engineering holding cross appointments to:
\*Chemistry
\*Management Sciences
\*Statistics

Faculty Members holding cross appointments to Chemical Engineering from:
\*Chemistry

Course Descriptions

Introductory Notes
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.

CH E 100
F 3C,1T,6L for first 6 weeks 0.75

Chemical 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

Chemical Engineering Concepts 2
An extension of the topics covered in CH E 100; energy balances; laboratory experiments illustrate the physical principles discussed.

CH E 102 F 3C,2T 0.5
Chemistry for Engineers
Chemical principles with applications in engineering. Stoichiometric calculations, properties of gases, properties of liquids and solutions; gas phase chemical equilibrium, ionic equilibrium in aqueous solution, oxidation-reduction reactions, chemical kinetics.

CH E 210 W,F 3C,1T 0.5
Transport Processes 1 (Equilibrium Stage Operations)
Equilibrium between phases; the equilibrium-stage concept. Cascades of stages with and without reflux; examples of their analysis when used to separate components by distillation, extraction, absorption and leaching. Introduction to computer methods for multicomponent mixtures.

CH E 213 S,F 3C,2L 0.5
Transport Processes 2 (Fluid Mechanics)
Fundamentals of fluid flow; conservation laws for mass, momentum and mechanical energy; flow of fluid in conduits; flow past immersed bodies. Description, collection and separation of particulate systems.

CH E 220 W,F 3C,1T 0.5
Applied Mathematics 1
Basic concepts of probability and their relevance to engineering decisions. Statistical frequency distributions, tests of significance, correlations, curve fitting, sampling theory, applications: errors, design of experiments.

CH E 230 W,F 3C,1T 0.5
Physical Chemistry 1
Introduction to physical chemistry: Ideal and real gases, the kinetic theory of gases, first law of thermodynamics, thermodynamics, heats of reaction, second law, chemical equilibrium in simple systems, phase equilibria in simple systems, third law.
Course Descriptions
Chemical Engineering

CH E 231 S.F 3C,11 0.5
Physical Chemistry 2
Prereq: CH E 230

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 213

CH E 317 W,F 3C,1T 0.5
Transport Processes 4 (Mass Transfer)
Mass transfer by molecular and turbulent motion, heat-mass transfer analogies, mass transfer models and application to separations such as: distillation, absorption, adsorption, extraction etc.: simultaneous heat and mass transfer in gas-liquid contacting and solids drying; introduction to mass transfer with chemical reaction.
Prereq: CH E 314

CH E 320 W,S 3C 0.5
Applied Mathematics 2
Gamma-Beta- and error-functions; sine-cosine- exponential- and elliptic-integrals, linear differential equations; Wronskian, Green function; initial and boundary value problems; Bessel functions; Fourier series, integrals and transforms; orthogonal functions. Laplace transforms; applications.

CH E 321 W,F 3C 0.5
Process Dynamics and Control 1
Block and signal flow diagrams, proportional-integral-derivative controllers, frequency response techniques, analytical and graphical stability criteria. Introduction to modern control theory.
Prereq: MATH 216, CH E 314, CH E 320

CH E 330 W,S 3C 0.5
Chemical Engineering Thermodynamics
Thermodynamics of flow processes, vapour power plants, internal combustion engines, liquefaction of gases, refrigeration and evaporation, chemical equilibria in chemical reactions, thermal pollution, the energy crisis; efficient energy utilization and thermodynamics.
Prereq: CH E 231

CH E 331 W,F 3C 0.5
Chemical Reaction Engineering
Homogeneous reactors; batch, CSTR, tubular flow systems, ideal models, residence time distributions in ideal reactors, temperature effects, steady states, semi-batch systems, nonideal behaviour. Heterogeneous catalysis: mass transfer effects; catalytic rate equations, fixed and fluidized bed reactors.
Prereq: CH E 231

CH E 332 W,S 3C 0.5
Inorganic Chemistry 2
Introductory electrochemistry; electrolysis, electrolytic conductance and transport, reversible electrode processes, irreversible electrode processes and electrode kinetics, electrochemical measurements and their analytical applications, chemistry of corrosion.
Prereq: CH E 232

CH E 333 W,F 3L 0.5
Instrumental Methods of Chemical Analysis
An introduction to modern analysis including optical, electrochemical, radio-chemical, chromatographic and spectrophotometric methods.

CH E 382 W,S 3C 0.5
Engineering Economics and Process Design 1
Mathematics of annuities, mortgages, bonds and small loans: cost accounting, including direct costing, depreciation, taxes and financial statements. Sizing and costing of piping and heat transfer equipment; design of process components.

CH E 401 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 464 S,F 3C 0.5
Engineering Economics and Process Design 2
Estimation of sales, and capital and operating costs of a new process or product; 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 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.
Course Descriptions
Chemical Engineering

CH E 515 W 3C 0.5
Two-Phase Flow Operations
Introduction to one-dimensional two-phase flow. Conventions, definitions, homogeneous theory, separated flow (Lockhart-Martinelli), particulate characterization and behavior: applications: two-phase flow in pipes, boiling and evaporation, filtration.

CH E 517 W 3C 0.5
Performance of Separation Processes
Introduction, patterns of change and computational approaches, group methods, limited flows and stage requirements, capacity and efficiency of contacting devices, energy requirements, selection, optimal design and operation, mass transfer with chemical reaction.

CH E 520 S,F 3C 0.5
Chemical Engineering Analysis
Application of advanced mathematical techniques to the analysis of chemical engineering processes. Prereq: Permission of instructor.

CH E 521 W 3C 0.5
Process Dynamics and Control 2
Analog computation, time domain analysis, control of complex chemical systems. Prereq: CH E 420

CH E 523 W 4L 0.5
Process Control Laboratory
Experiments on process dynamics, control and analog simulation of chemical processes. Time constant, step and frequency response, controller settings, cascade control of thermal, liquid level, and reaction systems. Prereq: CH E 420

CH E 540 S,F 3C 0.5
Introduction to Polymer Science
Basic concepts of polymer chemistry, classification of polymers, introductory physical chemistry of polymers, organic chemistry of polymerization reactions of polymers, naturally occurring polymers.

CH E 541 W 3C 0.5
Physical Chemistry of Polymers
Polymer solutions, molecular characterization of polymers, molecular weight distributions, morphology and crystallinity in polymers, reaction kinetics and mechanism of addition and condensation polymerization. Prereq: CH E 540

CH E 543 W 3L 0.6
Polymer Laboratory
Experimental studies of polymerization and physical properties of polymers: condensation and addition polymerization, copolymerization, molecular weight, extrusion rheology. Prereq: 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 electrolysis, 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 coordination 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 554 W 3C 0.5
Fermentation Operations
Application of process engineering principles to the design and operation of fermentation reactors which are widely used in the pharmaceutical, food, brewing, and waste treatment industries. Aspects of mass transfer, heat transfer, mixing, and rheology with biochemical and biological constraints. Course includes some lab work. Prereq: CH E 560 or permission of instructor.

CH E 556 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. Prereq: 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, electrochemical, reverse osmosis, etc.; economics, regulations, moral, legal, social and political implications.

CH E 580 S,F 6L 0.5
Research-Design Project 1
Individually supervised research and/or design project on any Chemical Engineering subject chosen by the student-professor group. Written report required.

CH E 581 W 12L 1.0
Research-Design Project 2
Continuation of CH E 580
Equivalent to 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.
Course Descriptions

Chemistry

T.E. Gough, BSc, PhD (Leicester)
A.J. Carty, BSc, Professors
Professors

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 585  W 6L  0.5

CH E 007  W.S.F  1C  0

Department of Chemistry

Course Descriptions

Adjunct Faculty
B.O. Fraser-Raid, MSc (Queen's), PhD (Alberta), FCIC
R.H. Marchessault, BSc (Montreal-Loyola), PhD (McGill)
R.G.A. Rodrigo, BA (Ceylon), PhD (Nottingham)
N.J. Taylor, BSc, PhD (Surrey)

Senior Demonstrators
S.O. deSilva, BSc (Ceylon), PhD (Waterloo)
C. Folier, BSc (Purdue), MSc, PhD (Rutgers)
S. McBride, BSc (Western Ontario)
T. Rudensky, BSc, PhD (Waterloo)

Faculty Members of Chemistry holding cross appointments to:

1. Physics
2. Applied Mathematics
3. Chemical Engineering

Faculty Members holding cross appointments to Chemistry from:

4. Physics
5. Applied Mathematics
6. Chemical Engineering
7. Biology

Course Descriptions

Some courses are regularly given every other year, and are listed in their regular places. Any other courses not offered in the current academic year are listed at the end of this section.

Introductory Notes
In all cases, it is the student's responsibility to determine eligibility to enter a course. It is advisable to obtain special consents in writing before registration period to avoid delays and complications.

Most 300- and 400-level courses are listed as 2 lecture hours. An additional hour may be scheduled at the discretion of the lecturer, usually for a tutorial.

Core Courses
The courses listed below are core courses.

(a) for Honours Students only:
Advanced Lab: 492
Courses Carrying No University Credit

CHEM 001

Pre-University Chemistry
The course covers the material considered essential preparation for first year chemistry courses. Included are formula, nomenclature, stoichiometry, an introduction to thermodynamics, 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

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

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

Chemical Reaction Laboratory 1
Selected experiments for students taking CHEM 123.

CHEM 124

Organic Chemistry 1
Bonding in carbon compounds. Structures, properties and nomenclature of several important classes of organic compounds. Interconversions of functional groups. Mechanisms of organic reactions. Prereq: Grade 13 Chemistry, Mathematics (Calculus) Coreq: (for Science students) CHEM 124L

CHEM 124L

Chemical Reaction Laboratory 2
Selected experiments for students taking CHEM 124.

Upper Year Chemistry Courses

CHEM 26

Organic Chemistry 2
An introduction to the important classes of heterocyclic compounds and natural products. Prereq: CHEM 26

CHEM 212

Structure and Bonding

CHEM 218

Development of Chemical Bonding and Structure

CHEM 219

Chemistry of Non-Transition Elements
Group trends in main group chemistry. Emphasis will be placed on correlation of structure with physical properties in various groups of compounds. Prereq: CHEM 212 or 218 Coreq: CHEM 313

CHEM 220

Introductory Analytical Chemistry
The principles underlying quantitative measurements. Prereq: CHEM 123, 123L Coreq: (for Science students) CHEM 220L Antireq: CHEM 226

CHEM 221

Analytical Chemistry Laboratory 1
Selected experiments for students taking CHEM 220.

CHEM 221L

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 222L

Analytical Chemistry Laboratory 2
Selected experiments for students taking CHEM 221.

CHEM 228

Analytical Chemistry for Life Sciences
Selected topics of importance to Biology students, with related experiments. Prereq: CHEM 123 and 124 Coreq: CHEM 220. 226 For students in Honours Biology only.

CHEM 237

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 265 Coreq: CHEM 237L

CHEM 237L

Introductory Biochemistry Laboratory
Selected experiments for students taking CHEM 237.

CHEM 254

Physical Chemistry 1
This course emphasizes the macroscopic approach. Areas to be studied include properties of gases: the first, second and third laws of thermodynamics applied to ideal systems; chemical equilibrium. Prereq: CHEM 123, MATH 113a/b or equivalent. Coreq: CHEM 356
CHEM 255  F.W,S  2C,1T  0.5
Physical Chemistry 2
Thermodynamic concepts are applied to a variety of systems, to mixtures of nonelectrolytes and to solutions of electrolytes. The difference between thermodynamic and dynamic equilibria is introduced to deal with rates of chemical reactions and their relationship to experimental data.
Prereq: CHEM 254

CHEM 264  F,W  3C  0.5
Organic Chemistry 2
Preparation and reactions of typical organic functional groups examined from the basis of the reaction mechanisms. Stereochemistry of organic molecules.
Prereq: CHEM 124
Antireq: CHEM 36, 266

CHEM 265  F.W,S  2C,1T  0.5
Organic Chemistry 3
The detailed treatment of organic chemistry begun in CHEM 124 and 264 is continued, with further emphasis on stereochemistry, reaction mechanisms and aromaticity. Introduction to spectroscopy.
Prereq: CHEM 264 taken in or after 1981-82
Antireq: CHEM 364, CHEM 366

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
Continued more detailed discussions of the important classes of aliphatic and aromatic compounds. An extended look at stereochemistry and its importance in reaction mechanisms.
Prereq: CHEM 124
Antireq: CHEM 36, 264

CHEM 266L  F,W  3L  0.25
Organic Chemistry Laboratory
Selected experiments for students taking CHEM 266.

CHEM 267  W  2C  0.5
Basic Organic Chemistry 3
A continuation of the concepts of CHEM 266. Introduction to carbohydrates, proteins, and lipids. Introduction to NMR and IR spectroscopies.
Prereq: CHEM 266
Antireq: CHEM 36, 265, 264

For students needing a full year of Organic Chemistry as a prerequisite to medicine, either the sequence 266-267 and 265L, or the sequence 264-265 and 265L should be selected.

CHEM 311  W  2C  0.5
Radiochemistry
Prereq: Grade 13 Chemistry

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
Antireq: CHEM 316

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
Antireq: CHEM 316

CHEM 314L  F,W,S  3L  0.25
Inorganic Chemistry Laboratory 1
An introduction to practical inorganic chemistry.

CHEM 315L  F,W  8L  0.5
Inorganic Chemistry Laboratory 2
Advanced experiments in inorganic chemistry.
Prereq: CHEM 314L

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
Antireq: CHEM 312

CHEM 316L  F  3L  0.25
Inorganic Chemistry Laboratory
Selected experiments for students taking CHEM 316.

CHEM 320  W  2C  0.5
Analytical Separations
Basic principles, instrumentation and methods of liquid and gas chromatography.
Prereq: CHEM 221 or permission of instructor.

CHEM 321L  W  3L  0.25
Advanced Analytical Laboratory
Selected experiments for students of analytical chemistry.
Prereq: CHEM 221 and 221L

CHEM 332  F,S  2C  0.5
Structural Biochemistry
Prereq: CHEM 237
Coreq: CHEM 265 or 267

CHEM 332L  F,S  3L  0.25
Structural Biochemistry Laboratory
Selected experiments for students taking CHEM 332.

CHEM 333  F,W  2C  0.5
Metabolism 1
Metabolism of carbohydrates, lipids and amino acids.
Prereq: CHEM 237
Coreq: CHEM 265 or 267

CHEM 333L  F,W  3L  0.25
Metabolism Laboratory
Selected experiments for students taking CHEM 333

CHEM 350  W  2C  0.5
Spectroscopy and Molecular Structure
Introduction to concepts and applications of microwave, Raman, IR, electronic and resonance spectroscopy with respect to molecular parameters.
Prereq: CHEM 355

CHEM 353  F,S  3C  0.5
Introduction to Polymer Science
Basic definitions and polymer nomenclature, molecular weight averages and distributions, polymer stereochernistry. step-growth and chain-growth polymerization reactions, applications of polymers.
Prereq: CHEM 264 or equivalent
Course Descriptions
Chemistry

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.
Antireq: PHYS 354

CHEM 355L F.W.S 3L 0.25
Physical Chemistry Laboratory 1
Selected experiments for students
taking CHEM 355.

CHEM 356 F 2C,1T 0.5
General Physical Chemistry
An introductory survey of the thermo-
dynamics of ideal systems; the appli-
cation of thermodynamic principles to
the study of solution, phase equilibria,
chemical equilibrium and the properties
of electrolytes.
Prereq: CHEM 123 and MATH 113a/b or
equivalent.
Antireq: CHEM 254

CHEM 356L F 3L 0.25
General Physical Chemical
Laboratory 1
Selected experiments for students
taking 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 113a/b or equivalent.

CHEM 357L W 3L 0.25
General Physical Chemistry
Laboratory 2
Selected experiments for students
taking CHEM 357.
Prereq: CHEM 356L

CHEM 358 F.W 2C,1T 0.5
Physical Chemistry 4
The statistical nature of large assem-
bles 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 266

CHEM 363 W 2C 0.5
Applied Organic Chemistry
The organic chemistry involved in
selected industrial processes will be
discussed. Petroleum chemistry,
synthesis of dyestuffs, pharmaceuticals,
pesticides, organic polymers, etc.
Prereq: CHEM 265 or 267

CHEM 366 F 2C 0.5
Structural and Synthetic Organic
Chemistry
Stereocchemistry of organic molecules; synthesis of selected organic com-
pounds examined in detail with empha-
sis on cyclo-addition reactions and condensation reactions.
Prereq: CHEM 267 or 364
Antireq: CHEM 368

CHEM 366L F 3L 0.25
Organic Chemistry Laboratory
Selected experiments for students
taking CHEM 366.

CHEM 368 F.W,S 2C 0.5
Organic Chemistry 4
The design of organic syntheses, and
especially the formation of enolate ions
and their use in the formation of new
carbon-carbon bonds. Acidity and basic-
city of organic molecules. Stereo-
chemical concepts applied to organic
molecules as well as conformational
analysis.
Prereq: CHEM 265
Antireq: CHEM 365, 366

CHEM 368L F.W,S 6L 0.5
Organic Chemistry Laboratory 2
Selected experiments for students
taking CHEM 368.

CHEM 395 W(even years only) 3C 0.5
History of Chemistry
The development of chemistry will be
traced from alchemy to the 20th
century. The contributions of famous
scientists to the concepts and models of
modern chemistry will be emphasized.
Prereq: Completion of two years of a
Chemistry Honours or Major program.

CHEM 411 F 2C 0.5
Organometallic Chemistry
The synthesis, characterization and
reactivity of compounds containing
metal-carbon covalent bonds. Metal
carbonyls and their derivatives. Olefin,
acetylene, pi-arene and related complexes. The nature of the metal-
carbon bond. Catalysis by transition
metal organometallics.
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 includ-
ing 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 carbo-
ranes 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
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Description</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 419 W 2C 0.5</td>
<td>Biological Aspects of Inorganic Chemistry</td>
<td>Metallocproteins 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.</td>
<td>Prereq: CHEM 312 or 316</td>
</tr>
<tr>
<td>CHEM 420 W 2C 0.5</td>
<td>Analytical Chemistry</td>
<td>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.</td>
<td>Prereq: CHEM 221 or permission of instructor</td>
</tr>
<tr>
<td>CHEM 421 W 2C 0.5</td>
<td>Mass Spectral and Chromatographic Analysis</td>
<td>Techniques and fundamental principles of combining chromatography and mass spectrometry for the identification of chemical compounds.</td>
<td>Prereq: CHEM 320 and 264, or permission of instructor</td>
</tr>
<tr>
<td>CHEM 422 F 2C 0.5</td>
<td>Thermal and Electrical Analytical Methods</td>
<td>Techniques and fundamental principles of thermal and electroanalytical methods.</td>
<td>Prereq: CHEM 221 and PHYS 243 or permission of instructor</td>
</tr>
<tr>
<td>CHEM 432 F 2C 0.5</td>
<td>Metabolism 2</td>
<td>Properties and metabolism of porphyrins, purines, pyrimidines and biogenic amines. Structure-function relationships of enzymes. Control and transport mechanisms.</td>
<td>Prereq: CHEM 333 and 333L Coreq: CHEM 332</td>
</tr>
<tr>
<td>CHEM 433 W 2C 0.5</td>
<td>Advanced Biochemistry</td>
<td>Oxidative phosphorylation, Vision, Mevalonic acid pathways, Serine proteases, Prostaglandins, Salt balance, Respiration.</td>
<td>Prereq: CHEM 333 and 333L</td>
</tr>
<tr>
<td>CHEM 434 W 2C 0.5</td>
<td>Applied Biochemistry</td>
<td>Chemistry and function of antibiotics; blood coagulation and related topics. Immuno-chemistry. Nutritional aspects of food.</td>
<td>Prereq: CHEM 333</td>
</tr>
<tr>
<td>CHEM 435 F 2C 0.5</td>
<td>Bioorganic Mechanisms</td>
<td>Modern techniques of biosynthetic studies. Enzyme reaction mechanisms. Prereq: CHEM 237 and one of 368, 366, 365.</td>
<td></td>
</tr>
<tr>
<td>CHEM 436 F 2C 0.5</td>
<td>Colloids, Liquid Crystals and Bilayer Chemistry</td>
<td>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.</td>
<td>Prereq: CHEM 255</td>
</tr>
<tr>
<td>CHEM 437 W 2C 0.5</td>
<td>Polymer Properties and Polymerization</td>
<td>Copolymerization, emulsion polymerization, ionic and coordinate polymerization, basics of polymerization process selection.</td>
<td>Prereq: CHEM 353 or equivalent.</td>
</tr>
<tr>
<td>CHEM 444 F 2C 0.5</td>
<td>Surface Chemistry</td>
<td>An introduction to the physical chemistry of surfaces. Qualitative and quantitative descriptions of surfaces and interfaces and the development of relevant techniques and theories. Application to surface tension, spreading, wetting, adsorption, and other interfacial phenomena.</td>
<td>Prereq: CHEM 255</td>
</tr>
<tr>
<td>CHEM 445 F 3C 0.5</td>
<td>Electrochemistry</td>
<td>Electrolytic conductance and transport, thermodynamics of electrolytic cells. Reversible and irreversible electrode processes, metallic corrosion; study of selected industrial electrochemical processes.</td>
<td>Prereq: CHEM 254 or 356</td>
</tr>
<tr>
<td>CHEM 446 F 2C 0.5</td>
<td>Spectroscopy in Organic Chemistry</td>
<td>Elucidation and identification of organic structures by contemporary spectroscopic techniques.</td>
<td>Prereq: CHEM 265 or 364</td>
</tr>
<tr>
<td>CHEM 447 W 2C 0.5</td>
<td>Special Topics in Organic Chemistry</td>
<td>Topics will be selected from photochemistry, organometallics, synthesis, heterocyclics, natural products, molecular rearrangements. (May be taken in third and fourth year as 456A and 456B provided topics are different).</td>
<td>Prereq or coreq: CHEM 365 or 368</td>
</tr>
<tr>
<td>CHEM 448 Y 9L 1.5</td>
<td>Advanced Laboratory</td>
<td>Laboratory work on a senior year research project. See CHEM 492 coordinator for descriptive booklet and details.</td>
<td></td>
</tr>
</tbody>
</table>
Course Descriptions
Civil Engineering

Department of Civil Engineering

Professor, Chairman of the Department
Vacancy

Professor, Dean of Engineering
W.C. Lennox, BASc, MSc (Waterloo), PhD (Lehigh), PEng

Professor, Associate Chairman
Graduate Studies
J. Roorda, BASc (Waterloo), PhD (London), PEng

Associate Professor, Associate Chairman, Undergraduate Studies
N. Kouwen, BASc, PhD (Waterloo), PEng

Professor, Dean of Graduate Studies
H.E. Leipholz, Dipl Ing, Rofasser, & an of Graduate Studies

Faculty Members holding cross-appointments to:

- Applied Mathematics
- Architecture
- Earth Sciences

Associate Professor, Associate Chairman, Graduate Studies
G.M. Gladwells, BASc (Waterloo), PhD (Cambridge), PEng

Associate Professor, Associate Chairman, Undergraduate Studies
E.F.P. Burnett, BASc, PhD (Alberta), PEng

Recipient of the Distinguished Teacher Award

Professors

S.T. Ariaratnam, BASc, MSc (Ceylon), MSc (London), PhD (Cambridge), PEng

M.B. Dusseaufii, BASc, PhD (Alberta), PEng

E.F.P. Burnett, BASc, PhD (London), PEng

M.Z. Cohn, CSc (Bucharest), PEng

G.J. Farquhar, BASc (Waterloo), PhD (Wisconsin), PEng, Recipient of the Distinguished Teacher Award

G.M.L. Gladwelh, BASc, PhD, DSc (London)

R. Green, BASc (Eng)(London), MSc (Queen's), MSc (Waterloo), PhD (Texas), PEng

D.E. Gniezson, BASc, MASC, PhD (Waterloo), PEng

R.C.G. Haas, BASc, MSc (Alberta), PhD (Waterloo), PEng

V.K. Handa, BASc (Calcutta), BSc (Eng) (London), MSc (Queen's), MASC, PhD (Waterloo), PEng

B.G. Hutchinson, BE (Sydney), MSc (Queen's), PhD (Waterloo), PEng

N.C. Lind, MSc (Tech. Univ. of Denmark), PhD (Illinois), FNSC, PEng

E.A. McBean, BASc (British Columbia), SM, PhD (MIT), PEng

W.A. McLaughlin, PEng (Saskatchewan), MS, PhD, PEng

G.M. MeNiece, BASc (Waterloo), PhD (London), PEng

J.T. Pindera, Dr of Tech Sciences (Warsaw), Docent Habil (Cracow), PEng

T. Prasad, BASc, MSc (Banaras Hindu Univ.), PhD (Cambridge)

J. Schroeder, BEng, MEng (McMaster), PhD (Waterloo), PEng

A.N. Sherbourne, BSc (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 Eng (Bucharest), PhD (City Univ., London), PEng

T.H. Topper, BASc (Toronto), PhD (Cambridge), PEng

T.E. Unny, BE (Madras), MTech (Kharagpur), Dr Ing (Dresden), PEng

S. Yagar, BASc, MASC (Toronto), PhD (California), PEng

Associate Professors

R.W. Cockfield, BSc, MSc (Queen's), PhD (Waterloo), PEng

B. LeLievre, BEng (West Australia), MASC, PhD (Waterloo), PEng

E.L. Matyas, BASc (Toronto), DSC, PhD (London), PEng

R.M. Schuster, BS, MS (North Dakota State), PhD (Iowa State), PEng

I.J. Smalley, CEng, PhD (City University, London)

J.F. Sykes, BASc, MASC, PhD (Waterloo), PEng

J.C. Thompson, BASc (Toronto), MS, PhD (Illinois), PEng

Assistant Professor

F.F. Saccamanno, BASc, MCP (Manitoba), PhD (Toronto), PEng

Adjunct Faculty

P.M. Allen

D.A. Godden, BASc (Toronto), LLB (Osgoode Hall), LLM (York)

D.T. McClurkin, Chartered Accountant N.W. McLeod, BASc (Alberta), MSc (Saskatchewan), ScD (Michigan), PEng

W.R. Petri, DiplEng (Berlin), PEng

D.W. Schnurr, BASc (Toronto), LLR (Osgoode Hall), PEng

O. Stradal, CE, DSc (Prague)

Faculty Members of Civil Engineering holding cross-appointments to:

- Mechanical Engineering
- Applied Mathematics
- Earth Sciences
- Architecture
- Earth Sciences

Courses Offered

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CIV E 126</td>
<td>W.S</td>
<td>2C,4L/T</td>
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<tr>
<td>CIV E 203</td>
<td>F.W</td>
<td>2C,2T</td>
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<tr>
<td>CIV E 223</td>
<td>F.S</td>
<td>1C,2T</td>
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Course Descriptions

Civil Engineering Concepts
A continuation of GEN E 115 with applications of graphics, measurement and other analytic principles to introductory problems in the various disciplines of Civil Engineering; an introduction to engineering design methods as applied to Civil Engineering and including specification development, information-gathering, concept formulation, feasibility analysis and report writing.

Statics
Equilibrium of rigid and deformable bodies. Analysis of internal forces in structures; beams, cables, arches, trusses.

Mechanics of Solids

Mechanics of Solids

Calculus

Differential Equations

Computer Workshop
An introduction to Microcomputers and the BASIC language. Workshop to include applications selected from Year 2 Civil Engineering courses. Ten weeks only.
Course Descriptions

Civil Engineering

CIV E 224 F,W 2C,2T 0.5
Probability and Statistics

CIV E 253 F,S 2C,2T 0.5
Geology for Engineers
A study of earth processes and earth materials from an engineering point of view. Topics include: mineral and rock identification, the rock cycle, structural geology, geology of Canada, effects of water, ice, and wind. Description of aggregates used in engineering works. Field trip.

CIV E 265 F,W 3C,1T,3L 0.5
Structure and Properties of Materials

CIV E 280 F,S 3C,1T,2L 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; Dimensional Analysis and Similarity; unsteady flow in pipes. 4 lab sessions.

CIV E 291 F 1 wk f/d lab 0.5
Survey Camp
A one-week course in surveying. Introduction to surveying, length measurements, levelling, transit surveys. Approximate cost to each student $85.

CIV E 292 F,W 2C,2T 0.5
Engineering Economics
An introductory course on the principles of engineering economy. Basic concepts; capital; interest formulas and derivations; annual worth comparisons; present worth; return on investment; benefit-cost ratio depreciation effect of taxes.

CIV E 294 F,S 2C,2T 0.5
Thermal Sciences
An introductory course in thermal science. Provides an understanding of thermodynamic principles as well as engineering aspects of heat transfer including applications to practical engineering problems.

CIV E 298 F,W 2S 0.0
CIV E 299 S,F 2S 0.0
Seminar
The engineer in society. Principles, methods and practice of Civil Engineering. Informal lectures.

CIV E 300 W,S 2C,2T 0.5
Civil Engineering Project I
The development of problem-solving skills utilizing the systems approach to the solution of civil engineering problems. Knowledge from previous courses and the practical application of the digital computer are integrated in a team/project-oriented environment. Ten weeks only.

CIV E 303 W,S 3C,1T 0.5
Structural Analysis I

CIV E 313 F,W 3C,1T 0.5
Structural Concrete Design I
Reinforced Concrete Members. Concrete and reinforcing steel materials. Safety, loads, design criteria. Flexure, shear, combined bending and axial force. Serviceability. One-way slabs, beams, columns, foundations and retaining walls.

CIV E 324 W,S 2C,2T 0.5
Transport Principles and Applications
The nature of intercity transport, estimating transport demands, highway transport, rail transport, air transport, pipelines.

CIV E 343 F,W 2C,2T 0.5
Transport Engineering Design
Vehicle dynamics and geometric design, road capacity, traffic signals, terminal design, pavement structure, transport facilities in permafrost areas.

CIV E 344
Urban and Regional Engineering
Natural system behaviour; Man's impacts on ecosystems. Current environmental issues in Canada; Canadian urban system; Trends in resource consumption and waste production; Population forecasting; Economic forecasting; Urban spatial structure; Regional water management; Sources of water supply; Spatial aspects of network design; impacts of urbanization on hydrological regimes; interactions with natural systems. Not for Civil Engineering students.

CIV E 363 W,S 3C,1T,2L 0.5
Geotechnical Engineering I
An introduction to geologic processes; subsurface exploration; classification systems; weight-volume relationships; soil mechanics principles including state of stress, ground water flow, consolidation and shear strength. 6 lab sessions.

CIV E 374 F,W 3C,1T 0.5
Geotechnical Engineering II
A course in foundation engineering; earth pressure theories; retaining walls; anchors; shallow and deep foundations; braced trenches and excavations; slope stability.

CIV E 375 F,W 3C,1T,2L 0.5
Water Quality Engineering
Basic water chemistry. Mathematical modelling of water quality. Treatment systems. Solid Waste Management. Air pollution. 7 lab sessions.

CIV E 381 W,S 3C,1T 0.5
Hydrology/Hydraulics 1

CIV E 388 W,S 2S 0.0
CIV E 399 F,W 2S 0.0
Seminar
The engineer in society. Principles, methods and practice of Civil Engineering. Informal lectures.

CIV E 400 S,F 1C,3T 0.5
Civil Engineering Project 2
The purpose is to provide the students with an opportunity to demonstrate their capacity to engage in the practice of civil engineering as a profession. The students are encouraged to independently identify and resolve a problem within the scope of their chosen area of specialization utilizing knowledge gained from their academic and employment experiences.
Department of Classical Studies

Course Descriptions

Classical Civilizations

(Courses in Translation)

Courses not offered in the current academic year are listed at the end of this section.

C CIV 101 F 3C 0.5
Colossus - The Major Figures of Ancient Greece
An introductory study of the achievement of ancient Greece through some of its most prominent figures.

Each year two of the following will be featured: Theseus: The Minoan-Mycenaean Age of Bronze; Pericles and the Rise of Democracy; Socrates, Men and Martyr; Alexander the Great and The Age of Expansion.

C CIV 102 W,S 3C 0.5
Colossus - The Major Figures of Ancient Rome
An introductory study of the achievement of ancient Rome through some of its most prominent figures. Each year two of the following will be featured: Julius Caesar and the Collapse of the Republic; Augustus: The Empire Rises; Nero and the Corruption of Power; Hadrian and the Imperial Machine.

C CIV 201 F,W 3C 0.5
Ancient Greek Society
A survey of the civilization of Classical Greece, featuring such topics as the individual (male and female), political institutions, art, religion, philosophy, literature, social life and leisure activities.

C CIV 202 W,S 3C 0.5
Ancient Roman Society
A survey of the civilization of the Roman Republic and Empire, featuring such topics as the individual (male and female), political institutions, art, religion, philosophy, literature, social life and leisure activities.

C CIV 251 F 3C 0.5
Greek History
A survey of ancient Greece, emphasizing its political, military, social and economic aspects. This course is acceptable for credit by the History Department.

C CIV 252 W 3C 0.5
Roman History
A military, political, social, economic survey of Rome from earliest times to the Empire's fall. This course is acceptable for credit by the History Department.

Classical Studies accepts HIST 238 for Classical Civilization credit, but a student may not take both HIST 238 and C CIV 252.

C CIV 255 F 3C 0.5
Medieval Civilization 1
A study of medieval literature, art, architecture, music and other expressive forms. The period from late antiquity to the high middle ages will be studied.

C CIV 265 F 3C 0.5
Ancient Epic in Translation
This course examines ancient epic through the Iliad and Odyssey of Homer, the Argonautica of Apollonius Rhodius and the Aeneid of Virgil. The evolution of the epic genre is traced in lectures and discussions. No knowledge of Greek or Latin is needed.

C CIV 266 W 3C 0.5
Ancient Tragedy in Translation
This course focuses upon the dramatic literature of the classical age in Athens. It features the Orestia of Aeschylus, the "Oedipus" plays of Sophocles, and the Medea, Hippolytus and Bacchae of Euripides. Roman tragedy is also studied, for comparative purposes, through the plays of Seneca. No knowledge of Greek or Latin is needed. Same as DRAMA 251.

C CIV 292 W 3C 0.5
Social Problems in Antiquity
A study of selected social problems in ancient Greece and Rome. Each year two of the following will be examined: women in society, slavery and the labour force, the aged and infirm, human sexuality and sexual mores, children and education, interpersonal relationships, minority groups and racial prejudice. Prereq: C CIV 201 or 202 or instructor's permission.

C CIV 301 F 3C 0.5
Ancient Myth and Religion 1
A study of Greek and Roman myth, including the birth of the gods, creation, the Olympians, Prometheus and the fall, the flood, the ages of man.

C CIV 302 W 3C 0.5
Ancient Myth and Religion 2
A study of Greek and Roman legend, including the cyclopes of Troy, Mycenae, Thebes, the Argonauts, the heroes, Odysseus, and the mystery religions (with their relation to Christianity).
C CIV 351 F 3C 0.5
Greek Art and Architecture
A survey of the art and architecture of the ancient Greek world from the Minoan to the Hellenistic periods. Same as FINE 310.

C CIV 352 W.S 3C 0.5
Roman Art and Architecture
A survey of the art and architecture of the Roman world from Etruscan to Imperial times. Same as FINE 311.

C CIV 381 F 3C 0.5
History of Ancient Philosophy 1
From the beginnings to Plato. Same as PHIL 380.

C CIV 382 W 3C 0.5
History of Ancient Philosophy 2
From Aristotle to the close of classical antiquity. Same as PHIL 381.

C CIV 366 F 3C 0.5
Ancient Lyric and Satire in Translation
Lyric Poetry of Greece and Rome, including Sappho, Pindar, Catullus, Horace and others; classical satire, including Horace, Petronius, Juvenal, Lucian. No knowledge of Greek or Latin is needed. Prereq: C CIV 265 or 266 or an appropriate course in literature, or instructor's permission.

C CIV 371 F 3C 0.5
Christianity and the Roman Empire 1
The relationship between Christianity and the Roman Empire from the beginning to 200 A.D., including the trial of Christ, the trials of Paul, the burning of Rome in 64 A.D., and the subsequent outlawing of Christianity. Not Offered 1983-84.

C CIV 372 W 3C 0.5
Christianity and the Roman Empire 2
A continuation of C CIV 371. Topics included are the persecutions by the Emperors Decius and Valerian, the Great Persecution and the triumph of Christianity under the Emperor Constantine. Not Offered 1983-84.

C CIV 401 W 2S 0.5
Atlantis: The Making of Myth
A study, through the Atlantis legend, of how ancient myths arose and developed. Topics include: the Platonic account of Atlantis; theories of lost continents; concepts of Utopia in the ancient world; Minoan Crete as a possible prototype for Atlantis; the destruction of Minoan civilization through the eruption of Thera. Prereq: C CIV 251 or 301 or 302 or 351 or instructor's permission.

C CIV 485 F 2S 0.5
Greco-Roman Civilization and History 1
Senior seminar: intensive study of various problems. Prereq: previous work in ancient history or instructor's permission. This course is acceptable for credit by the History Department (but not as a senior seminar).

C CIV 486 W 2S 0.5
Greco-Roman Civilization and History 2
Senior seminar: intensive study of various problems. Prereq: previous work in ancient history or instructor's permission. This course is acceptable for credit by the History Department (but not as a senior seminar).

C CIV 492-498
Senior Seminars
By arrangement with the Department, an individual student or a small group of students will follow a course of study under the supervision of a faculty member.

Not Offered 1983-84
C CIV 256 Medieval Civilization 2
C CIV 355 Ancient Comedy in Translation
C CIV 381 From Diocletian to Constantine
C CIV 382 Constantine the Great
C CIV 384 Science and Technology of Ancient Greece and Rome

Greek
Courses not offered in the current academic year are listed at the end of this section.

GRK 100 Y 3C 1.0
Introductory Ancient Greek
A course designed for students beginning the study of ancient Greek or who have not yet reached the level expected in GRK 231. 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.

GRK 100A 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.

GRK 100A and 100B are available only to part-time students, students in the Co-operative 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 or instructor's permission. Offered 1983-84 at Wilfrid Laurier.

GRK 262 W 3C 0.5
Introduction to Plato
Selections from Plato. Prereq: GRK 100, Grade 13 Greek or instructor's permission.

GRK 362 F 3C 0.5
The Drama of Sophocles
An examination of the dramatic art of Sophocles by translation of at least one play and the reading of others in translation. Prereq: One full 200 level Greek course or instructor's permission.

GRK 371 F 3C 0.5
Introduction to the Greek Historians
Selections from Xenophon and others. Prereq: One full 200 level Greek course or instructor's permission. Offered 1983-84 at Wilfrid Laurier.

GRK 452 W 2S 0.5
Homer
An intensive study of the Iliad. Prereq: One full 300 level Greek course or instructor's permission. Offered 1983-84 at Wilfrid Laurier.
GRK 490-499
Senior Seminars
By arrangement with the Department, an individual student or a small group of students will follow a course of study under the supervision of a faculty member.

Senior standing or instructor's permission is a prerequisite for any 400 level Greek course.

Not Offered 1983-84
GRK 271 Hellenistic and Later Greek Literature
GRK 351 Greek Composition and Grammar
GRK 361 The Drama of Euripides
GRK 461 The Drama of Aeschylus
GRK 462 The Comedy of Aristophanes

Latin

Courses not offered in the current academic year are listed at the end of this section.

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 100W W 3C 0.5
Introductory Latin B
Winter term of LAT 100. See note below.

LAT 100A and 100B 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.
Pre req: 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.
Pre req: LAT 203 or instructor's permission.

LAT 251 F 3C 0.5
Latin Composition and Grammar
Composition, translation, basic grammar with intensive analysis of selected passages.

LAT 261 F 3C 0.5
Latin Prose 1
Selections from the Letters of Cicero and Pliny.
Offered 1983-84 at Wilfrid Laurier.

LAT 262 Latin Prose 2
LAT 272 An Introduction to Vergil
LAT 282 Latin Poetry 2
LAT 352 The History of the Latin Language
LAT 362 Lucretius
LAT 371 An Introduction to the Roman Historians
LAT 372 Tacitus
LAT 381 Medieval Latin 1
LAT 382 Medieval Latin 2
LAT 462 Vergil 2
LAT 471 Roman Elegy
LAT 481 Roman Satire 1
LAT 482 Roman Satire 2

Course Descriptions
Classical Studies
Dance

Assistant Professor, Chairman of Dance Group
J. Officer, ARAD (Adv. and ATC) (London) Recipient of the Distinguished Teacher Award

Lecturer, Undergraduate Officer
N. DeShane-Gill, BA (York), MA (York)

Associate Professors
R. Priddle, BPHE (Toronto), MSc (Springfield), MA (Waterloo), PhD (Waterloo)

Assistant Professor
R. Ryman, BA (York), MA (York)

Lecturer, Full-Time
D. Taplin, BA (Bennington), MFA (York)

Instructors
G. Miceli, BSc (Waterloo), ARAD

Adjunct Faculty
L. Prada. BSc (Waterloo), ARAD

Course Descriptions
Courses not offered in the current academic year are listed at the end of this section.
DANCE 110 F 2C,2T 0.5
Introduction to the World of Dance
A survey of the evolution of dance as both ritual and art and of the capacities of the discipline today. Extensive viewing of films and live performances in addition to lectures. This is not a studio course.

DANCE 111 W 2C,2std 0.5
The Elements of Dance
Discussion and experience in the material, content and form of a work of art. Studio. Problem solving in space, dynamics and rhythm. Of particular interest to students planning a career in teaching or choreography.

DANCE 220 F 2C,1/2std 0.5
Socio-cultural Study of Western Dance
Development and significance of dance as a social phenomenon in Western Society.
Prereq: ANTH 102A or consent of the instructor.

DANCE 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 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.

DANCE 242 F 3C 0.5
Labanotation
A theoretical and practical introduction to Labanotation to the elementary level.
Prereq: 2 courses in dance technique or consent of the instructor.
Offered alternate years.

DANCE 336 F 3C 0.5
Dance Criticism
This course examines critical dance literature historically and stylistically and introduces students to practical skills in writing dance criticism.
Prereq: DANCE 231 or 233

DANCE 342 W 3C 0.5
Labanotation 2
This course examines the basic theoretical concepts of Labanotation to the intermediate level. Emphasis is placed both on reading and writing dance scores.
Prereq: DANCE 242
Offered alternate years.

DANCE 346 F 3C,2std 0.5
Applied Movement Analysis (Part 1)
A theoretical and practical study of classical ballet technique to the Elementary level.
Prereq: 4 courses in Ballet Technique or consent of instructor.
Offered alternate years.

DANCE 347 F 3C,3std 0.5
Applied Movement Analysis (Part 2)
Applied anatomy and biomechanics for the dancer. Topics covered include posture, leg extensions, torso and arm placement, balance, turns and jumps.
Prereq: DANCE 346 and KIN 200
Offered alternate years.

DANCE 351 W 2C,2std 0.5
Ballet Choreography
Analysis and study of themes and styles of the 20th century ballets. Through film and studio experience, consideration is given to the adaptations of the classical idiom to the artistic trends of this century.
Prereq: DANCE 351, 231 and 392B.

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 A 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 will emphasize creative dance activities for school-age children. Opportunity is available to work with children in an applied setting.
Prereq: DANCE 111
Antireq: DANCE 364B & 364C

DANCE 364B F 2C 1T
Development Aspects of Movement
A study integrating the theoretical and applied aspects of motor and perceptual motor development in children and adolescents. Tutorials will focus on movement education with preschool children. Opportunity is available to work with children in an applied setting.
Prereq: Early Childhood Education Students only.
Antireq: DANCE 364A & 364C

DANCE 364 C 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 will emphasize movement education as a foundation for sport, gymnastics and dance and investigate movement programmes for children.
Antireq: DANCE 364A and 364B.

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 ad methodology. DANCE 411 includes completion of the project begun in DANCE 410.
Prereq: Honours Dance students only.

DANCE 412 W 3C 0.5
Seminar in Dance
An examination of current and major issues in dance.
Prereq: Honours Dance students only.

DANCE 474 F,W 0.5
Directed Study on Special Topics
For the student who wishes to pursue a particular topic in depth through guided independent research and/or reading. A faculty member must approve a student's project prior to registration. This course may be repeated in subsequent terms.
Prereq: Consent of faculty.

DANCE 480 F,W wkshp 0.5
Workshop Series
The following courses are designed to give the student an opportunity to take theoretical knowledges to the applied setting. Offerings each year are determined by student interests. Topics available include:

DANCE 480 Court Dance
DANCE 481 Ballet Choreography
DANCE 482 Dance Notation
DANCE 483 Modern Dance
Reconstruction
DANCE 483 Modern Dance
Composition
DANCE 484 Teaching Creativity and Choreography to Children and Adolescents
DANCE 485 Methods and Teaching of Formalized Technique
DANCE 486 Dance Criticism
DANCE 487 Dance Ethnology
DANCE 488 Dance Production

The Workshop series is open only to 3rd and 4th year Honours Dance students. Two workshops may be taken in the 480 series toward the Honours degrees. 
Prereq: Permission of instructor.

Technique Courses 0.25
Each of the following technique courses consists of two classes per week for one term. Students should consult with a faculty advisor concerning the applicability of these courses for entry into future courses and possible careers such as teaching.

Students entering technique courses with previous dance training must audition for placement in upper level courses. Auditions are held during registration week on Thurs, Sept. 8th, 1983: 10:30 a.m. for ballet, 1:30 p.m. for Modern Dance and 3:00 p.m. for Jazz. Students holding credentials in specific technique syllabi should see the Undergraduate Officer in the Dance Department upon arrival on campus.

Entrance without audition is only possible in the following courses: DANCE 191B, 193A and 198.

Ballet "B" Division: For students with limited or no previous training.
DANCE 191B Basic Ballet I F
DANCE 192B Basic Ballet II W
DANCE 291B Basic Ballet III F
DANCE 292B Basic Ballet IV W
DANCE 391B Pre-elementary Ballet I F
DANCE 392B Pre-elementary Ballet II W

Ballet "A" Division: For students with background training equivalent to pre-elementary in one of the formalized systems:
DANCE 191A Elementary Ballet I F
DANCE 192A Elementary Ballet II W
DANCE 291A Intermediate Ballet I F
DANCE 292A Intermediate Ballet II F
DANCE 391A Advanced Ballet I F
DANCE 392A Advanced Ballet II W

Modern Dance "A" Division: A sequence of courses focusing on the Graham Technique:
DANCE 193A Pre-Graham I F
DANCE 194A Pre-Graham II W
DANCE 293A Basic Graham I F
DANCE 294A Basic Graham II W
DANCE 393A Elementary Graham I F
DANCE 394A Elementary Graham II W

Modern Dance "B" Division: A sequence of courses focusing on the Cunningham Technique.
Folk-Ethnic Dance: A sequence of courses progressing from simple to more complex forms:
DANCE 197 Basic Folk Dance I F
DANCE 297 Elementary Folk Dance II W
DANCE 397 Intermediate Folk Dance III F
DANCE 497 Character Dance W

Jazz Dance: A sequence of courses in Jazz:
DANCE 198 Beginner Jazz, F, W
DANCE 298 Elementary Jazz, W
DANCE 398 Intermediate Jazz, F
DANCE 498 Advanced Jazz, W

Not Offered 1983-84
DANCE 221 Socio-Cultural Study of Non-Western Dance
DANCE 231 History of Ballet in the Twentieth Century
DANCE 241 Benesh Notation I
DANCE 337 Philosophy of Dance
DANCE 341 Benesh Notation 2

Drama and Theatre Arts Group
Lecturer, Co-ordinator
C.D. Abel, BA (Queen's), MA (Toronto), LRAM (Speech and Drama)

Associate Professor
W.R. Chadwick, BA, MA (Toronto), PhD (London)
Assistant Professor
M. vanDijk, BA, MA (Wellington), PhD (Toronto)

Course Descriptions

Drama

Course Descriptions

Introduction Note
Laboratory sessions and rehearsal periods may be added to any course at the discretion of the instructor:

DRAMA 101A F 3C 0.5
Introduction to the Theatre 1
Introductory study of the theatre as a major art form. Selected plays as produced in their historical contexts. Contributions of the actor, designer and technician to theatrical production.

DRAMA 101B W 3C 0.5
Introduction to the Theatre 2
An extension of the studies described in 101A.

DRAMA 102 F W 4L 0.5
Introduction to Acting
An introduction to acting. The class will not 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.
Course Descriptions
Drama and Theatre Arts

DRAMA 243 F 2C, 2L 0.5
Introduction to Technical Production 1
Theory and practice of building, painting, rigging and shifting scenery; construction of properties; familiarity with lighting instruments, sound equipment and their control systems. Students must spend a certain number of hours working on department productions. Prereq: Permission of the instructor.

DRAMA 244 W 2C, 2L 0.5
Introduction to Technical Production 2
An extension of the studies described in DRAMA 243. Prereq: DRAMA 243.

DRAMA 251 F 3C 0.5
Survey of Dramatic Literature and
Dramatic Theory 1
The Greek and Roman periods. Cross-listed with C CIV 286.

DRAMA 255
Survey of Dramatic Literature and
Theory 5
Dramatic literature of the twentieth century.

DRAMA 258
Masterpieces of Western Drama. A Study of Performance 1.
Plays on film. This course will entail studying a play and then viewing it as a movie.

DRAMA 261 F 3C 0.5
Introduction to Directing 1
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 301 F 3C 0.5
Script Interpretation 1
Advanced study and analysis of plays in the process of production covering selected periods and types of playwriting. May include production casebook. Prereq: DRAMA 101A and B and two dramatic literature classes.

DRAMA 302 W 3C 0.5
Script Interpretation 2
An extension of the studies described above in 301. Prereq: DRAMA 101A and B and at least two dramatic literature classes.

DRAMA 306 (ABC) F std 0.5
Special Studies in Theatre Production 1
Production participation and the study of selected problems of theatrical production. Prereq: Permission of the play director.

DRAMA 307 (ABC) W std 0.5
Special Studies in Theatre Production 2
See Drama 306. Prereq: Permission of the play director.

DRAMA 311 F 6L 0.5
Advanced Acting 1
Advanced work in acting. Course involves individual and ensemble work in selections from specific plays with attention given to various periods and styles in acting. Prereq: DRAMA 221 and DRAMA 222.

DRAMA 322 W 6L 0.5
Advanced Acting 2
An extension of the studies described in DRAMA 321. Prereq: DRAMA 321 or permission.

DRAMA 326 F 5L 0.5
Seminar in Voice 2
Prereq: DRAMA 222.

DRAMA 327 W 5L 0.5
Seminar in Voice 2
Prereq: DRAMA 326.

DRAMA 331 F 3LD 0.5
Design for the Theatre 1
An introduction to the problems of designing for the theatre. Work for the course will include the preparation of drawings and models as well as practical experience in the theatre. Prereq: DRAMA 243.

DRAMA 332 W 3LD 0.5
Design for the Theatre 2
An extension of the studies described in DRAMA 331, concentrating on the practicalities of set design. Prereq: DRAMA 331.

DRAMA 341 F 4L 0.5
Lighting Design for the Theatre 1
An introduction to the theory and practice of theatre lighting design through studio experience. Prereq: DRAMA 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 343.

DRAMA 348 F, W
Arts Administration 1

DRAMA 351 0.5
Canadian Drama
See ENGLISH 316. Cross-listed with English 316.

DRAMA 371 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 stage production 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 stage production and DRAMA 101A and B.

DRAMA 409 W 3C 0.5
Theatre Criticism
Study and practice of the criticism of theatre production and performance. This course will not normally be taken until the student's final year.

DRAMA 421 F 6L 0.5
Advanced Acting Workshop 1
An intensive workshop designed to develop performance skills. Special attention given to individual acting problems. Prereq: DRAMA 321, 322, and permission of instructor.
Department of Earth Sciences

Professor, Chairman of the Department
P. Fritz, Dip. Geol, Dr. rer. nat. (Stuttgart)

Professors
J.A. Cherry, BE (Saskatchewan), MS (California, Berkeley), PhD (Illinois)
M.B. Dusseault, BSc, MSc, PhD (Alberta)
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. Applebyard, BSc (Western Ontario), MSc (Queen’s), PhD (Cambridge)
E.O. Frind, BASc, MASC, PhD (Toronto), PEng
I.L. Gibson, BSc, PhD (Imperial College, London)
R.W. Gillham, BSA (Toronto), MSc (Guelph), PhD (Illinois)
J.P. Greenhouse, BSc, MSc (British Columbia), PhD (California)
D.E. Lawson, BSc, MSc (New Brunswick), PhD (Reading)
A.V. Morgan, BSc (Leicester), MSc (California) (Cambridge), PhD Birmingham
J.J. Reardon, BSc (St. Francis Xavier), PhD (Pennsylvania State)
R.G. Roberts, BA (Cambridge), MSc, PhD (McGill)

I.J. Smalley, C Eng, PhD (City University, London)

Assistant Professors
J.F. Barker, BSc, MSc (McMaster), PhD (Waterloo)
J.A. Legault, BSc, MSc (Ottawa), PhD (Queens)

Research Assistant Professor
S.K. Frape, MSc, PhD (Queen’s)

Adjunct Faculty
M.E. Brookfield, PhD (Reading)
R.M. Brown, BSc (Bishops), PhD (McGill)
J.A. Franklin, BSc, (Gen. Civ. Eng.) (London), MSc, PhD (Imperial College, London)

E.J. Gale, BA, BSc (Memorial), MSc (Western Ontario), MEngSc, PhD (California, Berkeley), PEng
D. Lee, BSc, MSc (N. Dak.), PhD (Virginia Polytech. Inst.)
I.P. Martini, PhD (McMaster)

H.C. Sauderson, BA (Queens’s Belfast), MA, PhD (Toronto)
G. van der Kamp, MSc, PhD (Free University, Amsterdam)
O.L. White, BSc, MASC (Toronto), PhD (Illinois), PEng

Senior Demonstrators
J.L. Lang, BSc, MBA (Queen’s)
K. Lahay, BSc, MSc (Guelph)

Faculty members holding cross- appointments from Earth Sciences to:
Civil Engineering

Course Descriptions

Introductory Notes
EARTH 121-122 is normally regarded as a prerequisite for any Major programs in Earth Sciences. 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
Introduction to systematic mineralogy. Bases of mineral classification. Interrelationships of chemical, structural and physical properties. Occurrence of major groups of rock forming minerals. Introduction to optical properties of minerals and the use of the petrographic microscope as a tool in identifying minerals and interpreting their genetic history. 
Prereq: EARTH 121

EARTH 232 W,S 2C,3L 0.5
Petrography
The study of rocks in thin section. The classification and identification of sedimentary, igneous, and metamorphic rocks. 
Prereq: EARTH 231

EARTH 235 F 2C,3L 0.5
Stratigraphy
An introduction to the nature, origin and interpretation of stratified earth materials. Emphasis on principles and approaches. Stratigraphy in earth history and economic deposits. 
Prereq: EARTH 121-122

EARTH 236 F 2C,3L 0.5
Principles of Paleontology
The principles of paleontology with particular stress on the species concept and evolution; examples will be drawn primarily from the fossil record of plants and vertebrates. Laboratory work will include projects related to lecture topics. 
Prereq: EARTH 121-122

EARTH 238 W,S 2C,3L 0.5
Introductory Structural Geology
Prereq: EARTH 121-122

EARTH 260 F 3C,2L 0.5
Applied Geophysics 1
An introduction to seismic, gravity, electric, electromagnetic and magnetic methods of exploration geophysics. 
Prereq: PHYS 111-112 or consent of instructor.

EARTH 331 F 2C,3L 0.5
Igneous Petrology
The principles and theories of igneous rock genesis. Silicate phase equilibria in magmatic systems. Magmatic differentiation; distribution and occurrence of magma types. 
Prereq: EARTH 231, 232

EARTH 332 W 2C,3L 0.5
Metamorphic Petrology
Prereq: EARTH 232
For Honours Earth Sciences and Geological Engineering students only.

EARTH 333 W 2C,3L 0.5
Introductory Sedimentology
The origin, transport and deposition of sediments. Size analysis and sedimentary structures. Recent sedimentary environments as a key to the interpretation of ancient sediments. Sedimentary petrology. 
Prereq: EARTH 232

EARTH 334 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 233

EARTH 335 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
Prereq: GEOG 302

EARTH 345 W 2C,2L 0.5
Historical Geology
A systematic review of the geological history of North America from the Precambrian to the Recent exemplified by regional geology. Laboratory work will include study of rock and fossil regional suites and geological maps. 
Prereq: EARTH 235

EARTH 355 F 3C 0.5
Statistical Methods in Geology
Introduction to the principles of probability and statistics and their application in the earth sciences. Evaluation of quantitative data, statistical models. 
Prereq: MATH 113 and an introductory course in computer programming.

EARTH 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  f1ldlab
Methods in Geological Mapping
Ten day field camp at Whitefish Falls, held at beginning of spring term.

EARTH 421 F  2C,3L  0.5
Geochro\emistry  2
The application of chemical thermodynamics 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. Restricted to fourth year and graduate students.

EARTH 427 W  2C,3S  0.5
Crustal Evolution
An analytical critique of the plate tectonics theory. Tectonic syntheses based on the theory in the light of world geology. Normally restricted to fourth year Earth Sciences students.

EARTH 432 W  3C,2L  0.5
Precambrian Geology
The geology, tectonics, stratigraphy and history of the Canadian Precambrian Shield. The early evolution of the earth's crust. The Precambrian time scale and problems of geochronology. Life, climate and physical conditions in Precambrian time.

EARTH 433 W  2C,3L  0.5
Applied Sedimentology
The source, migration and sedimentary environment of hydrocarbons, exploration, types of traps, extraction. Carbonate sediments and their diagenesis. The environmental impact and control of recent sedimentation. Prereq: EARTH 333

EARTH 434 F  2C,3S  0.5
Biostratigraphy
Methods of using paleontological data to solve stratigraphic problems. Faunal provinces in space and time. Effects of continental drift and climatic change on biogeography through the Phanerozoic. Prereq: EARTH 336

EARTH 435 W  3C,2L  0.5
Advanced Structural Geology
The geometry, kinematics and dynamics of structural geology. The relationship of structures from the microscopic to the megascopic scale; statistical studies of structural elements. Prereq: EARTH 260

EARTH 436 Y  5L  1.0
Honours Thesis
(A course for Honours Earth Sciences students only.) Each student will work under the direction of a member of the Department on a short research project. The results of this will be presented in thesis form and will be critically examined by members of this and, where pertinent, other departments.

EARTH 438 F  2C,3wkshp  0.5
Engineering Geology
Review of basic concepts in soil and rock mechanics. Field and laboratory methods used to define and characterize the properties of geological materials and their use in selected engineering geologic design and construction problems. Laboratory assignments will focus on the determination of physical properties and site assessment problems.

EARTH 439 F,S  3C,1T  0.5
Hydrogeology
The location, exploitation, and conservation of groundwater. Groundwater-surface water interactions, effect of man's activities on 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. Antireq: GEOG 300 and GEOG 401. Not to be taken by third year students.

EARTH 456 F  3C  0.5
Numerical Methods in Geoscience
Introduction to numerical methods and their use in geology and hydrogeology. Finite differences and finite elements. Solution of boundary value problems, mathematical modelling. Prereq: MATH 113 and an introductory course in computer programming.

EARTH 460 W  3C,1T  0.5
Applied Geophysics 2
A detailed examination of selected topics in exploration geophysics, with an emphasis on data processing and computer modelling of geophysical responses. Prereq: EARTH 260 and an introductory course in computer programming.

EARTH 461 F  2C,3L  0.5
Metallic Mineral Deposits
The petrology and genesis of metalliferous ore deposits. The description of classic deposits; the stability of ore minerals; ore minerals in aqueous systems. The laboratory will include instruction and practice in ore microscopy. Prereq: EARTH 370

EARTH 470 F  3C,2L  0.5
Field Study
Depending on the demand and the availability of an instructor, a six week field course may be offered in an area of unusual geological interest during the spring or summer. This course will consist of two weeks of classroom lectures and one month in the field location. Expenses are to be paid by the student. Prereq: consent of the instructor.

EARTH 490 F  3C  0.5
Field Trip
One or more regional geology field trips normally conducted at the beginning of the Fall term. These trips will emphasize the integration of the various sub-disciplines within Geology to achieve an understanding and synthesis of a geologically complex region such as the central and western Appalachians of southern Quebec. Field exercises will be part of the trip. Enrolment will be limited to not more than 30 students per trip. Open to Honours Earth Sciences students only.
Course Descriptions
Economics

Department of Economics

Associate Professor, Chairman
K.M. Bennett, BA, MA (Queen's), PhD (McGill)

Professor, Associate Chairman
W.R. Thirsk, BA (British Columbia), MA, PhD (Yale)

Associate Professor, Graduate Officer
J. H. Hotson, BA (Colorado College), MA, PhD (Pennsylvania)

Assistant Professor, Undergraduate Officer
L. P. Fletcher, BComm (Mount Allison), AM, PhD (Brown)

Assistant Professor, Graduate Officer
S. W. Kardasz, BA (Loyola), PhD (Queen's)

Professors
S. K. Ghosh, BSc, MSc (Calcutta), MS, PhD (Wisconsin)
J. H. Hotson, BA (Colorado College), MA, PhD (Pennsylvania)
R. R. Kerton, BComm (Toronto), MA, PhD (Carleton), PhD (Duke)
A. Koutsogiannis, BA (Athens), PhD (Manchester), Recipient of the Distinguished Teacher Award
L. Needleman, MA (Oxford), PhD (Glasgow)
D. Wilton, BComm (McMaster), PhD (M.I.T.)

Associate Professors
A. A. Andrikopoulos, BA (Athens), MA (Wayne State), PhD (Southern California)
M. C. Howard, BA, MA (Lancaster), PhD (Leicester)
N. E. Lavigne, CR, BA (Western Ontario), MComm (Ottawa), MBA (Detroit), J.
W. R. Needham, BComm (Carleton), MA, PhD (Queen's)

Assistant Professors
J. A. Brox, BA (Toronto), MA, PhD (McMaster)
E. Carvalho, BA, MA, PhD (Waterloo)
J. E. Cuenca, LIC (Madrid), MA (Western Michigan), PhD (Toronto)
R. C. Kumar, BStat, MStat (Indian Statistical Institute), MA, PhD (Toronto)
F. N. Naqib, BSc (Washington), MSc (Oregon), PhD (Queen's)
K. Stollery, BA (Southern California), MA, PhD (Queen's)

Lecturer
E. W. Lau, BA (Toronto), MA (Manchester)

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes
Some Economics courses do not have a "term offered" indicated. This information will be available at pre-registration and students can confirm the "term offered" with their Departmental advisor.

The "normal" number of lectures per week in each course is three; however, each instructor determines how often his or her particular class will meet.

ECON 101 F,W,S 3C 0.5 Introduction to Microeconomics
An introduction to the central economic problems of society, the functioning of a mixed capitalistic 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 102 F,W,S 3C 0.5 Introduction to Macroeconomics
Determination of national income; the banking system; government fiscal and monetary policy; international trade and finance; and current economic problems.
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 behaviour 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 businesses, 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

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

ECON 211 F,W,S 3C 0.5 Mathematics of Economists
Application of elementary mathematics to problems in economic theory. Topics include the graphing of functions, elementary exponential and logarithmic functions and differentiation — all developed within the context of economic theory.
Prereq: ECON 101/102 or 103/102
Students who have not taken Grade 13 Algebra and Calculus are strongly advised to take MATH 104.

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

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

ECON 241 W 3C 0.5 Cost-benefit Analysis and Project Evaluation
Methods for evaluating private and public projects; decision rules, efficiency conditions and methods of conducting cost-benefit analysis. Application of the technique.
Prereq: ECON 201
ECON 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

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, 211

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 (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 365 W 3C 0.5
Contemporary Canadian Problems 1,2
A "topic oriented" seminar course. The class agrees to study a Canadian problem selected from a list that includes poverty, unemployment, industrial policy, and so forth. The format assists the student in gaining analytical skill through work on the selected topics.
Prereq: ECON 201, 202

ECON 366/367 F,W 3C 0.5/0.5
Economic Development of Modern Europe, 1780-1973
Prereq: ECON 101/102 or 103/102

ECON 368/369 F,W 3C 0.5
Comparative Economic Systems 1,2
A survey of different economic systems. The emphasis is on common economic problems and the relationship of economic development to social and political systems.
Prereq: ECON 101/102 or 103/102
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 Microeconomic Theory  
Production and consumption theory; advanced theory of oligopoly; price competition; non-price competition; growth decisions of the firm; financial decisions of the firm; decision-making under risk and uncertainty.  
Prereq: ECON 301

ECON 402  W  3C  0.5  
Advanced Macroeconomic Theory  
Classical and Keynesian models and recent contributions; theory of economic policy; inflation and unemployment; modern theories of economic growth.  
Prereq: ECON 301, 302

ECON 403  W  3C  0.5  
Economic Analysis, Forecasting, and Public Policy  
The course focuses on the problems of forecasting economic activity (as measured by the principal macroeconomic variables), and of designing and implementing policies to control those variables; topics covered include a critical review of current forecasting models, problems associated with lags in the impact of policies, and so forth. 
Prereq: ECON 301, 302, 321

ECON 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  
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 463  
Political Economy of Capitalist Development  
A study of the main tools and models of modern political economy. Micro and macro tools and concepts are integrated in a Marxian framework based on the work of Robinson, Sraffa, Kaldor, Pasinetti, Rowthorn, Neil, Sweezy and others in what can be termed the 'Classical Marxian' tradition.  
Prereq: Consent of the instructor.

ECON 481-489  3S  0.5 each  Special Studies  
Research and reading courses under the direction of individual instructors. Admission by consent of instructor.

Not Offered 1983-84:  
ECON 361 North American Economic History  
ECON 411 Mathematical Economics

Department of Electrical Engineering

Professor, Chairman  
I.F. Blake, BSc, MSc (Queen's), MA, PhD (Princeton), PEng

Professor, Associate Chairman for Graduate Affairs  
S.G. Chamberlain, MSc, PhD (Southampton)

Professor, Associate Chairman for Undergraduate Affairs  
R.S. Ramshaw, BSc, PhD (Nottingham), PEng

Professor, Director, Institute for Computer Research  
E.G. Manning', MSc (Waterloo) PhD (Illinois)

Associate Professor, Director, Computer Communications Network Group  
J.W.-N. Wong, PhD (California-Los Angeles)

Professors  
J.D. Aplavich, BE (Saskatchewan), PhD (Imperial College, London), PEng  
P.R. Bryant, MSc (London), MA, PhD (Cambridge)  
Y.L. Chow, BEng (McGill), MASc, PhD (Toronto), PEng  
J.D. Cross, BSc (Wales), MS, PhD (Carleton), PEng  
J.A. Field, BE (Saskatchewan), MASc, PhD (Toronto), PEng  
E.L. Heasell, BSc, PhD (Imperial College, London), PEng  
S.N. Kalra, BSc (Punjab), MS, PhD (Illinois), PEng  
R.H. MacPhie, BASc (Toronto), MS, PhD (Illinois)
Course Descriptions

Electrical Engineering

Course Descriptions

EL E 32 F,W 3C,3L,1,2T 0.5

**Electrical Engineering 2**
Introduction to electronic devices and their characteristics; integrated circuits; operational amplifiers; digital circuits and systems; electric power control using semiconductor devices and circuits; electronic instruments and instrumentation systems.

Alternate weeks.

EL E 123 W,S 3C,1,3L,1 0.5

Electrical Engineering Circuits
Introduction to network variables; resistors; Kirchhoff's laws; circuit simplification techniques; circuit analysis methods; operational amplifiers and their uses; resistor-capacitor circuits; resistor-inductor circuits; sinusoids and phasors; impedance and admittance; circuit functions and analysis techniques.

Alternate weeks.

EL E 126 W,S 3C,1,3L,1 0.5

Electricity and Magnetism
Electrostatics; electric flux and potential energy; dielectrics, capacitors and capacitance; flow of electric charge and resistance; Kirchhoff's Voltage and Current Laws; magnetism; magnetic materials and circuits; Faraday's Law and inductance.

Alternate weeks.

EL E 201 W,F 1C 0.0

Seminar
General Seminar

EL E 202 F,S 1C 0.0

Seminar
General Seminar

EL E 205 (Math 211) W,F 2C,2T 0.5

Advanced Calculus for Electrical Engineers 1
Differential equations; partial differentiation of functions of two or more variables; multiple integrals; line and surface integrals.

EL E 206 (Math 212) S,F 2C,2T 0.5

Advanced Calculus for Electrical Engineers 2
Fourier series, partial differential equations, separation of variables, wave equation, heat equation and Laplace's equation. Fourier integral, properties of complex analytic functions, complex integration.

EL E 222 W,F 2C,1,2L,1 0.5

Introduction to Digital Computers

EL E 233 W,F 3C,1,7 0.5

Physical Electronics

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,1,7 0.5

Energy Processing and Conversion

EL E 271 S,F 3C,1,7 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.
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: linear and non-linear resistors, capacitors and inductors; RC, RL and RLC networks. "Open lab.

Measurement and Instrumentation 2
Experiments related to material covered in courses EL E 261 and EL E 271 will be performed. This course also includes further topics on instrumentation and measurement techniques. "Open lab.

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.

Signal Analysis Methods
Representation of periodic and non-periodic signals in both continuous time and discrete time forms; the concept of sampling; the development and application of Fourier series. Fourier transforms, and the convolution integral to continuous time signals and systems; linear modulation, and modulation techniques such as DSO, AM, FM, etc.; the z-transform and its application to discrete time sequences and systems.

Principles of Digital Circuits and Systems

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-port network parameters. Prereq: EL E 241 or equivalent

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

Electronic Circuits
Large-signal amplifiers; biasing not works and stability, single and multi-stage small-signal amplifiers; the hybrid-pi model; high and low frequency effects; feedback amplifiers and stability criteria; oscillators; noise in electronic circuits. "Alternate weeks.

Energy Conversion
Electric motors and generators. "Alternate weeks. Prereq: EL E 261

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. "Alternate weeks.

Introduction to Systems and Control

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
Course Descriptions
Electrical Engineering

EL E 426 W 3C,1L 0.5
Software Engineering
Block structured languages (Alqol), actual and formal parameters, recursion, formal description, relationship to machine code. Structured programing, data structures, arrays, lists, stacks, associative structures. Searching and sorting. Compilers. Operating system organization, co-operating processes, process synchronization primitives. Prereq: EL E 222 or equivalent. Project.

EL E 427 SF 2C,1T,1L 0.5
Digital System Engineering

EL E 434 W 2C,2T 0.5
Quantum Electrodynamics and Electronics
Laser principles; solid state, semiconductor and gas lasers. Laser applications, holography, Ferromagnetism, ferrimagnetism, diamagnetism and paramagnetism, electron-spin resonance, core and bubble memories.

EL E 435 SF 2C,2T 0.5
Semiconductor Devices 1
This course deals with the theory and characteristics of modern semiconductor devices, SCRs, power rectifiers, MOSFETs, JFETs, radiation detectors, solar cells, LEDs, CCDs, IMPATT and Gunn effect devices, step recovery diodes, P-i-N diodes, Schottky diodes, memory devices.

EL E 436 W 2C,2T 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 non-ideal nonlinear devices. Prereq: EL E 342 or equivalent.

EL E 446 S,F 2C,2T 0.5
Linear Systems
Three types of linear multivariable systems are studied: 1) real time-continuous systems; 2) real time-discrete systems; and 3) modulo-two time-discrete systems. The unifying approach of state equations is developed and the importance of linear algebra is emphasized. Topics include: time domain analysis, transform analysis (Laplace- and Z-transforms), stability considerations, system equivalence, system decomposition, system realization. The necessary matrix and linear-algebra theory is developed as required.

EL E 453 W 2C,1T,3L 0.5
Linear Electronic Circuits

EL E 454 S,F 2C,1T,1L 0.5
Nonlinear Electronic Circuits
Switching characteristics of semiconductor devices, non-sinusoidal wave generation and shaping, voltage and current sweeps, binary circuits and gates, digital integrated circuits, DCTL, DTL, ECL, FTL and HPL. Open.

EL E 459 W 2C,1T,3L 0.5
Sound, Noise and Electroacoustics
An interdisciplinary study of acoustical physics, human response to sound and audio engineering. Main topics include: the physics of sound, electroacoustical systems, human audiology, acoustical measurements, audio electronics and applications. Every third week.

EL E 463 S,F 2C,1T,1L 0.5
Power Electronics
Characteristics and ratings of power semiconductor devices with emphasis on the thyristor. General methods of achieving design objectives. Performance and analysis of power conversion circuits for both static and rotating loads. Open.

EL E 464 W 3C,3L 0.5
High Voltage and Insulation Engineering
Nature and origin of high voltage surges encountered on power systems. Traveling waves on transmission systems; insulation engineering; electrostatic fields in high voltage apparatus, insulation failure; corena; 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; acoustics: power system planning and operation. Energy sources, environmental and resource implications. Per-unit and co-ordinate systems. Representation of equipment such as generators, transformers and transmission lines in system analysis. Analysis of imbalanced systems and faults. Voltage and reactive power control. Load/frequency control. Power transfer and system stability. Introduction to load flow methods. High voltage dc transmission.

EL E 473 W 2C,1T,3L 0.5
Microwave Engineering
Rectangular and circular waveguides; simple waveguide discontinuity, periodic transmission systems; microwave scattering theory; ferrite components; klystrons; travelling-wave amplifiers; backward-wave oscillators, magnetrons; 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, Schelkinov, binomial and Chebyshev arrays, aperture antennas Schelkinov equivalence theorem, frequency independent antennas; theory of antenna measurements. Every third week. Prereq: EL E 370 or equivalent.

EL E 481 S,F 2C,1T,1L 0.5
Control Systems 1
Course Descriptions
Electrical Engineering

EL E 482 W 2C,1T,1L 0.5
Control Systems 2
*Open lab. Prereq: EL E 448, EL E 481

EL E 499A S,F 9L 0.5
Project
An engineering assignment requiring the student to demonstrate initiative and assume responsibility. The student will select a project at the end of the 3B term from an approved list prepared by the Department. A short progress report at the end of the 4A term and a full report at the end of the 4B term are required.

EL E 499B W 9L 0.5
Project
Either a continuation of EL E 499A or a separate one-term project.

Department of English

Course Descriptions

1. Courses in this group count towards a degree as electives in any program in the University. None of them, however, fulfill 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

Introductory Notes

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.

W.K. Thomas's Correct Form in Essay Writing is the official style sheet for all undergraduate English courses.

The "normal" number of lectures per week in each course is three; however, instructors determine how often their particular class will meet.

In all English courses, emphasis will be placed on student essays written in connection with the reading.

'R' courses are administered by Renison College.

Group One

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In all English courses, emphasis will be placed on student essays written in connection with the reading.

‘R’ courses are administered by Renison College.
B) Courses in Group 1 are primarily designed to make students aware of the different functions of language in various contexts and to assist them to improve their writing.

- **ENGL 109** 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.

  Note: Students may receive credit for only one of ENGL 109 and ENGL 129R.

- **ENGL 110** W 0.5 Introduction to Essay Writing 2
  The course teaches the construction of the persuasive essay, with attention to the elements of logical thinking, to the techniques of successful persuasion, and to the demands of the library research paper. Six to eight writing assignments are required.
  **Prereq:** ENGL 109

- **ENGL 129R** F.W,S 1C,2L,2T 0.5 Introduction to Written English
  Instruction provided in basic grammar, sentence and paragraph structure, elements of composition and essay writing including focus on theme, development of central idea, exposition and argumentation. Minimum of four hours of instruction each week with additional tutorial hours as required.
  **Prereq:** Open only to students whose maternal language is not English and who lack language mastery sufficient for admission to other introductory English language courses.

- **ENGL 209** F 0.5 Advanced Essay Writing
  Provides further opportunities for serious students of writing to study and to practise descriptive, expository, argumentative, and persuasive writing. In addition to lectures, there are workshop sessions in which student writing is discussed.
  **Prereq:** Second-year standing or above.

- **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 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.

C) Courses in Group 2 are designed to take students beyond the introductory level to advanced study of language, thought, and expression.

- **ENGL 150** F,W,S 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.

- **ENGL 151** W 0.5 English as an Instrument of Thought and Communication 2
  A continuation of ENGL 150. From a basis of simple semantics and elementary logic, students will proceed to examine more complex language in fiction and other forms of literature. About six written exercises are assigned.
  **Prereq:** ENGL 150.

- **ENGL 140R** F.W 0.5 The Use of English
  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.

- **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.

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.

ENGL 105B W 0.5
Twentieth-Century Literature in English, 1930-80
A continuation of ENGL 105A. A close examination of a representative selection of works by major authors writing in English such as William Faulkner, Dylan Thomas, and Margaret Laurence. Prereq: ENGL 105A or consent of instructor. Also offered at St. Jerome's College.

ENGL 108
Themes of Literature
An exploration of the great variety of literature through thematic perspectives.

ENGL 108A 0.5
The Hero
A study of human excellence in thought and action embodied in representative men and women, as seen through works of literature.

ENGL 108C 0.5
Literature and Morality
Works in English literature from its beginnings are selected for their bearings on questions of morality.

ENGL 108E 0.5
Women in Literature
A study of the nature and role of women in British, Canadian, and American literature. Works by both men and women will be studied in which women are seen in such forms as mothers, saints, sex objects, and witches. Also offered at St. Jerome's College.

ENGL 108F 0.5
The Rebel
A study of various works of literature in which the protagonist is a rebel against existing norms. The course will examine a number of rebel types and concepts, moral implications and final outcomes either in successful realization or in tragic defeat. Also offered at St. Jerome's College.

ENGL 108H 0.5
Isolation and Alienation
The study of a variety of works centering on the theme of man in crisis, the stress being on the individual at variance with his inner self, his fellow man, or his world. The course will discuss the process in which wisdom and maturity are gained as the ultimate products of suffering. Also offered at St. Jerome's College.

ENGL 190 0.5
Shakespeare
Designed for students in all faculties, the course examines some of Shakespeare's comedies, history plays, and tragedies. Shakespeare's variety and flexibility in developing characters and dramatic structures are stressed, as are significant themes. No previous work in Shakespeare is required.

ENGL 200A/B
Survey of British Literature
An historical survey of major figures, types and trends in British literature from the Middle Ages to the present. Also offered at St. Jerome's College.

ENGL 200A 0.5
Survey of British Literature 1
An historical survey of major figures, types and trends in British literature from the Middle Ages to the late eighteenth century. Also offered at St. Jerome's College.

ENGL 200B 0.5
Survey of British Literature 2
An historical survey of major figures, types and trends in British literature from the late eighteenth century to the present. Also offered at St. Jerome's College.

ENGL 201 0.5
The Short Story
This course deals with the history and techniques of the short story with emphasis upon works by such British, American and Canadian writers as Henry James, James Joyce, D.H. Lawrence, Ernest Hemingway, and Alice Munro. Also offered at St. Jerome's College.

ENGL 202A/B
The Bible and Literature
The study of major themes, stories, myths, and characters of the Old and New Testaments of the King James Bible, and their influence on other English literature.

ENGL 202A F 0.5
The Bible and Literature 1
Selections from Hebrew Scripture will be studied in relation to English literature.

ENGL 202B W 0.5
The Bible and Literature 2
The course will continue the study of the Bible, emphasizing the Christian gospels and epistles in relation to English literature. Prereq: ENGL 202A or consent of instructor.

ENGL 205R F,W 3C 0.5
The Canadian Short Story
The Canadian short story, from its beginnings - in the bush, in the north, on the land, in the small towns - through the struggles of an urbanizing society to the present. Students will be expected to work in some depth with individual authors.

ENGL 208
Literary Genres and Themes

ENGL 208A 0.5
Forms of Fantasy
This course will deal with the history and forms of fantasy written for adults. In considering the genre, related forms like the romance, the fairy tale, the fable, and the gothic horror story will be discussed. Authors such as Morris, C.S. Lewis, Tolkien, Williams, and White will be studied.

ENGL 208B 0.5
Science Fiction
Various examples drawn, for instance, from Utopian and anti-Utopian science fiction, social science fiction, "gadget" science fiction, parapsychology, and alternate worlds and beings, will be considered. Some attention will be given to the historical development of the genre. Also offered at St. Jerome's College.
Course Descriptions

English

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, Geoghe MacDonald, Kenneth Grahame, and Thurber will be studied.
Also offered at St. Jerome's College.

ENGL 208E 0.5
Women Writers of the 20th Century
A study of such major 20th-century women writers as Woolf, Heilman, Murdoch, McCarthy, Lessing, Lawrence, Plath and Atwood. Emphasis will be on the concerns of these writers with the roles of women, the writer's search for new meanings, and their innovations in literary forms.
Also offered at St. Jerome's College.

ENGL 208F 0.5
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 251A/B
The Practice and Theory of Criticism
The study and practice of skills needed for a close, analytical reading of literary texts and for the writing of critical analyses on them; studies of theories concerning literature and literary criticism.
Also offered at St. Jerome's College.

ENGL 251A F 0.5
The Practice and Theory of Criticism 1
The first half of ENGL 251A/B (see above)
Also offered at St. Jerome's College.

ENGL 251B W 0.5
The Practice and Theory of Criticism 2
The continuation of ENGL 251A (see above).
Also offered at St. Jerome's College.

ENGL 305A/B
Old English
An introduction to the English language in its earliest form and to the literature of pre-Conquest England.
Also offered at St. Jerome's College.

ENGL 305A F 0.5
Old English 1
An introduction to the English language in its earliest form and to English prose in pre-Conquest England, examining Old English prose style, its principal practitioners and their world view.
Also offered at St. Jerome's College.

ENGL 305B W 0.5
Old English 2
An introduction to Old English poetry, noting in representative Old English poems those things about its purpose, style, and its audience which make it unique but which also provide the beginnings of the English poetic tradition.
Prereq: ENGL 305A
Also offered at St. Jerome's College.

ENGL 310A/B
Middle English
A study of Middle English literature with special emphasis on the work of Geoffrey Chaucer.
Also offered at St. Jerome's College.

ENGL 310A F 0.5
Middle English 1
Also offered at St. Jerome's College.

ENGL 310B W 0.5
Middle English 2
A study of Chaucer's Canterbury Tales and related Middle English poems and prose.
Also offered at St. Jerome's College.

ENGL 312 0.5
Literature of the Commonwealth
A survey of Australian poetry and prose, with some consideration of the literatures, in English, from Africa and the West Indies.
Also offered at St. Jerome's College.

ENGL 313 0.5
Canadian Literature to 1920
A study of Canadian prose and verse to 1920, with particular attention to the poetry of the School of the Sixties and to the historical and idyllic novels of the 19th and early 20th centuries.
Also offered at St. Jerome's College.

ENGL 314 0.5
Canadian Poetry Since 1920
Also offered at St. Jerome's College.

ENGL 315 0.5
Canadian 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 330A/B
Elizabenthian 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 330 B W 0.5
Elizabethan Literature 2 (excluding Drama)
The continuation of ENGL 330A. Reserved for special attention is Spenser's epic poem glorifying England and Elizabeth I - The Faerie Queene. Prereq: ENGL 330A or consent of instructor. Also offered at St. Jerome's College.

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 B W 0.5
American Fiction
The Southern Myth: its origins in early literature, its flowering and ruin, as seen by white and black writers, including Twain, Faulkner, Welty, Styron, Grau, O'Connor, Wright, and Ellison. Prereq: ENGL 343 or consent of instructor.

ENGL 346 C 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 345 or consent of instructor.

ENGL 347 A W 0.5
Contemporary American Literature
A study of American Literature from World War 2 to the present. Prereq: ENGL 345 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 350 A/F 0.5
Seventeenth-Century Non-Dramatic Literature
A study of secular and religious lyric poetry by poets such as Donne, Jonson, Herrick, Herbert, Vaughan and Marvell. Also offered at St. Jerome's College.

ENGL 350B W 0.5
Seventeenth-Century Non-Dramatic Literature 2
A study of selected prose works of Bacon, Burton and Browne. A more intensive study of Milton's English poetry and a selection of his prose works. Also offered at St. Jerome's College.

ENGL 352 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 373 A/B
An Introduction to the History of English
The process of linguistic change as exemplified in the development of the English language from its origins in Indo-European and Germanic through modern dialects. Traditional, structural and generative approaches will be employed. Also offered at St. Jerome's College.

ENGL 373 A F 0.5
An Introduction to Historical Linguistics
These lectures present language as an historical phenomenon subject to constant change. Methods of reconstruction as well as the various ways languages have undergone alteration will be discussed. Indo-European languages will be the source of examples. Also offered at St. Jerome's College.

ENGL 373 B W 0.5
The History of English
These lectures continue the discussion begun in ENGL 373A, focusing upon the changing English language. Phonetic, morphological, and syntactic changes as they contribute to the creation of modern English will be considered. Prereq: ENGL 373A or consent of instructor. Also offered at St. Jerome's College.

ENGL 375A/B
Linguistics and English Grammar
Linguistics and its application to the study of grammar and language. Included are 1) an introduction to descriptive and historical linguistics and the principles of linguistic analysis and 2) an evaluation of English grammars ranging from the traditional to the structural and transformational-generative. 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 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."

ENGL 410A/B
Restoration and Eighteenth-Century Literature
Literature of the period that began as neo-classical, England's Augustan Age paralleling that of ancient Rome, and gradually, through subtle changes, became the precursor to the Romantic movement, giving rise, along the way, to new genres, such as comedy of manners, heroic tragedy, descriptive-meditative poetry, and the novel.
Also offered at St. Jerome's College.

ENGL 410A F 0.5
Satire and Sense: The Restoration and Early Eighteenth Century
The Restoration comedy of manners, heroic and high tragedy, poetry of the court wits and other amused commentators on society, and the major writings of Dryden, Swift, Addison, Defoe, and the early Pope.
Also offered at St. Jerome's College.

ENGL 410B W 0.5
Sense and Sensibility: The Middle and Later Eighteenth Century
The probing of mores and manners by Pope and Johnson, the emergence of the novel with Fielding and Sterne, and the transformation (in "the age of sensibility") of literary attitudes and practice from classicism to romanticism.
Also offered at St. Jerome's College.

ENGL 415 0.5
Major Canadian Writers
An intensive study of the work of two or three major Canadian authors. Writers who may be studied include Morley Callaghan, F. P. Grove, Robertson Davies, A. M. Klein, Thomas Haliburton, Irving Layton, Margaret Atwood, and Margaret Laurence.
Also offered at St. Jerome's College.

ENGL 430A/B
The Romantic Movement
An historical and critical study of the principles and practice of the English Romantic authors from Blake to Keats, with primary emphasis on poetry.
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 430B W 0.5
The Romantic Movement 2
The poetry and critical theory of Byron, Shelley, and Keats. Emphasis is primarily on poetry; selected minor writers may be considered.
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). Provision will be made for students who wish to study other writers such as Hopkins, Swinburne, Carroll, Morris, or Pater.
Also offered at St. Jerome's College.

ENGL 451A F 0.5
Literature of the Victorian Age 1
An historical and critical study of major poets (Browning, Tennyson, Arnold) and of the literary criticism of the period.
Also offered at St. Jerome's College.

ENGL 451B W 0.5
Literature of the Victorian Age 2
An historical and critical study of major novelists (Dickens, Thackeray, Eliot) and major essayists (Newman, Ruskin, Mill, Huxley).
Also offered at St. Jerome's College.

ENGL 460A/B
British Literature from Shaw to Eliot
A study of the major writers in British Literature from 1885 to World War 2, with special emphasis on such writers as Shaw, Yeats, Eliot, Conrad, Joyce, and Lawrence.
Also offered at St. Jerome's College.

ENGL 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
Not Offered 1983-84

Group One
ENGL 309 Seminar in Essay Writing
ENGL 241R Form and Function 2

Group Two
ENGL 108A Utopia and Anti-Utopia
ENGL 108D The Quest Theme in Literature

ENGL 108K Literature and Science
ENGL 203 Introduction to Folklore 1
ENGL 204 Introduction to Folklore 2
ENGL 208D Modern Satire
ENGL 215 Canadian Regional Literature

ENGL 232 The Development of Drama to 1660
ENGL 233 Drama from 1660
ENGL 316 Canadian Drama
ENGL 339 Contemporary British Literature
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 316 Canadian Drama
ENGL 339 Contemporary British Literature
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 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 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."

ENGL 410A/B
Restoration and Eighteenth-Century Literature
Literature of the period that began as neo-classical, England's Augustan Age paralleling that of ancient Rome, and gradually, through subtle changes, became the precursor to the Romantic movement, giving rise, along the way, to new genres, such as comedy of manners, heroic tragedy, descriptive-meditative poetry, and the novel.
Also offered at St. Jerome's College.

ENGL 410A F 0.5
Satire and Sense: The Restoration and Early Eighteenth Century
The Restoration comedy of manners, heroic and high tragedy, poetry of the court wits and other amused commentators on society, and the major writings of Dryden, Swift, Addison, Defoe, and the early Pope.
Also offered at St. Jerome's College.

ENGL 410B W 0.5
Sense and Sensibility: The Middle and Later Eighteenth Century
The probing of mores and manners by Pope and Johnson, the emergence of the novel with Fielding and Sterne, and the transformation (in "the age of sensibility") of literary attitudes and practice from classicism to romanticism.
Also offered at St. Jerome's College.

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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.
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The Romantic Movement
An historical and critical study of the principles and practice of the English Romantic authors from Blake to Keats, with primary emphasis on poetry.
Also offered at St. Jerome's College.

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 430B W 0.5
The Romantic Movement 2
The poetry and critical theory of Byron, Shelley, and Keats. Emphasis is primarily on poetry; selected minor writers may be considered.
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). Provision will be made for students who wish to study other writers such as Hopkins, Swinburne, Carroll, Morris, or Pater.
Also offered at St. Jerome's College.

ENGL 451A F 0.5
Literature of the Victorian Age 1
An historical and critical study of major poets (Browning, Tennyson, Arnold) and of the literary criticism of the period.
Also offered at St. Jerome's College.

ENGL 451B W 0.5
Literature of the Victorian Age 2
An historical and critical study of major novelists (Dickens, Thackeray, Eliot) and major essayists (Newman, Ruskin, Mill, Huxley).
Also offered at St. Jerome's College.

ENGL 460A/B
British Literature from Shaw to Eliot
A study of the major writers in British Literature from 1885 to World War 2, with special emphasis on such writers as Shaw, Yeats, Eliot, Conrad, Joyce, and Lawrence.
Also offered at St. Jerome's College.

ENGL 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
Not Offered 1983-84

Group One
ENGL 309 Seminar in Essay Writing
ENGL 241R Form and Function 2

Group Two
ENGL 108A Utopia and Anti-Utopia
ENGL 108D The Quest Theme in Literature

ENGL 108K Literature and Science
ENGL 203 Introduction to Folklore 1
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ENGL 208D Modern Satire
ENGL 215 Canadian Regional Literature

ENGL 232 The Development of Drama to 1660
ENGL 233 Drama from 1660
ENGL 316 Canadian Drama
ENGL 339 Contemporary British Literature
ENGL 376R Our Changing Language: Syntax and Semantics 1
ENGL 377R Our Changing Language: Syntax and Semantics 2
ENGL 386R Twentieth Century Literature 1
Course Descriptions

Environmental Studies

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

ENV S 111 F 3C 0.5
Introduction to the Study of the Future
Non-technical survey of current approaches to thinking about and refining your views of the "Future". The role of images and scenarios, contributions of the arts and concepts of space and time. Impacts of regional science, ekistics, bioethics, synergetics, and prognostics. Paths to "inventing" the future and the comprehensive design of "optimum" environments.
Prereq: Environmental Studies students only.

ENV S 195A F 3C 0.5
Introduction to Environmental Studies
Theories, methods and conceptual approaches that have become associated with the study of environment are introduced. This course attempts to develop an understanding of the relationship between people and their environment.
Prereq: Environmental Studies students only.

ENV S 195B F,W 2C,1S 0.5
Introduction to Environmental Problems
A discussion of some major environmental problems and issues such as the impact of urbanization of man's environment, environmental pollution, resource management, conservation, and environmental planning.

ENV S 200 F,W 2C,2L 0.75
Field Ecology
Introduces the main concepts and principles of ecology: the cycling of elements; energetics and structural organization of major ecological systems; population dynamics; impact of natural resource management practices and urban and industrial development on the environment; incorporating environmental quality considerations into development activities. There are weekly field trips to study natural and disturbed ecosystems, urban and applied ecology.
Prereq: 2nd, 3rd and 4th year students only.
Course Descriptions
Environmental Studies

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 W 2C 0.5
Behavioural Studies
Studies of environmental perception and of the behaviour of individuals and groups in interaction with their environment. Emphasis will be divided between an explanation of the methods of social science suitable for the study of environmental behaviour and the substantive findings from such applications. Prereq: Second, third or fourth year students only.

ENV S 333 W 0.5
Parkland Management
Systems planning, master planning and site planning for 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 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; enrolment is by research team only with representatives from at least 3 units of the faculty (max. 7 people) and subject to selection of an advisor and a satisfactory project or research proposal.

ENV S 401 W 3C 0.5
Environmental Law
An advanced, in-depth version of ENV S 201, providing an opportunity for detailed analysis of institutional factors regulating the natural environment and resources development in Ontario and Canada. How satisfactory present statutes, court systems and boards are for improving environmental quality as well as alternatives to these legal-institutional approaches will be discussed. 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, 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 Jouvenal, Dror, Doxiadis, Ehrlich, Forrester, Fuller, Kahn, Mead, Meadows, McHale, Michael, Polak, Theobald, Thompson, Toynbee, and Ward. Prereq: 3rd or 4th year standing or consent of instructor.

ENV S 412 W 3S 0.5
Alternative Future Environments 2
Examination of "issues" in futurotics 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 444 F 3C,2L 1.0
Land Evaluation and Resources Management
The course will focus on the management of land and resources. It will emphasize the techniques of inventory, critical evaluation, and policy formulation related to sensible use of these commodities. Attitudinal, legal, and political influences will be investigated, particularly as they affect the design and implementation of planning decisions.

ENV S 500 0.5
Professional Development in Environmental Management
Those interested in qualifying for professional status and those from other related disciplines such as civil engineering, planning, architecture, and geography may find a discussion of professional environmental management strategies useful. Issues of technical principles, data assessment, ethics, interdisciplinary work and costs will be discussed. Prereq: 4th year students or consent of instructor.

Not Offered 1993-94:
ENV S 358 Environmental Pollution and Its Control
ENV S 418 Land Use History and Landscape Change 2
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
P. Forsyth, AB (Mount Holyoke), MA, PhD (Toronto) Recipient of the Distinguished Teacher Award
D.I. MacKay, BFA (Mt. Allison), MFA (Cornell)

Assistant Professors
A. Green, BFA (Art. Institute of Chicago)
B. Irland, BFA (Illinole), MFA (Massachusetts)
E. Kilman, MA, PhD (Toronto)
A. Roberts, BA (Guelph), MA (Claremont)
J. Uhde, MA (Purkeyne’s University Brno), PhD (Waterloo)

Adjunct Faculty
M. Bird, BA, MA, PhD (Iowa)
P. Swann, BA, MA (Oxford), DLitt (Brock), DLitt (Queen’s)

Faculty members holding cross appointments to Fine Arts from:
'Classical Studies

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Art History Offerings

FINE 110 F 3C 0.5
Introduction to World Art 1
A comparative survey of Prehistoric and Ancient Art, and of Oriental, African, New World and Oceanian Art, emphasizing visual form as an expression of its historical and cultural context.

FINE 111 W 3C 0.5
Introduction to World Art 2
A comparative survey of Western Art from the Classical to the Modern period, emphasizing visual form as an expression of its historical and cultural context.

FINE 210 F 3C 0.5
Modern Art 1
An examination of the history of Modern Art from the late 18th century up to the time of impressionism.

FINE 211 W 3C 0.5
Modern Art 2
A continuation of FINE 210, commencing with impressionism and proceeding through the major trends of the early 20th century up to the contemporary period.

FINE 212 F 3C 0.5
Italian and Northern Renaissance Art 1
A survey of the innovations in European painting, sculpture, and architecture between 1260 and 1500. Prereq: FINE 111 or consent of instructor.

FINE 213 W 3C 0.5
Italian and Northern Renaissance Art 2
A continuation of FINE 212 starting with the masters of the High Renaissance and concluding with the art of the Mannerists. Prereq: FINE 212 or consent of instructor.

FINE 214 F 3C 0.5
Medieval Art and Architecture
A study of Early Christian Romanesque and Gothic Art. Prereq: FINE 111 or consent of instructor.

FINE 219 F 3C 0.5
Canadian Art
A survey that begins with the art of British and French settlers in the 17th century and concludes with developments in contemporary Canadian art.

FINE 310 F 3C 0.5
Greek Art and Architecture (C CIV 351)
A survey of the art and architecture of the ancient Greek world from the Minoan to the Hellenistic periods. Consult Classical Studies.

FINE 311 W,S 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 316 F 3C 0.5
Canadian Native Art
The arts and crafts of Canadian Indian and Inuit (Eskimo) peoples are examined with slide lectures, films, and student presentations.

FINE 319 W 3C 0.5
Contemporary Art
A seminar exploring the contemporary avant garde art movements through critical analysis, historical correlation, discussions with artists and trips to Toronto and New York. Topics covered will include environmental sculpture, conceptual trends, earth works, performance, technology, postal art, and the business aspects of art.

FINE 390 F R 0.5
Selected Subjects in Fine Arts
Research and reading courses under the direction of individual instructors. Admission by consent of instructor.

FINE 390A F 3S 0.5
Methods in the History of Art
For students planning a Senior Honours Presentation in Art History. Students will examine methods of formal and stylistic analysis, iconographical interpretation and the application of social and political history to understanding of works of art. Required of all art history majors who take FINE 490/491. Admission by consent of instructor.

FINE 391 W R 0.5
Senior Seminar 1
Admission by consent of instructor.

FINE 472 F R 0.5
Senior Seminar 2
Admission by consent of instructor.

FINE 490 F,S S,std,R 0.5
Senior Honours Presentation 1
Course description is on p. 328.

FINE 490A F S,std,R 0.5
Senior Honours Presentation 2
Course description is on p. 328.

FINE 491 W S,std,R 0.5
Senior Honours Presentation 2
Course description is on p. 328.

FINE 491A W S,std,R 0.5
Senior General Seminar 2
Course description is on p. 328.
Not offered 1983-84:
FINE 215 Baroque Art
FINE 218 Western Religious Art
FINE 313 Special Topics in 19th Century Art
FINE 318 Canadian Ethnic and Traditional Art
FINE 319A Special Topics in 20th Century Art: 1900-1940
FINE 319B Special Topics in 20th Century Art: 1940-1970

Film Studies Offerings
FINE 250 F D,C 0.5
History of Film 1 - Silent Film
General history of world cinema in its silent era (1895-1929), covering the work of outstanding directors, important movements and the contribution to the silent medium as an independent art form. Regular film screenings.
Film fee.

FINE 251 W D,M,C 0.5
History of Film 2 - Sound Film
A continuation of FINE 250. The expression of film history into the sound era (since 1929) including the most recent period. Regular film screenings. Prereq: A film course or consent of instructor.
Film fee.

FINE 252 F 2C,1D 0.5
Film and the Quest for Meaning 1
An exploration of spiritual themes and issues in the cinema. An assessment of film's special characteristics as an art form capable of addressing the human quest for a significant existence. Emphasis upon the films of Ingmar Bergman.
Cross-listed as RS 266.
Film fee: $5.

FINE 253 W 2C,1D 0.5
Film and the Quest for Meaning 2
A consideration of selected themes - death, evil, guilt, fate, alienation, courage, love, redemption - in the films of several of today's leading directors. Emphasis upon a variety of directors from divergent cultural backgrounds.
Cross-listed as RS 267.
Film fee: $5.

FINE 255R 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.

FINE 258W 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 270W F 0.5
The Film as a Modern Medium
A study of the technical problems of filmmaking, leading to the writing, production and editing of a silent film. This is a WLU course for Film Studies Majors/Minors only.

FINE 271W W 0.5
Sound and Colour in Film
A study of the principles of sound recording for film and of the colour laboratory and its techniques. The students will produce a short colour/sound film. Prereq: FINE 270W, any other film course or consent of instructor. This is a WLU course for Film Studies Majors/Minors only.

FINE 275W F 0.5
French Film After 1945
A study of major achievements of the French cinema after World War II. Discussion and comparison of the two main creative impulses of the period: the "Academic tradition" of the 40's and 50's, and the rebellious nouvelle vague of the 60's. (Bresson, Carné, Ophuls, Renoir, Chabrol, Godard, Malraux, Truffaut, Resnais, and others.) Regular film screenings Prereq: A film course or consent of instructor.
Film fee.

FINE 351 W D,C 0.5
East European Film After 1945
A study of the development of motion picture art in Eastern Europe after World War II. Selected works of major directors of Czechoslovakia, Hungary, Poland, the USSR and Yugoslavia will be discussed, as well as characteristic features of East European cinema as a whole. (Chytilová, Forman, Jancsó, Makavejev, Tarkovski, Wajda, and others.) Regular film screenings. Prereq: A film course or consent of instructor.
Film fee.

FINE 358R/357R 0.5/0.5
Special Topics in Film
Special topics will be announced from year to year.

FINE 391 R 0.5
Selected Subjects in Fine Arts
Research and reading courses under the direction of individual instructors. Admission by consent of instructor.

FINE 390 F R 0.5
Senior Seminar in Film Concepts 1
Film screenings. Admission by consent of instructor.

FINE 391 .W R 0.5
Senior Seminar in Film Concepts 2
Film screenings. Admission by consent of instructor.

FINE 470 F 0.5
Senior Seminar in Film Concepts 2
Film screenings. Admission by consent of instructor.

FINE 471 W R 0.5
Senior Seminar in Film Concepts 2
Film screenings. Admission by consent of instructor.

FINE 490 F S,std,R 0.5
Senior Honours Presentation 1
Course description is on p. 328.

FINE 491 W S,std,R 0.5
Senior Honours Presentation 2
Course description is on p. 328.

Not offered in 1983-84:
FINE 360 Film Theory 1
FINE 361 Film Theory 2

STUDIO OFFERINGS
FINE 120 F.W 6 std 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.
Course Descriptions

Fine Arts

FINE 121 W 6std 0.5
Fundamentals of Visual Art 2
A continuation of FINE 120 with emphasis on colour.
Prereq: FINE 120

FINE 220 F 6std 0.5
Fundamentals of Painting 1
An exploration of the problems and possibilities of painting as a vehicle for serious creative expression. The fundamentals of composition and painting techniques will be presented through a series of studio projects.
Prereq: FINE 120/121 or consent of instructor. Lab fee.

FINE 220A F 6std 0.5
Watercolour Painting
An exploration of the technique of watercolour painting as a means of creating both non-objective and representational forms on a two-dimensional surface.
Prereq: FINE 120/121. Lab fee.

FINE 221 W,S 6std 0.5
Fundamentals of Painting 2
A continuation of the studio projects begun in FINE 220 with a greater emphasis on the development of individual expression.
Prereq: FINE 220 or consent of instructor. Lab fee.

FINE 222 F 6std 0.5
Fundamentals of Sculpture 1
An introduction to sculpture. Three-dimensional form will be explored with the emphasis on the handling of clay and wood as an expressive medium enhanced by surface treatment.
Prereq: FINE 120/121
Lab fee.

FINE 223 W,S 6std 0.5
Fundamentals of Sculpture 2
An introduction to multi-media sculpture. Additive and subtractive use of wood, metal and plaster casting together with a mastery of three-dimensional forms in a variety of media.
Prereq: FINE 222.
Lab fee.

FINE 224 F 4std 0.5
Introduction to Drawing
Half the time will be devoted to drawing from the model and the remainder to a series of drawing concepts. At least one field trip will be included: Art Gallery of Ontario or the Albright Knox in Buffalo.
Prereq: FINE 120/121
Lab fee.

FINE 225 W,S 6std 0.5
Analytical Figure Drawing
Analytical figure drawing from the model will be combined with a study of human anatomy for artists.
Prereq: FINE 120/121
Lab fee.

FINE 226
Printmaking
Introduction to materials and methods of printmaking. Current offerings are given below.

FINE 226A W 4std 0.5
Printmaking (Intaglio)
An introduction to basic intaglio techniques including etching and engraving through workshops, class demonstrations and field trips.
Prereq: FINE 120/121 or consent of instructor.
Lab fee.

FINE 226B W 4std 0.5
Printmaking (Relief)
An introduction of relief printing including linocogliph, block wood, lino cut and type using press and non-press materials to make print images in a series of workshops, demonstrations and field trips.
Prereq: FINE 226A or permission of instructor.
Lab fee.

FINE 227 W 3std 0.5
Scientific Drawing
Through studio experiences, students will learn techniques for making accurate scale drawings of biological subjects in line and value, using various media. Methods of preparing drawings for reproduction will be included.

FINE 228
Applied Arts
The history, design and practice of various applied arts will be explored in slide lectures and studio projects. Specific arts will vary from year to year; current offerings are given below.

FINE 228A W 3std 0.5
Expressive Textile Forms
The history of textile arts and problems of design for textile media will be explored combining lectures and studio projects in both two and three dimensional expressive forms. Traditional textile materials and methods will be applied to the creation of contemporary expressive and autonomous forms. Students will supply their own materials.

FINE 228C W 3std 0.5
Images and Effigies
A study of contemporary and historical images and effigies in art, ritual, and popular culture, and a series of studio projects in which three-dimensional images are constructed.

FINE 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 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.
Prereq: FINE 220/221 or consent of instructor.
Lab fee.

FINE 321 W 6std 0.5
Advanced Painting 2
A continuation of Fine Arts 320 with a further emphasis on independent problems.
Prereq: FINE 320 or consent of instructor.
Lab fee.

FINE 322 F 6std 0.5
Advanced Sculpture 1
An exploration of sculpture problems in a variety of media as vehicles for serious creative expression. Wood, metal, glass and soapstone will be used for visual portrayal of spatial ideas.
Prereq: FINE 222/223.
Lab fee.

FINE 323 W 6std 0.5
Advanced Sculpture 2
Organization and integration of sculptural concepts in clay to develop a series of representational or abstract sculptures. Clay and glaze technology for oxidation stoneware firing will be stressed.
Prereq: FINE 322.

FINE 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.
Prereq: FINE 224 or consent of instructor.
Lab fee.

FINE 325 W 6 std 0.5
Advanced Drawing 2
Continuation of FINE 324.

FINE 326A W std 0.5
Advanced Printmaking
A continuation of printmaking concepts for independent study.
Admission by permission of instructor. Lab fee.

FINE 328 F 3 std 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 3 std 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 392 F R std 0.5
Selected Subjects in Fine Arts
Studio and practice courses under the direction of individual instructors.
Admission by consent of instructor.

FINE 393 W R std 0.5
Selected Subjects in Fine Arts
Studio and practice courses under the direction of individual instructors.
Admission by consent of instructor.

FINE 420 F 4 std 0.5
Senior Graphics Techniques 1
Admission by consent of instructor.

FINE 421 W 4 std 0.5
Senior Graphics Techniques 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.

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 or research project. The result of this endeavour will be presented in the form of an exhibition or its equivalent (i.e. film, illustrated book, portfolio, or essay), which will be examined by faculty members of Fine Arts and also where pertinent, by members of other departments. Required of all students in Honours Fine Arts. Admission by permission only.

FINE 490A F S std R 0.5
Senior General Seminar
As in FINE 490, each student will work under the direction of a Fine Arts faculty member on an advanced creative 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.

Not offered in 1983-84:
FINE 223A Clay Studies from the Human Form
FINE 226C Printmaking (Screen)
FINE 228E Photography for Artists
FINE 323A Experimental Explorations
FINE 323A Assemblage

Department of French

Associate Professor and Chairman of the Department
W.D. Wilson, MA, PhD (Trinity College, Dublin)

Associate Professor and Graduate Officer
P.H. Dubé, BA, MA (Toronto), PhD (Ohio State)

Associate Professor and Undergraduate Officer
D.W. Russell, BA, MA, PhD (Toronto)

Professors
A Ages, BA (Carleton), MA, PhD (Ohio State)
J.R. Finn, CR, BA (Western Ontario), MA (Toronto), PhD (Illinois) J
R.L. Myers, BA (Western Ontario), MA, PhD (Johns Hopkins)

Associate Professors
J.R. Dugan, BA, MA (Toronto), PhD (Yale)
P. Socken, BA (Toronto), MA (Iowa), PhD (Toronto)

Assistant Professors
H.S. Fournier, BA (Toronto), MA, PhD (Western Ontario)
R.J. Fournier, BA, MA, PhD (Western Ontario)

Sessional Appointments
C.A. Abbott, BA, MA, PhD (Ohio State)
G. Beck, BA (Guelph), MA (Waterloo)
H. McLenaghan, Licence en Phil. Rom. (Brussels), MA (Waterloo), PhD (Western Ontario).

Lecturers
M. Aderan, BA, MA (Toronto), DEA (Paris)
N. Vassiliadis, Baccalauréat ô Arts, Licence ès Lettres (Laval), MA (Toronto)

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Study In France or Quebec
The Department offers students the possibility of studying for a year at the University of Nantes under a special third-year program. As well, there is an
arrangement between the Department and the Université Laval, at Quebec, whereby Waterloo students may study for a year or a term at Laval. More information may be obtained from the Department.

First Year Courses
Students who have completed Ontario Grade 13 French or equivalent may take FR 192 and/or FR 195/196. Students who have little or no high school French will be placed in the appropriate beginning course, either FR 151/152 or FR 155 for one or two terms. The Department reserves the right to refuse admission to any of its language courses to a student who has, in the view of the Department, a level of competence unsuited to any given course.

FR 151  F,W,S  4C  0.5
Basic French
For students with little or no high school French. An elementary course designed to give a comprehensive approach to French-language study to the beginning student of French. Involves reading, writing and speaking French. Successful completion of FR 151 qualifies a student to take FR 152. The Placement Test is not required but students must consult the Department before enrolling.

FR 152  F,W,S  4C  0.5
Basic French
A continuation of the work done in FR 151. Successful completion of FR 152 qualifies a student to take FR 152. Prereq: FR 151 or consent of Department.

Language Workshop
A two hour per week tutorial workshop, concurrent with FR 151.

FR 155  F,W  4C,1L  0.5
Intensive Review of French
Normally, students with up to Ontario Grade 12 French are placed in this course. A one-term course which gives an intensive review of French language study for students who do not have the equivalent of Ontario Grade 13 French. Prereq: The equivalent of Ontario Grade 12 French or consent of the Department. Not open to students who have completed FR 151/152. The Placement Test is not required, but students must consult the Department before enrolling.

FR 192  Y  4C,1L  1.0
French Language
For students with Ontario Grade 13 French. An intensive French language course. Emphasis will be placed on strengthening oral expression, comprehension of spoken French, reading and writing skills. Taught in French. All students enrolling in FR 192 must take the French Placement Test to be held on Thursday, September 8th, 1983, in Arts Lecture Building Room 116 from 11:30 a.m. to 1:30 p.m.
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.

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 I
For students with Ontario Grade 13 French. A study of various critical approaches and their application to French literature, with emphasis on the literature of French Canada. Taught in French.
Prereq: Grade 13 French or equivalent, FR 152, 155 or consent of Department.

FR 198  F  3C  0.5
French Literature II
For students with Ontario Grade 13 French. A study of various critical approaches and their application to French literature, with emphasis on the literature of France. A continuation of FR 195. Taught in French.
Prereq: Grade 13 French or equivalent, FR 152, 155 or consent of Department.

FR 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.

UPPER-YEAR COURSES

Language Courses
Linguistics and Literature courses are listed separately below. Please refer to the degree requirements outlined in the Faculty of Arts Program Section. Chapter 8. Students in a Major or Honours program may count only one of FR 207, 200, 252, 255 in their French requirements, but may include several of these as elective credit. Please consult Departmental brochure for more details.

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. These groups will be streamed according to the fluency of the students.
Prereq: normally one of: FR 152, 155, or consent of Department.
Maximum enrolment of 15 in each section.

FR 206  F,W,S  3C,1L  0.5
Spoken French
Continuation and completion of work begun in FR 205.
Prereq: FR 205 or consent of Department.
Maximum enrolment of 15 in each section.

FR 207  F,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.
Maximum enrolment of 15 in each section.
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.*  
Maximum enrolment of 15 in each section.

FR 210 2C 0.5  
**Report Writing in French**  
This course is designed to give students practice in the research, the organization and the writing of a variety of reports in the French language.  
*Prereq: FR 192. 195/196 or consent of Department.*  
May only be used for elective credit by French Major and Honours students.

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**  
A French language course designed to enable the student to carry on standard business practices in spoken and written French.  
*Prereq: FR 192, 195/196 or consent of Department.*

FR 301 F 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 302 W 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 401 S,F 0.5  
**Advanced Language Study**  
Consult the Department for further details of this course.  
*Prereq: FR 300, 302, or consent of the 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.

**Linguistics and Literature Courses**  
Students should consult the Departmental brochure for further details.

FR 203 W 3C,1L 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, 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 253 F 3C 0.5  
**Survey of Nineteenth Century French Literature**  
This course will trace the development of French Literature from the French Revolution to the end of the nineteenth century. Taught in French.  
*Prereq: FR 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 275 F 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; Andrè Langeven; Hubert Aquin; Gérard Bessette. 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.  
*FR 291 and 292 taught in English. 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.*

FR 303  
**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.*
Course Descriptions

French

General Engineering

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 372 3C 0.5
Contemporary Quebec Theatre
A study of contemporary Quebec theatre, from Gratien Gélinas to Michel Tremblay. Taught in French.

FR 373 F.W 1S 0.0
Co-ordination Orientation
Given by the Department of Co-ordination for students in Year 1 Engineering. Its purpose is to introduce the students to the various features of the co-operative program and engineering as a profession.

FR 374 F 3C 0.5
Senior Tutorials
A small group of students follows a course of study under the supervision of a faculty member. For details, inquire of the Department.

FR 400-498 0.5
Survey of Eighteenth Century French Literature
This course will trace the development of French literature from 1700-1800. Taught in French.

FR 409 F 3C 0.5
Medieval French Language
Introduction to the early development of French. Taught at St. Jerome's College.

FR 410 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.

FR 411 3C 0.5
Co-ordination Orientation
Given by the Department of Co-ordination for students in Year 1 Engineering. Its purpose is to introduce the students to the various features of the co-operative program and engineering as a profession.

FR 412 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 413 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 414 F 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 415 F 3C 0.5
Introduction to Linguistic Thought
A general introduction to modern linguistic thought as developed principally by Saussure and the Structuralists, as well as the new tendencies in linguistics (socio-linguistics, pragmatics, discourse analysis). Taught in French.

FR 416 F 3C 0.5
Modern French Language
Introduction to the early development of French. Taught at St. Jerome's College.

FR 417 F 3C 0.5
French Poetry of the Renaissance
Readings in sixteenth century poetry: Marot, the Pédale, the baroque poets, etc. Taught in French.

FR 418 F 3C 0.5
History of Philosophy
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.

FR 419 F 3C 0.5
Introduction to Human Communications Systems
The processes involved in man-man, man-machine and man 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.11.
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
L.T. Guelke, BSc (Cape Town), MA (York), PhD (Toronto)

Professor, Dean of Environmental Studies
J.G. Nelson, BA (McMaster), MA (Colorado), PhD (Johns Hopkins)

Professor, Associate Dean, Graduate Studies
J.S. Gardner, BSc (Alberta), MSc, PhD (McGill), Recipient of the Distinguished Teacher Award

Professor, Associate Chairman, Undergraduate Studies
R.R. Kreuger, BA (Western Ontario), PhD (Indiana)

Assistant Professors
C.R. Bryant, BA, PhD (London)
D.F. Walker, BA, MA (Belfast), PhD (London)

Adjunct Faculty
G. Brannon, CC
B.C. Matthews, BSc (Toronto), AM (Missouri), PhD (Toronto), LLB (Waterloo)
D.I. McKenzie, BSc (Toronto), AM (Western Ontario), MA (McGill), Recipient of the Distinguished Teacher Award

Course Descriptions

Geography

GEOG 102 F,W 2C,2L 0.75
Introduction to Physical Geography
Emphasis on the natural environment as an integrated system of which it is a part. Selected aspects of weather - climate, water, soils, biota, landforms along with flows of energy, water and matter and their resultant effects on the subsystems of the natural environment are studied.

GEOG 110 F 2C 0.5
Introduction to the Field of Geography
The goals of this course are to introduce first year geographers to: Geography as a profession, different approaches to solving geographical problems, research report writing, and to the Geography program at the University of Waterloo. Prereq: First year Geography Majors only or 1st year Arts students intending to major in Geography or consent of instructor.

ENV S 111
Introduction to the Study of the Future

GEOG 125 F W 3C 0.5
Introduction to the Third World
A thematic approach to such topics as population issues, planning and practices: education and health in the social development process; urbanization and industrialization; planning for rural and urban development in Asia, Africa and Latin America.

GEOG 127 F, 2C,2L 0.75
Regional Problems of Europe
An introduction to the Geography of Europe which examines agricultural, industrial and urban problems. Lectures, discussions and visual presentations based on field experience of instructors.

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
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 271
Introduction to Quantitative Research Methods

ENV S 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 $15-$20.

GEOG 300 F,S 2C,4L 0.75
Geomorphology and the Southern Ontario Environment
Emphasizes field work and field trips in exploring the evolution of S. Ontario landforms. The identification of landforms, landscape assemblages and their relationships. The meaning and utility of this information in terms of the contemporary and future environment will be stressed.
Prereq: GEOG 201, or consent of instructor. Third and Fourth Year Students only.
Lab fee $10-$15.

GEOG 301 W 3C 0.5
Climatology
Prereq: GEOG 201.

GEOG 302 F 2C,2L 0.75
Geographical Process
The impact of processes in forming the earth’s surface 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 erosion, karst, coastal and fluvial landforms.
Prereq: Third and fourth year students only with GEOG 201 or consent of instructor.
Lab fee $10.

Social Science Approaches to Environmental Problems

EOG 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.

EOG 203 W,S 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 3C 0.5
Soviet Union
Introduction to the geography of the Soviet Union, with a focus on selected problems in urbanization, industrialization, resource use and regional economic development in a planned economy.

GEOG 205 F 3C 0.5
Africa
The geography of modern Africa south of the Sahara in the context of changing attitudes to the continent on the part of the “developed” countries. Attention will focus on problems of the physical, social and economic environments.

GEOG 220 Y 2C,2L 1.5
World Regional Geography
Study in depth of selected areas of the world’s climatic regions, emphasizing characteristic problems as well as their physical, cultural and economic interrelationships. Utilization of natural resources, the effects of increasing population density, the occupation 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 W 3C 0.5
Urbanization in the Third World
An analysis of the factors behind the rapid urbanization of selected areas in Asia, Africa and Latin America, with an examination of related problems of urban planning and development control policies.
Prereq: Any Faculty of Environmental Studies course.

GEOG 232 F 3C 0.5
Geography of Population

GEOG 251 F,W 3C 0.5
Cities in Canada
An introduction to some basic concepts in urban studies emphasizing a systematic approach to processes and problems of urban development in Canada.

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.
GEOG 303 W 2C,2L 0.75
Physical Basis and the Geography of Water
Specific topics include: the earth's water balance and cycle, oceans, lakes and swamps, snow cover, ground ice, glacier ice and streams. Attention is directed to the impact of water on the earth's surface, the role of water in the earth's system, and water as a resource and hazard. Some field work.
Prereq: GEOG 201, or consent of instructor.

GEOG 307 F,W 2C,1D 0.5
Social Survey Techniques
Social research and the planning process; interview and self administered surveys; questionnaire design; profile data; sampling; data processing; non-survey data collection techniques, practical applications.
Prereq: Second or third year Geography students and ENV S 271; other ENV S students with consent of instructor. Cross-listed as PLAN 307.

ENV S 310
Behavioural Studies

GEOG 311 F 3C 0.5
Regional Industrial Development
Manufacturing and transportation in the context of economic development at regional and urban scales. Aims at deepening conceptual insights and fostering appreciation of their relevance to understanding particular areas. Empirical focus on Canada and the U.K.
Prereq: GEOG 202 or consent of instructor.

GEOG 315 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.
Prereq: ENV S 271 or consent of instructor.

GEOG 317 Nonparametric Statistics
The theory and application of nonparametric statistics, with particular emphasis upon social science problems. Same as PLAN 317. Prereq: ENV S 271 or consent of instructor.

GEOG 318 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 neighbour 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 W 2S 0.5
Comparative Regional Problems
A geographical analysis of selected regions and current problems. The theme chosen in any given year will vary.
frontier problems, the location of capital cities, internal organization of states, national relations, and geopolitics.

GEOG 348 F, W 3C 0.5
Water Planning and Management: Strategies and Experiences
Benchmark theory and principles of comprehensive water planning and integrated river basin management. Selected international to local scale case studies.
Prereq: GEOG 356 or consent of instructor.
Lab fee $10-$15.

GEOG 359 F 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 relationships 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 361 F 3C, 1L 0.5
Water Planning
Integrated river basin management with emphasis on the environment. Special attention will be given to river basin analysis and integrated water planning and management of water resources.
Prereq: GEOG 359 or consent of instructor.

GEOG 366 F, W 3C 0.5
The Nature of Geography
Prereq: Any three GEOG credits or consent of instructor
Lab fee $10.

GEOG 375 F 2C, 2L 0.5
Air Photo Interpretation
The principles of air photo interpretation utilizing specific criteria visible in the conventional air photo. Examples from local and foreign environments.
Prereq: GEOG 275 and either GEOG 201 or EARTH 121-122 or SCI 100.
Lab fee $15-$20.

GEOG 376 F, S 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 sensors like RADAR and LANDSAT. Methods of RS data processing and analysis and the application of RS techniques to studies of physical and human environments.
Prereq: GEOG 275
Lab fee $10-$15.

ENV S 360/381 Environmental Studies Workshop

ENV S 401 Environmental Law
ENV S 402 Planning Law

GEOG 400 W 2C, 2L 0.75
Climatic and Periglacial Morphology
Characteristics of the main principles of climatic and climatogenetic geomorphology. Examination of processes and forms related to the periglacial environment.
Prereq: One of GEOG 300, GEOG 302 or EARTH 342 or consent of instructor.

GEOG 401 F, S 3S 0.5
Glacial Geomorphology and Some Contemporary Applications
Advanced study of the total effect of glaciation. Glacial and fluvioglacial 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.
Course Descriptions

Geography

GEOG 403 W 1C,3L 0.75
Advanced Cartography 1
Advanced study of numerical map analysis and computer mapping techniques.
Prereq: GEOG 260, and ENV S 271.

GEOG 404 W 1C,3L 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 photo mechanics, inking, process photography, typography, proofing and printing processes. Theoretical topics include the map as a communications system, advanced map design and principles of information selection and generalization.
Prereq: GEOG 360
Lab fee $25.

GEOG 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 Sflalab 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.
Prereq: GEOG 300, GEOG 302, EARTH 342 or consent of instructor.
Field-trip expenses: $15 per student.

GEOG 410 F 3C 0.5
Recreation Geography
The environmental implications of existing and potential recreational demands. Recreational travel, site capability, economic and ecological impact models will be considered as well as the behavioural aspects of amenity resources.
Prereq: GEOG 356

ENVS411
Alternative Future Environments 1

ENVS 412
Alternative Future Environments 2

GEOG 412 W,S 2S 0.5
Geography of Manufacturing Firms and Industries
A companion course to GEOG 311. Emphasis on decision-making, multinational corporations, technological change, and analysis of the locational patterns of specific industries.
Prereq: GEOG 311

GEOG 414 F,S 2S 0.5
Energy Resources Management
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.

ENVS 417
Land Use History and Landscape Change 1

ENVS 418
Land Use History and Landscape Change 2

GEOG 421 Y 2C,1L 1.5
Europe and the Mediterranean
Detailed study of physical, cultural, economic and political geography, including the development of cities, problems of agriculture, changing industrial patterns, distribution of trade, regional disparities, and planning on the city, regional and national levels.

GEOG 422 W 2S 0.5
Canada
Seminar on the geographical analysis of selected Canadian topics. Emphasis on regional synthesis and topics of continuing Canadian concern.
Prereq: GEOG 322 or PLAN 222.

GEOG 424 F 3C 0.5
Soviet Union
Advanced study of selected aspects of the geography of the Soviet Union. A degree of flexibility in the course to allow some emphasis on topics of particular interest to the students registered in it.
Prereq: GEOG 204

GEOG 425 W 3C 0.5
Africa
Examination of selected aspects of the geography of a major region in Africa, with particular reference to problems of development. The region will normally be East Africa; a degree of flexibility will facilitate the selection of topics related to the interests of participants.
Prereq: GEOG 205

ENVS 444
Land Evaluation and Resources Management

GEOG 450 W,S 3C 0.5
City and Regional Systems
A continuation of Geography 349 and 350 with an emphasis on student projects.
Prereq: GEOG 350 and GEOG 349 or consent of instructor.

GEOG 451 F 1C,3L 0.5
Soils Geography
Prereq: ENVS 200 and GEOG 315

GEOG 452 W 2S 0.5
Problems of Rural Land Use
The nature of rural land problems and a critical evaluation of the methods of rural land use planning, in both metropolitan areas and underdeveloped or depressed rural regions.
Prereq: GEOG 315 and/or GEOG 352

GEOG 459 F 3C 0.5
Land Dereliction & Rehabilitation 1
Examination of the reasons for land dereliction, its processes, and effects. Analysis of rehabilitation techniques, includes principles of landscape architecture and optimizing ecological considerations and use of post operation areas.
Prereq: 4th year students or consent of instructor.

GEOG 470 F 2C,2L 0.75
Applied Air Photo Interpretation
Advanced air photo interpretation and its application in geomorphology, geology, resources inventory, engineering soils, hydrology, and pre-planning studies (terrain analysis). Projects in specific fields of interest form a significant part of the course.
Prereq: GEOG 375 and GEOG 300 or GEOG 302 or consent of instructor.
Lab fee $15-$20.
**Course Descriptions**

**Geography**

**Geological Engineering**

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**GEOG 475** F.W.S 2S 0.5

*Special Reading and Seminar on Selected Topics*

- A brief outline is to be filed with the Chairman or UG officer.
- Prereq: 3 full credits in GEOG and consent of instructor.

**GEOG 476** F 2S 1.0

*Special Readings and Seminar on Selected Topics*

- A brief outline is to be filed with the Chairman or UG officer.
- Prereq: 3 full credits in GEOG and consent of instructor.

**GEOG 481** F 2S 0.5

*Frontiers in Geography*

- Current philosophical and methodological trends in geographical thought. New and resurgent developments in various sub-fields and issues in related disciplines including professional planning, architecture, future studies, environmental psychology and public administration.
- Prereq: GEOG 381 or consent of instructor.

**GEOG 482** W 2S 0.5

*Geography and Education*

- 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.

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**ENV S 500**

*Professional Development in Environmental Management*

**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.

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**Not Offered 1983-1984:**

- GEOG 126R
- GEOG 226R
- GEOG 330
- GEOG 406
- GEOG 408
- GEOG 409
- GEOG 419
- GEOG 421
- GEOG 423
- GEOG 430
- GEOG 448
- GEOG 462
- GEOG 471

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**GEOG 475** F.W.S 2S 0.5

*Special Reading and Seminar on Selected Topics*

- Prereq: 3 full credits in GEOG and consent of instructor.

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**GEOG 476** F.W.S 2S 1.0

*Special Readings and Seminar on Selected Topics*

- Prereq: 3 full credits in GEOG and consent of instructor.

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**GEOG 481** F 2S 0.5

*Frontiers in Geography*

- Current philosophical and methodological trends in geographical thought. New and resurgent developments in various sub-fields and issues in related disciplines including professional planning, architecture, future studies, environmental psychology and public administration.
- Prereq: GEOG 381 or consent of instructor.

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**GEOG 482** W 2S 0.5

*Geography and Education*

- 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.

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**department of Germanic and Slavic Languages and Literatures**

**Course Descriptions**

**GEO E 126** W 2C.3L 0.5

*Geological Engineering Concepts*

- An introduction to processes that shape the earth’s landscapes. Consideration of the time concept in geology. Introductions to fossils, the occurrence and uses in earth sciences. The geological history of North America.

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**Course Descriptions**

**Geological Engineering**

**Professor, Chairman of the Geological Engineering Board**

M.B. Dusseault, BSc, PhD (Alberta)

**Professor, Chairman of Earth Sciences**

P. Fritz, Dipl Geol. Dr rer. nat. (Stuttgart)

**Professor, Dean of Engineering**

W.C. Lennox, BASc, MSc (Waterloo), PhD (Illinois), PEng

**Professors, Department of Earth Sciences**

J.A. Cherry, BE (Saskatchewan), MS (California-Berkeley), PhD (Illinois), PEng

P.F. Karrow, BSc (Queen's), PhD (Illinois)

**Associate Professors, Department of Earth Sciences**

I.J. Smalley, CEng, PhD (City University, London)

**Associate Professors, Department of Civil Engineering**

N. Kouwen, BASc, PhD (Waterloo), PEng

B. LeLievre, BEng (W Australia), MSc, PhD (Waterloo), PEng

E.L. Matyas, BASc (Toronto), DIC, PhD (London), PEng

J.C. Thompson, BASc (Toronto), MS, PhD (Illinois), PEng

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**Course Descriptions**

**GEO E 126** W 2C.3L 0.5

*Geological Engineering Concepts*

- An introduction to processes that shape the earth’s landscapes. Consideration of the time concept in geology. Introductions to fossils, the occurrence and uses in earth sciences. The geological history of North America.

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**Course Descriptions**

**Geological Engineering**

**Professor, Chairman of the Geological Engineering Board**

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J.C. Thompson, BASc (Toronto), MS, PhD (Illinois), PEng

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**Course Descriptions**

**GEO E 126** W 2C.3L 0.5

*Geological Engineering Concepts*

- An introduction to processes that shape the earth’s landscapes. Consideration of the time concept in geology. Introductions to fossils, the occurrence and uses in earth sciences. The geological history of North America.
Course Descriptions
Germanic and Slavic: German

Course Descriptions

German

Introductory Notes

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 in the program section 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 106 W 3C 0.5
German for Reading Knowledge
As GER 105.
Prereq: GER 105.

GER 111 F.W.S 3C 0.5
First Year Scientific German
For students with little or no knowledge of German. The basic elements of German grammar and pronunciation with an emphasis on reading and translation of elementary scientific literature from various fields.

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 have an equivalent background in the language. If in doubt, consult the Department.

GER 121 F 3C 0.5
Studies in German Literature with Language Practice
An introduction to German literature designed to accomplish the transition from language studies to reading and discussing literary texts. Grammar review, conversation practice, and the reading of selected works.
Prereq: At least 2 years of High School German, or equivalent.

GER 122 W 3C 0.5
Studies in German Literature with Language Practice
As GER 121.
Prereq: GER 121.

GER 151 F 3C 0.5
German Conversation and Grammar Review
Conversation on topics of everyday life as well as on political, social, and cultural aspects of the German-speaking countries: West and East Germany, Austria, and Switzerland. Comprehensive grammar review, vocabulary building, written practice. Language lab is recommended.
Prereq: At least 2 years of High School German, or equivalent.

GER 152 W 3C 0.5
German Conversation and Grammar Review
As GER 151.
Prereq: GER 151.

GER 201 F 3C 0.5
Second Year German
This course is a continuation of first year GER 101/102. It offers extensive practice in both the spoken and written language. It provides vocabulary building, grammar review, and exercises in pronunciation and comprehension. Language Lab.
Prereq: GER 102 or equivalent.

GER 202 W 3C 0.5
Second year German
As GER 201.
Prereq: GER 201.

GER 211 F 3C 0.5
Intermediate Scientific German
Grammar review and more advanced study of German structure and idiom. Reading and translating of scientific writings for vocabulary building and mastery of difficulties peculiar to technical style. Reading material is selected according to the field of the individual student.
Prereq: GER 106, 112 or equivalent.

GER 212 W 3C 0.5
Intermediate Scientific German
As GER 211.
Prereq: GER 211.
Course Descriptions
Germanic and Slavic: German

GER 251 F 3C 0.5
German Conversation and Composition
This course offers extensive practice in all the spoken and written languages, provides vocabulary building, grammar review, and exercises in pronunciation and comprehension. Prereq: GER 251.

GER 252 W 3C 0.5
German Conversation and Composition
As GER 251.

GER 256 F 3C 0.5
The Age of Goethe (Classicism)
Reading, interpretation, and critical analysis of representative works (Goethe, Schiller, Holderlin, etc.). Prereq: GER 251, 152 or equivalent.

GER 291 F 3C 0.5
Survey of German Literature
Introduction to the major periods of German literature. Readings and interpretation of representative texts. Prereq: GER 122, 152, 202 or equivalent.

GER 292 W 3C 0.5
Survey of German Literature
As GER 291. Prereq: GER 122, 152 or equivalent.

GER 311 F 3C 0.5
Theory of Translation
Theory, methodology, and techniques of translation. Patterns and problems in the translation of scholarly texts from the arts and sciences, with special emphasis on idiom and structure as compared with the target language. Prereq: GER 212 or equivalent.

GER 312 W 3C 0.5
Theory of Translation
As GER 311. Prereq: GER 311.

GER 351 F 3C 0.5
Intermediate Conversation and Composition
Conversation on modern topics. Exercises in advanced grammar, stylistics, and composition. Prereq: GER 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, Buchner, 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 361 F 3C 0.5
Young Germany and Biedermeier
Reading, interpretation, and critical analysis of prescribed prose, drama and poetry. (Grillparzer, Mörke, 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 from the early 20th century to the end of World War II (Kalha, Brecht, etc.). Prereq: GER 122, 152 or equivalent.

GER 372 W 3C 0.5
Modern German Literature
As GER 371. 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 (Rüchner), 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 392Z F 2.5
Waterloo in German Program
See page 110 for description.

GER 396Z W 2.5
Waterloo in German Program
As GER 395Z.

GER 441 F 3C 0.5
Humanism, Reformation and Baroque
Reading, interpretation, and critical analysis of prescribed texts (Erasmus, Luther, Secha, Oititz, Gryphius, Grimmelehausen, etc.). Prereq: Second year standing in German.
Course Descriptions
Germanic and Slavic: Dutch

GER 442 W 3C 0.5
Enlightenment and Storm and Stress
Reading, interpretation, and critical analysis of prescribed texts (Lessing, Wieland, Klopstock, Lenz, Klinger, etc.).
Prereq: Second year standing in German.

GER 451 F 3C 0.5
Advanced Conversation, Grammar and Composition
This course is conducted in German and provides intensive practice in spoken and written German on the advanced level.
Prereq: GER 352 or equivalent.

GER 452 W 3C 0.5
Advanced Conversation, Grammar and Composition
As GER 451.
Prereq: GER 451 or equivalent.

GER 461 F 3C 0.5
Introduction to the History of the German Language with Readings in Middle High German
Prereq: GER 122, 152 or equivalent
Offered in alternate years.

GER 462 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, Nibelungenlied, Hartmann von Aue, Wolfram von Eschenbach, etc.
Prereq: GER 461.
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.

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 Dyunny near Leningrad. Daily instruction by Russian faculty at the elementary, intermediate, and advanced levels, according to the proficiency of the students.
Prereq: At least one year of Russian language at the university level or equivalent.
Credits: 1.5 for completion of
a) first year Russian: 193, 194, 195, or
b) second year Russian: 293, 294, 295, or
c) third year Russian: 393, 394, 395, or
d) fourth year Russian: 493, 494, 495.
The Workshop may be attended more than once. However, a maximum of 1.5 credits will normally be granted towards a degree.
Prereq: RUSS 101 or equivalent.

RUSS 101 F 3C.1L 0.5
First Year Russian
(Ats Oriented) For students with little or no knowledge of Russian. The elements of Russian grammar and composition with emphasis on oral practice and pronunciation. Language Laboratory and Visual Aids. Selected readings of major Russian authors.
Open to all university students, except those who have credit for RUSS 111/112.

RUSS 102 W 3C.1L 0.5
First Year Russian
As RUSS 101.
Prereq: RUSS 101 or equivalent.

RUSS 111 F.S,W 3C 0.5
First Year Russian
(Science Oriented) For students with little or no knowledge of Russian. Essential grammar, sentence structure. Reading and translation of scientific literature according to the students' fields of interest.
Open to all university students, except for those who have credit for RUSS 101/102.

RUSS 112 W.F 3C 0.5
First Year Russian
As RUSS 111.
Prereq: 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.
Prereq: RUSS 102, 112 or equivalent.

RUSS 202 W 3C 0.5
Intermediate Scientific Russian
As RUSS 201.
Prereq: RUSS 201 or equivalent.

RUSS 251 F 3C 0.5
Conversation, Composition, Grammar and Phonetics
The course is conducted largely in Russian and provides intensive practice in spoken Russian. Vocabulary building, comprehension, pronunciation and intonation are stressed.
Prereq: RUSS 102, 112 or equivalent.
RUSS 252 W 3C 0.5
Conversation, Composition, Grammar
of Phonetics
Prereq: RUSS 251.
As RUSS 251.
Prereq: RUSS 251 or equivalent.

RUSS 256 F 3C 0.5
Introduction to Russian Literary
migrations
Reading of representative works from
Russian Classicism, Romanticism, 19th
century Realism, and various periods of
the 20th century Russian literature.
Prereq: RUSS 102 or equivalent.

RUSS 272 W 3C 0.5
Russian Thought and Culture
A survey of cultural history from 862 to
1905. Lectures will focus on major develop-
ments in literature, philosophy, art, archi-
tecture, and music as seen against
the background of Russia's historical
past. Discussion will be devoted
primarily to works of Russian literature.
Taught in English.
Open to all students.

RUSS 282 W 3C 0.5
Russian Short Story
As RUSS 281.
Taught 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 sciences and arts, with special
emphasis on idiom and structure as
compared with the target language.
Prereq: RUSS 202 or equivalent.

RUSS 312 W 3C 0.5
Theory of Translation
As RUSS 311.
Senior language and literature courses in
Russian will normally only be offered in
alternate years.

RUSS 341 F 3C 0.5
Russian Drama
A study of the origins and development of
Russian drama up to 1905. Reading
and critical analysis of major works in
various genres with emphasis on
authors of the nineteenth century.
Taught in English.
Extra work in Russian required of
Russian majors only.
Open to all students.

RUSS 342 W 3C 0.5
Russian Drama
As Russ 341.
Taught in English.
Extra work in Russian required of
Russian majors only.
Open to all students.

RUSS 351 F 3C 0.5
Intermediate Conversation and
Composition
Written reports on prescribed themes
and topics. Oral drill and translation.
Prereq: RUSS 252 or equivalent.

RUSS 352 W 3C 0.5
Intermediate Conversation and
Composition
As RUSS 351.
Prereq: RUSS 351 or equivalent.

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 tech-
nique. The course includes theory and
selected dramas of such playwrights as
Gogol, Chekhov, Tolstoy, Gorky,
Mayakovsky, and Pogodin.
Taught entirely in English.
Fall term: See 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 Russia 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, Tur-
genov, and Tolstoy. Lectures on social
and intellectual background.
Taught in English.
Extra work in Russian required of
Russian majors only.
Open to all students.

RUSS 392 W 3C 0.5
Great Russian Novels
Reading and interpretation of 19th and
20th century novels selected from the works of
Dostoevsky, Gorky, Pasternak,
Solzhenitsyn, and Zamiatin. Lectures on
social and intellectual background.
Taught 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.
Taught in English.
Open to all students.
RUSS 442 3C 0.5
Russian Epic Tradition
As RUGS 441.
Taught in English.
Open to all students.

RUSS 451 F 3C 0.5
Advanced Conversation, Grammar and Composition
This course is conducted in Russian and provides intensive practice in spoken and written Russian on the advanced level.
Prereq: RUSS 352 or equivalent.

RUSS 452 W 3C 0.5
Advanced Conversation, Grammar and Composition
As RUSS 451.
Prereq: RUSS 451 or equivalent.

RUSS 451 F 3C 0.5
Twentieth Century Russian Literature
Reading, interpretation, and critical analysis of selected fiction and drama (Andreev, Bunin, Gorky, Kataev, Shulukhin, A.N. Tolstoy).
Taught in English.
Extra work in Russian required of Russian majors only.
Open to all students.

RUSS 452 W 3C 0.5
Twentieth Century Russian Literature
Reading, interpretation, and critical analysis of selected fiction and drama (Arbusov, Bulgakov, Erenburg, Nabokov, Pasternak, Solzhenitsyn).
Taught in English.
Extra work in Russian required of Russian majors only.
Open to all students.

RUSS 461 F 3C 0.5
Russian Poetry
A study of themes and forms of representative authors of Classicism, Romanticism (Lomonosov, Derzhavin, Pushkin, Lermontov, Nerkrasov, Fet, Tiutchev, etc.).
Prereq: RUSS 102 or equivalent.

RUSS 462 W 3C 0.5
Russian Poetry
A study of themes and forms of representative authors from Symbolism to the present (Blok, Esenin, Mayakovskiy, Akhmatova, etc.).
Prereq: RUSS 102 or equivalent.

RUSS 485 F 3C 0.5
History of Russian Literature
This course deals with the emergence of the Russian national literature, emphasizing the cultural and intellectual setting from the beginning to 1917. Literary movements and major representative works not studied in other courses will be discussed.
Taught in English.
Extra work in Russian required of Russian majors only.
Open to all students.

RUSS 486 W 3C 0.5
History of Russian Literature
This second part deals with Russian literature up to the present. Literary movements and major representative works not studied in other courses will be discussed.
Taught in English.
Extra work in Russian required of Russian majors only.
Open to all students.

RUGS 496-498 F,W,S 0.5
Reading Courses in Approved Topics
Open to fourth year students only.

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.

UKRAN 102 W 3C,1L 0.5
Beginners' Ukrainian
As UKRAN 101.
Prereq: UKRAN 101 or equivalent.

UKRAN 201 F 3C,1L 0.5
Intermediate Ukrainian
This course will be conducted in English.
And provides intensive practice in grammar, composition, and conversation.
Prereq: UKRAN 102 or equivalent.
Offered in alternate years.

UKRAN 202 W 3C,1L 0.5
Intermediate Ukrainian
As UKRAN 201.
Prereq: UKRAN 201 or equivalent.
Offered in alternate years.

UKRAN 301 F 3C 0.5
Introduction to Ukrainian Literature
Reading and critical interpretation of texts chosen from the works of Skovoroda, Kotliarevsky, Shevchenko, Franko, L. Ukrainka and others.
Taught in English.
Open to all students.

UKRAN 302 W 3C 0.5
A Critical Survey of Literary Movements in 20th Century Ukrainian Literature
With special attention to the rise of the new angry generation of poets of the Sixties (V. Symonenko, L. Kostenko, V. Korotych, and others).
Taught in English.
Open to all students.

UKRAN 401 F 3C 0.5
Ukrainian Romanticism
Taras Shevchenko and his Time.
Kharkov and Kiev as literary centres.
Reading and critical analysis of prescribed texts (Shevchenko, Kulish, Kostomariv, etc.).
Prereq: UKRAN 202 or equivalent.
UKRAN 402 W 3C 0.5  
Ukrainian Romanticism  
A critical study of the literary movement with special emphasis on the major authors (Shashkevych, Vahylevych, Ilovats'kyj and others).  
*req: UKRAN 202 or equivalent.

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Gerontology

Professor, Director of the Program 
N.F. Forbes, BSc, PhD, DSc (London)

Professor, Graduate Advisor 
B.D. McPherson, MA (Western), PhD (Wisconsin)

Associate Professor, Undergraduate Advisor 
J.C. Carlson, MS, PhD (Massachusetts)

Associate Professor, Undergraduate Advisor 
N.H. Charness, MS, PhD (Carnegie-Mellon)

Associate Professor, Part-time Studies 
A.J.R. Cameron, BA, MA, PhD (Waterloo)

Assistant Professor 
M.E. Haight, MSc PhD (McMaster)

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Course Descriptions

Course Descriptions

Gerontology 
Health Studies

Department of  
Health Studies

Associate Professor, Chairman of  
Department of Health Studies  
J.A. Best, BA (Queen's), PhD (Waterloo)

Assistant Professor, Associate Chairman Undergraduate Affairs  
R.S. McColl, BSc (McGill), PhD (Purdue)

Assistant Professor, Associate Chairman Graduate Affairs  
K. Prachin, BA, MA, PhD (British Columbia)

Associate Professor, Associate Dean, Special Projects  
R.P. Schiegel, BA (Western Ontario), MSc (Illinois), PhD (Ohio State)

Associate Professors  
N.F. Forbes, BSc, MSc, PhD (York)

K.S. Brown, BM, PhD (Waterloo)

A.J.R. Cameron, BA, MA, PhD (Waterloo)

M.E. Houston, BSc (Toronto), PhD (Waterloo)

M.T. Sharratt, BA, MA (Western Ontario), PhD (McMaster)

Assistants Professors  
L. Hoffman-Goetz, BA (SUNY Buffalo), MA, PhD (Michigan)

O. Martinez, BSc, MNS, PhD (Cornell)

D. Mills, BS Ag (Purdue), PhD (Indiana)

A. Myers, BA (Winnipeg), MA, PhD (York)

P. Wainwright, BSc (Rhodes, S.A.), MA, PhD (Waterloo)

Adjunct Faculty  
H.W. Gruchow, BSc, MSc, PhD (Wisconsin)

N. Kreiger, BA (Pennsylvania), MH, PhD (Yale)

Faculty Members holding Cross appointments to Health Studies from:  
1Statistics  
2Kinesiology  
3Urban and Regional Planning and Environmental Studies

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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 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.  
*req: 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.  
*req: 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.  
*req: Health Studies students only, or permission of instructor.
HLTH 302  F  2C  0.5
Introduction to Biomathematics 1
(MTHEL 302a) Biomicrotomy is a biological discipline requiring both a knowledge of mathematics and some basic understanding of specific biological phenomena. The course material has been selected from genetics and gerontology to provide examples of where both mathematics and biology have contributed to the advancement of knowledge in interdisciplinary areas.
Prereq: KIN 116 or first year Chemistry or consent of instructor.

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 434  F  3C  0.5
Epidemiology of Chronic Diseases
An investigation of the epidemiology of selected non-communicable diseases. The course emphasizes understanding of epidemiologic methods and identification of risk factors. Specific diseases examined will vary from year to year.
Prereq: HLTH 241 and an introductory statistics course or consent of instructor.

HLTH 443  W  3C  0.5
Behaviour and Chronic Disease
A critical analysis of various behavioural strategies for the prevention of coronary heart disease, hypertension, chronic obstructive pulmonary disease, and lung cancer. The role of behaviour in the pathogenesis of disease and the feasibility of behavioural change for prevention of disease will be discussed.
Prereq: HLTH 344, 348, 349.

HLTH 445  W  3C  0.5
Seminar in Health Promotion
A study of current issues pertaining to health promotion, health behaviour, or biomedical research. Topics may include pertinent research that is significant to the health of individuals, families and groups, or the community.
Prereq: Health Studies students only. Normally only 4th year students will be admitted.

HLTH 472  F,W,S  0.5
Independent Study
For the student who desires to pursue a particular topic in depth through guided independent research and/or reading. A faculty member must approve a student's project prior to registration. May be repeated in subsequent terms.
Prereq: Consult with Department.
Course Descriptions

History

Department of History

Associate Professor, Chairman of the Department
W. Walker, BA (Toronto), MA (Waterloo), PhD (Dalhousie)

Associate Professor, Associate Dean (Special Programs), Faculty of Arts
J. Stubbs, BA (Toronto), MSc (Econ) (London), DPhil (Oxford)

Associate Professors
D.J. Horton, BA (Waterloo Lutheran), MA (Waterloo), PhD (McGill)
S.K. Johannesen, BA (Evangel College), MA, PhD (Missouri)
D.E. Wright, BA (Cambridge), MA, PhD (McMaster)

Adjunct Faculty
R.P. Fuke, BA (Toronto), MA (Maryland), PhD (Chicago)
T.E.D. Shortt, BA (McGill), MA (Carleton), PhD (Queen's), MD (Western Ontario)
W. Stanford Reid, BA, MA (McGill), PhD (Pennsylvania), FRHistS

Faculty Members of History holding cross appointments to:

1. Classics
2. Geography

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes:

100 Level: Introductory Courses.
For First Year Arts students and for all other students interested.

200-249: Survey Courses.
Primarily intended for non-History Majors, but open to History Majors.

250-257: 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.

HIST 100 F 0.5
Landmarks in World History
A thematic introduction to the development of the world's major civilizations. This year's theme is "Community and Social Order", examining the dynamic relationship between individuals and their social structures, and their state.

HIST 102A W 0.5
The American Identity 1607-1980
A consideration of the shaping of American characteristics under the headings of: The Frontier; Religious Denominationalism; Libertarian Revolution; Black Slavery; New Immigrations; Mass Production; the Great Depression; War and Global Americanism.

HIST 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.

HIST 102C W 0.5
The Origins of Wars in the Twentieth Century
An analysis of the diplomatic, political, economic, ideological, social and cultural explanations of the causes of the major wars of this century with special emphasis on Canada.

HIST 102D W 0.5
From Nationalism to Totalitarianism
The growth of nationalism and nation states since the French Revolution with attention to the Industrial Revolution, the World Wars, Fascism, Nazism and Stalinism.
Offered at St. Jerome's College.

HIST 102E W 0.5
Canadian History
Selected major themes from pioneer life to Canadian involvement in twentieth century wars.
Offered at St. Jerome's College.

HIST 102F W 0.5
An Introduction to Western Intellectual History since the Renaissance
An exploration of some of the questions and answers posed by thinkers on the human predicament from Renaissance and Reformation times to the modern period. Readings range from Luther to J.P. Sartre, Shakespeare to Marx and Freud.

HIST 102H F 0.5
Early Modern Europe
This course will survey the chief features of early modern European society. Topics will include the Renaissance and Reformation, Old Regime society, the scientific revolution, the Enlightenment and the French Revolution.
Offered at St. Jerome's College.
HIST 102M W 0.5
Law and Society in the Middle Ages: 500-1400
A study of the social and political fabric, the laws and legal procedures of the Middle Ages. Barbarian Codes, Feudal Law and rediscovered Roman Law will be examined along with legal procedures and institutions such as oaths, ordeals and the Inquisition. Offered at St. Jerome's College.

HIST 130 F.W.S 0.5
The Modern World in Historical Perspective
This course will introduce students, through the interrelationships and interaction of selected themes, to the contemporary history of Europe, North America, and the Far East. Its format includes two interpretive lectures per week plus major films on twentieth century crises and optional discussion groups.

HIST 200 W 0.5
Twentieth Century History as Documented by Films
A history of the twentieth century through films. The First World War, Europe between the Wars, the Second World War, North American society in the twentieth century and other political, moral and social themes will be explored.

HIST 201X W 0.5
Canadian Urban History
An historical examination of the urbanization process, the social, political and economic factors that shaped the Canadian city, and the relationship between selected metropolitan and hinterland areas.

HIST 202X F 0.5
The Individual and the Family in History
A survey of the changes in the quality and structure of life with special emphasis on love, marriage and the family in the West since the sixteenth century. 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.

HIST 205X W 0.5
Canadian Business History
A study of the development of business in Canada at both the general economic and the individual enterprise level.

HIST 206X F 0.5
History of Canadian Minorities
An introduction to the history of selected racial and regional minorities in Canada. The course examines the emergence of minority communities, and their position in modern Canadian society.

HIST 208 F 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; Roosevelt, Truman and Stalin; post 1945 — containment, co-existence, and critics.

HIST 209X W.S 0.5
Twentieth Century America 1898-1978

HIST 210X F.W 0.5
History of Law
An historical introduction to law throughout the ages: concepts, institutions, practices. Offered at St. Jerome's College.

HIST 211 F 0.5
British History to 1603
A survey of the main stages in the transition of Britain from a remote province of the Roman Empire to a prominent state of post-Reformation Europe. Within the chronological framework, political and constitutional as well as ecclesiastical and social developments will be examined.

HIST 212 F.W 0.5
British History since 1603
A survey of the shaping of British society and the British experience from the time of Shakespeare to the present: constitutional conflict and compromise, rise and fall of empire, industrial and urban revolution, world wars and welfare state.

HIST 213X W 0.5
Modern Western Popular Culture
This course examines historically the formation of a distinct modern western popular culture, looking primarily at Britain, France, Canada and the United States from around 1850 to the present, and emphasizing such aspects as: industrialism and leisure, the family and sexual attitudes, religion and popular belief, education and literacy, drinking habits, organized sport and mass entertainment.

HIST 216 F 0.5
Irish History: Achievement, Unification, Revolt
Political, social and religious history of Ireland from the beginning of the golden age of Irish medieval civilization to the Act of Union, c. 400 to 1800.

HIST 217 W 0.5
Irish History: The Nineteenth and Twentieth Centuries
Political, social and religious history of Ireland emphasizing social changes, the struggle for Home Rule and the Republic, 1800 to present.

HIST 222 F 0.5
History of Modern Revolutions
An introduction to historical explanations of revolutions with special focus on social change and revolutionary theories. The French, Russian and Chinese Revolutions will be used as case studies. Offered at 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.

HIST 224 W 0.5
Canadian Culture and Society in the Twentieth Century
An approach to modern Canadian development as the people have wrestled with such phenomena as: war, depression, internal and external tensions, urban growth, the "post industrial" society.

HIST 225 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. Offered at Conrad Grebel College.
Course Descriptions

History

HIST 232 F 0.5
Revolutions in Latin America
An evaluation of the causes and effects of revolutions in Latin America through examination of such countries as Cuba, Mexico, Chile, etc.
Offered at St. Jerome's College.

HIST 233 W 0.5
Civil-Military Relations in Latin America
A study of the relationships between civilians and the military in the history of Latin America. Topics explored will include European and U.S. influences on professionalization and on the development of political interest, and the post-World War II flourishing of professional militarism.
Offered at St. Jerome's College.

HIST 235 (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.
Offered at Conrad Grebel College.

HIST 237 F 0.5
Ancient Civilizations
A study of the civilizations of the ancient Near East focusing on Mesopotamia (Sumer and Akkad, the Babylonian Dynasty and the Third Dynasty of Ur), Hatti, Assyria, Egypt and Persia.
Offered at St. Jerome's College.

HIST 246 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.
Offered at Conrad Grebel College.

HIST 247 F 0.5
Mennonite History: A Survey
This course covers Mennonite origins, teachings, migrations, settlement patterns, divisions, leaders, institutions, and religious and social practices, indeed all facets of Mennonite history in various national settings.
Offered at Conrad Grebel College.

HIST 251X W 0.5
History of Medieval Europe 814-1303
The political, cultural, economic and ecclesiastical development of Europe from Charlemagne to Philip IV of France.
Offered at St. Jerome's College.

HIST 252X F.S 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.

HIST 253X F 0.5
Canadian History: The British Period
The evolution of Canadian society in the face of dominant British and American influences.
Also offered at St. Jerome's College.

HIST 254X W.S 0.5
Canadian History: The National Period
This course studies the development of Modern Canada. Themes of the course include immigration, industrialization, feminism, labor unrest, and regionalism.
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.

HIST 256X W 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.

HIST 257 F 0.5
History of the United States until 1865
The settlement of English North America, British colonial society, the American Revolution, politics and culture in the American Republic, the Civil War. A special emphasis on religious and political culture.

HIST 300 F 0.5
The Idea of History
The course is an introduction to the Philosophy of History and to the art of historical writing. It deals with the great theoretical issues influencing historical analysis and with the classics of historical literature. It is equally concerned with the practical problems of historical research.

HIST 305 F 0.5
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.

HIST 307 F 0.5
British History 1760-1867
A study of people, power, thought and culture in the world's first industrializing society.

HIST 308 W 0.5
British Since 1867
A study of the British experience and of Britain's part in world history from the 1900's to the 1980's.

HIST 311 W 0.5
Western European Cultural History 1600-1950
A canvass of European thought between 1600 and 1950, on questions of self, society, science and spirituality.

HIST 319 F 0.5
French-Canadian History
An examination of Pre-Industrial French Canada with emphasis on the cultural, political and economic themes which form the background to Modern Quebec history.

HIST 320 W 0.5
The History of Modern Quebec
The course will treat the history of Quebec from 1857 to the present. Nationalism, separatism, language and cultural problems, economic and social issues are all examined in their historical context.

HIST 321 F 0.5
History of Canadian-American Relations to 1914
An examination of the history of relations between the two countries until 1914. Topics of a political, economic, social and cultural nature will be studied.
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.

HIST 325 F 0.5
History of Canadian Indians to 1870's "From Freedom to Conquest". The history of Indian-white contact and its effect on the life and culture of the native Canadians.

HIST 329 W 0.5
History of Anglo-American Law
The emphasis will be on the early development of the common law in England and the formulation of constitutional law in the United States. Offered at St. Jerome's College.

HIST 332 F 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. Offered at Conrad Grebel College.

HIST 335 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. Offered at Conrad Grebel College.

HIST 336 F 0.5
Mennonite History: Canadian Issues
Special issues examined in historical context include church/state conflicts in education, conscription and social policies, and such phenomena as non-conformity, internal divisions, organizational proliferation, theological shifts, changing forms of leadership, and issues of identity. Offered at Conrad Grebel College.

HIST 338 W 0.5
The Radical Reformation
A study of sixteenth century Anabaptism - a religious Reformation movement dissenting from both Protestantism and Roman Catholicism - its origins, its social, political and theological content, and its relationship to such independent dissenters as Sebastian Franck. Offered at Conrad Grebel College.

HIST 339 W 0.5
West Indian History
A study of the Caribbean region from aboriginal times, including European imperialism, the history of plantations, slavery and slave society, independence movements, and the problems posed by modernization, underdevelopment and neo-colonialism.

HIST 335 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. Offered at Renison College.

HIST 337 F 0.5
The Italian Renaissance
A study, against a social and political background, of creative achievements in the age of Machiavelli, Leonardo da Vinci, the Borgias. Offered at Renison College.

HIST 339 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. Offered at Renison College.

HIST 340 W 0.5
Ontario History to Confederation
The course will examine the growth of Ontario from a pioneer settlement, with particular emphasis on economic, social, political and cultural aspects of change. An emphasis will also be placed on the sources and methods of local historical research.

HIST 342 F 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.

HIST 345 W 0.5
Directed Studies in Special Topics
Study in a limited field under tutorial guidance. A high standard of written work will be expected.
Prereq: Honours History standing and permission of the instructor.
Not available to students with credit for 399A or B.

HIST 349 W 0.5
Directed Studies in Special Topics
Study in a limited field under tutorial guidance. A high standard of written work will be expected.
Prereq: Honours History standing and permission of the instructor.
Not available to students with credit for 399A or B.

All 400 courses are designed for fourth-year Honours students. They are research seminars.

HIST 401X European 1.0
HIST 403X Canadian 1.0
HIST 407X Imperial 1.0
HIST 409X American 1.0

Not offered 1983-84:
HIST 101R Major Themes of Western Civilization 1
HIST 102R Major Themes of Western Civilization 2
HIST 204X Life on the Ontario Frontier
HIST 207 East Central European History 1914-1983
HIST 214X Empires and Missionaries
HIST 230 Church & State in Modern Latin America
HIST 231 Oil & Politics in Latin America
HIST 302 Medieval Church History 312-1096
HIST 303 Medieval Church History 1096-1499
HIST 326 History of Canadian Indians Since 1870s
HIST 344 Mystical and Utopian Movements 2
HIST 355 Russian History 1613-1825
HIST 358 Russian History Since 1825
HIST 364R The Enlightenment 1
HIST 365R The Enlightenment 2
HIST 405X British
Course Descriptions
Italian
Kinesiology

ITAL 101 F.W 3C,1L 0.5
Introduction to Italian Language
An intensive study of the fundamentals of grammar and conversation. The language laboratory will be used. In the first year of Italian, emphasis will be placed on the fundamentals of grammar and speech.

ITAL 102 F.W 3C,1L 0.5
Introduction to Italian Language
A continuation of ITAL 101, with more emphasis on conversation and everyday uses of language.
Prereq: ITAL 101 or consent of instructor.

ITAL 191 F 3C,1L 0.5
Intermediate Italian
Advanced study of grammar. Conversation sessions will be based on intermediate level readings reflecting contemporary Italian life. Short works by modern writers will also be studied.
Prereq: ITAL 101/102 or consent of instructor.

ITAL 192 W 3C,1L 0.5
Intermediate Italian
A continuation of ITAL 191 with emphasis on discussion of modern texts as illustrations of the creative possibilities and the limitations of the language.
Prereq: ITAL 191 or consent of instructor.

ITAL 291 F 3C 0.5
Italian Culture and Civilization I
A survey of developments in Italian culture - history, literature, painting, and music - in the post-Renaissance period, with emphasis on modern Italy. Taught in English.
Prereq: Second year standing.

ITAL 292 W 3C 0.5
Italian Culture and Civilization II
A survey of developments in Italian culture - history, literature, painting, and music - in the post-Renaissance period, with emphasis on modern Italy. Taught in English.
Prereq: Second year standing.

ITAL 396 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.

ITAL 397 W 2S 0.5
Special Topics/Directed Readings
Winter term of ITAL 396.

Not Offered 1983-84:
ITAL 251 Conversation and Composition
ITAL 252 Conversation and Composition
ITAL 391 The Modern Italian Novel
ITAL 392 Modern Italian Poetry

Department of Kinesiology

Associate Professor, Chairman of Department
M.T. Sharratt, BA, MA (Western Ontario), PhD (Wisconsin)

Professor, Dean of the Faculty of Human Kinetics and Leisure Studies
R.G. Marteniuk, BPE, MA (Alberta), EdD (California-Berkeley)

Associate Professor, Associate Dean, Undergraduate Affairs
W.N. Widmeyer, BA, (Western Ontario), BPE (McMaster), BPE (California), PhD (Illinois)

Associate Professor, Associate Dean, Graduate Affairs, faculty of Human Kinetics and Leisure Studies
R.W. Norman, BS, BPE (McMaster), MSc (Alberta), PhD (Pennsylvania State)

Associate Professor, Associate Chairman, Graduate Affairs
F. Allard, BA, BPE, PhD (Waterloo)

Assistant Professor, Associate Chairman, Undergraduate Affairs
J.A. Thomson, BA, MSc (McMaster), PhD (Waterloo)

Assistant Professor, Head of School of Anatomy
D.A. Ranney, BA (Toronto), MD (Toronto), FRCS (England)

Professors
N.J. Ashton, BSc (McGill), MS (Michigan)
B.D. McPherson, BA, MA (Western Ontario), PhD (Wisconsin)
D.A. Winter, BSc, MSc (Queen's), PhD (Dalhousie)

Assistant Professors
J.E. Curtat, BA, MA (Central Michigan), PhD (Cornell)
H.J. Green, BA, BPHE (Queen's), MA (Alberta), PhD (Wisconsin)
M.E. Houston, BSc (Toronto), PhD (Waterloo)
I.D. Williams, MS, PhD (Illinois)

Assistant Professors
L. Brawley, BPE (Calgary), MSc (Oregon), PhD (Penn State)
J. Frank, BSc, MSc (Waterloo), PhD (Southern California)
R. Hughson, BSc (Western Ontario), MSc (British Columbia), PhD (McMaster)
C.L. MacKenzie, BSc, MSc (Waterloo), PhD (Waterloo)
A. Patla, BTech (Indian Inst. of Tech., Indi), MSc Eng (New Brunswick), PhD (SFU, British Columbia)
N. Theberge, BA (Massachusetts), MA (Boston), PhD (Massachusetts)
R. Wells, BSc (Manchester), MEng (McMaster), PhD (Manchester)

Adjunct Faculty
E. English, MBA (UCLA), MD (Toronto), FRCS (Canada)
K.C. Hayes, Dip PE, MSc, PhD (Massachusetts)
J.A. Israel, MD (Toronto), FRCS (Canada)
D.R. McTavish, MD (Western Ontario), FRCS
G.H. Mann, MB, BS (London), DRCOG (London)
D.C. Rainham, MBBCh (Wales), CCFP
E. Roy, BSc (Waterloo), MPE (British Columbia), PhD (Waterloo)
Course Descriptions

Kinesiology

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

KIN 102 F 3C,1T 0.5
Biophysical Basis of Kinesiology
Human physical movement is discussed from mechanical, anatomical and physiological viewpoints. The course provides a general orientation to the study of Kinesiology.

KIN 103 F 3C,1T 0.5
Psycho-Social Basis of Kinesiology
An introduction to the study of human physical activity from psychological, sociological, anthropological and historical perspectives.

KIN 116 W 3C 0.5
General and Organic Chemistry
An introduction to the chemical concepts of importance in kinesiology and health studies.

KIN 200 F 3C,2L 0.5
Human Anatomy of the Limbs and Trunk
Functionally-oriented study of the limbs and trunk by regions using predissected cadavers. A brief introduction to Neuroanatomy is included. 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 PSYCH 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 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. Prereq: KIN 222

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 constructs 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,
Sociology of Aging (SOC 344)

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.
Pre: PSYCH 101 or consent of instructor.

KIN 344 F.S 3C 0.5

Principles of Behaviour Modification (HLTH 349)

KIN 352 F 3C 0.5

Sociology of Aging (SOC 344)

An introduction to individual and population aging. Topics discussed include: aging from a historical and comparative perspective; aging in subcultures; aging and the social structure; aging and social processes; and aging and leisure patterns.
Pre: PSYCH 101 and one other SOC course. Offered even years only.

KIN 354 W.S 2C,1T 0.5

Social Psychology and Physical Activity

An examination of sport and other forms of physical activity as social situations. Topics such as social facilitation, modelling, person perception, expectancies, group structure, unity, motivation, leadership, conformity, and intergroup relations are introduced in relation to motor performance.
Pre: 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.
Pre: KIN 222, 255.

KIN 357 W 2C,1T 0.5

Motor Learning

A course focused on the bases and applications of theories of motor learning. Included are selected psychological and neurophysiological processes as they relate to these theories.
Pre: KIN 222, 255.

KIN 401 W.S 3C,2L 0.5

Physiological Adaptations to Physical Activity

An examination of the physiological adaptations that occur in response to protracted physical activity and the influence of such adaptations on the response to work in a variety of environmental conditions. Special emphasis is given to the changes occurring in skeletal and cardiac muscles and the neuroendocrine mechanisms involved.
Pre: KIN 300 and 317.

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.
Pre: 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.
Pre: KIN 300 or equivalent.

KIN 410 W 3C 0.5

Growth, Development, and Aging (HLTH 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.
Pre: 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.
Pre: KIN 201 and PSYCH 261 or permission of instructor.

KIN 420 W 3C 0.5

Kinesiological Considerations in Equipment Evaluation

The principles of analysis and assessment of equipment for human use (e.g. helmets, backpacks, shoes) and selected tasks (e.g. manual materials handling) are studied from a kinesiological perspective. The use of biomechanical analytical techniques is emphasized.
Pre: KIN 321, 38 and 4th year students only or consent of instructor. KIN 425 is advisable and may be taken concurrently.

KIN 425 W 3C,2L 0.5

Biomechanics of Human Movement

The quantitative measurement and analysis of the movement of the human 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.
Pre: 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.
Pre: 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.
Pre: 4th year Honours Kinesiology.
Course Descriptions

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 modeling, 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

Adaptive 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.

**KIN 472** F.W.S 0.5

Directed Study in Special Topics

For the student who desires to pursue a particular topic in depth through guided independent research and/or reading. A faculty member must approve a student's project prior to registration. May be repeated in subsequent terms.

**Prereq:** Consent of department.

**KIN 480** F.W.S 0.5

Coaching Foundations

A study of basic principles and philosophies of coaching today. Emphasis is placed upon the application of kinesiological principles of performance as well as social, organizational and resource problems pertinent to each of several sport sections.

- The specific sections offered are: KIN 481T - Volleyball, KIN 482T - Basketball, KIN 483T - Gymnastics, KIN 484T - Hacquets, KIN 485T - Football, KIN 486T - Ice Hockey, KIN 487T - Field Hockey, KIN 488T - Aquatics, KIN 489T - Track and Field. Students must complete a minimum of three (3) sport sections before credit is given.

**Prereq:** Students must complete 1 Physical Activity course in order to enroll in that particular 480 section.

**KIN 491** F.W.S 5T 0.5

Clinical Kinesiology - Practicum in Sports Injuries Assessment

Practical experience in the examination, diagnosis, and treatment of sports injuries under the supervision of a physician and an athletic therapist.

**Prereq:** Permission of instructor.

**KIN 492 Y 2T 0.5**

Clinical Kinesiology - Practicum in Cardiac Rehabilitation

Practical experience with cardiac patients in a rehabilitation setting; major emphasis is placed on the cardiorespiratory implications of exercise and behaviour modification.

**Not Offered 1983-84**

**KIN 171** History of Sport and Physical Activity

**KIN 280** Administration

**KIN 402** Hydrospace, Altitude, and Aerospace Physiology

**Physical Activity Courses**

All physical activity courses are elective and non-credit and available only to students enrolled in Kinesiology. Students should consult with a faculty advisor concerning the applicability of these courses for entry into careers such as teaching.

In an attempt to satisfy those students who are keenly interested in teaching, the Sport Proficiency Certification Program is available. The contents of this program are tied to the requirements of the Colleges of Education and help to produce a more marketable graduate in this field. A small fee may be charged to cover the costs of print materials, additional instruction, etc. Further information regarding this program can be found in the Kinesiology Undergraduate Student Handbook.

The following activity courses are offered if there are sufficient requests.

**KIN 180** Elem. Basketball, W,S

**KIN 183** Gymnastics - Floor Exercises, F,W

**KIN 187** Beginner Swimming, F

**KIN 189** Elem. Aquatics, F,W

**KIN 261** Elem. Volleyball, F

**KIN 282** Elem. Lacrosse, W

**KIN 283** Gymnastics - Apparatus, W (Men)

**KIN 284** Gymnastics - Apparatus, W, (Women)

**KIN 285** Elem. Football, F,S

**KIN 286** Elem. Badminton, W

**KIN 287** Elem. Soccer, F (even years)

**KIN 288** Elem. Wrestling, W

**KIN 298** Elem. RUGGER, F (odd years)

**KIN 381** Elem. Tennis, F,S

**KIN 382** Elem. Squash, F

**KIN 383** Elem. Golf, F,S

**KIN 384** Elem. Racquetball, W

**KIN 385** Elem. Field Hockey, F,S

**KIN 386** Elem. Ice Hockey, W

**KIN 387** Elem. Curling, W

**KIN 388** Int. Aquatics, W

**KIN 389** Elem. Track and Field, F,S

**KIN 389A** Outdoor Skills Camp, F

**KIN 481** Adv. Volleyball, W

**KIN 482** Adv. Basketball, F

**KIN 483** Adv. Gymnastics, W

**KIN 484** Adv. Racquetball, W

**KIN 485** Adv. Football, W,S

**KIN 486** Adv. Ice Hockey, W

**KIN 487** Adv. Field Hockey, F,S

**KIN 488** Adv. Aquatics, W

**KIN 489** Adv. Track and Field, F,S

**KIN 409A** Ski School, W
Department of Man-Environment Studies

Chairman
Vacancy

Associate Professor, Undergraduate Officer
R.F. Keith, BSA (Guelph), MA, PhD (Michigan State)

Professors
G. Francis, BA (Toronto), BA (McGill), MA (British Columbia), PhD (Michigan)
C.K. Knapper, BA Honors (Sheffield), PhD (Saskatchewan)
J.E. Robinson, BSc (Western Ontario), MA, PhD (Toronto)
G.B. Priddle, BA (Western Ontario), MA, PhD (Clark)

Assistant Professors
C.E. De'Ath, BA (Auckland), ASOPA Cert. (Sydney), MED, PhD (Pittsburgh)
D. Estrin, BA, LLB (Alberta)
S. Kumar, BSc, MSc (Punjab), MA, PhD (Toronto)
G.B. Priddle, BA (Western Ontario), MA, PhD (Clark)

Adjunct Faculty
E.J. Farkas, BSE (Princeton), ScD (MIT), PEng

Faculty Members of Man-Environment Studies holding cross and/or joint appointments to:
Geography, Urban and Regional Planning, and School of Landscape Architecture, University of Guelph

Faculty Members holding cross and/or joint appointments to Man-Environment Studies from:
Environmental Studies and Psychology

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

(Environmenal Studies course descriptions (ENV S) begin on page 323.)

ENV S 111
Introduction to the Study of the Future

M ENV 130 F 3C 0.5
Environmental Issues 1
Survey and analysis of selected environmental issues drawing upon concepts and theories from the natural and social sciences and the humanities.
Prereq: Honours Man-Environment Studies.

M ENV 131 W 3C 0.5
Environmental Issues 2
Continuation of M ENV 130.
Prereq: Honours Man-Environment Studies.

M ENV 150 F 3C 0.5
Environmental Methods and Techniques 1
Series of concurrent six week workshops to introduce methods and techniques appropriate for investigating different environmental problems. Students to select one or two from a series of workshops such as field studies, laboratory analyses, questionnaire design, survey research, small group dynamics and participant observation of social interactions.
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,1wkshp 0.5
Seminar-Workshop
Faculty supervised individual or small group investigation of selected environmental issues to help develop skills for defining and resolving problem situations.
Prereq: Honours Man-Environment Studies.

M ENV 191 W 4S,1wkshp 0.5
Seminar-Workshop
Continuation of M ENV 190.
Prereq: Honours Man-Environment Studies.

M ENV 192 A F 0.25 course credit
M ENV 192 A W 0.5 course credit
Series of concurrent six week workshops to continue the methods and techniques offerings of M ENV 150/151. Students to select one or two from a series of workshops such as field studies, laboratory analyses, questionnaire design, survey research, small group dynamics and participant observation of social interactions.
Prereq: Man-Environment Studies or consent of instructor.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Description</th>
<th>Prerequisites</th>
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<tbody>
<tr>
<td>ENV S 252</td>
<td>Media Tools for Environmental Studies</td>
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<tr>
<td>ENV S 253</td>
<td>Media Tools for Environmental Studies - Advanced Level</td>
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<tr>
<td>M ENV 260</td>
<td>W  3C  0.5 Visual Perception and Communication</td>
<td>An exploration of the nature of perception and its relationship to communication with special reference to visual phenomena.</td>
<td>Prereq: Consent of the instructor.</td>
</tr>
<tr>
<td>ENV S 271</td>
<td>Introduction to Quantitative Research Methods</td>
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<tr>
<td>ENV S 272</td>
<td>Computer Programming in Environmental Studies</td>
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<tr>
<td>M ENV 275</td>
<td>F.W  2R  0.5 Special Readings</td>
<td>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.</td>
<td>Prereq: Consent of instructor.</td>
</tr>
<tr>
<td>M ENV 279</td>
<td>W.S  4S/wkshp  0.5 Seminar-Workshop</td>
<td>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.</td>
<td>Prereq: Man-Environment Studies</td>
</tr>
<tr>
<td>M ENV 285</td>
<td>F  2C,1S  0.5 Development of Environmental Thought 1</td>
<td>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.</td>
<td>Prereq: Man-Environment Studies or consent of instructor</td>
</tr>
<tr>
<td>M ENV 290</td>
<td>W  2C,1S  0.5 Development of Environmental Thought 2</td>
<td>Continuation of M ENV 295.</td>
<td>Prereq: M ENV 295</td>
</tr>
<tr>
<td>ENV S 310</td>
<td>Behavioural Studies</td>
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<tr>
<td>M ENV 318</td>
<td>W  3C  0.5 Soft Energy Paths in Canada</td>
<td>Analysis and evaluation of energy strategies based on energy conservation and renewable energy systems. Technical, economic, ecological, and social aspects will be examined.</td>
<td>Prereq: M ENV 218 or consent of instructor.</td>
</tr>
<tr>
<td>M ENV 320</td>
<td>F.W  3C  0.5 Environmental Economics</td>
<td>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</td>
<td></td>
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<tr>
<td>M ENV 331</td>
<td>F  2C  0.5 Environmental Issues in a Global Perspective</td>
<td>Review of recent writings on the theme of environmentally sound development strategies, in national and international settings. Relationships between environmental and other major issues receiving global attention. Canadian involvement in issues of environment and development in the context of a changing world order. Illustrative case examples.</td>
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<tr>
<td>M ENV 333</td>
<td>Parkland Management</td>
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<tr>
<td>M ENV 337</td>
<td>W  3C  0.5 Environmental Management</td>
<td>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.</td>
<td>Prereq: Third and fourth year students and consent of instructor.</td>
</tr>
<tr>
<td>M ENV 338</td>
<td>F  3C  0.5 Social Impact Assessment</td>
<td>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.</td>
<td>Prereq: Second year or above Environmental Studies students or consent of instructor.</td>
</tr>
<tr>
<td>M ENV 350</td>
<td>W  2C  0.5 Community Action on Environmental Problems</td>
<td>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.</td>
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<tr>
<td>M ENV 351</td>
<td>W  3S  0.5 Organizations and Environmental Management</td>
<td>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.</td>
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<tr>
<td>M ENV 360</td>
<td>F  3C  0.5 Man and Nature</td>
<td>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.</td>
<td>Prereq: Third and fourth year students and consent of instructor.</td>
</tr>
</tbody>
</table>
Course Descriptions
Man-Environment Studies

M ENV 375 F, W 2R 0.5
Special Readings or Seminars on Selected Topics
Prereq: Consent of instructor

M ENV 375F/475F
- Environments of Work
  - International Development and Environmental Issues
- Issues in Resources Law
  - Environmental Education
- Ecological and Social Dimensions of Planning and Development in Tropical Islands
- Politics of the Environment

M ENV 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, workshop 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, workshop 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 390A F, W 4S, workshop 0.5
- Seminar-Workshop
  - Continuation of M ENV 390A.
  - Prereq: M ENV 390A

M ENV 391B W 8S, workshop 1.0
- Seminar-Workshop
  - Continuation of M ENV 390B.
  - Prereq: M ENV 390B

M ENV 400 Y 3C 1.0
Senior Honours Seminar
- Provides practice in applying skills that are useful to people working in different kinds of organizations. Readings, discussions and exercises emphasize: problem perceptions and diagnoses, actor system analyses, and planning management and evaluation activities as these are carried out by and within organizations. Special attention given to roles that persons having an environmental studies background may be particularly well prepared to develop and refine.
  - Prereq: Third or fourth year Man-Environment Studies or consent of instructor.

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 418 F 3C 0.5
Energy Research Seminar
- Detailed examination of specific energy issues emphasizing research skills. Students will participate in a research project. General areas of research may include technical and economic analysis of specific soft energy options, environmental impacts of certain energy technologies.
  - Prereq: M ENV 318 or consent of instructor.

M ENV 444 Land Evaluation and Resources Management

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 478 Y 2R 1.0
Special Readings or Seminar on Selected Topics
Prereq: Consent of instructor.

M ENV 480 Special Topics Seminar

M ENV 490A, B, or C Y 4, 8, 12C 1.0/2.0/3.0
Senior Honours Assignment
490A (1 course credit)
490B (2 course credits)
490C (3 course credits)
- A project of sufficient scope to demonstrate mastery of problem-solving and communication skills on a selected problem or issue concerning man-environment interrelationships. Variable credit only by consent of faculty.
  - Prereq: Honours Man-Environment Studies.

ENV S 500 Professional Development in Environmental Management

Not Offered 1983-84:
M ENV 335 Anthropology of Education
M ENV 361 Communication Systems and International Development
M ENV 445 Technology Assessment and Policy Analysis
M ENV 450 Environmental Design
M ENV 470 Environmental Teaching and Learning
Course Descriptions

Management Sciences

**Course Descriptions**

**M SCI 21** F, W 3C 0.5  
**Probability and Statistics 1**  

**M SCI 23** F, W, S 2C, 1T 0.5  
**Managerial and Engineering Economics 1**  
This course is designed to satisfy Engineering Economics requirements of the Canadian Accreditation Board. Price and output decisions. Choosing among alternative inputs and production processes. Evaluating alternative investments, equipment service life, and new products.

**M SCI 23** W 2C, 1T 0.5  
**Behavioural Decision Analysis**  
This course concerns decision making processes within organizations at the individual and group levels. Topics include goals and the measurement of utility; decisions without probabilities and uncertainty reduction; incentives and contributions; and multiple-criteria methods.

**M SCI 32** W 2C, 1T 0.5  
**Managerial and Engineering Economics 2**  

**M SCI 43** W 2C, 1T 0.5  
**Managerial and Engineering Economics 2**  

**M SCI 44** F, W, S 3C 0.5  
**Organizational Behaviour 1**  
Introduction to the concepts of learning, person perception, attitudes and motivation in an organization. Consideration of communication, roles, norms and decision making within a group. Discussion of power, control, leadership and management in light of the above concepts.

**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.
Faculty of Mathematics

Department of Applied Mathematics

Professor and Chairman of the Department
B. Forte¹, PhD (Pisa), Habil DSc (Rome)

Professor, Associate Dean of the Faculty of Mathematics
I.J. McGee, BASc (Toronto), MSc (Waterloo), PhD (Yale)

Professor and Associate Chairman of the Department
C.B. Collins, BSc (London), PhD (Cambridge)

Professors
J. Cizek², RNDr (Charles University, Prague), CSC (Czechoslovak Academy of Sciences, Prague)
H.F. Davis, PhD (MIT)
S.G. Davison, PhD (Manchester)
J.A. George¹, MSc (Alberta), PhD (Stanford)
G.M.L. Gladwell¹, BSc, PhD, DSc (London)
F.O. Goodman, BSc (London), PhD (London), DSc (London), FinstP, FAIP
W.H. Hui, BSc (Peking), PhD (Southampton)
J.D. Lawson², BASc (Toronto), PhD (Waterloo), FIMA
F.R. McCourt², BSc, MSc, PhD (British Columbia)
M.A. McKiernan³, MA (Loyola), PhD (IIT)
J. Paidus¹, RNDr (Charles University, Prague), CSC (Czechoslovak Academy of Sciences, Prague)
P.J. Ponto, MA (Toronto), PhD (Illinois)
C. Rogers, BA (Oxford), MEd (Toronto), MSc, PhD (Nottingham), FIMA FinstP
R.B. Simpson³, MASC (Toronto), PhD (Maryland)
J.M. Varah³, BSc (British Columbia), PhD (Stanford)
J. Wainwright, BSc (Natal), PhD (South Africa), Recipient of the Distinguished Teacher Award

Associate Professors
R.H. Bartels³, MS (Michigan), PhD (Stanford)
C.F.A. Beaumont, DA (McMaster), MA (Toronto)
J. Froese, BA (Manitoba), MA (Queen's), PhD (British Columbia)
K.O. Geddes³, BA (Saskatchewan), MSc, PhD (Toronto)
G.J. Lastman, MA (British Columbia), PhD (Texas)

S.P. Lipshitz¹, BSc (Natal), MSc (South Africa), PhD (Witwatersrand)
R.G. McLenaghan, MSc (Queen's), PhD (Cambridge)
J. Li Morris³, BSc (Leicester), PhD (St. Andrews)
R.A. Wentzell, BSc (Acadia), PhD (Western Ontario)

Assistant Professors
W.F. Shadwick, BSc, MSc (Western), PhD (London), NSERC University Research Fellow
M.E. Snyder, BSc (Western Ontario), MSc (Waterloo)

Adjunct Faculty
M.A. Donelan, PhD (British Columbia)
R.B. Simpson, BA (British Columbia), PhD (Ithaca), FinstP
J.G. Horne, BSc (Washington), PhD (Waterloo)
R. Rund, PhD (Cape Town), Habilitation (Freiburg)
R.E. Woolsey, PhD (Texas)

Lecturer
B.J. Marshman, PhD (Waterloo)

Faculty Members of Applied Mathematics holding cross appointments to:
¹Pure Mathematics
²Chemistry
³Computer Science
⁴Civil Engineering
⁵Physics

Department of Combinatorics and Optimization

Associate Professor and Chairman of the Department
P.J. Schellenberg, PhD (Waterloo)

Professor, Associate Dean of the Faculty of Mathematics
K.D. Fryer, DA (Western Ontario), PhD (Toronto)

Professor and Associate Chairman for Undergraduate Affairs
R.C. Read, MA (Cambridge), PhD (London)

Associate Professor and Associate Chairman for Graduate Affairs
L.B. Richmond, MSc (Manitoba), PhD (Alberta)
Faculty Members holding cross appointments to Combinatorics & Optimization from:

1. Computer Science
2. Pure Mathematics
3. St. Jerome's

Department of Computer Science

Professor and Chairman of the Department

J.A. Brzozowski, BSc. MSc (Toronto), PhD (Princeton)

Professor, Dean of the Faculty of Mathematics

J.A. George\textsuperscript{1}, BSc, MSc (Alberta), PhD (Stanford)

Associate Professor and Associate Chairman for Undergraduate Studies

F.W. Tompa, ScB, ScM (Brown), PhD (Toronto)

Associate Professor and Associate Chairman for Graduate Studies

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

Professors

E.A. Ashcroft, BA (Cambridge), PhD (Imperial College)

D.D. Cowan, BASc, MSc (Toronto), PhD (Waterloo)

K. Gulik, MSc, RNDr (Prague), PhD (Czechoslovak Acad Sci)

J.D. Dyment, BSc, MSc, PhD (Columbia Pacific) Canadian Pacific Chair in Computer Applications

W.M. Gentleman, BSc (McGill), MA, PhD (Waterloo)

J.W. Graham, BA, MA (Toronto), Recipient of the Distinguished Teacher Award

J.D. Lawson\textsuperscript{1}, BASc (Toronto), MSc, PhD (Waterloo), FIMA

E.G. Manning\textsuperscript{2}, BSc, MSc (Waterloo), PhD (Illinois)

J.I. Munro, BA (New Brunswick), MSc (British Columbia), PhD (Toronto)

R.B. Simpson\textsuperscript{1}, BSc, MSc (Toronto), PhD (Maryland)

J.M. Varah\textsuperscript{1}, BSc (British Columbia), PhD (Stanford)

D. Wood, BSc, PhD (Leeds)

Associate Professors

R.H. Bartels\textsuperscript{1}, BS, MS (Michigan), PhD (Stanford)

K.S. Booth, BS (California Inst. Tech.), MA, PhD (California-Berkeley)

F.J. Burkowski, BSc, MMath, PhD (Waterloo)

A.R. Conn\textsuperscript{3}, BSc (Imperial College), MSc (Waterloo)

M.I. Elmasry\textsuperscript{2}, BSc. EEE (Cairo), MASC. PhD (Ottawa)

K.O. Geddes\textsuperscript{1}, BA (Saskatchewan), MSc, PhD (Toronto)

J.R. Gentleman\textsuperscript{2}, MS (Chicago), PhD (Waterloo)

G.H. Gonnet, Cpr. U. (Uruguay), MMath, PhD (Waterloo)

P.A. Larson, BEcon, MBA, PhD (Sweden)

M.A. Malcolm, BSc, MScEng (Denver), MS, PhD (Stanford)

F. Mavaddat, BSc (Bucharest), Diploma-Graduate Studies (Netherlands), PhD (Imperial College), DIC

J.L. Morris\textsuperscript{1}, BSc (Leicester), PhD (St. Andrews), FIMA

N. Ostlund, BA (Saskatchewan), MSc, PhD (Carnegie-Mellon)

D. Rotem, BSc (Hebrew University of Jerusalem), PhD (Witwatersand)

M.H. van Emde, MEngMath (Delft), PhD (Amsterdam)

Assistant Professors

R. Aleluanta, BMath (Waterloo), MSc, PhD (Toronto)

J.C. Beatty, AB (Math) (Princeton), PhD (California-Berkeley)

B.W. Char, BA (Swarthmore), PhD (California-Berkeley)

V.A. Dyk, BMath (Waterloo)

P.W. Dymond, BSc, MSc, PhD (Toronto)

K. Kumaran, BSc (Indian Institute of Technology), MBA, PhD (McMaster)

A. Nait-Abdallah, MMath, MSc, Doctorat 3eme cycle, Doctorat es Sciences (Paris)

D.J. Taylor, BSc (Saskatchewan), MMath, PhD (Waterloo)

J.H. Vellinga, BA (Western Ontario), MA (Waterloo) (part-time)

J.W. Welch, BSc (McGill), PhD (Waterloo) (part-time)

Adjunct Faculty

B.A. Barsky, BSc (McGill), MS (Cornell), PhD (Utah)

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

D.C.-L. Lam, BSc (Hong Kong), PhD (Waterloo)

Lecturers

R.G. Goebel, BSc (Regina), MSc (Alberta)

B.L. Leong, AB (California-Berkeley)

R.L. Walker, BSc, MSc (Western Ontario) (part-time)

V.J. Zinszer, BSc (Ohio State), MA (York)

Faculty Members of Combinatorics & Optimization holding cross appointment to:

1. Statistics and Actuarial Science

Distinguished Professor

W.T. Tutte, PhD (Cambridge), FRSC

Professors

G. Berman, MA, PhD (Toronto)

J. Edmonds, BA (George Washington), MS (Maryland)

K.D. Haff, BA (Western Ontario), PhD (Toronto)

C.E. Hammer, BA (Stanford), PhD (Waterloo)

D.M. Jackson, PhD (Cambridge)

R.C. Mullin, BA (Western Ontario), PhD (Waterloo)

D.H. Younger, PhD (Columbia)

Associate Professors

L.J. Cummings\textsuperscript{1}, PhD (British Columbia)

L.J. Dickey\textsuperscript{1}, MA (Arizona), PhD (Wisconsin)

R.A. Honsberger, BA (Toronto), MA (Waterloo)

U.S.R. Murty, MA (Osmania), PhD (Indian Stat. Inst.)

W.R. Pulleyblank, MSc (Alberta), PhD (Waterloo)

S.A. Vanstone\textsuperscript{2}, PhD (Waterloo)

Assistant Professors

R.P. Anstee, BMath (Waterloo), PhD (Caltech), NSERC University Research Fellow

M. Farber, PhD (Rutgers)

N.M. Gould, DPhil (Oxford)

I.P. Goulden\textsuperscript{1}, PhD (Waterloo), NSERC University Research Fellow

Adjunct Faculty

G.E. Andrews, MA (Oregon State), PhD (Pennsylvania)

P. Erdős, PhD (Budapest), DSc (Manchester), DMATH (Waterloo)

L. Lovász, Dr. R hum. Nat. (Corvinus L., Budapest), Dr. Math. Sci. (Hungarian Academy of Sciences)

C. St. J.A. Nash-Williams, PhD (Cambridge), FRSE

K. Ritter, Dhab (Karlsruhe)

R.M. Wilson, PhD (Ohio)

Lecturers

E. Anderson, BA (McMaster)

R.G. Dunkley, BA (Western Ontario)

A.R. Conn\textsuperscript{3}, BSc (Imperial College), MSc (Waterloo)
Course Descriptions
Mathematics 359

Faculty Members of Computer Science
holding cross appointments to:
1Applied Mathematics
2Electrical Engineering
3Combinatorics & Optimization

Faculty Members holding cross
appointments to Computer Science
from:
4Electrical Engineering
5Statistics and Actuarial Science
6Accounting Group

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
F. Zorzitto, BSc (Windsor), PhD
(Queen's)

Associate Professor and Associate
Chairman for Graduate Affairs
C.L. Stewart, BSc (British Columbia),
MSc (McGill), PhD (Cambridge)

Distinguished Professor
J. Aczel, PhD (Budapest), HabilDSc
(Hungarian Academy of Sciences),
FRSC

Professors
J.A. Baker, MA (Saskatchewan), PhD
(Waterloo)
S. Burris, PhD (Oklahoma)
D.Z. Djokovic, PhD (Beograd)
B. Forte1, PhD (Pisa), Habil DSc (Rome)
H. Haruki, PhD (Osaka)
P. Hoffman, BA (Toronto), PhD
(Manchester)
Pl. Kannapann, BScHons (Annamaalai),
PhD (Washington)
J.W. Lawrence, MSc (McGill), PhD
(Carleton)
M.A. McKiernan1, MA (Loyola), PhD
(Indiana Institute of Technology)
C.T. Ng, BSc (Chinese University of
Hong Kong), PhD (Waterloo)
R.A. Staal, PhD (Toronto)
F.C.Y. Tang, BSc (Hong Kong), MS
(South Carolina), PhD (Illinois)
J.W. Tucker2, BSc (London), PhD
(London)

Associate Professors
L.J. Cummings1, PhD (British Columbia)
K.R. Davidson, BMath (Waterloo), PhD
(Berkeley)
L.J. Dickey2, MA (Arizona), PhD
(Wisconsin)

W.J. Gilbert, MA (Cambridge), DPhil
(Oxford)
D.A. Higgs, BScHons (Witwatersrand),
MA (Cambridge), PhD (McMaster)
A. Kerr-Lawson2, BA (Toronto), MA
(Chicago), PhD (McMaster)
E. Moskal, BA (Toronto), PhD (Illinois)
D. Mowat5, PhD (Waterloo)

Assistant Professors
A.A. Adamson, MMath (Waterloo), PhD
(Berkeley)
K.A. Rowe, BSc (Toronto), MS
(Wisconsin), PhD (Illinois)

Faculty Members of Pure Mathematics
holding cross appointments to:
1Applied Mathematics
2Philosophy
3Combinatorics & Optimization

Faculty Members holding cross
appointments to Pure Mathematics
from:
4Applied Mathematics/Computer
Science
5St. Jerome's

Department of Statistics and
Actuarial Science

Professor and Chairman of the
Department
J.F. Lawiess, BSc, MSc, PhD (Waterloo)

Professor and Associate Chairman of
the Department
M.E. Thompson, BSc (Toronto), MSc,
PhD (Illinois)

Associate Professor and Associate
Chairman, Actuarial Science
H.H. Panjer, BA, MA, PhD (Western),
FSA, FCIA

Professors
P.P. Boyle1, PhD (Trinity College,
Dublin), FCIA, FIA
W.F. Forbes, BSc, PhD, DSc (London),
DRC, ARCS
V.P. Godambe, MSc (Bombay), PhD
(London)
J.D. Kalbfleisch, BSc, MMath, PhD
(Waterloo)
J.G. Kalbfleisch, BSc (Toronto), MA,
PhD (Waterloo)
P.M. Reilly2, UE, BASc (Toronto), DIC,
PhD (London), PEng
K.R. Shah, BA, MA (Bombay), PhD
(Indian Statistical Institute)
D.A. Sprott1, BA, MA, PhD (Toronto),
FRCS, FRPS

Assistant Professors
B. Abraham, BSc (Kerala), MSc
(Guelph), PhD (Wisconsin)
W.H. Atken, BA (Toronto), FSA, FCIA,
EA
G.W. Bennett, BSc, BA, PhD (Adelaide)
M.A. Bennett, BA (Nottingham), FSA,
FCIA
A. Brender, BSc (McGill), MA, PhD
(California-Berkeley), ASA, FSA,
FCIA
K.S. Brown3, BMath, PhD (Waterloo)
W.H. Cherry, BSc, PhD (Melbourne)
J.F. Gentleman5, BA, MS (Chicago),
PhD (Waterloo)
R.J. MacKay, BSc (Waterloo), MSc, PhD
(Toronto)
D.L. McLeish, BSc (Queen's), MSc
(Toronto), PhD (McGill)
F.G. Reynolds, BSc, MSc (Manitoba),
FSA, FCIA
W.S. Rickert, BSc, PhD (Waterloo)
J.C. Robinson, BASc, MSc, PhD
(Waterloo)
J.B. Whitney, BA, MA (Western
Ontario), PhD (Toronto)
J.C. Young, BASc (Toronto), MSc
(Waterloo), PhD (Edinburgh)

Research Assistant Professor
J.A. Jackson, BS, BCIR, MB, MA
(Cambridge), Gerontology Research
Council Fellow

Adjunct Faculty
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

Lecturer
C. Springer, BSc, MSc (McGill)

Faculty Members of Statistics and
Actuarial Science holding cross
appointments to:
1Psychology
2Recreation
3Computer Science
Faculty Members holding cross-appointments to Statistics and Actuarial Science from:
4Accounting Group
5Chemical Engineering and Management Sciences
6Combinatorics & Optimization

Strategy Board Members
University of Waterloo Faculty of Mathematics

Dr. D.C. Baxter
Assistant Auditor General
Control Evaluation Branch
E.G. Burton
G. Corlett
Vice President, Business Services
Noranda Mines Limited
D. Eckerley
Vice President & Actuary
Dominion Life Assurance Company
A. Gordon
Deputy Minister
Ministry of Government Services
Ontario
S.L. Hartley
Senior Vice President, Finance
The Molson Companies Ltd.
C.A. Hayles
Vice President & General Manager
Marketing
Esso Petroleum Canada
R.D. Hossack
Partner
Currie, Coopers & Lybrand
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
Senior Vice President
Canadian Imperial Bank of Commerce
Dr. C.D. Sadlier
Assistant Vice President,
Systems Planning
Bell Canada
D.W. Seaborn
Vice President,
Technical Systems Division
Systemhouse Ltd.
G.F. Sekely
Director, Information Systems
Canadian Pacific Limited

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

Introductory Notes
1. Courses with the following abbreviations are offered by the Faculty of Mathematics: ACTSC (Actuarial Science), AM (Applied Mathematics), C&O (Combinatorics & Optimization), CS (Computer Science), MATH (non-departmental faculty courses), 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, 110a/b, 111a/b, 113a/b, 114, 115a/b, 210, 211, 212, 213a/b, 215, 216; STAT 202, 204, 205, 210, 300.

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 130b
Credit will be granted for only one of ACTSC 221, 231.

ACTSC 231 F.W.S 3C 0.5

Life Contingencies - Single Lives

Prereq: ACTSC 231
Credit will be granted for only one of ACTSC 222, 232.

ACTSC 232 F.W.S 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 331 F.S 3C 0.5

Life Contingencies - Single Lives

Prereq: ACTSC 231
Credit will be granted for only one of ACTSC 222, 232.

ACTSC 332 W 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 formulae. Introduction to data graduation.

Prereq: MATH 130b, 134b

Course Descriptions

Mathematics

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

ACTSC 221 F.W.S 3C 0.5

Mathematics of Investment
The theory of rates of interest and discount. Annuities and sinking funds with practical applications to mortgage and bond questions. Yield rates.

Prereq: At least second year standing.
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 130b
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, MTHEL 305a
Credit will be granted for only one of ACTSC 222, 232.

ACTSC 331 F.S 3C 0.5

Life Contingencies - Single Lives

Prereq: ACTSC 231
Credit will be granted for only one of ACTSC 222, 232.

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 formulae. Introduction to data graduation.

Prereq: MATH 130b, 134b
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 431 F,S 3C 0.5
Risk Theory 1
Monte Carlo Theory. Distribution of
Aggregate claims. Classification of Risk.
Prereq: ACTSC 232
Coreq: STAT 333

ACTSC 432 W 3C 0.5
Risk Theory 2
Calculations of net premiums and
reinsurance premiums. Ruin theory.
Utility theory.
Prereq: ACTSC 431, STAT 333

ACTSC 433 F,S 3C 0.5
Construction of Life Tables
Methods of analysis of data to produce
raw rates for mortality, morbidity and
other tables.
Prereq: ACTSC 232 or consent of
instructor.

ACTSC 435 W 3C 0.5
Introduction to Demographic Statistics
Topics in demography with emphasis on
population projections, mortality
theories, and construction of life tables.
Prereq: ACTSC 232 or consent of
instructor.

ACTSC 451 F 3C 0.5
Selection of Risks 1
The effects of medical and non-medical
risk factors on bodily systems are
explored to determine the amount and
incidence of additional morbidity and
mortality. Techniques for expressing the
increased risk in premiums and reserves
are investigated.
Coreq: MTHEL 305b, ACTSC 331

ACTSC 452 W 3C 0.5
Selection of Risks 2
A further selection of topics on medical
and non-medical risks and indemnity
Prereq: ACTSC 451

ACTSC 453 F,S 3C 0.5
Basic Pension Mathematics
Theory and practice of pension plan
funding. Assumptions, basic actuarial
functions and population theory applied
to private pensions. Concepts of Normal
Costs, Supplemental Liability,
Unfunded Liability arising from
individual Accrued Benefit and
Projected Benefit cost methods.
Prereq: ACTSC 332 or consent of
instructor.

ACTSC 454 W 3C 0.5
Pension Funding
Group and other generalized cost
methods for Pension plans. Effects of
early retirements, plan design and
actuarial assumptions on Pension costs.
Cost forecasts applied to private and
public pension plans - in particular to
the CPP.
Prereq: ACTSC 453 or consent of
instructor.

ACTSC 455 W 3C 0.5
Analysis of Financial Statements
Topics in insurance financial reporting
including amortization of gains, the
Canadian method of actuarial reserves,
investment and currency reserves, and
the analysis of gains and losses.
Prereq: ACTSC 331 or consent of
instructor.

ACTSC 456 W 3C 0.5
Taxation of Life Insurance
Taxation of life insurance. Insurance
companies and employee benefits.
Prereq: ACTSC 332, MTHEL 305a/b

ACTSC 458 W 3C 0.5
Insurance Law
Topics in Canadian and American
Insurance Law.
Prereq: ACTSC 331, MTHEL 305a/b

ACTSC 463 W 3C 0.5
Topics in Casualty Insurance 1
Topics in casualty insurance chosen
from areas such as coverages, rate-
making and underwriting.
Prereq: ACTSC 232

Not Offered 1983-84:
ACTSC 391 Topics in Actuarial
Mathematics
ACTSC 441 Advanced Topics in
Actuarial Mathematics
ACTSC 484 Topics in Casualty
Insurance 2
ACTSC 491 Seminar in Actuarial
Mathematics 1
ACTSC 492 Seminar in Actuarial
Science 2

Course Descriptions
Mathematics
Actuarial Science

Applied Mathematics
Course Descriptions

Courses not offered in the current
academic year are listed at the end of
this section.

AM 101 F 3C,1T 0.5
Applications of Mathematics 1 (For
Biology Students)
Review of basic algebra, geometry, and
trigonometry. Sets, relations,
operations, and functions. Complex
numbers. Exponential and logarithmic
functions. Difference equations.
Interpolation, estimation, and
approximation. Introduction to linear
algebra and matrix theory.
Not open to students in the Faculty of
Mathematics

AM 111 W 3C,1T 0.5
Applications of Mathematics 2 (For
Biology Students)
An introduction to probability and
statistics. Deterministic and non-
deterministic modeling. Numerical
methods using a pocket calculator.
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 130b

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.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Instructorship</th>
<th>Credits</th>
<th>Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM 362 F,S 2C.1T 0.5</td>
<td>Elementary Differential Geometry and Tensor Analysis</td>
<td>Prereq: MATH</td>
<td>0.5</td>
<td>Mathematics, Applied Mathematics</td>
</tr>
<tr>
<td>AM 381 F,S 2C.1T 0.5</td>
<td>Ordinary Differential Equations 1</td>
<td>Existence and uniqueness theorems, second and higher order equations, series solutions and Special Functions, Laplace transforms, Application to Mathematical Physics.</td>
<td>Prereq: MATH 230b</td>
<td>0.5</td>
</tr>
<tr>
<td>AM 391 W 2C.1T 0.5</td>
<td>Ordinary Differential Equations 2</td>
<td>Sturm-Liouville problems and eigenfunction expansions, Nonlinear mechanics, phase plane method and stability analysis.</td>
<td>Prereq: AM 391</td>
<td>0.5</td>
</tr>
<tr>
<td>AM 395 F 2C.1T 0.5</td>
<td>Mechanics</td>
<td>Three-dimensional rigid body motion, Lagrange’s equations of motion, Ignorable co-ordinates, Hamilton’s principle, Noether’s theorem and conservation laws, Canonical equations, Canonical transformations, Lagrange and Poisson bracket relations, Integral invariants.</td>
<td>Prereq: MATH 230b or consent of instructor.</td>
<td>0.5</td>
</tr>
<tr>
<td>AM 371 F,S 2C.1T 0.5</td>
<td>Partial Differential Equations of Applied Mathematics 1</td>
<td>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.</td>
<td>Prereq: AM 260, MATH 230b, or consent of instructor.</td>
<td>0.5</td>
</tr>
<tr>
<td>AM 372 W 2C.1T 0.5</td>
<td>Introduction to General Relativity</td>
<td>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.</td>
<td>Prereq: AM 362/PMATH 365 or consent of instructor.</td>
<td>0.5</td>
</tr>
<tr>
<td>AM 389 F 0.5</td>
<td>Reading Course</td>
<td></td>
<td></td>
<td>0.5</td>
</tr>
<tr>
<td>AM 399 W 0.5</td>
<td>Reading Course</td>
<td></td>
<td></td>
<td>0.5</td>
</tr>
<tr>
<td>AM 430 F 2C 0.5</td>
<td>Applications of Mathematics</td>
<td>Integral equations and integral transforms will be applied to systems with memory.</td>
<td>Prereq: Consent of instructor.</td>
<td>0.5</td>
</tr>
<tr>
<td>AM 440 W 2C 0.5</td>
<td>Applications of Mathematics</td>
<td>As a project, students will develop a mathematical model and interpret its behaviour.</td>
<td>Prereq: Consent of instructor.</td>
<td>0.5</td>
</tr>
<tr>
<td>AM 444 W 3C 0.5</td>
<td>Applications of Algebra</td>
<td>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.</td>
<td>Prereq: MATH 224b</td>
<td>0.5</td>
</tr>
<tr>
<td>AM 462 F 2C 0.5</td>
<td>Measure and Integration</td>
<td>The theory of measure and the Lebesgue integral.</td>
<td>Prereq: MATH 332a or PMATH 351a</td>
<td>0.5</td>
</tr>
<tr>
<td>AM 464 F 2C 0.5</td>
<td>Topics in General Relativity</td>
<td>Basic ideas of relativistic cosmology (Friedmann-Robertson-Walker universes, observational status of cosmological theories, black hole theory (the Schwarzschild and Kerr solutions, their event horizons and singularities, gravitational collapse, observable properties of black holes), and an introduction to gravitational waves. Other topics of current interest may be discussed.</td>
<td>Prereq: AM 362 and 372 or consent of instructor.</td>
<td>0.5</td>
</tr>
<tr>
<td>AM 465 Y 2C 1.0</td>
<td>Quantum Mechanics</td>
<td>Schrödinger equation. Solution of one dimensional problems, commutation relations, uncertainty principle, W.K.B. approximation. Hydrogen atom, angular momentum.</td>
<td></td>
<td>0.5</td>
</tr>
<tr>
<td>AM 466 F 3C 0.5</td>
<td>Fluid Mechanics A</td>
<td>Fundamental equations of inviscid fluids, compressibility, vorticity, two and three-dimensional irrotational, incompressible flow, Blasius’ theorem, Joukowski hypothesis. Water Wave Motion.</td>
<td>Prereq: AM 365</td>
<td>0.5</td>
</tr>
<tr>
<td>AM 466 F 2C 0.5</td>
<td>Topics in Applied Mathematics</td>
<td>A selection of special topics given by members of the Applied Mathematics Department.</td>
<td>Prereq: Consent of instructor.</td>
<td>0.5</td>
</tr>
<tr>
<td>AM 472 W 2C 0.5</td>
<td>Linear Operators</td>
<td>Linear operators in Hilbert spaces. Compact operators. Introduction to functional analysis.</td>
<td>Prereq: AM 462 or consent of instructor.</td>
<td>0.5</td>
</tr>
</tbody>
</table>
AM 474 W 2C,1T 0.5
Topics in Differential Geometry
Grassman algebras, differential forms, Lie derivatives, isometries, Killing vector fields, applications to continuum mechanics, differentiable manifolds and applications of differential forms to physics. Prereq: AM 562/MATH 365 or consent of instructor. Cross-listed as PMATH 465.

AM 476 W 3C 0.5
Fluid Mechanics II

AM 478 W 2C 0.5
Topics in Applied Mathematics
Same as in AM 488. Prereq: Consent of instructor.

AM 481 F 2C 0.5
Partial Differential Equations of Applied Mathematics II
Second-order partial differential equations and characteristics; d'Alembert's solution of the wave equation, concepts of distributions, construction of Green's functions, Fourier integral theorem, integral transforms, inverse transforms by contour integration. Applications to physical problems. Prereq: AM 371, 381, 391 or consent of instructor.

AM 481b W 2C 0.5
Partial Differential Equations of Applied Mathematics III

AM 482 F 2C,1T 0.5
Calculus of Variations

AM 485 F 2C 0.5
Electromagnetism
Applications of Maxwell's equations. Introduction to wave guides and antennae. Prereq: PHYS 253 or consent of instructor.

AM 486 F 2C 0.5
Statistical Mechanics
Applications of probability theory to theoretical Physics. Prereq: Consent of instructor.

AM 488 W 3C 0.5
Control Theory

AM 489 F 0.5
Reading Course
AM 495 W 2C,1T 0.5
Elasticity
Basic equations of elasticity for homogeneous isotropic bodies; bending of beams; plane elastic waves; Rayleigh surface waves, Love waves. Solution of problems by potentials, variational methods and Saint Venants' principle. Prereq: AM 365.

AM 499 W 0.5
Reading Course
Not Offered 1983-84:
AM 364 Special Relativity
AM 461 Non-Linear Differential Equations
AM 463 Introduction to Differentiable Manifolds

Course Descriptions
Mathematics: Combinatorics & Optimization

AM 483 W 3C 0.5
Graph Theory I
An introduction to the ideas, methods and applications of graph theory. Finding shortest paths and maximum matchings in weighted graphs. Determining the connectivity of a graph. Prereq: MATH 224a. C&O 230

AM 484 F 2C,1T 0.5
Introductory Combinatorics
Elementary principles of enumeration. Principles of inclusion - exclusion, generating functions, recurrence equations. Elementary graph theory and graphical algorithms. Introduction to design theory. Credit will be granted for C&O 220 or 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 220 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 C&O 220 or 230.

C&O 270 F,W 3C 0.5
Introduction to Optimization
Structure and classification of optimization problems. The concepts of algorithm and heuristic. Continuous models. Linear models. Methods of branch-and-bound, implicit enumeration and approximation. Applications. Prereq: MATH 130b, MATH 134b. Students may not enrol in C&O 270 if they have previously completed, or are concurrently enrolled in, C&O 350 or 367. Also offered by St. Jerome's College in Fall term.

C&O 330 F,W 3C 0.5
Combinatorial Enumeration
The combinatorics of ordinary and exponential generating functions. Matrix methods, and decompositions. The Lagrange theorem. Applications to enumeration of sequences, trees, covers, lattice paths and partitions. Prereq: C&O 230

C&O 331 W 3C 0.5
Coding Theory
A first course in error correcting codes. Linear block codes, Hamming-Golay codes and multiple error-correcting BCH codes are studied. Various encoding and decoding schemes are considered. Prereq: MATH 224b. Offered by St. Jerome's College.

C&O 342 W 3C 0.5
Graph Theory II
Course Descriptions
Mathematics:
Combinatorics & Optimization

C&O 350  F.W,S  3C  0.5
Linear Programming

C&O 351  F,W  3C  0.5
Network Flow Theory

C&O 367  F.W  3C  0.5
Nonlinear Programming
Vector calculus with applications to Newton's method and method of steepest descent. One-dimensional optimization. Introduction to constrained optimization, including the elements of Kuhn-Tucker theory and Lagrange multipliers. Prereq: MATH 220a, 224a

C&O 370  F.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: C&O 350
In 1983/84, sections of this course will be made available for students who do not satisfy this prerequisite requirement. Students cannot obtain credit for C&O 350, however, after having taken C&O 370.

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 queuing theory, inventory theory and reliability theory. Prereq: STAT 221

C&O 380  W,S  3C  0.5
Mathematical Discovery and Invention
A study of about 100 challenging problems taken from many areas of elementary mathematics - number theory, combinatorics, geometry, probability, logic.

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. Offered at St. Jerome's College. Prereq: C&O 330

C&O 430  F  3C  0.5
Algebraic Enumeration
The course is an extension of C&O 330. The combinatorics of Eulerian generating functions, the algebra of sequence types, maximal decomposition theorem. Lagrangian methods and their applications. Random walks and the Hopf factorization. Symmetric functions and plane partitions. Prereq: C&O 330

C&O 434  F  2C  0.5
Combinatorial Design
Topics covered include error correcting codes, resolvable designs, affine designs, weighing matrices, and their interaction. Prereq: MATH 324

C&O 438  W  3C  0.5
Combinatorial Computing
A course covering a number of applications of computers to combinatorial problems. General procedures - backtrack programming, generation of permutations, partitions etc., as well as the solution of many specific problems. Includes an introduction to computational complexity. Prereq: C&O 230

C&O 439  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

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.S  3C  0.5
Scheduling
Sequencing algorithms for scheduling tasks on single machines, parallel machines, and flow shops. Applications to scheduling computers and manufacturing facilities. Combinatorial techniques used in algorithm development and convergence proofs. Prereq: C&O 351 or 370

C&O 456  W,S  3C  0.5
Game Theory
An introduction to the analysis, through appropriate mathematical models, of competitive situations such as those arising in social, economic, political or military conflict. Emphasis is placed on the theory of two-person games. Prereq: C&O 350

C&O 458  F  3C  0.5
Numerical Linear Programming
Methods for the minimization and maximization of piecewise linear functions and linear functions subject to linear constraints, with applications to linear programming and data fitting. Emphasis is on algorithms, numerical considerations and software implementation. Prereq: One of C&O 350, CS 332, or consent of instructor. Cross-listed as CS 473.
### Course Descriptions

#### Mathematics:

**Computer Science**

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**Computer Science Course Descriptions**

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### Introductory Notes

1. The Computer Science Department is experiencing tremendous demand for its courses beyond available resources. Thus, 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 CS courses students may take concurrently 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. The prerequisites for several CS courses include registration in a Computer Science Major program. In this context, "Computer Science Major programs" include Honours Computer Science, Honours Co-op Computer Science with Electrical Engineering Electives, Honours Co-op Computer Science-Information Systems Option, all Joint and Double Honours BMath programs involving Computer Science as one of the majors. Where resources permit, students with exceptionally high academic standing in other programs may be considered for admission to these courses on an individual basis. To be considered, students should first obtain a written recommendation from their Faculty Advisor and then consult a Computer Science Advisor.

3. 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.

4. 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: CS212, 115, 116, 118, 316.

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**CS 112 F,W 2C,1T,1L 0.5**
**Introduction to Business Problem Solving by Computer**

Emphasis on the solution of mathematical problems in business. Concept and properties of an algorithm. Language and notation for describing algorithms. Analysis of problems, development of models and algorithms; implementation in a procedure-oriented language (usually FORTRAN IV); execution of these programs using several systems. 

**Prereq:** none.

Credit will be granted for only one of CS 112, 118, 140. CS 112 cannot be counted for credit toward a BMath degree.

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**CS 115 F,W 2C,1T,1L 0.5**
**Introduction to Commercial Problem Solving by Computer**

Introduction to file processing techniques such as file maintenance, sorting and report generation. Language and notation for describing such algorithms. Analysis of problems dealing with files, and development of algorithms for their solution. Introduction to procedure-oriented languages (usually COBOL) for solving such problems.

**Prereq:** none.

Credit will be granted for only one of CS 115, 180. CS 115 cannot be counted for credit toward a BMath degree.

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**CS 116 F,W 2C,1T,1L 0.5**
**Introduction to Computing**

This course tries to develop an appreciation of the capabilities and limitations of computing and a reasonable capability for using a programming language (usually BASIC). Topics include: computers - past, present and future; the problem solving process; algorithmic and programming techniques; file processing; text processing; applications and implications of computers.

**Prereq:** No mathematical background is required.

Credit will be granted for only one of CS 112, 116, 140. CS 116 cannot be counted for credit toward a BMath General or Honours degree.

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**CS 118 F,W 3C,1L 0.5**
**Introduction to Scientific Problem Solving by Computer**

An introduction to the analysis of scientific problems, development of mathematical models and algorithms for
their solution; implementation in a procedure-oriented language (normally FORTRAN). Topics discussed are: solution of equations, computation of integrals, graph plotting, and simulation. Prereq: Grade 13 mathematics is recommended. Credit will be granted for only one of CS 112, 116, 118, 140. CS 118 cannot be counted for credit toward a BMath degree.

CS 140 F,W,S 3C,2L 0.5
Introduction to Mathematical Problem Solving by Computer
An introduction to the analysis of mathematical problems, development of mathematical models and algorithms for their solution; implementation in a procedure-oriented language (normally FORTRAN). Topics discussed are: solution of equations, computation of integrals, graph plotting, and simulation. Prereq: Grade 13 mathematics is recommended. Credit will be granted for only one of CS 112, 116, 118, 140. Special sections of this course will use 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 be granted for only one of CS 115, 190.

CS 210 F 3C 0.5
Introduction to Numerical Computing
A survey of numerical procedures with emphasis upon computer implementation using FORTRAN. 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 be granted for only one of CS 210, 332/333, 375.

CS 234 F,W,S 2C,2T 0.5
Programming Principles and Practice
To develop a sophisticated user-oriented understanding of software. A disciplined approach to program design. The need for and use of various control structures and data structures. Features of several high-level languages; techniques for their effective use. Specific topics include: structured programming, linked-list processing, recursion, string processing, tree processing and language development. Prereq: One of CS 116, 140, 180 or two of CS 112, 115, 116. Credit will be granted for only one of CS 234, 240.

CS 235 F,W,S 2C,1T 0.5
Introduction to Computers and Computer Systems
To give a basic understanding of what goes on inside a computer, of machine organization, and of machine and assembly-language programming. To introduce students to computer software designed to assist user programs. To make students better users of a computer. Specific topics include: simple machine architecture, assembler-level programming, addressing modes and operating system services. Prereq: One of CS 118, 140, 180 or two of CS 112, 115, 116. Credit will be granted for only one of CS 235, 250.

CS 240 F,W,S 2C,2T 0.5
Programming Principles, Languages, and Techniques
To develop a thorough understanding of software as needed for program design. The need for and use of various control structures and data structures. Features of several high-level languages, techniques for their effective use. Specific topics include structured programming, linked-list processing, recursion, string processing, tree processing and language development. Prereq: CS 250 and second-year standing in a Computer Science Major program. Credit will be granted for only one of CS 240, 250.

CS 250 F,W 3C,1T 0.5
Fundamentals of Computers and Computer Systems
To give a thorough introduction to what goes on inside a computer, of machine organization, and of machine and assembly-language programming. To introduce students to computer software designed to assist user programs. Specific topics include: addressing modes, subroutines and macros, microcomputer architecture, and operating system components. Prereq: CS 140 and second-year standing in a Computer Science Major program. Credit will be granted for only one of CS 235, 250.

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: One statistics course. CS 316 cannot be counted for credit toward a BMath degree.

CS 330 F,W,S 2C 0.5
Computer Applications in Business: Introduction
A discussion of the implementation of business procedures on computers. Students study and modify a computerized accounting system as an illustration of the methods used. The accounting system is then extended to consider other applications such as inventory control and also more complicated file structures to improve the performance of the system. Prereq: CS 180 and (ACC 121/122 or 101/102), or consent of instructor. CS 330 cannot be counted for credit toward a BMath Honours Computer Science degree.

CS 332 F 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 220b, 224a. Credit will be granted for only one of CS 210, 332/333, 375. Formerly CS 370.
Course Descriptions

Mathematics:

Computer Science

CS 333 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 332, the intent is to expose students to modern computer techniques for solving mathematical problems.
Prereq: Knowledge of a high-level programming language (preferably FORTRAN), MATH 220b, 224a.
Credit will be granted for only one of CS 210, 332/333, 375.
Formerly CS 371.

CS 338 F,W,S 3C 0.5
Computer Applications in Business: Data Bases and Data Communications
A user-oriented approach to data communications and to the management of large collections of data. The three basic models (hierarchical, network, and relational) are presented. Specific examples are used to illustrate data base design. Data communication principles are related to specific business applications.
Prereq: CS 330, 340 or consent of instructor. Credit will be granted for only one of CS 338, 448. CS 338 cannot be counted for credit toward a BMath Honours Computer Science degree.

CS 340 F,W,S 3C 0.5
Data Structures
The study of data structures in a language independent setting. Levels of data description and their role in design of structures. The effects of secondary store. Introduction to the analysis of algorithms. Topics include: primitive data types; sequences; designing representation-independent data structures; tuples; arrays and tables; trees and forests; sets.
Prereq: CS 240, one of C&O 220, 230.

CS 350 F,W,S 3C 0.5
Machine Structures
The intent is to give a basic understanding of what goes on inside a computer, of machine architecture, and of some fundamental operating system services. Topics include: introduction to an actual computer; representation of data; memory; central processor; addressing schemes; input/output; linking and loading.
Prereq: CS 250 or EL E 222, CS 369 or EL E 323 is recommended.

CS 354 F.W 3C 0.5
Software Systems
A study of those software components comprising a computing system, with an emphasis on the management of hardware resources and the support of multiple processes. Topics include: operating system services; file systems; linkers, loaders and libraries; monitors and debuggers; interrupt handling; critical sections; process communication and synchronization.
Prereq: CS 340 and third-year standing in a Computer Science Major program.
CS 350 is recommended as a prerequisite.

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 375 F,W,S 3C 0.5
Introduction to Numerical Analysis
Pitfalls in computation; solution of linear algebraic equations; polynomial interpolation; least squares; numerical integration and differentiation. The intent is to expose students to the theory behind modern computer techniques for solving mathematical problems.
Prereq: CS 240, MATH 230b, 234a, and third-year standing in a Computer Science Major program.
Credit will be granted for only one of CS 210, 332/333, 375.

Enrolment in some fourth-year courses may be restricted to students registered in Computer Science Major programs.

CS 432 W 3C 0.5
Business Systems Analysis
Prereq: CS 340 or CS 330 and 338, and fourth-year standing.
Credit will be granted for only one of CS 432, 434, 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/effectiveness analysis of controls. Computer audit techniques. Case studies including examples of poorly controlled systems and computer abuse.
Prereq: ACC 251 and either CS 338 or 448. Credit will be granted for only one of CS 432, 434, 482. CS 434 cannot be counted for credit toward a BMath Honours Computer Science degree.

CS 437 W 3C 0.5
Simulation by Computer
An introduction to the basic techniques of simulation. Discrete simulation models: random number generators; the SIMSCRIPT and GPSS languages; analysis of simulation output; continuous simulation models and the CSMP language.
Prereq: STAT 220; CS 330 and 338, or 340. Credit will be granted for only one of CS 437, 457. CS 437 cannot be counted for credit toward a BMath Honours Computer Science degree.

CS 442 W 3C 0.5
Comparative Programming Languages
This course is designed to give students a critical understanding of programming language concepts and to provide them with an appreciation for the implications of various language design decisions. Students also learn some fundamentals about language processors.
Prereq: CS 340, 360
Course Descriptions
Mathematics:
Computer Science

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: CS 340, 350.

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 be granted for only one of CS 338, 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, 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, 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 queuing theory, data communications and the telephone network, computer architecture for data communications, protocols, error handling, multiprocessing and switching, and packet switching networks.
Prereq: CS 340, 450, STAT 231, 333. CS 457 is a recommended corequisite.

CS 457 W 3C 0.5
Queueing Models: Analysis, Simulation, and Computer Applications
An introduction to the basic results of queuing theory and the techniques of discrete event simulation. Emphasis is placed on the application of queuing models to computer systems and computer communication networks.
Prereq: STAT 231 and 333; CS 240 and 350. Credit will be granted for only one of CS 437, 457.

CS 462 F 3C 0.5
Formal Languages and Parsing
Prereq: CS 360.

CS 464 W 3C 0.5
Computability and Recursive Function Theory
Models of the computational process as reflected by computers, linguistic systems, functional specifications, transformational systems, formal logic, etc. Equivalence of these models. Computational complexity for specific models and abstractions fitting all models. Formal reducibilities between computational problems, and the complexity of these reducibilities.
Prereq: CS 360

CS 466 F,S 3C 0.5
Algorithm Design and Analysis
Design of good algorithms and analysis of the resources they consume. Lower bounds on the resource requirements of algorithms to compute certain functions. Problems from the following areas are discussed in this light: sorting and order statistics, data structures, arithmetic computations, the NP-complete problems.
Prereq: CS 340. CS 380 is recommended.

CS 468 W 3C 0.5
Program Verification
Methods of program verification. Implications for structured programming. Inductive reasoning about recursive programs and recursively defined data structures.
Prereq: CS 360

CS 472 W 3C 0.5
Numerical Linear Algebra
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 332, 375, C & O 350, or consent of instructor. Cross-listed as C & O 458.
Course Descriptions
Mathematics:
Computer Science

CS 474 S 3C 0.5
Numerical Approximation
Prereq: (CS 333 or 375) and MATH 332b.

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 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 be granted for only one of CS 432, 434, 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 and 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, 350 and MATH 234a.

CS 492 F.W 2C.1D 0.5
The Social Implications of Computers
This course is designed to consider the problems caused for organizations and society by the advent of computer technology so that constructive solutions to these problems may be discussed.
Prereq: CS 330 and 338, or CS 340

CS 498 0.5
Advanced Topics in Computer Science
See the course offerings list for topics available.

CS 499 0.5
Readings in Computer Science

Mathematics
Course Descriptions

Introductory Notes
1. Certain core mathematics courses are offered at three different levels. The Advanced Honours level courses are intended for exceptionally gifted students in an Honours program. A student pursuing an Honours degree may substitute the corresponding Advanced Honours level course(s) for any required Honours level course(s). Similarly, a student pursuing a Pass or General degree may substitute the corresponding Honours level course(s) for any required General level course(s), unless the student has been required by the Standings & Promotions Committee to switch from an Honours program to General or Pass. In this case, the student must enrol in General level courses. The following table sets out corresponding Advanced/Honours/General Courses.

Prerequisites involving these core courses will be given in terms of the lowest level acceptable (e.g. Prereq: MATH 230b implies that MATH 240b is also acceptable but MATH 220b is not).

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, PMATH 341a/b have been phased out and replaced by MATH 224a/b, 234a/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 sequence.

MATH 000 F.W 1C 0.0
Co-op Orientation
MATH 000 is a non-credit orientation course for new Co-op Math students.

MATH 010 0.0
Non-Credit Night Lab
At its June 21/82 meeting, the University Senate approved a proposal that "all students enrolled in MATH 130a/b, MATH 134a/b, and/or CS 140/180 be enrolled in a non-credit lab that meets on some one evening each week from 7:00 to 9:00 p.m.". This time slot appears as a MATH 010 entry on student timetables and is reserved for midterm tests.
Course Descriptions
Mathematics

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.
Not open to students in the Faculty of Mathematics or to students who have credit in Grade 13 Algebra.
Students who have credit in both Grade 13 Calculus and Relations and Functions must obtain permission from the instructor to take MATH 103. 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.
Not open to students in the Faculty of Mathematics or to students who have credit in Grade 13 Calculus. Grade 12 Mathematics is strongly 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. 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.
Not open to students in the Faculty of Mathematics.

MATH 110a F 3C,2T 0.625
Calculus 1a (For Engineering Students)
Functions and their inverses, limits, continuity and derivatives. The trigonometric functions, their inverses and derivatives. Applications to rate, max./min. curve sketching problems. Sequences, the definite integral, the fundamental theorem of calculus. Applications to area and volume problems.
Prereq: Grade 13 Calculus. Not open to students in the Faculty of Mathematics.

MATH 110b W,3 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 113a F 3C,2T 0.5
Calculus (For Arts and Science Students)
Differentiation and integration of algebraic and transcendental functions, techniques involved and applications to real life problems.
Prereq: Grade 13 Calculus. Not open to students in the Faculty of Mathematics.

MATH 113b W 3C,2T 0.5
Calculus (For Arts and Science Students)
Prereq: MATH 113a.
Not open to students in the Faculty of Mathematics.

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, hyperbolic and inverse hyperbolic 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.
<table>
<thead>
<tr>
<th>Course Description</th>
<th>Mathematics</th>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>MATH 130a F, W, S</strong></td>
<td>3C, 1T</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Calculus</strong></td>
<td>Functions and limits, differentiation of trigonometric, logarithmic and exponential functions, the chain rule, Rolle's theorem, the mean value theorem, extreme value theorem, applications of the derivative, the differential, the definite integral, fundamental theorem of calculus.</td>
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<tr>
<td><strong>Prereq:</strong></td>
<td>Grade 13 Calculus.</td>
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<tr>
<td><strong>Credit will be granted for only one of MATH 130a, 140a.</strong></td>
<td>Also offered at St. Jerome's College.</td>
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<tr>
<td><strong>MATH 130b F, W, S</strong></td>
<td>3C, 1T</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Calculus</strong></td>
<td>Techniques of integration, applications of the integral, indeterminate forms. Taylor's theorem, convergence of sequences and series, power series.</td>
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<tr>
<td><strong>Prereq:</strong></td>
<td>MATH 130a.</td>
<td></td>
</tr>
<tr>
<td><strong>Credit will be granted for only one of MATH 130b, 140b.</strong></td>
<td>Also offered at St. Jerome's College.</td>
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<tr>
<td><strong>MATH 134a F, W</strong></td>
<td>3C, 1T</td>
<td>0.5</td>
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<tr>
<td><strong>Algebra</strong></td>
<td>Basic set theory, cardinality, elementary number theory, number systems, polynomials.</td>
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<tr>
<td><strong>Prereq:</strong></td>
<td>Grade 13 Algebra.</td>
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<tr>
<td><strong>Credit will be granted for only one of MATH 134a, 144a.</strong></td>
<td>Also offered at St. Jerome's College.</td>
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<tr>
<td><strong>MATH 134b F, W, S</strong></td>
<td>3C, 1T</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Linear Algebra 1</strong></td>
<td>Systems of equations, vector spaces, matrices, determinants, geometric applications.</td>
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<tr>
<td><strong>Prereq:</strong></td>
<td>Grade 13 Algebra (MATH 134a is recommended, but not required).</td>
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</tr>
<tr>
<td><strong>Credit will be granted for only one of MATH 134b, 144b.</strong></td>
<td>Also offered at St. Jerome's College.</td>
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<tr>
<td><strong>MATH 140a F</strong></td>
<td>3C</td>
<td>0.5</td>
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<tr>
<td><strong>Calculus</strong></td>
<td>MATH 140a is an advanced-level, enriched version of MATH 130a.</td>
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<tr>
<td><strong>Prereq:</strong></td>
<td>Grade 13 Calculus and a Grade 13 Math. Average of at least 85% (or permission of instructor).</td>
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<tr>
<td><strong>Credit will be granted for only one of MATH 130a, 140a.</strong></td>
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<tr>
<td><strong>MATH 140b W, S</strong></td>
<td>3C</td>
<td>0.5</td>
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<tr>
<td><strong>Calculus</strong></td>
<td>MATH 140b is an advanced-level, enriched version of MATH 130b.</td>
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<tr>
<td><strong>Prereq:</strong></td>
<td>MATH 140a (or permission of instructor).</td>
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<tr>
<td><strong>Credit will be granted for only one of MATH 130b, 140b.</strong></td>
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<tr>
<td><strong>MATH 144a F</strong></td>
<td>3C</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Algebra</strong></td>
<td>MATH 144a is an advanced-level, enriched version of MATH 134a.</td>
<td></td>
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<tr>
<td><strong>Prereq:</strong></td>
<td>Grade 13 Algebra and a Grade 13 Math. Average of at least 85% (or permission of instructor).</td>
<td></td>
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<tr>
<td><strong>Credit will be granted for only one of MATH 134a, 144a.</strong></td>
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<tr>
<td><strong>MATH 144b W, S</strong></td>
<td>3C</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Linear Algebra 1</strong></td>
<td>MATH 144b is an advanced-level, enriched version of MATH 134b.</td>
<td></td>
</tr>
<tr>
<td><strong>Prereq:</strong></td>
<td>MATH 144a (or permission of instructor).</td>
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<tr>
<td><strong>Credit will be granted for only one of MATH 134b, 144b.</strong></td>
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<tr>
<td><strong>MATH 210 F, W</strong></td>
<td>3C</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Calculus 2</strong> (For Chemical Engineers)</td>
<td>Partial differentiation, the gradient, multiple integrals with applications, line and surface integrals, divergence and curl, theorems of Green and Stokes. Applications to physical problems.</td>
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<tr>
<td><strong>Prereq:</strong></td>
<td>MATH 110b.</td>
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<tr>
<td><strong>Not open to students in the Faculty of Mathematics.</strong></td>
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<tr>
<td><strong>MATH 211 F, W</strong></td>
<td>2C, 2T</td>
<td>0.5</td>
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<tr>
<td><strong>Calculus 2</strong> (For Electrical Engineers)</td>
<td>Differential calculus of functions of several variables. Differential equations. Multiple integrals.</td>
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<tr>
<td><strong>Prereq:</strong></td>
<td>MATH 110b.</td>
<td></td>
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<tr>
<td><strong>Not open to students in the Faculty of Mathematics.</strong></td>
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</tr>
<tr>
<td><strong>MATH 212 F, S</strong></td>
<td>2C, 2T</td>
<td>0.5</td>
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<tr>
<td><strong>Prereq:</strong></td>
<td>MATH 211.</td>
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<tr>
<td><strong>Not open to students in the Faculty of Mathematics.</strong></td>
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<tr>
<td><strong>MATH 213a F</strong></td>
<td>3C</td>
<td>0.5</td>
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<tr>
<td><strong>Calculus 2</strong> (For Science Students)</td>
<td>Infinite series. Partial derivatives, chain rule, total differential, Taylor's theorem, extreme values.</td>
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<tr>
<td><strong>Prereq:</strong></td>
<td>MATH 113b (or MATH 115b) and MATH 111b, or equivalent.</td>
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<tr>
<td><strong>Not open to students in the Faculty of Mathematics.</strong></td>
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<tr>
<td><strong>MATH 213b W, S</strong></td>
<td>3C</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Calculus 2</strong> (For Science Students)</td>
<td>Multiple Integrals. Vector calculus: gradient, directional derivative, divergence, curl, line integrals and path independence. Green's theorem, Stokes theorem and Gauss' theorem.</td>
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<tr>
<td><strong>Prereq:</strong></td>
<td>MATH 213a or 220a, or equivalent.</td>
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<tr>
<td><strong>Not open to students in the Faculty of Mathematics.</strong></td>
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<tr>
<td><strong>MATH 215 F, W</strong></td>
<td>3C</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Differential Equations</strong> (For Chemistry Students)</td>
<td>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.</td>
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<tr>
<td><strong>Prereq:</strong></td>
<td>MATH 113b or 115b, or equivalent.</td>
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<tr>
<td><strong>Not open to students in the Faculty of Mathematics.</strong></td>
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<tr>
<td><strong>MATH 216 F, S</strong></td>
<td>3C</td>
<td>0.5</td>
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<tr>
<td><strong>Prereq:</strong></td>
<td>MATH 113b or 115b, or equivalent.</td>
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<tr>
<td><strong>Not open to students in the Faculty of Mathematics.</strong></td>
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<tr>
<td><strong>MATH 220a F</strong></td>
<td>3C, 1T</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Advanced Calculus</strong></td>
<td>Differential calculus for functions of several variables.</td>
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<tr>
<td><strong>Prereq:</strong></td>
<td>MATH 130b or equivalent.</td>
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<tr>
<td><strong>Coreq:</strong></td>
<td>MATH 134b.</td>
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<tr>
<td><strong>Not open to Honours Mathematics students.</strong></td>
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<td><strong>During the 1983/84 academic year, whenever there is sufficient demand from Co-op math students who are still eligible to enrol in General-level programs, this course will also be offered in terms other than the term listed above.</strong></td>
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</tr>
</tbody>
</table>
MATH 220a. 230a. 240a.
Prereq: MATH 224a.
Eligible to enrol in General-level students.
During the 1983/84 academic year, whenever there is sufficient demand from Co-op math students who are still eligible to enrol in General-level programs, this course will also be offered in terms other than the term listed above.

MATH 224a F 3C 0.5
Linear Algebra 2
Linear transformations, eigenvalues, characteristic polynomials, inner products.
Prereq: MATH 134b.
Not open to Honours Mathematics students.
During the 1983/84 academic year, whenever there is sufficient demand from Co-op math students who are still eligible to enrol in General-level programs, this course will also be offered in terms other than the term listed above.

MATH 224b F,W,S 3C 0.5
Abstract Algebra 1
Elementary group and field theory and other topics in algebra.
Prereq: MATH 224a.
Not open to Honours Mathematics students.
During the 1983/84 academic year, whenever there is sufficient demand from Co-op math students who are still eligible to enrol in General-level programs, this course will also be offered in terms other than the term listed above.

MATH 230b F,W,S 3C,1T 0.5
Advanced Calculus
Prereq: MATH 230a.
Credit will be granted for only one of MATH 220b, 230b, 240b.
Also offered at St. Jerome's College.

MATH 234a 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 240b, 234b, 244b.
Also offered at St. Jerome's College.

MATH 240a F,W 3C 0.5
Advanced Calculus
Differential calculus of functions of several variables: limits and continuity, partial derivatives, differentiability, chain rule, Taylor's formula, extreme values, mappings and Jacobians. Integral calculus of functions of several variables: multiple integrals, iterated integrals, change of variables, applications to area and volume calculations.
Prereq: MATH 130b.
Coreq: MATH 134b.
Credit will be granted for only one of MATH 220a, 230b, 240a.
Also offered at St. Jerome's College.

MATH 244a F 3C 0.5
Linear Algebra 2
MATH 244a is an advanced-level, enriched version of MATH 234a.
Prereq: MATH 144b (or permission of instructor).
Credit will be granted for only one of MATH 224a, 234a, 244a.
MATH 322a F,W 3C 0.5
Real Variables

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 334 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 380a F,S 2C,1T 0.5
Introduction to Information Theory with Applications

MATH 380b W 2C,1T 0.5
Information Theory with Applications
Measures of expected conditional information. Maximizing expected conditional information. Applications to communication theory and programming. Basics in questionnaire theory.

Mathematics Electives

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes
MTHEL courses are not restricted to students in the Faculty of Mathematics. When taken by Mathematics students, MTHEL courses count as non-mathematics electives.

MTHEL 100 F,W,S 2C 0.5
Commercial and Business Law for Mathematics Students

MTHEL 102 W,S 3C 0.5
Uses and Abuses of Statistics
This course provides an appreciation of how to correctly use statistical arguments in a wide variety of applications. Topics include descriptive statistics, sample surveys, experimental design, index numbers, regression models.

MTHEL 205a F,W 2C 0.5
Introduction to Biomathematics Education
Current trends in education, professional practices and administration, the role of the department head, lesson planning, techniques of teaching, evaluation of students, special students, extra-curricular activities, the relationship between elementary and secondary school mathematics, audio-visual materials.
This course is offered only to students in the Co-op Math/Teaching Option, MTHEL 302a or consent of the instructor.

MTHEL 206a F,W 2C 0.5
Introduction to Biomathematics 1
Biometry is a biological discipline requiring both a knowledge of mathematics and some basic understanding of specific biological phenomena. The course material has been selected from Genetics and Gerontology to provide examples of where both mathematics and biology have contributed to the advancement of knowledge in interdisciplinary areas. Cross-listed as HLTH 302.

MTHEL 302b W 2C 0.5
Introduction to Biomathematics 2
A continuation of Biomathematics 1. Topics considered are first order reaction kinetics in biological systems, including statistical considerations in enzyme kinetics, models for and the measurement of Evolution from a knowledge of genetics and protein structure and assessing the relative importance of environmental factors as evolutionary determinants. Prereq: MTHEL 302a Cross-listed as HLTH 303. May not be offered 1983-84.

MTHEL 305a F,W,S 3C 0.5
General Life Insurance 1
Types of Life Insurance contracts and their uses, basis of risk measurements, deficiency reserves, modified valuation methods, non-forfeiture values, dividend formulae, selection of risks, substandard risks, and principles of reinsurance.

MTHEL 305b W,S 3C 0.5
General Life Insurance 2
Legal aspects of life insurance, settlement options, principles of group and industrial insurance, organization and administration, the role of the department head, lesson planning, techniques of teaching, evaluation of students, special students, extra-curricular activities, the relationship between elementary and secondary school mathematics, audio-visual materials.

MTHEL 305c W,S 3C 0.5
General Life Insurance 3
The mathematics of life insurance, settlement options, principles of group and industrial insurance, organization and administration, the role of the department head, lesson planning, techniques of teaching, evaluation of students, special students, extra-curricular activities, the relationship between elementary and secondary school mathematics, audio-visual materials.

MTHEL 402a F 2C 0.5
Topics in Mathematical Aspects of Chemistry, Biology and the Medical Sciences 1
Topics will be selected from the area of epidemiology and mathematical models of disease processes with special reference to heart disease and cancer. Prereq: MTHEL 302a/b or consent of the instructor.

MTHEL 402b W 2C 0.5
Topics in Mathematical Aspects of Chemistry, Biology and the Medical Sciences 2
Factors contributing to various disease processes will be discussed with special references to the quantitative evaluation of environmental factors relevant to human disease and aging processes. Prereq: MTHEL 302a/b and 402a or consent of the instructor.
Pure Mathematics

Course Descriptions

Introductory Notes
More detailed course descriptions and course outlines are available upon request from the Pure Mathematics Department.

PMATH 340 W 3C 0.5
Elementary Number Theory
An elementary approach to the theory of numbers. Topics will include the Euclidean algorithm, unique factorization, congruences and the Euler phi function, and solutions to Diophantine equations.
Prereq: MATH 2246.
Will be of interest to all math students.
Credit will be granted for only one of PMATH 340, 441a.

PMATH 344 F 3C 0.5
Abstract Algebra
Groups, rings, fields and applications.
Prereq: MATH 2446, or consent of instructor.
PMATH 344 may be substituted for MATH 334 whenever this is a requirement in an Honours program.
Offered in Fall 1983, 1984. Offered in Winter from 1985 on.

PMATH 351a F S 3C 0.5
Real Analysis
Theory of functions of real variables. The notions of compactness, connectedness and uniformity are used in a study of continuity, differentiation, and integration.
Prereq: MATH 230b.
PMATH 351a may be substituted for MATH 332a whenever this is a requirement in an Honours program.

PMATH 351b W 3C 0.5
Real Analysis
Continuation of PMATH 351a.
Prereq: PMATH 351a.

PMATH 352a F S 3C 0.5
Complex Analysis
Holomorphic functions, Cauchy's integral theorem, Cauchy's integral formulas, Taylor and Laurent expansions, classification of isolated singularities, the Residue theorem.
Prereq: MATH 230b.
PMATH 352a may be substituted for MATH 332b whenever this is a requirement in an Honours program.

PMATH 352b W 3C 0.5
Complex Analysis
Continuation of PMATH 352a.
Prereq: PMATH 352a.

PMATH 360 F 3C 0.5
Geometry
An introduction to affine, projective and non-Euclidean forms of geometry. Conic sections in the projective plane, inversion in circles.
Prereq: MATH 224b.
Will be of interest to all math students.

PMATH 365 F S 2C,1T 0.5
Differential Geometry and Tensor Analysis
Curves in Euclidean 3-space (E3) and the Serret-Frenet 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.
Prereq: MATH 230b, or consent of instructor.
Cross-listed as AM 362.

PMATH 367 W 3C 0.5
Set Theory and General Topology
Intuitive set theory, metric spaces, point set topology.
Prereq: MATH 230a.

PMATH 399
Readings in Pure Math

PMATH 430a F 2C 0.5
Introduction to Mathematical Logic
A broad introduction to Mathematical Logic. The logic of sentences: truth-functions and axiomatic approaches (e.g., Natural Deduction and Gentzen sequent calculi). A brief introduction to the logic of predicates and to the foundations of mathematics.

PMATH 430b W 2C 0.5
Introduction to Mathematical Logic
Continuation of PMATH 430a. Godel's incompleteness theorem (in outline). Logicism, intuitionism, formalism. Selected topics (some of intuitionistic logic, modal logic, the representation theorem for Boolean Algebras normally are treated).
Prereq: PMATH 430a.
Will be of interest to all math students.
Credit will be granted for only one of PMATH 430b, 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, 432a.
Offered in Fall 1983 and Winter 1985.

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, 432b.
Offered in Winter 1984 and Fall 1985.

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, 441a.
Offered in Fall 1984 and Winter 1986.

PMATH 441b W 2C 0.5
Number Theory
Continuation of PMATH 441a.
Prereq: MATH 334 (or PMATH 344) and PMATH 441a.
Next offered Fall 1986.

PMATH 445 W 2C 0.5
Ring Theory
Continuation of the theory of rings and modules.
Prereq: MATH 334 or PMATH 344.
Offered in Winter 1984 and Fall 1985.

PMATH 446 F 2C 0.5
Group Theory
Permutations, Cayley Theorem, Sylow Theorem, Jordan-Holder Theorem, nilpotent and solvable groups, direct and semidirect products, free groups.
Prereq: MATH 334 or PMATH 344.
Offered in Fall 1983 and Winter 1985.

PMATH 447 F 2C 0.5
Field Theory
Field extensions and Galois theory.
Prereq: MATH 334 or PMATH 344.
Offered in Fall 1984.
PMATH 451a F 3C 0.5
Measure and Integration
An introduction to integration and measure theory with emphasis on the real line.
Prereq: MATH 332a or PMATH 351a

PMATH 451b W 3C 0.5
Functional Analysis
Banach spaces and linear operators.
Prereq: PMATH 451a

PMATH 465 W 2C,1T 0.5
Topics in Differential Geometry
Grassman algebras, differential forms, Lie derivatives, isometries, Killing vector fields, applications to continuum mechanics, differentiable manifolds and applications of differential forms to physics.
Prereq: AM 362/PMATH 365 or consent of instructor.
Cross-listed as AM 474.

PMATH 499
Readings In Pure Math
Not offered 1983-84:
PMATH 230a Introduction to Pure Mathematics
PMATH 230b Introduction to Pure Mathematics
PMATH 443 Linear Algebra 2
PMATH 459a Complex Analysis 2A
PMATH 459b Complex Analysis 2B
PMATH 461 Finite Geometries
PMATH 463 Differentiable Manifolds
PMATH 470a Functional Equations
PMATH 470b Functional Equations

Course Descriptions
Mathematics: Statistics

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.
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. For Science students only.

STAT 205 W 2C,1L 0.5
Statistics for the Physical Sciences 2
Prereq: STAT 202 or 204.

STAT 210 F,W 3C,1T 0.5
Applied Probability and Statistics
Prereq: MATH 110a/b.
For students in Mechanical Engineering.
Cross-listed as M SC/21.

STAT 220 F,W 3C,1T 0.5
Introduction to Statistical Methods
Probability theory; discrete and continuous random variables, expectation.
Prereq: MATH 130b.
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.
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
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.
Cannot be taken for credit toward a BMath degree.

STAT 320 W 3C 1T 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.
**Course Descriptions**

**Mathematics:**

**Statistics**

STAT 330 F,W 3C 0.6
**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**
Extensions to weighted least squares and non-normal 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 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.

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 1983-84.

STAT 340 W 2C 0.5
**Exploratory Data Analysis**
Prereq: STAT 321 or 331.

STAT 442 F 2C,1T 0.5
**Statistical Methods for Business and Industry**
Prereq: STAT 320 or 330.

STAT 443 W 3C 0.5
**Forecasting**
Prereq: STAT 321 or 331.

STAT 444 3C 0.5
**An Introduction to Econometrics**
Prereq: STAT 331
May not be offered in 1983-84.

STAT 445 0.5
**Topics in Econometrics**
Continuation of STAT 444.
Prereq: STAT 444.
May not be offered in 1983-84.

STAT 450 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 451 W 2C 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 456 0.5
**Topics in Probability Theory**
Prereq: STAT 333/334 or consent of instructor.
May not be offered 1983-84.

STAT 466 0.5
**Topics in Statistics 1**
Prereq: STAT 330/331 or consent of instructor.
May not be offered 1983-84.

STAT 467 0.5
**Topics in Statistics 2**
May not be offered 1983-84.

STAT 468 0.5
**Readings in Statistics 1**

STAT 469 0.5
**Readings in Statistics 2**

STAT 470 0.5
**Readings in Statistics 3**
Course Descriptions

Mechanical Engineering

Department of Mechanical Engineering

Professor, Chairman of the Department
H.W. Kerr, BASc, MASc, PhD (Toronto), PEng

Professor, Associate Chairman
A. Plumtree, BASc, PhD (Nottingham), PEng, CEng, FIM

Professor, Associate Chairman
J.H.G. Howard, BASc (Queen’s), MSc, PhD (Birmingham), PEng

Professor, Vice President Academic
T.A. Brzustowski, BASc (Toronto), AM, PhD (Princeton), PEng

Professor, Director, Office of Research Administration
E.L. Holmes, BASc (Bristol), MASc, PhD (Toronto), PEng

Professors
G.M. Bragg, BASc (Toronto), PhD (Cambridge), PEng
E. Brundrett, BSA (OAC), BASc, MASc, PhD (Toronto), PEng
D. Burns, BASc, PhD (Bristol), PEng, CEng
R.N. Dubey, BASc (Hons) (Patna), BASc (Eng) (Bihar), PhD (Waterloo), PEng
D. French, BASc, CEng, PEng
K.G.T. Hollands, BASc (Toronto), PhD (McGill), PEng
H.R. Martin, BASc, MSc (Queen’s) (Belfast), PhD (Nottingham), PEng
P. Niessen, BASc (McMaster), MASc, PhD (Toronto), PEng
G.F. Pearce, BASc (British Columbia), MASc (Toronto), PEng
R.J. Pick, BASc (British Columbia), MSc (Imperial College), PhD (Waterloo), PEng
K.R. Piekariski, Dipl Ing (London), PhD (Cambridge), PEng
G.D. Rainthby, BSc, MSc (Western Ontario), PhD (Minnesota), PEng
J.A. Schey, Dipl Ing, CSc (Budapest), PEng
P.R. Slawson, BASc, MASc, PhD (Waterloo), PEng
A.B. Strong, BASc (Waterloo), MSc (London), PhD (Waterloo), PEng
D.M.A. Taplin, BSc (Aston), DPhil (Oxford), DSc, PEng, CEng, CEng, FIM
M.M. Yovanovich, BASc (Queen’s), MS (Buffalo), ME, ScD (Massachusetts Institute of Technology)

Associate Professors
K.G. Adams, BASc (Queen’s), MASc, PhD (Waterloo), PEng
G.C. Andrews, BASc, MASc (British Columbia), PhD (Waterloo), PEng
G.A. Davidson, BASc, PhD (Toronto), PEng
A.M. Hale, BASc, MA (New Brunswick), BASc (Toronto), MASc, PhD (Waterloo), PEng
U.H. Mohaupt, BASc, MASc, PhD (Waterloo), PEng
G.E. Schneider, BASc, MASc, PhD (Waterloo)
H.F. Sullivan, BASc (Waterloo), AM, PhD (Princeton), PEng

Assistant Professors
J.B. Medley, BASc, MASc (Waterloo), PhD (Leeds), PEng
G.D. Stubley, BASc (Waterloo), MSc (Stanford), PhD (Waterloo), PEng

Adjunct Professors
J.W. Church, BASc (Queen’s), MASc (Toronto)
R.G.R. Lawrence, QC

Introductory Notes
Details of the undergraduate program in Mechanical Engineering are to be found in Chapter 9. All courses extend over one term only, and consist of 3 hours of lectures per week unless otherwise specified. In general, the only prerequisites are the core courses, unless otherwise specified.

Course Descriptions

M E 100 F.W 3C 0.5
Introductory Survey of Law
The rights and responsibilities of the engineer as a citizen of Ontario and Canada under the law; brief history of Canadian law differentiating between Civil and Criminal Law, the rights and duties of citizens and police, a review of Domestic Law, Real Estate Law, Landlord and Tenant Law. The law as it may pertain to the engineer in his profession, brief reviews of the Laws of Contracts, Patents, Trademarks, industrial design, and copyright, Bills of Exchange, Company law, incorporation of companies, Common and Preferred shares, the Law of Master and Servant, Surveying Law, Constitutional Law, Private International Law, and other topics. This course is restricted to senior Mechanical Engineering students.

M E 126 W.S 2C, 4L 0.5
Engineering Concepts 2
A continuation of GEN E 115 with applications of graphics, measurement and other analytic principles to introductory 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.

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

M E 203 S, F 3C, 1T 0.5
Ordinary Differential Equations
Course Descriptions
Mechanical Engineering

M E 212 S,W 3C,1T 0.5
Dynamics

M E 215 F,W 3C,3L 0.5
Structure and Properties of Materials
The relevance of materials to engineering practice. The microstructure of materials, crystallinity and crystal imperfections, glasses and amorphous solids. Elastic and plastic deformation in metals, viscoelasticity of plastics, fracture of brittle and ductile solids. Electrical and magnetic properties of materials.

M E 219 F,W 2C,10,1T 0.5
Mechanics of Deformable Solids 1

M E 220 S,F 2C,10,1T 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,1T 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.

M E 304 S,W 3C,1T 0.5
Numerical Analysis
A survey of numerical procedures with emphasis upon computer implementation using the WATFIV programming language. In particular, the following topics are covered: interpolation, curve fitting, solution of non-linear equations, numerical integration, numerical solution of ordinary differential equations, matrix algebra and solution of systems of linear equations, and problems in the solution of partial differential equations.

M E 305 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 330 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,1T 0.5
Thermodynamics 2
Emphasis on applications of thermodynamics to flow processes, real fluids, evaluation of state functions of real fluids. Non-reacting mixtures, reacting mixtures, equilibrium considerations. Introduction to the kinetic theory of gases.

M E 360 F,W 3C,2T,1L 0.5
Introduction to Control Systems
M E 382  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.

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; sintering, brazing and welding; corrosion and oxidation; metal failure analysis.

M E 443  W  3C  0.5
Metal Casting Processes

M E 448  W  3C,2T  0.5
Production Engineering: Design of Manufacturing Systems
The interaction and relationship of manufacture to the factory organization. Product design and development, planning and control of production. Principles of mass and flow production. Machine loading and line balancing. Design analysis and evaluation techniques of plant layout and materials handling systems as basic components of a manufacturing facility and system.

M E 452  W  3C  0.5
Energy Transfer In Buildings
Thermodynamic properties of moist air; psychrometric charts; humidity measurements; direct water contact processes; heating and cooling of moist air by extended surface coils; solar radiation, heating and cooling of loads on buildings; effects of the thermal environment; air conditioning and calculations; air flow in and around buildings, diffusers.

M E 456  F,S  3C  0.5
Heat Transfer 2
Selected topics in heat transfer fundamentals and applications. Topics to be covered include the fundamentals of convection with analytical solutions to simple laminar flow problems and approximate solutions to turbulent flow problems based on analogies between momentum and heat transfer. Also covered is radiant exchange in grey enclosures and in black enclosures containing emitting-absorbing gases. The remaining topics will be chosen from design of heat exchangers; condensation heat transfer; boiling heat transfer, and the treatment of problems in heat conduction.

M E 459  S,F  3C  0.5
Energy Conversion
Review of reserves and consumption trends of Canada's and the world's energy resources. Design of fossil-fuel central power plants including boiler efficiency calculations and advanced steam and binary cycles. Review of atomic physics including fission and fusion energy. Design of nuclear fission power plants including design of reactor core for critical conditions, fuel cycles and radiation hazards. Design considerations for solar energy conversion devices including: availability of solar energy, solar-thermal converters, thermal storage and photovoltaics. Principles of fuel cells and some aspects of their design. Other topics as appropriate.

M E 462  S,F  3C,2T,3L  0.5
Introduction to Automation
Number systems, Codes and Coding, minimization techniques applied to design of logic systems. Comparison of microprocessors, memories, input/output logic elements, design and application of Digital systems for data collection, and control of pneumatic, hydraulic and mechanical systems; comparison of software and hardware techniques in such applications.

M E 463  F,W  3C  0.5
Tribology 1
The science of friction, lubrication and wear. The topography and contact mechanics of real surfaces. The measurement of friction and wear. Friction and wear theories for elastic and plastic contact. Lubrication mechanisms; hydrostatic, hydrodynamic, elastohydrodynamic, boundary, extreme pressure, and solid film. Physical and chemical properties of lubricants. Bearings and their selection.

M E 466  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. Langrangian and computer simulation methods are introduced. Basic stress analysis methods are reviewed and indeterminate structures are discussed, along with finite-element and other computer techniques. A design project (involving synthesis), utilizing the concepts studied, is usually included.

M.E.525 F.S 3C 0.5 Mechanical Vibration 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

M.E.541 W 3C.1L 0.5 Deformation Processes

M.E.544 W 3C 0.5 Welding
Features and advantages of the various welding processes. Welding arc characteristics. Temperature distributions around welds. Metallurgy of the weld metal and heat affected zone in various alloys, including carbon and stainless steels, and aluminum alloys. Origin of various weld defects and methods of detecting them. Static and dynamic design of welded joints. Residual stresses, distortion and fracture of welds.

M.E.548 S.F 3C.4L 0.5 Numerical Control of Machine Tools 1

M.E.557 W 3C 0.5 Combustion 1
Combustion thermodynamics; Introduction to chemical kinetics of combustion; Combustion properties of fuels. Flammability of combustible mixtures. Flame propagation mechanisms, pre-mixed and diffusional; Stability of flames; Introduction to combustion aerodynamics. jet flames; Atomization; Droplet and spray combustion; Elementary ignition concepts and theory; Basic detonation theory.

Fluid Power Control Systems

M.E.563 W 3C 0.5 Turbomachines

M.E.565 W 3C 0.5 Gas Dynamics
Basic laws of compressible fluid flow. Wave propagation in compressible fluids, isentropic flow of a perfect gas, normal and oblique shock waves. Prandtl-Meyer flow. Flow in ducts and over bodies, flow with friction (Fanno) and heat transfer (Rayleigh), imperfect gas effects, measurement of compressible flows, use of formulæ, charts and tables. Introduction to the method of characteristics.

M.E.566 S.F 3C 0.5 Fluid Mechanics 3
Reynolds stresses, intensity and scale of turbulence. The "law of the wall" logarithmic velocity profile and velocity defect laws, effects of roughness. Pressure loss in pipes and conduits. Jets and wakes. Flow in diffusers and contractions, and experimental measurement techniques.

M.E.568 W 3C 0.5 Noise Analysis and Control
Course Descriptions
Mechanical Engineering

M E 569  S.F.  3C  0.5
Fluid Mechanics-Design Topics
A study of the design aspects of fluid mechanics. Unsteady flow, pipe and duct systems, two and three dimensional flow techniques, practical calculation of boundary layers, separation, base pressures, jets, wakes and shear layers, diffusers and flow distribution devices, flow control, two-phase flow, instrumentation, wind tunnel modelling, wind loading. The course will be oriented to practical design techniques for flow systems, reactors, air pollution control equipment, etc.

M E 571  S.F.  3C  0.5
Air Pollution 1
Nature and sources of air pollution, chemical and biological aspects, effects on health and environment. Physical aspects of the atmosphere, thermodynamics, vertical variation of wind and temperature, stability, convection, atmospheric turbulence, diffusion equations, plumes, thermals, jets in stratified flow, radioactive plumes, particulate dispersion, instrumentation (micrometeorological), air pollution control techniques and equipment monitoring instrumentation.

Music

Assistant Professor, Chairman
H. Enns, ARCT, BSM (CMBC), BMus (Wilfrid Laurier), MMus, PhD (Northwestern)

Associate Professors
H. Martens, ARCT, LRSM, BA, MA (Minnesota), PhD (Columbia)
W.R. Maust, BS (EMC), BMus (Peabody Conservatory), MMus, PhD (Indiana)

Lecturer
K. Hull, ARCT, BA (Waterloo), BMus, MMus (Western Ontario)

Part-time Lecturers
D. Harrison, BIS (Waterloo)
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, BMus (Manhattan School of Music, N.Y.); French Horn
Ronald Brown, BM (New England Conservatory, Boston); Percussion
Cedric Coleman, BM, MM (New England Conservatory, Boston);
Bassoon
Gisela Depkat; Cello
Bruce French; Classical Guitar
Kenneth Hull, ARCT, BA (Waterloo),
BMus, MMus (Western Ontario);
Piano
Thomas Kay, BM (Boston); Flute
Lilian Kiliiansk; BMus (Wilfrid Laurier),
Dip. in Opera Perf. (Toronto); Voice
Eugene Laskiewicz, BMus (Queen’s),
BEd, MMus (Toronto); Accordion
Peter Maness; Trombone
James Mason, BM (Shenandoah Conservatory), MM (Catholic U.,
Washington); Oboe
Jane Noyes; Tuba
Victor Sawia, BM (McGill), MM (New England Conservatory, Boston);
Clarinet
John Tickner; Trumpet
Dianne Werner; BMus (Toronto),
Art.Dip. (Western Ontario); Piano

Course Descriptions
Courses not offered in 1963-64 are listed at the end of this section.

MUSIC 100  W.S  3C  0.5
The Basics of Music
An introduction to music terminology, techniques and styles, through lectures and listening, with examples from all eras of music history.

MUSIC 101  F.W.S  2L  0.25
Music Ensemble
The study of selected music literature through rehearsals and performance in one of the Music Department’s ensembles: Choir, Concert Band, Stage Band, Orchestra. Regular attendance at rehearsals and performances is required. Offered on a credit/fail basis.

MUSIC 102  F.W.S  2L  0.25
Music Ensemble
(See MUSIC 101 for course description.)

MUSIC 103  W  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 104  F.W.S  2L  0.25
Music Ensemble
The study of selected music literature through rehearsals and performance in one of the Music Department’s ensembles: Choir, Concert Band, Stage Band, Orchestra. Regular attendance at rehearsals and performances is required. Offered on a credit/fail basis.

MUSIC 105  W.S  3C  0.5
Fundamentals of Music Theory
An introduction to the primary skills of music practice emphasizing the reading and writing of musical notation. Students will learn elementary keyboard, listening, and sight-singing skills. For students with minimal musical background. Does not fulfill music major or minor requirements.

MUSIC 125  F  3C  0.5
Popular Music and Culture
An examination of the popular music world and the interplay between rock, folk, jazz and gospel idioms and classical music. The social, commercial and technological elements of popular music are considered.

MUSIC 150  F  3C  0.5
Introduction to Music 1
An introduction to music from early Christian chant to Beethoven through listening, lectures, discussion and analysis.

MUSIC 151  W  3C  0.5
Introduction to Music 2
An introduction to the music of the 19th and 20th centuries through listening, lectures, discussion and analysis. Compositions include symphonies, concertos, chamber music, operas, electronic, and computer music. Prereq: MUSIC 150 or consent of instructor.

MUSIC 201  F.W.B  2L  0.25
Music Ensemble
(See Music 101 for course description).

MUSIC 202  F.W.S  2L  0.25
Music Ensemble
(See Music 101 for course description).

MUSIC 250  F  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 251  W.S  3C,1L  0.5
Music Theory 2 (Baroque and Classical)
The study of four-part homophonic and contrapuntal music of diatonic and simple chromatic harmonies, and of elementary forms, emphasizing Baroque and Classical music. Ear-training and sight-singing lab sessions will cover four-part diatonic exercises. Prereq: MUSIC 250 or permission of the instructor.
MUSIC 253 F 3C 0.5
Medieval and Renaissance Music
The study of music that flourished under courtly and church patronage from the early Christian Church to 1600. Georgian chant, liturgical drama, mass, motet, secular songs, and instrumental music are studied.
Prereq: MUSIC 150 and MUSIC 151 or MUSIC 100 or consent of the instructor.

MUSIC 254 W 3C 0.5
Baroque and Classical Music
The study of music of the Baroque and Classical era from 1600 to 1800. A survey of major genres by Monteverdi, Schütz, Purcell, Bach, Handel, Haydn, Mozart and others.
Prereq: MUSIC 150 and MUSIC 151 or MUSIC 100 or consent of the instructor.

MUSIC 256 F 3C 0.5
Vocal Literature
A study of the music written for solo voice from the seventeenth century to the present.
Prereq: MUSIC 100 or MUSIC 150 or consent of instructor.

MUSIC 256 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 266 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 273 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 274 W 3C 0.5
Introduction to Jazz
A survey of the development of jazz schools and individual styles as well as a study of melodic, harmonic, and rhythmic improvisation. Styles will be demonstrated through recordings and live performance.

MUSIC 275 W.S 3C 0.5
Computer Applications in Music
A survey of computer applications in music history, analysis and composition. Concepts from computer science and specific techniques and implementations of these various music activities are examined. Theoretical study is coupled with practical hands-on experience.
Prereq: MUSIC 100 or 150/151 or consent of instructor.

MUSIC 301 F.W.S 2L 0.25
Music Ensemble
(See MUSIC 101 for course description.)

MUSIC 302 F.W.S 2L 0.25
Music Ensemble
(See Music 101 for course description.)

MUSIC 354 S 3C 0.5
Music of the Twentieth Century
The study of the various genres of music of the 20th century in the context of the various artistic, political, and social movements. The course will include seminars, lectures, listening, and analysis.
Prereq: MUSIC 150/151 or MUSIC 100 or consent of instructor.

MUSIC 366 F.W.S std 0.5
Music Studio
(See MUSIC 266 for course description.)
Prereq: MUSIC 267 and consent of Music Faculty. Studio fee.

MUSIC 267 F.W.S std 0.5
Music Studio
(See MUSIC 266 for course description.)
Prereq: MUSIC 266 and consent of Music Faculty. Studio fee.

MUSIC 280 F,W,S std 0.25
Music History
A study of music written for solo voice from the seventeenth century to the present.
Prereq: MUSIC 100 or MUSIC 150/151 or consent of instructor.

MUSIC 361 F.W.S std 0.5
Music History
A study of music written for solo voice from the seventeenth century to the present.
Prereq: MUSIC 100 or MUSIC 150/151 or consent of instructor.

MUSIC 360/361 F,W 0.5/0.5
Directed Study in Music
Prereq: Advanced standing in music and consent of instructor.

MUSIC 360 W 3C 0.5
Special Topics in Music History I
Study of a limited field under tutorial guidance.
Prereq: MUSIC 100 or MUSIC 150/151 and consent of instructor.

MUSIC 361 F 3C 0.5
Special Topics in Music History II
Study of a limited field under tutorial guidance.
Prereq: MUSIC 100 or MUSIC 150/151 and consent of instructor.

MUSIC 367 F.W std 0.5
Music Studio
(See MUSIC 266 for course description.)
Prereq: MUSIC 367 and consent of Music Faculty. Studio fee.

MUSIC 368 F.W.S 3C.1L 0.5
Music Studio
(See MUSIC 266 for course description.)
Prereq: MUSIC 366 and consent of Music Faculty. Studio Fee.

MUSIC 370 F 3C.1L 0.5
Music Theory 3 (19th Century)
The study of the harmonic, melodic, and formal aspects of the 19th century music. Ear-training and sight-singing lab sessions will cover chromatic chord progressions and modulatory melodies.
Prereq: MUSIC 250/251 or consent of instructor.

MUSIC 371 W 3C.1L 0.5
Music Theory 4 (20th Century)
The study of the compositional aspects of 20th-century music, including extended tonality, atonality, 12-tone writing, neo-classical idioms, and contemporary compositional procedures. Lab sessions will cover non-tonal melodic reading and complex chord structures.
Prereq: MUSIC 370.

MUSIC 380/381 F.W 0.5/0.5
Directed Study in Music
Prereq: Advanced standing in music and consent of instructor.

MUSIC 390 W 3C 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).

Not Offered 1983-84:
MUSIC 265 Piano Literature
MUSIC 280 Canadian Music
MUSIC 353 Music of the Romantic Period
MUSIC 355/356 Music and Culture in Vienna
MUSIC 360 Music of the Church
MUSIC 361 Music of the Church
MUSIC 372 Choral Music, Repertoire and Techniques 1
MUSIC 373 Choral Music, Repertoire and Techniques II
MUSIC 374 Composition Seminar
MUSIC 376 Electronic Music
**School of Optometry**

**Professor, Director of School**
W.S. Long, BA (Toronto), OD (College of Optometry of Ontario)

**Professor, Associate Director**
J.G. Sivak, BSc (Montreal), MS (Indiana), PhD (Cornell), OD (Penn College of Optom)

**Assistant Professor, Graduate Officer**
J.V. Lovasik, BSc (McGill), OD, MSc, PhD (Waterloo)

**Professor, Undergraduate Officer**
G.C. Woo, OD, (College of Optometry of Ontario), MS, PhD (Indiana), LOSc (Melbourne) DiplV

**Professors**
W.K. Adrien, Dipl-Ing, Dr-Ing, (TH Darmstadt), Dr habil, apl Professor (Karlsruhe)
A.P. Cullen, DiplOpt (City Univ. London), MSc (Saskatchewan), OD (Penn College of Optom), PhD (City Univ. London), DCLP
E.J. Fisher, BA, MA (Toronto), DSc (Pennsylvania College of Optometry) (part-time)
W.M. Lyle, OD (College of Optometry of Ontario), MS, PhD (Indiana) (part-time)
R.D. Pellowe, OD (College of Optometry of Ontario) (part-time)
R.D. Seims, OD (College of Optometry of Ontario), MS, 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)
D.A. Ranney, BA, MD (Toronto)
R.D. Seal, BA (Queen's), PhD (Waterloo)
T.D. Williams, OD (College of Optometry of Ontario), MS, PhD (Indiana)

**Assistant Professor**
G.Y. Mousa, BSc, MSc (American Univ Beirut), PhD (Western Ontario), OD (New England College of Optom)

**Adjunct Faculty**
I. Baker, OD (College of Optometry of Ontario)
E.L. Buchner, OD (College of Optometry of Ontario)
M.S. Kannan, BVSc (Madras Veterinary College), MSc (All India Institute of Medical Science), PhD (Alberta)
R.G.R. Lawrence, Q.C.
K.M. Robertson, OD (College of Optometry of Ontario), MSc (Waterloo)
G.W. Wyszecki, Dipl Ing, Dr Ing (Tech. Univ. Berlin)

**Lecturers**
B.R. Chou, BSc (Toronto), OD, MSc (Waterloo)
D.J. Egan, BS (St. Johns), BS, OD (Pennsylvania College of Optometry)
S. Hoffmann, MD, DPH (Toronto)
B. Robinson, OD (Waterloo) MPH (Washington)
M.J. Samek, OD (College of Optometry of Ontario), MSc (Waterloo)

**Senior Demonstrator**
D.J.H. Thompson, BA (Waterloo)

**Faculty Members of Optometry holding cross appointments to:**

1. **Biology**

**Faculty Members holding cross appointments to Optometry from:**

2. **Kinesiology**

3. **Psychology**

**Clinic Supervisors - Full-time (1982-83)**
K.S. Ames, BS, OD (Ohio State)
D.B. Buck, OD (College of Optometry of Ontario), Chief of Clinics
D. Lutzi, OD (Waterloo)
R. Pace, OD (Waterloo)
S.D. Riome, OD (LA College of Optometry)
L. Sorbara, OD (Waterloo)
J.G. Strong, OD (College of Optometry of Ontario)
R. Wiggins, BS, OD (Indiana)

**Clinic Supervisors - Part-time (1982-83)**
W.B. Andrews, OD (Waterloo)
W.R. Andrews, 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)
A.S. Buxton, OD (Waterloo)
J.W. Capell, OD (Waterloo)
K.S. Chhatwal, OD (Waterloo)
R.R. Chen, OD (College of Optometry of Ontario)
L. Ciz, OD (Waterloo)
D.S. Craig-Paul, OD (Waterloo)
G.M. Curik, OD (Waterloo)
P.A. Devenny, OD (Waterloo)
A.H. Dick, OD (Waterloo)
T.A. Dietrich, OD (Waterloo)
M.H. Falkie, OD (Waterloo)
C.C. Foster, OD (Waterloo)
D.H. Hansen, OD (Waterloo)
D.A.K. Hayhoe, OD (Waterloo)
A. Hirano, OD (Waterloo)
T. Johnson, OD (Waterloo)
D. Klein, OD (Waterloo)
J.M. McDowell, OD (Waterloo)
R.E. Miller, BSc (Toronto), OD (Waterloo)
J.M. Newman, OD (Waterloo)
R.R. Phillips, OD (Waterloo)
H.L. Saari, OD (Waterloo)
R.J. Scheid, OD (Waterloo)
P. Shaw, OD (Waterloo)
S.C. Tait, OD (Waterloo)
V. Timpano, OD (Waterloo)
J.S.G. Walcott, OD (Waterloo)
R. Watson, OD (College of Optometry of Ontario)
R.L. Wilson, OD (Waterloo)
M. Witer, OD (Waterloo)

**Course Descriptions**

**Introductory Notes**
Students in other disciplines may register for Optometry courses only upon the approval of the Director of the School of Optometry.

**OPTOM 100**
F 2C 0.5

**History and Orientation**
A brief history of the profession and the development of visual science; a consideration of legal and organizational development of optometry; the role of professional associations. The role and scope of optometry and its relationship to other professions and the community.

**OPTOM 104**
F 3C,3L 0.5

**Anatomy of the Eye and Associated Structures**
The gross, microscopic and ultra structure of ocular tissues. The embryology and comparative anatomy of the eye will be emphasized. The relationship of the eye to the vascular supply of the head and the nervous system will be studied. This course is credited only upon completion of OPTOM 114.

**Prereq:** BIOL 201
OPTOM 105 F 3C,1T 0.5

**General Pathology**
Basic disease processes, including inflammation, degeneration, neoplasia; pathogenic microbiology and related diseases; immunity and hypersensitivity; disease caused by physical agents; diseases of the organ systems. Prereq: BIOL 201.

OPTOM 106 F 3C,3L,1T 0.5

**Geometrical Optics**

OPTOM 109 F 2C,1T 0.5

**Light and Illumination**
Principles of radiometry and photometry; illumination and related factors involved in the design and control of the visual environment in relationship to the human visual system; lighting surveys.

OPTOM 111 W 3C,3L 0.5

**Physiological Optics**

OPTOM 114 W 3C,2L 0.5

**Anatomy of the Eye and Associated Structures**
A continuation of Optom 104. Prereq: OPTOM 104.

OPTOM 115 W 4C,1T 0.5

**General Pathology**
A continuation of 105. Prereq: OPTOM 105.

OPTOM 118 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 211 F 3C,3L 0.5

**Physiological Optics**
Ocular motility: Kinematics of eye movements, muscle actions, measurements of eye movements, types of eye movements, innervational systems subserving eye movements, clinical application. Prereq: OPTOM 111.

OPTOM 212 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 214 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 215 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 216 F 3C,4L 0.5

**Optometrical Optics**

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 phorometry, prism vergence tests, relative accommodation tests, retinoscopy, and monocular and binocular cross cylinder tests. Prereq: OPTOM 241/242.

OPTOM 254 W 2C,2L 0.5

**Physiology of The Eye and Ocular Adnexa**
The physiology of the smooth muscles of the eye, the extraocular striate muscles, the lacrimal apparatus, the cornea, the iris, the lens, the ciliary body and the vitreous body. Production and drainage of aqueous and related influences on intraocular pressure. The vascular supply of the eye. Prereq: OPTOM 104.

OPTOM 255 W 3C,2L 0.5

**Ocular Pathology**
A continuation of 245. Prereq: OPTOM 245.

OPTOM 261 F 3C,3L 0.5

**Physiological Optics**

OPTOM 274 W 2C 0.5

**Genetics for Optometrists**
A brief review of Mendelian genetics, and the molecular basis of modern genetics. Inherited conditions of particular interest, e.g., colour vision, albinism, aniridia, refractive error, retinoblastoma. Genetic 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 2C 0.5
Optometrical Optics
The lecture course deals with problems involved in selecting, preparing and fitting ophthalmic materials. Optical, cosmetic and comfort requirements, and patient counselling are considered. 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. Prereq: OPTOM 242, 252, 352.

OPTOM 350 W 4C 0.5
Optometrical Jurisprudence and Praxis

OPTOM 351 W 3C, 3L 0.5
Physiological Optics

OPTOM 352 W 3C, 2L 0.5
Clinical Optom: Strabismus and Orthoptics
Detection and evaluation of sensory and motor characteristics of vision in strabismus. Classifications, diagnosis, prognosis, modes of therapy for strabismus and amblyopia. Prereq: OPTOM 242, 252, 342

OPTOM 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 F 4C, 1L 0.5
Ocular Pharmacology
Neurohumoral theory, response to drugs, use of sterile techniques, disinfectants. Drugs used topically on the eye. Systemically administered drugs which may affect the eye and vision. Drugs and contact lenses. Prereq: OPTOM 245, 255

OPTOM 372 W 2C 0.5
Pediatric Optometry
Special aspects of the management of vision problems of infants and young children. Prereq: OPTOM 242, 252

OPTOM 385 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 391 F 3L 0.5
Optometry Research Project
A series of lectures and practical demonstrations of the principles and procedures of advanced contact lens materials and resources including their physiological implications. Prereq: OPTOM 347

OPTOM 408 W 2C 24 Clinic 1.0
Optometry Clinic
The clinical program teaches the student how to provide optometrical services including pathology detection, strabismus evaluation and the application of spectacle therapy, contact lenses and vision training. The patients cared for extend from the pediatric to the geriatric, and include those with perceptual problems, or with low vision. Prereq: OPTOM 348, 358.

OPTOM 441 F 3L 0.5
Optometry Research Project
A continuation of 441. An elective may be chosen as an alternative to OPTOM 451. Prereq: OPTOM 441

OPTOM 452 W 2C 0.5
A: Visual Aspects of Learning Difficulties
The aspects of vision problems related to learning difficulty including tests and measurements taken by optometrists. The role of the optometrist in conjunction with the parents, teachers, and psychologists in assisting children to achieve is discussed. Prereq: OPTOM 342, 352, PSYCH 101.

B: Visual Gerontology
Aspects of the aging process on the visual system and the optometrical management of the visual problems of older persons.

OPTOM 459 W 4C 0.5
Environmental Vision
Aspects of prevention of accidents and injury to the visual system. The production of efficient and comfortable vision at work and recreation.

OPTOM 468 F Clinic 0.0
Vision Care Projects
Between the third and fourth professional years, students may be required to participate in vision care projects of varying durations. These will be arranged by faculty. Prereq: Successful completion of OPTOM 348, 358, and permission of the Chief of Clinics.

OPTOM 480 F 2S 0.5
Senior Seminar
An opportunity for discussion of clinical cases, new techniques and instruments. Presentations by students, visiting lecturers and faculty.

OPTOM 490 W 2S 0.5
Senior Seminar
A continuation of OPTOM 480.
Course Descriptions
Peace and Conflict Studies
Personnel and Administrative Studies

OPTOM 499-A-E  W,S
Comprehensive Examinations
in Anatomy and Physiology, Pathology and Pharmacology, Physiological Optics, Optometrical Optics, and Optometry. Graduation in Optometry is contingent upon successful completion of these comprehensive examinations involving oral, written and clinical applications of optometry. These examinations are ordinarily held in the final exam period of the winter term, fourth professional year. These exams have been approved for purposes of licensure for 1983 by the Council of the College of Optometrists of Ontario.

Peace and Conflict Studies

Associate Professor, Director of the Program
C.G. Brunk, BA (Wheaton), MA, PhD (Northwestern) G

Lecturer, Undergraduate Officer
T.R. Neufeld, BA (Manitoba), MDiv (Harvard) G

Research Associate, Institute of Peace and Conflict Studies
E.E. Regehr, BA (Waterloo), Funded by Project Ploughshares G

Members of the Peace and Conflict Studies Faculty Group

Professors
L. Costa-Pinto, BA, PhD (Brazil)
F.H. Epp, (Bethel), MA, PhD (Minnesota) G
W. Klaassen, BA, BD (McMaster), D. Phil (Oxford) G

Associate Professors
C.G. Brunk, BA (Wheaton), MA, PhD (Northwestern) G
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) G
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) R

Peace and Conflict Studies Content Courses Offered by PACS
(Peace and Conflict Studies content courses offered in various disciplines by participating Departments are listed in Chapter 15.)

(a) Core Courses

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 intergroup level. Contributions of the behavioural and social sciences, as well as the humanities, will be explored.

PACS 202 W 2C 1D 0.5
Conflict Resolution
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.

Interdisciplinary PACS-related courses

PACS 230 F 3S 0.5
The Politics of Nonviolence
An examination of the possibilities of a nonviolent approach to resolving human conflict with special emphasis on the nature and uses of power, the nature of the nation state and the problem of relating a personal ideal to the realities of communal life.

PACS 271 F 3S 0.5
Introduction to Peace Research 1
A study of current research in the developing field of "peace research" including studies of personality and aggression, international tension, causes and predictability of war, United Nations voting patterns, disarmament studies, and peace activism.

PACS 272 W 3S 0.5
Introduction to Peace Research 2
A continuation of PACS 271, above.

PACS 398/399 R 0.5
Directed Readings in Peace and Conflict Studies
Students may arrange independent studies in the area of peace and conflict studies on problems of special interest. Students may also register under these numbers in order to repeat PACS 301 and/or 302.

Personnel and Administrative Studies

Associate Professor, Course Director and Undergraduate Advisor
E.S. Lucy, BA (Hobart)

PAS 200 F 1L,2T 0.5
Basic Personnel Administration
Examines the management environment in which personnel administration takes place. Includes some of the organizational theories and motivational theories on which personnel administration is based. Students have the opportunity to develop operational skills in the basic technical areas of personnel administration, and to examine the organizational development responsibilities often assigned to a Personnel Department.
Department of Philosophy

Professor, Chairman of the Department
R.A. George, MA, PhD (Michigan State)

Professor, Associate Dean, Graduate Affairs, Faculty of Arts
B.H. Suite, BA, MA (Chicago), PhD (Illinois) Recipient of the Distinguished Teacher Award

Professor, Associate Chairman and Graduate Advisor
L.L. Haworth, BA (Rollins), MA, PhD (Illinois)

Associate Professor, Associate Chairman and Undergraduate Advisor
J.R. Hone, BA, MA (Western Ontario), BTh (Huron), PhD (Columbia).

Faculty members holding joint appointments as shown 'Department of Pure Mathematics

Consulting Faculty
L. Code, BA (Queen's), MA, PhD (Guelph)

Faculty members holding joint appointments as shown 'Department of Pure Mathematics

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes

Any full course or two half courses in Philosophy can be used to satisfy the Group A (i) requirement.

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.

Courses suffixed with "J" are administered by St. Jerome's College.

PHIL 101X F, W, S 3C 0.5 Introduction to Philosophy

A general introduction, designed to provide the student with an understanding of the major problems of classical and contemporary philosophy.

PHIL 102A W 2C, 1D 0.5 Introduction to Knowledge and Reality

Discussion of the nature of reality. Rival theories concerning mind, matter, freedom, the existence of God, and the place of experience and reason in human knowledge are considered.

PHIL 102B F, W, S 2C, 1D 0.5 Introduction to Social and Political Philosophy

An introduction to basic concepts and principles in classic and contemporary social and political philosophy. Differing views on basic questions are examined, with applications to such issues as capital punishment, welfare provisions, taxation, natural resource ownership, and terrorism.

PHIL 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, sages, skeptics, pleasure-seekers, mystics, pragmatists, etc. have promoted, and why.

PHIL 120J F 3C 0.5 Philosophy of Life and Death

A study of what some of the great philosophers have said about the meaning of life and death and the transition from life to death. Students are urged to raise questions and help direct discussion.

PHIL 130J W 3C 0.5 Philosophy of Discontent

A study of what some of the great philosophers have said about the causes of discontent. Social disobedience and the extent to which ethical principles can be altered to accommodate changing conditions are possible topics for discussion.
PHIL 140 F,W,S 3C 0.5
Introduction to Formal Logic
Elementary sentence and predicate logic. Translation from English into the formalism, decision methods and deductions. Application of Graphical 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.

Note
Either PHIL 200A or PHIL 200B may be taken separately.

PHIL 200J F 3C 0.5
Intentional Logic
An introduction to the understanding of how words are used, the formation of propositions, the construction of arguments and the examination of fallacies to help the student argue with order, with facility and without error.

PHIL 201 2C,1D 0.5
Love
A philosophical analysis of different forms and functions of love. Among the topics to be considered: love and sexuality, religious love, love and knowledge. Classical and contemporary sources will be treated.

PHIL 202 F 3C 0.5
Philosophy of Women
A study of some of the issues raised by the Women’s Liberation movement. Philosophical writings of the past and present will be used on such subjects as: the two sexes, physiological femininity, personal and social relations between the sexes, the position of women in public life, marriage and its alternatives, the importance of childbearing.

PHIL 203 3C 0.5
Philosophical Perspectives on Death
This course critically examines how philosophers from the Pre-Socratic to Wittgenstein have analyzed the concept of death. The course is also concerned with topics like the concept of a person, personal identity, and survival after death.

PHIL 205 3C 0.5
Science, Technology, and Society
Alternative philosophical perspectives on problems raised by scientific and technological developments including moral issues (e.g. privacy and data-gathering, ‘clean’ vs. ‘dirty’ energy.) Also an examination of the nature and scope of scientific and technical knowledge as it bears on the responsibilities of scientists and engineers.

PHIL 205J F 3C 0.5
Philosophy of Nature
An examination of ancient and modern accounts of the natural world. Problems include whether matter alone can account for change, whether there is more than one cause, whether nature operates by purpose or chance.

PHIL 210 2C,1D 0.5
Philosophy in Literature
Each term philosophical themes (such as alienation, freedom, and responsibility) will be explored through appropriate literary works (e.g. works by Camus, Dostoevsky, Kafka, and Sartre).

PHIL 210J 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 215 F 3C 0.5
Professional and Business Ethics
Study of ethical and moral issues that typically arise in professional and business activity. What responsibilities to society at large do people in such business and professional activities as teaching, engineering, planning, architecture, and accounting have? How far should professional autonomy extend?

PHIL 216 W 3C 0.5
Rational Behaviour and Decision-Making
An elementary introduction to the subject of ‘rational’ behaviour and decision-making for individuals and groups. Emphasis is on the definition and measurement of utility functions and various criteria employed in models of decision-making. This course is intended to help those whose work will involve them in making decisions in either the public or private sectors.

PHIL 218J F 3C 0.5
Ethical Theory
A normative approach, employing several of the classic Western traditions of rational thought, to general ethics. The various schools of ethical thought will be discussed.

PHIL 219J W 3C 0.5
Practical Ethics
This course will discuss the applications of general ethics to more specific areas of human endeavour. Among the topics discussed will be abortion, contraception, sex, obscenity, violence, drugs, egoism, dishonesty, and various forms of human exploitation.

PHIL 220 F 3C 0.5
Moral Issues
The aim of this course is to improve the student’s understanding of ethical ideas and principles by careful discussion of selected concrete moral issues, such as abortion, euthanasia, capital punishment, and violence. Choice of issues is partly determined by student interest.

PHIL 221 F 3C 0.5
Ethics 1
This course is intended to be both a history of and an introduction to moral philosophy. Views on the foundations of ethics of the great philosophers from classical antiquity to about 1900 are systematically examined. Writers studied include: Plato, Aristotle, Aquinas, Kant, Mill and Nietzsche.
PHIL 224 3C 0.5
Mankind and Nature
An examination of some of the issues raised by recent discussions on ecology. Various theories of nature, the human being, and relations between the two will be explored. Possible foundations for duties of mankind toward nature will be examined.

PHIL 225 W 3C 0.5
Social and Political Philosophy: Canadian Problems
Basic ideological perspectives - conservative, socialist, and liberal - on Canadian problems - such as native rights, nationalism, separatism, and regionalism - are philosophically presented and assessed. Prereq: PHIL 102B or consent of the instructor.

PHIL 226 3C 0.5
Ethics and the Life Sciences
An investigation of some critical ethical issues in human research and therapy. Includes discussions of the right to live and right to die, behaviour control (e.g. psychosurgery, behaviour modification and psychotherapy), human experimentation (including "informed consent" and fetal research) and genetic engineering. Prereq: One of PHIL 102B, 221, 322, or consent of instructor.

PHIL 230 J 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 236 W 3C 0.5
Magic, Mysticism, and the Occult
A critical philosophical discussion of reports of several kinds of extraordinary experiences, such as magic, extrasensory perception, mysticism, and divination will lead us to discussions of such concepts as insanity, irrationality, the supernatural, and the miraculous.

PHIL 237 J F 3C 0.5
Ethics and Society
This course examines the nature and purpose of community living as well as such traditionally controversial issues as private and public morality, the individual good and the common good, personal freedom and group responsibility.

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 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 3C 0.5
Extensions and Applications of Elementary Logic
The classical logic introduced in PHIL 140 will be extended to form systems of modal logic, including logics of obligation, belief and knowledge, necessity, and temporal order. Essentialism, future contingencies, proofs for the existence of God will be discussed. Prereq: PHIL 140 or consent of the instructor.

PHIL 243 3C 0.5
Conflict, Contract and Choice
Basic concepts of game and decision theory are introduced and applied to ethical theory and problems in social philosophy. Prereq: PHIL 140, 145 or consent of instructor.

PHIL 258 3C 0.5
Introduction to the Philosophy of Science
A discussion of the fundamental concepts on which science is based. Consideration is given to such topics as scientific theories, the nature of law-likeness, the grounds for scientific confirmation, and the debate between rationalism and empiricism in science.
PHIL 311 F 3C 0.5
Philosophy of Education 1
A philosophical analysis of classical and
contemporary theories of education,
with a view to formulating a clear
workable concept of education, its aims
and methods.
Prereq: At least second year standing or
consent of instructor.

PHIL 312 W 3C 0.5
Philosophy of Education 2
An introduction to current work in the
field, particularly that of Peters, Hirst,
and Dearden. Special attention will be
paid to the question of the desirability
of a core curriculum and its proposed
content.
Prereq: PHIL 311 or consent of
instructor.

PHIL 315 — See page 381, col. 1.

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 322 W 3C 0.5
Contemporary Ethical Theory
Continues the history and discussion of
ethics begun in PHIL 221 with writings
from 1900 to the present. Theories such as
intuitionism, emotivism,
utilitarianism, and relativism are
examined via the writings of such
people as Moore, Hare and Warnock.
Prereq: PHIL 221 recommended.

PHIL 327 A F 0.5
Philosophy of Law - Part 1
An investigation of alternative views of
law and legal reasoning forms the core
of this course. Law's relations to
morality, social practice, and politics
are considered. Authors to be studied
include Aquinas, Kant, Austin, and Hart.
This is a required course for the Legal
Studies Option.

PHIL 327 B 3C 0.5
Philosophy of Law - Part 2
An examination of areas within the law
in which philosophical problems and
methods are featured prominently.
Topics such as liberty, responsibility
and liability, punishment, rights and
possession are considered.
Prereq: PHIL 327A or consent of the
instructor.

PHIL 329 3C 0.5
War, Peace and Justice
An intensive study of the moral issues
involved in war and armed revolution.
Critical evaluation of "just war" theories,
and international rules of warfare is
pursued as well as the moral arguments
for and against pacifism and 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 333 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 335 Y 3C 1.0
Epistemology
An analysis of human knowledge, its
conditions and types. The first part con-
centrates 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 350 A F 3C 0.5
Epistemology
The first part of PHIL 350.

PHIL 350 B W 3C 0.5
Epistemology 2
The second part of PHIL 350.
Either 350A or 350B may be taken
separately.

PHIL 359 3C 0.5
Philosophy of the Formal Sciences
A study of philosophical problems con-
cerning mathematics. Topics discussed
include formalism, intuitionism, logic-
ism, 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 369 F 3C 0.5
History of Ancient Philosophy 1
From the beginnings to Plato.
Cross-listed as C CIV 361.
Prereq: One full course in Philosophy
or consent of instructor.

PHIL 375 W 3C 0.5
History of Ancient Philosophy 2
Cross-listed as C CIV 362.
Prereq: One full course in Philosophy
or consent of instructor.

PHIL 376 F 3C 0.5
Medieval Philosophy 1
The early period from the 13th century.
Among those considered will be:
Augustine, Boethius, Anselm, and
Abailard.
Prereq: One half course in Philosophy,
or consent of instructor.

PHIL 383 W 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 395J W 3C 0.5
The Thomistic Tradition in Philosophy
An examination of the work of Thomas Aquinas, his philosophical relation to his time, the revival of Thomism in the modern era.
Prereq: One full course in philosophy and third year standing, or consent of instructor.

PHIL 396J-397J F,W 0.5 each
Special Topics/Directed Readings
A series of readings and/or seminars on one or two topics or thinkers, with periodic reports and discussions.
Prereq: Consent of instructor and permission of College Discipline Co-ordinator.

PHIL 315 W 3C 0.5
Ethics and the Engineering Profession
An analysis from the standpoint of philosophical ethics of moral issues arising in professional engineering practice. Issues include the social responsibility of engineers, conflict of interest and obligation, morally acceptable levels of risk, and moral implications of technology.

PHIL 420/421 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 the ultimate nature of history and historical knowledge.
Prereq: One full course equivalent in Philosophy, or 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 455 Y 3C 1.0
Metaphysics
Studies of reality, metaphysical problems and issues. The first part ontology (nature of being) considers objects, their properties, and causation. The second part cosmology (principles of the universe) examines space, time, and motion.

PHIL 455A F 3C 0.5
Ontology
The first part of PHIL 455.

PHIL 455B W 3C 0.5
Cosmology
The second part of PHIL 455.

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.

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, Marx, 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 489(A-R) F,W,S,R 0.5

Directed Reading in Special Areas
Prereq: Consent of instructor.

PHIL 496(J-497J F,W 0.5

Special Topics/Directed Readings
A series of readings and/or seminars on one or two topics or thinkers, with periodic reports and discussions.
Prereq: Consent of instructor and permission of College Discipline Co-ordinator.

PHIL 499 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.

PHIL 499J Y 1.0

Tutorial and Honours Essay
Students wishing to enroll in 499J should consult the College Discipline Co-ordinator.

Not Offered 1963-84:
PHIL 100 Introduction to Philosophy
PHIL 206J Philosophy of Science
PHIL 328 The Philosophy of Karl Marx
PHIL 333J Contemporary Philosophical Problems in Art

Department of Physics

Professor, Chairman of the Department
J. Grindlay, BSc (Glasgow), DPhil (Oxford)

Professor, Dean of the Faculty of Science
D.E. Brodie, BSc, MSc, PhD (McMaster)

Associate Professor, Associate Chairman of the Department
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)
S.G. Davison, PhD, DSc (Manchester)
M.P. FitzGerald, BSc, MSc (Toronto), PhD (Case)
F.O. Goodman, BSc, PhD, DSc (London), FinstP, FAI P
N.R. Iaenor, BSc (Acadia), MSc, PhD (McMaster)
J. Kruvi, BSc (Waterloo), PhD (Western Ontario)
J.W. Leech, BS, PhD (London), FinstP
J.D. Leslie, BSc (Toronto), MS, PhD (Illinois)
S.P. Lipshitz, BSc (Natal), MSc (South Africa), PhD (Witwatersrand)
A.D.S. Nagi, BA, BSc, MSc (Panjab), PhD (Dalai)
J.L. Ord, BSc (Toronto), MS, PhD (Illinois)
R.K. Pathria, BSc, MSc (Punjab), PhD (Delhi) Recipient of the Distinguished Teacher Award
W.B. Pearson, DFC, MA, DSc (Oxford), FRSC, FIC
M.M. Pinta, BSc, MSc, PhD (Ljubljana)
L.W. Reeves, BSc, PhD, DSc (Bristol), FRSC, FCIC
G. Scolee, BSc, PhD (Genova)
R.A. Snyder, BSc, PhD (Western Ontario)
D.M.R. Taplin, BSc (Aston), DPhil (Oxford), DSc, PEng, CEng, FIM
S.F. Wang, DSc (Nagoya)

Associate Professors
J.M. Corbett, BSc (Toronto), MSc, PhD (Waterloo)
A.E. Dixon, BSc, MSc, PhD (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. Lepock, BS, MS (W. Virginia), PhD (Penn State)
C.C. Lim, BA (DePauw), MA (Nebraska), PhD (Toronto)
R.A. Moore, BSc, MSc (McMaster), PhD (Alberta)
H.M. Morrison, BSc, PhD (Edinburgh)
J.T. Smith, BSc, PhD (London)
B.H. Torrie, BSc (Toronto), PhD (McMaster)
J. Vanderkooy, BEng, PhD (McMaster)
K.A. Woolner, BSc (London)

Senior Demonstrators
A.B. Haner, BSc, MSc (Waterloo)
D.S. McVicar, BSc (Waterloo)

Research Assistant Professors
G.L.H. Harris, BA (Mont Holyoke), MA (Wesleyan), PhD (Toronto)
J.W. Hepburn, BSc (Waterloo), PhD (Toronto), NSERC University Research Fellow
W.-K. Liu, BS, MS, PhD (Illinois)

Adjunct Faculty
J.A. Blackburn, BSc (Manitoba), MSc, PhD (Waterloo)
W.E. Harris, BSc (McMaster), MSc, PhD (Toronto)
M.L. Klein, BSc, PhD (Bristol)
J. Lit, BSc, DipEd (Hong Kong), DSc (Laval)
L.A.A. Read, BA, MSc (McMaster), PhD (Waterloo)
R.C. Shukla, BSc, MSc, PhD (Ahmedabad)
P.G. Sutherland, BSc (McGill), MS, PhD (Illinois)

Faculty Members of Physics holding cross appointments to:
1Biology
1Chemistry
3Applied Mathematics
4Chemistry
5Mechanical Engineering
Course Descriptions

Physics

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes
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 100 1C
No University Credit.

PHYS 010 F.W.S 1C 0
Physics Seminar
This seminar brings together Honours Physics (including Co-op students) in Years 2,3 and 4, to receive information concerning the activities of the Physics Department and to hear invited speakers.

PHYS 103 W 3C3L2T 0.5
Mechanics in Human Movement
An introduction to the physical principles required for the analysis of the mechanics of human movement. For Kinesiology students.

PHYS 105 F 3C3L2T 0.5
Electrical Science
Basic electricity, magnetism and electronics. An introduction to the physical principles required for an understanding of the electrical instruments used in Kinesiology. For Kinesiology students.

PHYS 111 F 3C1T 0.5
Physics For The Life Sciences 1
An introduction to physics for students intending to concentrate their further studies in biology, medicine or dentistry; includes particle kinematics and dynamics, energy and momentum conservation, gravitation, rotational mechanics, fluid mechanics, elasticity and oscillations.

PHYS 111L F 3L 0.25
Physics For The Life Sciences 1 Laboratory
For students taking PHYS 111.
Lab alternate weeks.

PHYS 112 W.S 3C1T 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,S 3L 0.25
Physics For The Life Sciences 2 Laboratory
For students taking PHYS 112.
Lab alternate weeks.

PHYS 115 F 3C2T 0.5
Mechanics

PHYS 121 F 3C2T 0.5
Introductory Physics 1
An introductory course in physics for students intending to concentrate their future studies in the physical sciences, optometry or mathematics; includes particle kinematics and dynamics, forces in nature, work and energy, conservation of energy and linear momentum, rotational kinematics and dynamics, and conservation of angular momentum.

PHYS 122 W.S 3L 0.25
Introductory Physics 2 Laboratory
For students taking PHYS 121.
Lab alternate weeks.

PHYS 125 W,S 3C2T 0.5
Physics for Engineers
Oscillations; simple harmonic motion. Wave motion, travelling and standing waves; transverse and longitudinal waves, including sound. Geometrical optics; reflection and refraction. Physical optics; interference and diffraction. Quantum physics; quantization of radiation, hydrogen atom.

Students requiring PHYS 222-223 should take PHYS 250 (Fall) and PHYS 243 (Winter).

PHYS 226 F 2C1T 0.5
Optics 1
Reflection and refraction at plane and curved surfaces, thin and thick lenses, optical instruments.

PHYS 226L F 3L 0.25
Optics 1 Laboratory
For students taking PHYS 226.

PHYS 243 F.W.S 3C 0.5
Electricity and Magnetism
Electrostatics, interaction of charges, fields, potential, capacitors and dielectrics. Magnetism, fields due to moving charges, Ampère’s law, Faraday’s law, instruments, energy.

PHYS 243L F.W.S 3L 0.25
Electricity and Magnetism Laboratory
For students taking PHYS 243.
PHYS 246 W 3C,1T 0.5
Physical Optics
Prereq: First year Physics and calculus.
Coreq: PHYS 246L.

PHYS 246L W 3L 0.25
Physical Optics Laboratory
For students taking Phys 246. Lab alternate weeks.

PHYS 250 F 3C 0.5
The Solar System
An introduction to the astronomy and astrophysics of the solar system for students with a background in (elementary) University Physics and Mathematics.
Prereq: First year PHYS and MATH.

PHYS 251 W,S 3C 0.5
The Stellar System
An introduction to the astronomy and astrophysics of objects beyond the solar system for students with a background in (elementary) University Physics and Mathematics.
Prereq: First year PHYS and MATH.

PHYS 253 W 3C 0.5
Electricity and Magnetism
An introductory course in electricity and magnetism; includes Coulomb's Law, electric fields, Gauss' Law, electric potential, capacitance and dielectrics, magnetic forces and fields, inductance, magnetization, Maxwell's equations, electromagnetic waves. Forms a basis for the understanding of most of today's electronic and electrical technology.
Prereq: First year Physics and calculus, MATH 216. Physics majors must take 253L with this course. Recommended for students in Honours programs.

PHYS 253L W,S 3L 0.25
Electricity and Magnetism Laboratory
For students taking PHYS 253. Lab alternate weeks.

PHYS 254 F 3C 0.5
Thermal Physics and Properties of Matter
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 W 3L 0.25
Optics Laboratory
For students taking PHYS 256. Lab alternate weeks.

PHYS 259 W 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 266 F 3C 0.5
Relativity and Special
Electrical and Magnetism
An introductory course in electricity and magnetism; includes Coulomb's Law, electric fields, Gauss' Law, electric potential, capacitance and dielectrics, magnetic forces and fields, inductance, magnetization, Maxwell's equations, electromagnetic waves. Forms a basis for the understanding of most of today's electronic and electrical technology.
Prereq: First year Physics and calculus, MATH 216. Physics majors must take 253L with this course. Recommended for students in Honours programs.

PHYS 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, Raman and fluorescence spectrometry; 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: Year two electricity and optics courses. 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. Prereq: PHYS 324. Recommended for students in General programs.
Course Descriptions

Physics

PHYS 350 W 3C 0.5
Astrophysics 1
Atomic and molecular spectra, forbidden and permitted transitions. Emission and absorption of radiation. Planck, Saha and Boltzmann equations. Line broadening effects. Radiation transfer theory. Sources of opacity. The spectra of the sun and stars. Prereq: PHYS 250-251 or consent of instructor. For third and fourth year students. Offered in odd calendar years.

PHYS 351 S,F 3C 0.5
Astrophysics 2
Physical properties of the stars. Stellar distance determination. Distribution of the stars in space. The solar motion. Galactic rotation. Stellar dynamics. Characteristics and structure of our galaxy and external systems. Prereq: PHYS 250-251 or consent of instructor. For third and fourth year students. Offered in odd calendar years.

PHYS 352 F,S 3C 0.5
Electronics 1
DC and AC circuit theory, p and n materials, pn diodes, junction and FET transistors. Transistor amplifiers and their equivalent circuits. Operational amplifiers. Feedback, oscillators and power supplies. Prereq: Knowledge of determinants, elementary calculus and elementary electricity. Coreq: 352L.

PHYS 352L F,S 3L 0.25
Electronics 1 Laboratory
For students taking PHYS 352. Lab alternate weeks.

PHYS 353 W 3C 0.5
Electronics 2
Logic gates, flip-flops and shift registers. Binary numbers and Boolean algebra. An introduction to microprocessors is discussed based on the 6800. This will include arithmetic logic units, parallel input/output ports, assembly language and a number of examples. Prereq: PHYS 352 or equivalent. Coreq: PHYS 353L.

PHYS 353L W 3L 0.25
Electronics 2 Laboratory
For students taking PHYS 353. Lab alternate weeks.

PHYS 354 F,S 3C 0.5
Atomic and Molecular Physics
The Schrödinger equation applied to simple one-and three-dimension potentials, hydrogen atoms, angular momentum and spin, molecular vibrations and rotations, many electron atoms, radiation processes. Prereq: PHYS 263.

PHYS 355 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 356 W 3C 0.5
Statistical Mechanics

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
Classical Mechanics

PHYS 360 A 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

PHYS 364 F,S 3C 0.5
Mathematical Physics 1

PHYS 365 W 3C 0.5
Mathematical Physics 2

PHYS 366 F 2C 0.5
Geophysics 1

PHYS 369 W 3C 0.5
Geophysics 2

PHYS 371A F,S 3L 0.25
Intermediate Laboratory
Further experiments in atomic, nuclear and solid state physics, optics and electronics. For honours students who are taking PHYS 360A. 18 hours experiments.

PHYS 371B W 3L 0.25
Intermediate Laboratory
Continuation of 371A. For honours students who are taking PHYS 360B. 18 hours experiments.

PHYS 380 F 3C 0.5
Molecular Biophysics
Macromolecular structure and function, weak interactions, DNA replication, protein synthesis, energy production, photosynthesis, control of intracellular processes, structure of viruses, physical techniques.
**Course Descriptions**

**Physics**

**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 342**  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.

**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 Co-operative Applied Physics program.

**PHYS 434**  F  3C  0.5  
**Introductory Quantum Mechanics**

**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.

**PHYS 437A**  F,W  3R  0.5  
**Theoretical Physics Project**
Selected subjects for advanced study by theoretically inclined students, topics in relativistic, quantum, and statistical physics. Fall term enrolment will be limited.

Students in the regular Honours Physics program must take either PHYS 437A or PHYS 437B. Although students in the Co-operative Applied Physics (Honors) program are encouraged to take one of these courses, enrolment may be limited.

**PHYS 437B**  W  3R  0.5  
**Continued Theoretical Physics Project**
A continuation and extension of the project initiated in PHYS 437A. Available only to those students who have satisfactorily completed that portion of the project contained in PHYS 437A in the immediately preceding term.

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 253 and 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  3C  0.5  
**Radio Astronomy**
Radio telescopes. Radio sources including the sun, H II regions, HI regions. The galactic centre. Pulsars, quasars, other extragalactic sources, cosmological implications.

Prereq: PHYS 253 and PHYS 250-251 Offered in even calendar years.

**PHYS 450**  F  3C  0.5  
**Astrophysics 3**
Solar system astrophysics (excluding the sun). The physical nature of planetary (and satellite) surfaces, atmospheres and interiors. Asteroids, meteorites and comets. The interplanetary medium (solar wind). Solar interactions with the interplanetary medium and earth’s magnetosphere.

Prereq: none.

Familiarity with the contents of PHYS 250-251, however, will be assumed.

**PHYS 451**  S,F  3C  0.5  
**Astrophysics 4**
The structure of stellar interiors, nuclear reactions and energy sources in the stars of the main sequence, early evolution of stars from the main sequence. Lifetimes of the stars.

Prereq: None. Familiarity with the contents of PHYS 250-251, however, will be assumed.

Offered in even calendar years.

**PHYS 449, PHYS 451** are also open to third and fourth year students. PHYS 350 alternates with PHYS 451 and PHYS 361 alternates with PHYS 449.
PHY 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

PHY 454 W 3C 0.5  
**Quantum Mechanics**  
Prereq: PHYS 434.

PHY 454 is strongly recommended for students intending to do graduate work.

PHY 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.

PHY 464 F 3C 0.5  
**Mathematical Physics 3**  
Applications to Physics of the theory of functions of a complex variable.  
Prereq: PHYS 364-365.

PHY 465 W 3C 0.5  
**Mathematical Physics 4**  
Theory and applications of integral transforms, integral equations and Green's functions. Asymptotic analysis.  
Prereq: PHYS 464.

PHY 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.

PHY 481 W 3C 0.5  
**Biophysics of Organ Systems**  
Physics of haeomostasis, interactions with the environment, circulation of blood, temperature regulation, respiration, transport problems and special organ systems.

PHY 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.

PHY 481 and 482 are offered in alternate years.  

Not Offered 1983-84:  
PHY 222 Electricity and Magnetism 1  
PHY 223 Electricity and Magnetism 2

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**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.D. Burt, BA, MA (Waterloo), PhD (York)  
A.F. Cooper, BA, MA (Waterloo), DPhil (Oxford)  
T.J. Downey, MA (Waterloo), MA, PhD (Western Ontario)  
W.B. Moul, BA, MA, PhD (British Columbia)  
J.E. Surfch, BA, MA (Waterloo)  
J.A. Telchman, BA, MA PhD (Toronto)  
R.P. Woolstencroft, BA, PhD (Alberta)

Lecturer  
R.A. Nutbrown, BA (Bishop's), MA (Carleton)

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**Adjunct Faculty**  
G.W. Corby, BA (WLU), LLB (Western Ontario), LLM (London)  
W.W. Johnston, LOC, BA (Memorial), LLB (Queen's)  
W.J. Morrison, QC, BA (Western Ontario), LLB (Osgoode)

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**Course Descriptions**

**Physics**

- **Electronics 4**
- **Quantum Mechanics**
- **Mathematical Physics 3**
- **Mathematical Physics 4**
- **Radiation Biophysics**
- **Biophysics of Organ Systems**
- **Biophysics of Nervous Systems**
- **Electricity and Magnetism 1**
- **Electricity and Magnetism 2**

- **Not Offered 1983-84:**
- **Nuclear and Particle Physics**
- **Mathematical Physics 3**
- **Mathematical Physics 4**
- **Radiation Biophysics**
- **Biophysics of Organ Systems**
- **Biophysics of Nervous Systems**
- **Electricity and Magnetism 1**
- **Electricity and Magnetism 2**

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**Political Science**

- **Introductory Notes**
- **Imperialism In International Relations**
- **Politics In Action**
- **Politics Rights and Obligations**

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**Course Descriptions**

**Introductory Notes**

- Extensive descriptions of the content of Political Science courses are available in the Department at the time of pre-registration.

**Politics In Action**

An examination of the way in which society's conflicting demands are organized, articulated, and translated in action. The part played by the various political and economic forces in society will be examined in a comparative framework.

**Politics Rights and Obligations**

An introductory examination of the idea of individual rights as a limitation on legitimate governmental authority, the possible grounds for such claimed rights, and their relationship to political obligations (dues).
A distinctive social feature of our seventeenth century.

Western political theorists from the seventeenth century. The principal ideas of environmental, and political problems, as well as the process of policy-making. 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 F 2C,1T 0.5 Quantitative Analysis
An introduction to the use of quantitative methods in Political Science. Only a rudimentary understanding of mathematics is required. Prereq: Second year standing.

P SCI 225 F 2C,1T 0.5 The History of Political Theory 1
A survey of the principal ideas of Western political theorists from the earliest times to the seventeenth century. Prereq: Second year standing.

P SCI 226 W 2C,1T 0.5 The History of Political Theory 2
A survey of the principal ideas of Western political theorists since the seventeenth century. Prereq: Second year standing.

P SCI 253 F 2C 0.5 Comparative Communism 1
An examination of the historical development of the communist international system, the cause of its diversity and doctrinal variety, with emphasis on common problems and the role of ruling parties, their objectives, performance, and strategy. Prereq: Second year standing.

P SCI 254 W 0.5 Comparative Communism 2
This course will concentrate on contemporary issues in communist politics, examining selected ruling and non-ruling communist parties. Prereq: P SCI 253 or consent of the instructor.

P SCI 255 F,W 0.5 The Politics of Western Industrial Nations
A systematic introduction to the political processes of industrial countries. The central focus will be on Western Europe and North America. Some attention, however, will be devoted to the Antipodes, the Mediterranean countries, South Africa, and Japan. Prereq: Second year standing.

P SCI 256 W 0.5 The Politics of Western Industrial Nations II
This course will examine a number of ways by which developed countries have tried to overcome the contemporary "crisis". Topics to be discussed include economic planning and participation, wage controls, corporatism, decentralization and authoritarianism. Prereq: Second year standing.

P SCI 260A F,S 2C,1D 0.5 Canadian Government and Politics 1
An analysis of the political environment in which the Canadian political system operates, including discussion of the Canadian political culture, federalism, the constitution, federal-provincial relations, and the role of the Governor General. No prereq for students in the second year and above.

P SCI 260B W,S 2C,1D 0.5 Canadian Government and Politics 2
An analysis of the decision-making machinery of the Canadian political system, including discussion of cabinet government, the role of the House of Commons, interest groups, the electoral system, the party system and voting behaviour. Prereq: P SCI 260A or consent of instructor.
Course Descriptions
Political Science

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 315 0.5
Research Design in Political Science
Introduction to the logic and limitations of experimental and non-experimental research designs. Selected studies of politics are examined to demonstrate how plausible threats to validity are made less plausible with appropriate design and data analysis.
Prereq: P SCI 214 or consent of instructor.

P SCI 321 F 2S 0.5
Marxist Theory
An examination of the formation of Marx's method and of its significance for the proletariat.
Prereq: Consent of the instructor.

P SCI 322 W 0.5
Marxism and Revolution After Marx
A selective study of developments in Marxist theory and political movements after Marx.
Prereq: P SCI 321

P SCI 323 0.5
Ancient Political Philosophy
A selective examination of political philosophy during the classical period in Greece.
Prereq: Consent of instructor.

P SCI 324 0.5
Modern Political Philosophy
A selective examination of political philosophy in the modern period.
Prereq: Consent of instructor.

P SCI 331 F 2C 0.5
Public Administration 1
An introduction to the principles of public administration illustrated by the study of Canadian institutions largely at the federal level, but including provincial and municipal examples.
Prereq: P SCI 260A and 260B or consent of instructor.

P SCI 332 W,S 2S 0.5
Public Administration 2
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 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 2S 0.5
Comparative Federal Systems
A comparative examination of federal systems, with an emphasis on the problems and processes of integration and disintegration.
Prereq: Consent of the instructor.

P SCI 352 F 3S 0.5
Comparative Legislative Systems
A comparison of the institutional and behavioural characteristics of legislatures in a comparative framework, with emphasis on Canada, the United States, Great Britain, and Australia.
Prereq: Consent of the instructor.

P SCI 362 F 2S 0.5
Soviet Government and Politics
An intensive survey of the development of Soviet political structures with analysis of the relative influence of ideological goals on the one hand and social forces on the other.
Prereq: P SCI 253-254 or consent of instructor.

P SCI 363 F 0.5
Canadian Constitutional Law
An introduction to the nature and basic principles of constitutional law. This course will deal especially with the distribution of powers in the Canadian federation, and its evolution, notably by judicial decision. Leading cases will be examined.
Prereq: 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.
Prereq: Consent of the instructor.

P SCI 375 W 0.5
The Politics of Self-Management
An examination of the participation of citizens in decision making, both at work and in politics. The self-management system of Yugoslavia will be studied in detail.
Prereq: Second year standing or above.
Course Descriptions
Political Science

P SCI 30A 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 30B 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 30-398 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 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 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 prerequisite 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 429 W 0.5
Labour Organization in Advanced Capitalist Society
This course presents an analysis of western approaches to the integration of workers into the capitalist production process through the intervention of the state. Prereq: P SCI 428 or consent of instructor.

P SCI 431 F 0.5
Canadian Public Policy
An examination of the way that policy making processes and institutions have responded to the problems of governing, especially at the federal level in Canada. 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: The Politics of Food
P SCI 436 will introduce the actors and the framework of norms, rules and practices that control the global food regime. The course will then proceed to deal with selected problems in the politics of food. Prereq: Consent of the instructor.

P SCI 437 W 3S 0.5
The Politics of International Resources
An examination of the politics of international resources. Attention will be given to the set of issues relating to minerals, water, oceanic fisheries, oil energy, timber and labour. Prereq: Consent of the instructor.

P SCI 442 W 3S 0.5
Politics in Ontario
A critical examination of the distinctive elements of government and politics in the Province of Ontario. Prereq: P SCI 260A and 260B or 341 or consent of the instructor.

P SCI 443 2S 0.5
Politics in Western Canada
A critical examination of the distinctive elements of government and politics in the provinces of Manitoba, Saskatchewan, Alberta, and British Columbia. Prereq: P SCI 260 or 341 or consent of instructor.

P SCI 453 F 3S 0.5
Comparative Politics of Latin America
The course examines the politics of Latin America focusing upon the interplay between external ties and internal processes. Topics include comparative studies of class alliances, the establishment of bureaucratic authoritarian regimes and revolutionary movements. Prereq: Fourth year standing or consent of instructor.

P SCI 454 W 3S 0.5
Comparative Politics
Selected topics in the politics of the Third World. Prereq: Fourth year standing or consent of instructor.

P SCI 461 F 2C,1S 0.5
Problems in Canadian Politics 1
Selected aspects of Canadian national politics.

P SCI 462 W 0.5
Problems in Canadian Politics 2
Selected aspects of Canadian provincial politics. For fourth year Political Science students but open to others with prerequisite P SCI 461.

P SCI 471 0.5
Public Opinion and Propaganda
A detailed study of the nature of public opinion and the attempt to control it through propaganda. Prereq: Consent of the instructor.

P SCI 473 2S 0.5
Voting Behaviour
A comparative study of the motivations underlying electoral choice in Canada, Great Britain and the United States. Prereq: P SCI 214, 373 or consent of instructor.

P SCI 475 F 2S 0.5
Political Socialization
A study of the processes and agents of political socialization and their effects on political stability or change in liberal democratic societies. Prereq: Consent of the instructor.
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.

Senior Research Seminar: Violence in the Political Process
Politics can be brutal. This seminar deals with violence in the political process. The focus is on the relationships between the society and the coercive apparatus of the state.
Prereq: third or fourth year standing.

Research Seminar on World Politics
An examination of research on the causes and consequences of interstate warfare.
Prereq: P SCI 360 or consent of instructor.

Power Politics and World Order Studies
This course examines the evolution of the international system; the capacity of the system of states to cope with the demands on it; meanings of international and regional power and order.
Prereq: Fourth year standing or consent of instructor.

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.

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.

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.

Senior Honours Essay
Students wishing to undertake a senior honours essay in their fourth year should consult the Department's Undergraduate Officer.

Not Offered 1983-84:
- P SCI 102D The Political Process in the Modern Democracies
- P SCI 102L Political Influences in Ontario
- P SCI 311 Methodology of Political Science: The Foundations
- P SCI 312 Approaches to Survey Analysis in Political Science
- P SCI 325 Radical Political Theory
- P SCI 327 Political Science and Political Values
- P SCI 341 Provincial Politics
- P SCI 373 Political Parties
- P SCI 374 Interest Group Politics
- P SCI 411 Theories and Methods of Political Science
- P SCI 425 English Political Theory of the Nineteenth Century

Department of Psychology

Professor, Chairman of the Department
P.M. Merkile, BA (Knox), MA, PhD (Virginia)

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

Associate Professor, Associate Chairman Graduate Affairs
J.A. Cheyne, BA (Waterloo Lutheran), MA, PhD (Waterloo)

Associate Professor, Associate Chairman Undergraduate Affairs
J.G. Holmes, BA, MA (Carleton), PhD (North Carolina)

Associate Professor, Undergraduate Officer
R.D. Seim, BA (Queen's), PhD (Waterloo)

Professors
K.S. Bowers, BA, PhD (Illinois)
M. Breidenbaugh, BA (Wittenberg), PhD (Vienna)
M.P. Bryden, BS (MIT), MSc, PhD (McGill)
W.C. Cornbig, BA (Heidelberg), PhD (Rochester)
D.P. Crowne, BA (Antioch College), EdM (Rochester), PhD (Purdue)
J.A. Dyel, BA (Oklahoma), PhD (Illinois)
C.K. Knappert, 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, PhD (Alberta), EdD (California)
D. Meichenbaum, AB (City College of New York), MA, PhD (Illinois)
S. Reina, MD, SCS (Charles)
M.A. Ross, BA (Toronto), MA, PhD (North Carolina)
P.M. Rowe, BA (Toronto), MA, PhD (Dalhousie), PhD (McGill)
K.H. Rubin, BA (McGill), MA, PhD (Penn State)
D.A. Sprott, BA, MA, PhD (Toronto), FSS
R.A. Stelly, BA (Albright), MA, PhD (Illinois)
M.D. Vogel-Sprott, BA (Master), MA, PhD (Illinois)
D.L. Wahisten, BS (Alma College), PhD (California, Irvine)
T.G. Waller, BS, MS (Southern Mississippi), PhD (Vanderbilt)
M.P. Zanna, BA, PhD (Yale)

Associate Professors
R.J. Alapack, BA (Scranton), MA, PhD (Duquesne), J
F.A. Allard, BA, BPE, MA, PhD (Waterloo)
D.M. Amuruso, BA, MA (Toronto), PhD (Waterloo)
J.M. Anglin, BA (Toronto), PhD (Harvard)
P.E. Bowers, BA (Queen's), MA, PhD (Illinois)
T.E. Cadell, BA (British Columbia), MA (Massachusetts), PhD (Wisconsin)
N. Charness, BA (McGill), MS, PhD (Carnegie-Mellon)
J.M. Cornell, BA, MS, PhD (Washington)
R.H. Lahue, BSc (Fordham), PhD (Waterloo)
G.E. MacKinnon, BA (Queen's), PhD (John Hopkins)
P.J. Naus, BA, PhD (Nijmegen), J
J.E. Orlando, BA (Western Ontario), MA (Dortmund), MA, PhD (Michigan), J
H. Ross, BA (Toronto), PhD (North Carolina)

Graduate Officers
R.D. Steimle, BA, MA (Toronto), PhD (McMaster)
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)
R.H. Lahue, BSc (Fordham), PhD (Waterloo)
G.E. MacKinnon, BA (Queen's), PhD (John Hopkins)
P.J. Naus, BA, PhD (Nijmegen), J
J.E. Orlando, BA (Western Ontario), MA (Dortmund), MA, PhD (Michigan), J
H. Ross, BA (Toronto), PhD (North Carolina)
Course Descriptions

Psychology

Course Descriptions

Introductory Note
See departmental course listing catalogue for specific terms of the various course offerings in 1983-84.

PSYCH 101 3C 0.5
Introductory Psychology
A general survey course designed to provide the student with an understanding of the basic concepts and techniques of modern psychology as a behavioural science. Also offered at Renison College and St. Jerome's College.

PSYCH 102 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 St. Jerome's College.

PSYCH 102A 3C 0.5
Applied Psychology
Applications of Psychological research to contemporary problems: man and environment, human factors engineering, management and organizations, crime and violence, and public health.

PSYCH 102B 3C 0.5
Nature, Nurture and Human Behaviour
The role of heredity and environment in personality and personality disorders, the development of intelligence, Nature, Nurturism, and violence, and public health.

PSYCH 102C 3C 0.5
Culture's Influence on Behaviour
The role of culture on the development of Perception, Cognition, Learning, and Memory; cultural influences on personality and personality disorders, and on conflict and aggression.

PSYCH 102D 3C 0.5
Psychology of Consciousness
Modes of thinking, emotion, creativity, and altered states of consciousness.

PSYCH 102E 3C 0.5
Psychological Intervention
Applications of Psychology to human coping problems and growth with emphasis on analyzing critically current treatment methods. Offered at St. Jerome's College.

PSYCH 102F 3C 0.5
Personal Adjustment
Focus on research which investigates the everyday task of coping with ourselves, our environment, and the people we encounter. Topics will focus on the themes of knowing the self, interpersonal relationships, and of the way in which our social and physical environment affects our behaviour.

PSYCH 102G 3C 0.5
Body and Mind
The relation between brain as a substrate and mind as a process is an important scientific and philosophical problem. In this course, those biological aspects of brain function will be discussed which are directly related to the functioning of the human mind.

PSYCH 200 3C, 1L 0.5
Measurement in Psychology
The logic of measurement in Psychology. Descriptive procedures for collecting and handling data. Making inferences from test scores. The use of correlational procedures in measuring intelligence, achievement, aptitudes, interests and personality.

PSYCH 203 3C 0.5
Learning and Motivation
This course is designed to introduce the student to theories in Learning and Motivation and to provide the student with an understanding of the experimental techniques in these areas. Prereq: PSYCH 101

PSYCH 206 3C 0.5
Perceptual Processes
An examination of data and theory concerning perceptual processes. Topics will include the perception of form and space, perceptual learning and a consideration of the effect of personality variables in perception. Prereq: PSYCH 101

PSYCH 207 3C 0.5
Cognitive Processes
An examination and evaluation of selected topics dealing with human learning, thinking, concept formation, memory and language. Prereq: PSYCH 101

PSYCH 211 3C 0.5
Developmental Psychology
An examination of the process and factors of human development. Prereq: PSYCH 101
Also offered at St. Jerome's College.
PSYCH 212 3C 0.5
Educational Psychology
A consideration of the main variables affecting learning in the classroom with special focus upon the conditions essential to efficient learning.
Prereq: PSYCH 101
Also offered at St. Jerome's College.

PSYCH 213 3C 0.5
Exceptional Children
Educational problems associated with mental retardation, emotional disturbances, sensory and physical impairments and intellectual giftedness.

PSYCH 214 3C 0.5
Psychology of Adolescence
A study of the psychological processes in the second decade of human development. Consideration is given to such areas as intellectual, emotional and social growth, and identity formation. Current concepts, issues, and research are stressed.
Prereq: PSYCH 211
Also offered at St. Jerome's College.

PSYCH 217 3C 0.5
Aging and Basic Psychological Processes
What processes change as adults age? Is the idea of age-related decline in functioning a myth? The course deals with processes such as memory, perception, intelligence, and problem-solving. It also outlines the problems in interpreting developmental research.
Prereq: PSYCH 101

PSYCH 218 3C 0.5
Aging, Dying and Death
An examination of the psychological aspects of aging and the traditional and recent literature relating to various views on the reality of death in the life of man. Therapy with dying individuals is reviewed and evaluated.
Prereq: PSYCH 101
Offered at St. Jerome's College.

PSYCH 231 3C 0.5
Psychology of Religious Experience
Approaches of traditional psychological theories and especially of a modern psychology of consciousness toward phenomena of religious experience, mysticism and meditation are examined. The transcendent phenomena are compared with other altered states of consciousness.
Prereq: PSYCH 101
Offered at St. Jerome's College.

PSYCH 236 3C 0.5
A Psychological Analysis of Human Sexuality
This course will examine psychological and social psychological theories and empirical investigations of human sexuality.
Prereq: PSYCH 101 or permission of instructor.
Offered at St. Jerome's College.

PSYCH 253 3C 0.5
Social Psychology
An introduction to theories and research on people in their physical and social environment. 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 3C 0.5
Interpersonal Relations
A psychological analysis of social interaction. The development of interpersonal attraction from first impressions to long-term relationships. The roots of hostility, conflict and communication problems.
Prereq: PSYCH 253
Cross-listed as PSYCH 221R

PSYCH 258 3C 0.5
Principles and Evolution of Psychoanalytic Thought
This course expresses the fundamental psychoanalytic vision as articulated by Sigmund Freud, and its relevance to the humanities. The theme is to understand the potentially liberating spirit which is at the root of psychoanalysis.
Prereq: PSYCH 101
Also offered at St. Jerome's College.

PSYCH 261 3C 0.5
Physiological Psychology
Introduction to brain, basic physiological processes and their roles in behaviour. Course covers sensing and perceiving; neural bases of action; motivation; learning and memory; and consciousness. Both experimental and clinical data are considered.
Prereq: PSYCH 101 or permission of instructor.

PSYCH 271 3C 0.5
Animal Behaviour
Survey of mechanisms, development, adaptive value and evaluation of behaviour in non-human animals. Covers ethology, sociobiology and experimental comparative psychology.

Emphasis on principles of research with laboratory and wild animals as well as methods of observing behaviour.
Prereq: PSYCH 101 or permission of instructor.

PSYCH 291 3C,1L 0.5
Basic Research Methods
An introduction to the methods used in psychological research. Methods for observing behaviour and the procedures used to summarize these observations are emphasized.
Prereq: PSYCH 101 and Honours standing.

PSYCH 292 3C,1L 0.5
Basic Data Analysis
An introduction to the logic and methods of inferential statistics with emphasis on application in Psychology. Also included is a more detailed treatment of the methods and projects introduced in PSYCH 291.
Prereq: PSYCH 291 and Honours standing.

PSYCH 305 2C,2L 0.5
Sensory Processes
A consideration of data and theory concerning sensory processes. Topics will include psychophysical methodology, sensory mechanisms, and the 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

PSYCH 311 3C 0.5
Behaviour and Development of Human Infants
The purposes of this course are to study the behaviour and development of human infants, to gain direct experience with infants, and to examine community attitudes and resources available for infant care.
Prereq: PSYCH 211 or permission of instructor.
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<th>Course Descriptions</th>
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<td><strong>Psychology</strong></td>
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PSYCH 312 3C 0.5  
**Learning Disabilities**  
A critical examination of the concept of learning disability and of current issues in the assessment and remediation of learning problems.  
Prereq: PSYCH 211 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.

PSYCH322 Y 2C 1.0  
**Principles and Practice in Early Childhood Education**  
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 332 Y 3P 0.5  
**Practicum in Early Childhood Education**  
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 333 3C 0.5  
**Industrial/Organizational Psychology**  
An introduction to the methods and problems in Industrial Psychology.  
Prereq: PSYCH 101

PSYCH 334 3C 0.5  
**Theories of Individual Counselling Psychology**  
An introduction to the methods, theories and problems in Individual Counselling Psychology.  
Prereq: PSYCH 101.  
Also offered at Renison and St. Jerome's College.

PSYCH 335 3C 0.5  
**Personality and Behaviour Change**  
Forms of psychological intervention that produce important changes in the way people think, feel and behave including psychoanalysis, behaviour therapy, brainwashing, cult conversions, deprogramming, hypnosis, biofeedback and meditation.  
Prereq: PSYCH 101

PSYCH 339 3C 0.5  
**Personnel Psychology**  
An examination of the following major topics in personnel psychology: employment planning, selection and recruitment, selection techniques, career development, performance appraisal, training programs, labour relations, compensations systems.  
Prereq: PSYCH 333

PSYCH 340 3C 0.5  
**Community Psychology**  
Theory and practice are integrated in an attempt to identify and to understand the social factors which inhibit or facilitate healthy development of the individual. The adequacy of existing social structures and institutions in the treatment of various personal problems is assessed.  
Prereq: PSYCH 253.  
Also offered at St. Jerome's College.

PSYCH 341 3C 0.5  
**Psychology of Early Childhood Education**  
An introduction to theories and issues in early childhood education. Topics include issues differentiating preschool programs and application of psychological theory/research to early education.  
Prereq: PSYCH 211

PSYCH 344 3C 0.5  
**Theories of Group Counselling**  
Contemporary theories on the therapeutic application of group processes. Issues such as group development, leader skills and training, selection of members, problems encountered in both process and outcome research will be examined.  
Prereq: PSYCH 101.  
Offered at St. Jerome's College.

PSYCH 353 3C 0.5  
**Aggression and Social Conflict**  
This course will examine the genetic, physiological, and social causes of aggression, with the emphasis on social-psychological causes.  
Prereq: PSYCH 253

PSYCH 365 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.  
Also offered at St. Jerome's College.

PSYCH 356 3C 0.5  
**Contemporary Approaches to the Study of Personality**  
An examination and evaluation of current research in Personality focusing on such topics as intrinsic motivation, self concept, emotion, locus of control, etc.  
Prereq: PSYCH 355

PSYCH 357 3C 0.5  
**Psychopathology**  
The nature and origin of deviant behaviour.  
Prereq: PSYCH 101.  
Cross-listed as PSYCH 322R.  
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 292 or permission of instructor.
Offered at St. Jerome's College.

PSYCH 391 3C,1L 0.5
Advanced Data Analysis
An examination of the effective use and interpretation of statistics in complex research designs. Topics include an introduction to multivariate analysis, analysis of variance, and applied psychological research.
Prereq: PSYCH 292 and Honours standing.

PSYCH 392 3C,1L 0.5
Psychological Measurement
An introduction to the logic of measurement in Psychology, with special emphasis placed on the use of psychological tests to assess individual and group differences.
Prereq: PSYCH 391 and Honours standing.

PSYCH 393 2C,2L 0.5
Research in Developmental Psychology
Open only to students in Psychology Program (Honours, Joint Honours, General, Minor) who have Honours standing.
Prereq: PSYCH 211 and 391 (acceptable as a corequisite).

PSYCH 394 2C,2L 0.5
Research in Perceptual and Cognitive Processes
Open only to students in a Psychology Program (Honours, Joint Honours, General, Minor) who have Honours standing.
Prereq: PSYCH 206 or 207, and 391 (acceptable as a corequisite).

PSYCH 395 2C,2L 0.5
Research in Social Psychology
Open only to students in a Psychology Program (Honours, Joint Honours, General, Minor) who have Honours standing.
Prereq: PSYCH 253 and 391 (acceptable as a corequisite).

PSYCH 396 2C,1L 0.5
Research in Biopsychology
Open only to students in a Psychology Program (Honours, Joint Honours, General, Minor) who have Honours standing.
Prereq: PSYCH 261 and 391 (acceptable as a corequisite).

PSYCH 397 2C,2L 0.5
Research in Personality and Psychopathology
Open only to students in a Psychology Program (Honours, Joint Honours, General, Minor) who have Honours standing.
Prereq: PSYCH 355 or 357, and 391 (acceptable as a corequisite).

PSYCH 398 2C,1L 0.5
Research in Learning and Motivation
Open only to students in a Psychology Program (Honours, Joint Honours, General, Minor) who have Honours standing.
Prereq: PSYCH 203 or 271, and 391 (acceptable as a corequisite).

PSYCH 400 Y 3C 1.0
Group and Individual Counselling
The practice of counselling in terms of current psychological theories and research. The demonstration and development of these concepts are aided by personal participation, exercises, role play and videotape simulation.
Prereq: PSYCH 334 and 344 or suitable alternative and permission of instructor.
Offered at St. Jerome's College.

Seminars
Departmental listing of seminar offerings for 1963-64 should be consulted.

PSYCH 451 2S 0.5
Senior Seminar in Learning
Admission by consent of instructor.

PSYCH 452 2S 0.5
Senior Seminar in Perception
Admission by consent of instructor.

PSYCH 453 2S 0.5
Senior Seminar in Developmental Psychology
Admission by consent of instructor.
Also offered at St. Jerome's College.

PSYCH 454 2S 0.5
Senior Seminar in Educational Psychology
Admission by consent of instructor.
Course Descriptions
Psychology

PSYCH 456 2S 0.5
Senior Seminar in Personality
Admission by consent of instructor.
Also offered at St. Jerome's College.

PSYCH 457 2S 0.5
Senior Seminar in Clinical Psychology
Admission by consent of instructor.
Also offered at St. Jerome's College.

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 460 2S 0.5
Senior Seminar in Psychological Processes
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 Behavior
Admission by consent of instructor.

PSYCH 463(A-Z) 2S 0.5
Senior Seminar in Special topics.
Admission by consent of instructor.

PSYCH 464(A-Z) 2S 0.5
Senior Seminar in Special topics.
Admission by consent of instructor.

PSYCH 465(A-Z) 2S 0.5
Senior Seminar in Special topics.
Admission by consent of instructor.

PSYCH 466(A-Z) 2S 0.5
Senior Seminar in Special topics.
Admission by consent of instructor.

PSYCH 467 Y.M R 1.0
Senior Honours Essay - Review Paper
Each student will work under the direction of a member of the department on a critical integrative review of an issue in research of literature. The result of this review will be presented in the form of a thesis, which will be critically examined by members of the department.
Open to fourth year Honours or Makeup only.
Also offered at St. Jerome's College.

PSYCH 468 Y.M R 1.0
Senior Honours Essay - Experimental Study
Each student will work under the direction of a member of the department on an experimental study. The result of this investigation will be presented in the form of a thesis, which will be critically examined by members of the department.
Open to fourth year Honours or Makeup only.
Also offered at St. Jerome's College.

PSYCH 498 Y.M R 1.0
Senior Honours Essay - Review Paper
Each student will work under the direction of a member of the department on a critical integrative review of an issue in research of literature. The result of this review will be presented in the form of a thesis, which will be critically examined by members of the department.
Open to fourth year Honours or Makeup only.
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.
Open to fourth year Honours or Makeup only.
Also offered at St. Jerome's College.

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, RedD (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, BSS (William and Mary), MA, EdD (Columbia)

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, BSc (Prague Institute of Sociology), PhD (Charles University, Prague)

Assistant Professors
K.S. Brown, PhD (Waterloo)
P. Eagles, BSc (Waterloo), MSc (Guelph), PhD (Waterloo) MCIP
W. Frisby, MHK (Windsor)
D. Getz, BES (Waterloo), MA (Carleton), PhD (Edinburgh)
L. Heywood, BA (North Dakota), MA (Florida State), PhD (Wisconsin)
M.L. Hutchison, 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)

Lecturers
W. Frisby, BA, MA (Windsor)
R.D. Graham, BA, MA (Western Ontario)

Faculty Members of Recreation holding cross appointments to:
1Sociology
2Planning
Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

REC 100 F 3C 0.5
Introduction to the Study of Leisure and Recreation
An overview of the total field of recreation emphasizing the understanding of leisure phenomena and implications for contemporary society.

REC 101 W 2C,1T 0.5
Introduction to Leisure Services
An introduction to various leisure service agencies and the services provided. Field trips to municipalities, specialized institutions, and voluntary agencies.

REC 200 F.S 3C 0.5
Theories of Play
A critical analysis of definitions, concepts and assumptions of classical, recent and modern theories of play with implications for research strategies, programming and planning for play.

REC 201 F 3C 0.5
Leisure and the Social Sciences
Examination of modern methodological and theoretical approaches to the study of leisure behaviour with emphasis upon the socio-cultural, socio-psychological and economic dimensions.

REC 203 W.S 3C 0.5
An Introduction to the Sociology of Sport (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

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 F 3C,3L 0.5
Administration of Camping and Outdoor Education
The philosophy and objectives of camping and outdoor education; administration, organizing, planning, staff, relationships, leadership training, trends in camping and outdoor education. The emphasis in this course will be the place of the resident camp in education and recreation.
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 analysed, 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 recreative behaviour as related to positive and negative mental health, discussing in detail, structure, semiotic factors and interaction patterns.
Prereq: REC 250

REC 270 F 3C 0.5
Statistical Techniques Applied to Leisure Studies
An introduction to descriptive and inferential statistics and the interpretation of data. A major consideration of the course is the use of statistics in the solution of problems in recreation and leisure.

REC 300 W 3C 0.5
Philosophy of Leisure
Examination of major philosophical themes through the ages with reference to contemporary viability and effect upon social behaviour.
Prereq: Consent of instructor, third year standing.

REC 301 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,1L 0.5
Travel and Tourism
The scope and nature of travel and tourism as contemporary leisure experiences. Economic, political and social ramifications, research strategies employed, implications for the future.
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 interact with recreation systems and power relationships between citizens' 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

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 F,S 3C 0.5  
**Problems in Recreation Management**  

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**Course Descriptions**  
**Recreation**

REC 325 F 3C 0.5  
**Marine Recreation**

REC 326 F 3C 0.5  
**Introduction to Museum Management**

REC 327 W 3C,1L 0.5  
**Leisure and Environmental Design**

REC 331 F 2C,2L 0.5  
**Outdoor Education**  
The present status of outdoor education in modern society; government functions and policies related to outdoor education services; the planning and administration of outdoor education activities. Current problems.  
Prereq: REC 230

REC 332 F,S 2C,2L 0.5  
**Applied Methods in Outdoor Recreation**  
Emphasis on methods and techniques for the selection, development, and implementation of programs and projects through the utilization of diverse and unique natural settings and environments.  
Prereq: REC 230

REC 334 F 3C,1L 0.5  
**Park Management**  
Basic administrative procedures in park management.  
Operational techniques are examined together with general policies of acquisition, operation and development.  
Prereq: REC 210, REC 230 or equivalent

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.  
Third year Departmental students only.

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 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 6-6 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 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
Course Descriptions
Recreation
Religious Studies

R S 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

R S 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

R S 100E F,W 3C 0.5
Biblical Studies 1
A survey of the literature, history and religion of ancient Israel as seen in its cultural setting in the ancient Near East.

Area 3

R S 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

R S 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

R S 100K F,S 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

R S 105 Y 3C 1.0
Elementary Biblical Hebrew
An introductory course designed to tend to a reading knowledge of Biblical Hebrew; the sound and forms of the language followed by the reading of selected texts from the Hebrew Bible. Cross-listed as H&B 140-3C, taught at WLU.
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

The Parables of Jesus
Detailed examination of the stories Jesus told, their form, method, message, and significance for religious thought, past and present.
Area 3

The Apostle Paul: Life and Letters
An examination of the career and thought of Paul as seen in his letters and in the Acts of the Apostles.
Area 3

Hinduism
A study of the developments of religious thought in India from the Vedic Period to the present. The course will combine a historical survey with a study of representative texts from the religious, philosophical, social and political thought of the Hindus.
Area 1

Buddhism
An introduction to the unifying beliefs and philosophical presuppositions of the Buddhist world-view, and an overview of the diverse forms of Buddhism in South and South-East Asia, Tibet, China and Japan.
Area 1

Islam
An introduction to the Islamic faith and practice, with a review of the development, achievements and impact of the Muslim community from Muhammad the Prophet to the present day.
Area 1

Judaism
An introduction to the religious tradition of the Jews, in terms of beliefs, practices, ideals and institutions from the beginning to the present time.
Area 1

Evangelical Christianity
A descriptive, historical and theological review of the wing of North American Christianity known as evangelicalism, fundamentalism, or revivalism.
Area 2

Sects, Cults and New Religious Movements
An analysis of minority religions considered deviant by the dominant society such as the Amish, Mormons, and Jehovah’s Witnesses with special consideration of the recent new religious movements including Unification (Moonies), Scientology and Krishna consciousness. Cross-listed as SOC 225.
Area 5

History of Christianity
The development of Christianity in its Roman Catholic, Eastern Orthodox and Protestant traditions from the time of Christ to the present.
Area 2

History of Christian Thought
An analysis of the major theological developments in the Christian traditions from the apostolic era to the present.
Area 4

Jesus Christ in Contemporary Perspective
An examination of current approaches to the person of Jesus through the writings of contemporary theologians attempting to answer the question, “Who is Jesus?”
Area 4

Human Sexuality and Christian Morality
An investigation of the moral implications of an evolving sexual consciousness in the Christian tradition. Prereq: Second year standing or consent of instructor.
Area 4

Biblical Foundations of Christian Pacifism
An examination of the documents of the early church, notably the Bible, with reference to their teaching on war and peace.
Area 4

War and Peace in Christian Theology
The Contemporary Discussion. A survey of Christian teaching on war and peace, focusing on the twentieth century discussion.
Area 4

Christian Ethics
An examination of the development of Christian ethics, the Christian Doctrine of Man, Christian ethics and society, and faith and reason in ethical decisions.
Area 4

Current Ethical Issues
An examination of specific current individual and social problems such as human sexuality, social justice, urban decay, and human rights, in the light of Christian moral consciousness.
Area 4

Issues in Science, Technology and Religion
A study of the questions raised by the interaction of religious faith with modern scientific and technological approaches to understanding the physical, social and psychological dimensions of our world.
Area 5

Women and the Great Religions
Through a review of the teachings of the great religious traditions about women, this course aims to arrive at a global view of the situation of women ‘in the world of religion’. On the basis of
**Course Descriptions**

**Religious Studies**

the evidence gathered, it will attempt an estimation of the role of religion as an intimate and importance influence on human development.

**Area 5**

R S 263 F 3C 0.5

*Religion and Politics*

An examination of movements, communities, and theologies which express a Christian hope for the experience of justice, peace and development in the encounter with injustice, oppression and poverty.

**Area 4**

R S 264 W 2C.1D 0.5

*Religion in the Canadian Experience*

An examination of the role of religion in Canadian immigration and settlement, education and social reform, political and national identity, secularization and pluralism.

**Area 5**

R S 266 F 2C.1S 0.5

*Film and the Quest for Meaning 1*

An exploration of spiritual themes and issues in the cinema. An assessment of film's special characteristics as an art form capable of addressing the human quest for a significant existence. Emphasis upon the films of Ingmar Bergman.

*Cross-listed as FINE 252(R).*

Film fee $5.00

**Area 5**

R S 267 W 2C.1S 0.5

*Film and the Quest for Meaning 2*

A consideration of selected themes — death, evil, guilt, fate, alienation, courage, love, redemption — in the films of several of today's leading directors. Emphasis upon a variety of directors from divergent cultural backgrounds.

*Cross-listed as FINE 253(R).* Film fee $5.00.

**Area 5**

R S 268A S 3C 0.5

*Religious Perspectives in Contemporary Literature*

A discussion of religious perspectives in contemporary literary works. Emphasis will be on religious pluralism as reflected in the culture with a primary focus on man's search for meaning, both individually and culturally.

**Area 5**

R S 269 S 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**

R S 270 F 3C 0.5

*Psychology of Religion*

A study of theories of the psychological nature of religious experience, the sources of religious belief and the religious significance of psychological phenomena. Topics include faith, doubt, evangelism, conversion, faith healing, mysticism, drugs and religious experience, tongues-speaking.

**Area 5**

R S 271 W 3C 0.5

*Personality and Religion*

A study of the psychology of personality in its relationship between personality and religious thought, experience and behaviour.

**Area 5**

R S 274 W 3C 0.5

*Religious Approaches to Personal Crisis*

A critical historical review of Judaeo-Christian approaches to emotional and interpersonal problems, with an analysis of the clinical and pastoral education movement in the church.

**Area 5**

R S 275 W 3C 0.5

*Religion and Psychotherapy*

A review and analysis of the dialogue between theistic religion in the West and the personality sciences since Freud their respective views of God, man, sin, sickness and the therapeutic process. Clinicians and theorists in psychotherapy and religion from the surrounding community will contribute to the exploration.

**Area 5**

R S 281 S 3C 0.5

*Theology of Worship and Sacrament*

The course will examine Christian corporate worship in its existential reality and historical development. New trends will be analyzed in the light of both tradition and present needs.

**Area 4**

R S 290B J 3C 1.0

*The Just Society*

A multi-disciplinary approach to the study of the involvement of the Roman Catholic and protestant churches in issues of poverty, unemployment and prejudice; their reaction to socialism and capitalism; their social activities in Latin America; their attitudes towards women.

**Area 4**

R S 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**

R S 305 Y 3C 1.0

*Intermediate New Testament Greek*


*Prereq: R S 106 or consent of instructor.*

**Area 3**

R S 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.*

R S 307A-D

*Selected Topics in Biblical Theology*

Special topics will be offered Fall and Winter, 1983-84. Consult department.

R S 309 W 3C 0.5

*New Testament Themes*

A comparative study of the distinctive ways in which New Testament writers view key issues in the early Church; e.g., freedom and authority, social responsibility, the role of law, relations with the Jewish religion, the person of Jesus. An attempt will be made to relate their views to issues facing Christianity today.

*Prereq: R S 100F or consent of instructor.*

**Area 3**
Course Descriptions
Religious Studies

RS 314 W 3C 0.5
Zen Buddhism
A seminar based on eastern and western interpretations of the Zen tradition. First half, basic Buddhist concepts and principles; second, a study of classical Zen literature.
Prereq: RS 100A or RS 214 or consent of instructor.

RS 315 W 3C 0.5
Canadian Native Religions
An introduction to the stories of Canada’s pre-modern Native Peoples in order to appreciate “story” as a basic mode of religious expression and to understanding the religious beliefs of these peoples.
( WL U 317/367-30)
Area 1

RS 318 W 0.5
Islam and Christianity
A survey of the history of the Muslim-Christian relations from the rise of Islam to the present, with special emphasis on the characteristic polemic literature which each community produced against the other.
Prereq: RS 100B or consent of the instructor.
Area 1

RS 322 W 3C 0.5
Radical Reformation
A study of Anabaptism and its place in the history of the Christian Church and of the Reformation period.
Prereq: Second year standing
Area 2

RS 331 A W 3C 0.5
The Church in the Modern World
A study of the recent transformations of the Roman Catholic Church through the events, movements, personalities, and historical realities of the past fifty years.
Area 2

RS 335 F 3C 0.5
Modern Theology
A study of modern thinkers (for example, Kant, Hegel, Schleiermacher and Kierkegaard), with special emphasis on their influence on nineteenth century theology.
Prereq: RS 230 or 231 or consent of instructor.
Area 4

RS 336 W 3C 0.5
Contemporary Theology
A study of major themes and movements in contemporary theology, with reference to selected thinkers, such as Barth, Tillich, Buber, de Chardin and Rahner.
Prereq: RS 231 or consent of instructor.
Area 4

RS 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: RS 230 or 231 or consent of instructor.
Area 4

RS 350 F,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: RS 230 or 231 or consent of instructor.
Area 4

RS 360 S.3 C 0.5
Religion and the Arts
A consideration of the spiritual dimension in art, both sacred and secular. An exploration of the quest for meaning in the various arts — painting, music, architecture, sculpture, dance, and cinema—encountered through slides, films, recordings, and readings.
Prereq: RS 100C or 266 or 267, or consent of the instructor.
Area 5

RS 370 F 3C 0.5
Dreams in Religious Experience
The course examines the place of dreams in religious experience from ancient to modern times. Present day advances in understanding dream symbols will be explored, as well as the possibility of incorporating the use of dreams in one’s personal religious growth and development.
Prereq: RS 271 or consent of instructor.
Area 5

RS 371 W 3C 0.5
Religion and Suicidal Behaviour
A study of self-destructive behaviour and its relation to relevant religious concepts. The range of experience from illness to suicide will be explored and related to the concepts of guilt, hope, and meaning in the Christian faith.
Prereq: RS 271 or consent of instructor.
Area 5

RS 398-399
Directed Reading in Special Subjects
RS 400 A-h
Special Topics in Religious Studies
Special topics will be offered in terms in 1983. Consult Department.

RS 490 A S.F.W 0.5
Honours Seminar
A course of study and research designed to provide the student with guidance and supervision towards completing an Honours research assignment.
Prereq: Fourth year standing and consent of the Undergraduate Officer.

RS 490 B S.F.W 0.5
Honours Seminar
A continuation of the above.

Every student in the Honours RS Program is required to take RS 490 A and 490 B.

RS 590-597 F.W R 0.5
Directed Research in Special Subjects for Graduate Students

RS 598-599 R 0.5
Directed Research in Special Subjects for Graduate Students

† Students wishing to enrol in a course marked with a dagger (†) should consult the department.

Not Offered 1983-84
RS 203 Wisdom Literature in the Old Testament
RS 206 Modern Study of Jesus
RS 215 Religion in China
RS 232B Jesus Christ in Historical Perspective
RS 238 The Ecumenical Movement
RS 265 Unity and Diversity in Canadian Religion
RS 268B Religious Perspectives in Contemporary Canadian Literature
RS 282 New Perspectives in Sacramental Theology
RS 290A Religious Experience of the Young
RS 291A-D Studies in the History of Religions
Faculty of Science

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes
The Faculty of Science offers the following courses of a general nature, intended for students registered in other Faculties (Arts, Environmental Studies, 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 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.

A special course available to students in the Mathematics Faculty who do not have a strong science background, especially at the Secondary School Year 5 level. Not open to students registered in the Faculty of Science.
No prereq.

SCI 200 F 3C 0.5
Contemporary Science 1
The interaction between science and society will be discussed for several items of contemporary public interest. Recent topics have included noise pollution, its reduction and control; materials, structures and properties; atmospheric science, weather and climate; nuclear fission, new future or no future; outer space exploration, its effects on the activities of man; low temperature phenomena, their impact on society. Open to students in the Faculties of Arts, Environmental Studies, Human Kinetics and Leisure Studies. Mathematics and the Program of Integrated Studies in the first as well as upper years.

SCI 201 W 3C 0.5
Contemporary Science 2
Students registered in Science or Engineering may not take this course for credit.

SCI 202 F 3C 0.5
Energy
Prereq: At least one year of Secondary School Physics.

SCI 203 W 3C 0.5
Applied Physics in the Modern World
Selected topics in the applications of physics such as acoustics, cosmology, fusion, health physics, lasers and holography, oceanography, physics in Canada, reactor physics, space research, superconductivity, symmetry.

SCI 205 F,W 3C 0.5
Physics of High Fidelity Sound Reproduction
Applies elementary physical principles to the study of the components of high fidelity systems. Will convey an appreciation of the physics of such systems and an understanding of the specifications of modern equipment. Includes several evening clinics during which interested students can measure their own or available systems using laboratory measuring equipment.
Prereq: At least one year of Secondary School Physics.

SCI 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.

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.
an examination of recent advances in Human Genetics

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 255 W 2C,1T 0.5
The Biology of Aging
An introduction to the biological mechanisms of aging at the molecular, cellular and systemic levels. Topics to be discussed will include the theories of aging, methods for studying the aging process, the role of diseases in aging and chronological changes in organisms during aging.

SCI 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 351 F,W,S T 0.5
Human Biology 1
An introduction to selected topics in human physiology and consideration of factors that influence normal physiological function. Topics discussed include the structure and mechanism of action of nerves, muscles, the cardiovascular and respiratory systems. Antireq: BIOL 233
Offered only by Correspondence for 1983-84.

SCI 352 F,W,S T 0.5
Human Biology 2
An introduction to selected topics in human physiology. Attention will be given to the areas of homeostasis, nutrition, digestion, reproduction and the endocrine hormones. Antireq: BIOL 233
Offered only by Correspondence for 1983-84.

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 Chymique. The beginnings of the industrial revolution. Emphasis will be on reading the works of the originators of Science. Prereq: First year Science or equiv.

SCI 400B W 2C 0.5
The History of Science 2
The growth of scientific ideas in the 19th and early 20th centuries. Developments in physics, chemistry, geology, biology (particularly Darwin) and technology. Emphasis will be on reading the works of the originators of science. Prereq: First year Science or equiv.
Course Descriptions

Social Development Studies

Professor, Principal of Renison College
I.L. Campbell, BA (Carleton), MSc (Econ/London) R

Assistant Professor, Undergraduate Officer
M. Smyth, BA (Toronto), MA, PhD (York) R

Professor Emeritus
D.G.S. M'Timkulu, BA, MA (South Africa), MA (Yale), PhD (Natal) R

Professor
J.O. Towler, BA (Toronto), MEd, PhD (Alberta) R

Associate Professor
J.T. Harris, BMus (Temple), MSW (Pennsylvania) R
R. Lahue, BSc (Fordham), PhD (Waterloo) R
M.I. Nagler, BA (British Columbia), MA (Chicago), PhD (Stirling) R

Assistant Professor
M. Zentner, BA (Temple), MSW (Kansas) R

Co-ordinator of Placements-Diploma Program
M. MacDougall, BA (Gonzaga), MSW (Smith) R

Associated Faculty

Associate Professors, Religious Studies
M. Bird, BA, MA, PhD (Iowa) R
D. Bryant, BA (Carleton College), STB (Harvard), MA, PhD (St. Michael's) R

Associate Professor, Geography
B. Hyma, BSc, MSc (Lancas), MA (Sheffield), PhD (Pittsburgh) R

Associate Professor, History
W. Packull, BA (Guelph), MA (Waterloo), PhD (Queen's) R

Co-ordinator of English Language Programs
J. Miller, BA, BLS (McGill), MA, MPhil (Waterloo), PhD (York)

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Interdisciplinary Social Science

ISS 131R W 3C 0.5 Social Ideas, Social Policy and Political Practice 1
An introduction to some of the major social and political ideas of Western civilization. Attention is given to the influence and applicability of these ideas to social policy and political practice in contemporary Canada.

ISS 150R F 3C 0.5 Lifespan Crises: Introduction to Helping Strategies
Introductory examination of theories and research related to crises in the human lifespan, and strategies of the helping professional for prevention and intervention. Topics include: symbiosis, separation, identity crises, autonomy, stress, self-control.

ISS 231R W 3C 0.5 Changing Concepts of Childhood
Childhood has changed as a social and cultural concept. This course will trace these changes, examining sociological, psychological, cross-cultural, historical and political factors. Art and literature will also be used to reflect attitudes about childhood.

ISS 231R W 3C 0.5 Social Ideas, Social Policy and Political Practice 2
Concentration will be on selected social and political ideas of the 19th and 20th centuries and their influence on social policy and political practice in contemporary Canada.
Prereq: ISS 131R

ISS 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.
Course Descriptions
Social Development Studies

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 qualitative and quantitative methods.
Prereq: second year standing or consent of instructor.

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 350(A-F)
Special Topics in Interdisciplinary Social Science
One or more term 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 350C W 3C 0.5
Children in Difficulty: Biosocial Perspectives
A multidisciplinary introduction to recent advances in theory, diagnosis, classification, and remedial strategies for children who have achieved "problematical" status. An examination of social and family characteristics and the symptoms of the problematical child with an overview of major therapeutic strategies.

ISS 350D W 3C 0.5
Adult Life Crises and Events
A study of normal events occurring during the adult years, why they happen and how we cope with them. Relying on research, popular literature and life experiences, students examine social change, the future, adult development and adjustment.
Prereq: ISS 150R or consent of instructor.

ISS 350E W 3C 0.5
Family Law and Social Work
An introductory examination of family law as it applies to the practice of social work. Topics will include history of family law, divorce, custody, child welfare legislation.
Prereq: Second year standing.

ISS 386R/396R 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 25 1.0
Senior Seminar Workshop
Social and human phenomena will be examined holistically. Students will be encouraged to synthesize knowledge learned in other social science courses in an intensive study of specific social issues and human concerns. The issues examined will vary from year to year reflecting social change, immediate community concerns, developments in the social sciences and the interests of students and instructors. Students will be required to engage in field projects, including community based learning experiences.
Prereq: Open to senior honours students only.

ISS 499R Y T 1.0
Senior Honours Essay
The essay will normally be related to the student's chosen theme area, supervised by only one faculty member, but critically examined by faculty from all areas of the program.
Prereq: Open to senior honours students only.

Psychology

PSYCH 120R F 3C 0.5
Introductory Psychology
Basic concepts and techniques of modern psychology as a behavioural science, with special emphasis on social aspects of behaviour. Topics may include the nervous system, perception, learning, memory, cognition, motivation, emotion, development, personality, social influences, psychopathology and psychotherapy.

PSYCH 121R W 3C 0.5
Introductory Psychology (Special Topics)
A continuation of PSYCH 120R with in-depth study of some selected topics.
Prereq: PSYCH 120R.

PSYCH 220R F 3C 0.5
Social Psychology
Examination of psychological principles involved in individual - society interaction. Topics may include research methods, self, sexual attitudes and behaviour, person perception, attitudes, affiliation, aggression, altruism, groups, environment and behaviour, loneliness, social psychology and legal process.
Prereq: An introductory Psychology course.
Cross-listed with PSYCH 253.

PSYCH 221R W 3C 0.5
Introductory Psychology (Special Topics)
An introductory Psychology course.

PSYCH 254.

PSYCH 322R F 3C 0.5
Personality Theory
An examination of the major theories of personality including consideration of the psychoanalytic, dispositional, humanistic, and behaviouristic models.
Prereq: An introductory Psychology course.
Cross-listed with PSYCH 355.
PSYCH 323R W 3C 0.5  
**Abnormal Psychology**  
A survey of concepts, theory, and research dealing with the nature and etiology of behavioural abnormality. Topics include neurosis, schizophrenia, depression, psychophysiological and behavioural disorders.  
*Prereq: An introductory Psychology course.*  
*Cross-listed with PSYCH 397.*

PSYCH 367R-369R 0.5 each  
**Special Topics in Psychology**  
One or more term courses will be offered from time to time as announced by the Social Development Studies Program. Subjects will be dependent upon special research and/or instructional interests of faculty.

PSYCH 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.*

**Sociology**

SOC 120R W 3C 0.5  
**Fundamentals of Sociology 1**  
An examination of the fundamental concepts of sociology and their application in seeking to understand the changing patterns and life-styles taking place specifically in Canada, and in general, within North American society.

SOC 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 origins, religion, racial factors and social status will be examined as factors which 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 course will analyze modernization, constitutional debates and historical events in terms of their impact on minority adjustments.  
*Prereq: An introductory Sociology course and second year standing or consent of instructor.*

SOC 367R S,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  
**Spoiled identity resulting from deviant criminal and "social" adaptations are examined from a symbolic interactionist perspective.**  
*Prereq: An introductory Sociology course.*

SOC 369R W 3C 0.5  
**Custodial and Rehabilitative Institutions**  
"Total institutions" are concerned with resocialization of "inmates". The philosophies, organization, goals and effectiveness in modifying and controlling behaviour, of maximum security prisons, mental hospitals, isolated work environments and concentration camps constitute the central focus.  
*Prereq: An introductory Sociology course.*

SOC 398R/399R S,F,W R 0.5  
**Independent Study**  
An independent in-depth study of a selected area of concern to the student within the discipline of Sociology. Available to individuals or small groups of third or fourth year Social Development Studies majors and arranged with one of the faculty members from the program.  
*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 skill base, principles and purposes of the profession, and an examination of methods of practice. Traditional and innovative social work settings are discussed. Historic development of social work and its influence on contemporary practice is reviewed.

SOCWK 121R W 3C 0.5  
**Contemporary Social Problems**  
A study of contemporary social problems with which social work is concerned. Emphasis is divided between theoretical 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.*

SOCWK 221R S,F,W 3C 0.5  
**Social Group Work**  
Presentation of some of the theoretical constructs necessary for an understanding of social group work as well as an introduction to methodology and interventions.  
*Prereq: SOCWK 120R or consent of instructor.*

SOCWK 222R F 3C 0.5  
**Community Organization 1**  
An examination of social work practice as it relates to functional and geographical communities. The course will explore the theoretical foundations of organization practice as well as a variety of models.  
*Prereq: SOCWK 120R or consent of instructor.*
Course Descriptions
Social Development Studies

SOCWK 320R W 3C 0.5
Social Casework 2
An examination of some of the more complex intellectual components of the social work skills necessary to work with individuals in casework. Social work theories of the individual will be examined in order for the student to learn some clinical casework applications.
Prereq: SOCWK 220R or consent of instructor.

SOCWK 321R S,F,W 3C 0.5
Social Work with Families
Presentation of some of the theoretical constructs necessary for an understanding of the family in the social work relationship as well as an introduction to methodology and interventions.
Prereq: SOCWK 120R or consent of instructor.

SOCWK 322R W 3C 0.5
Community Organization 2
An investigation of the process of change as it affects functional and geographic communities. Canadian examples of organizational processes and collective action of citizen groups, neighbours, welfare recipients, ethnic minorities, employees, political parties and public housing tenants.
Prereq: SOCWK 222R or consent of instructor.

SOCWK 325R W 3C 0.5
Philosophy and History of Social Welfare
Social welfare from early civilization to the present. The effects of religious, political, economic, and cultural factors on social welfare development and the continuity 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 350D F 3C 0.5
Social Casework 3
Casework treatment issues categorized according to the character styles of clients will be examined in depth. The client's mode of functioning and symptom presentation and appropriate treatment strategies will be assessed through readings, clinical example and process recordings.
Social Work Diploma students only.

SOCWK 350E
Social Casework Techniques
Theoretical and practical consideration of conceptual and interpersonal techniques relevant to the practice of clinical social work. Topics may include formation and use of case histories, interviewing, treatment plans, therapeutically-oriented contracts, process-recording, client disengagement.
Social Work Diploma students only.

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 356R F 3C 0.5
Mental Retardation and the Family
A critical application of Social Work theory to real situations involving the social, emotional and physical functioning of the family that has a mentally retarded member. Will also include consideration of the impact of current social policies.

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 367R W 3C 0.5
Social Work with the Elderly
An examination of social work theory and practice concerning the needs of the elderly. Social work strategies of intervention with the healthy and frail aged will be considered from the individual, group, family, community, and bureaucratic perspectives.
Prereq: SOCWK 120R or consent of instructor.

Not Offered 1983-84:
ISS 221R Community Issues
ISS 343R Interdisciplinary Investigation of Human Sexuality
ISS 350A The Non-Medical Use of Drugs, Drug Dependency and its Management
ISS 350B Adult Education: Interdisciplinary Examination
PSYCH 369R Advanced Topics in Counselling Psychology
SOC 121R Fundamentals of Sociology 2
SOC 220R The Individual, Society and Religion
SOC 221R Master Trends in Modern Society
SOC 225R Race and Culture in the Third World 1
SOC 226R Race and Culture in the Third World 2

Elective Courses
The following elective courses are administered by Renison College. For fuller descriptions, see appropriate Departments.
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. FaIding, 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)
C. Redekop, BA (Goshen), MA (Minnesota), PhD (Chicago) G
E.W. Vaz, BA, MA (McGill), PhD (Indiana)

Associate Professors
J. Curtis, BA (Sir George Williams), MA (Central Michigan), MA (Cornell)
F.A. Fasick, BA (Penn. State), MA, PhD (Columbia)
J. Goyer, BA (Bishop's), MA, PhD (McMaster)
R.D. Lembert, BA, MA (McMaster), PhD (Michigan)
S.A. McDaniel, BA (Massachusetts), MA (Cornell), PhD (Alberta) Recipient of the Distinguished Teacher Award
M.I. Nagler, BA (British Columbia), MA (Chicago), PhD (Stirling)
R.C. Pius, BA (Manitoba), MA, PhD (Iowa)
W.G. Scott, BA (Western Ontario), MA (Toronto)
M. Shimpo, BA (International Christian, Japan), MA, PhD (British Columbia) J
K. Westhues, BA (Conception), MA, PhD (Vanderbilt)
A. Wipper, BA, MA (McGill), PhD (California, Berkeley)

Assistant Professor
F. Desroches, BA (Waterloo), MA (Toronto), PhD (Waterloo) J

Associated Faculty

Professors
G.L. DeGré, BSS (City College, N.Y.), MA, PhD (Columbia), Cated Hon (San Marcos, Lima) (Ret.)
J. Zuzanek, MA (Moscow State Univ.), CSC, PhD (Charles Univ. Prague), Recreation

Associate Professors
B. McPherson, BA, MA (Western Ontario), PhD (Wisconsin), Kinesiology

Assistant Professor
N. Theberge, BA (Massachusetts), MA (Boston), PhD (Massachusetts), Kinesiology

Course Descriptions

Sociology

Sociology 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(l), 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.

Sociology 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.

Sociology 103 2C 0.5
Canadian Society
An introductory survey of Canadian society. This course will examine issues in the socio-historical development of Canadian society, its present social structure, organizations and ideologies.
Course Descriptions
Sociology

SOC 104 2C 0.5
Social Psychology and Everyday Life
Introducing students to symbolic interaction, a sociological social psychology, this course examines: the impact of culture on socialization experiences; the development of self-identities and social reputations; and interaction patterns in a variety of casual, occupational and deviance contexts.

SOC 106 2C 0.5
Collective Behaviour
The sociological analysis of the behaviour of crowds, mobs, publics and related phenomena and their relationships to social organization and social change.

SOC 107 2C 0.5
Social Structure and Character
This course will examine the connections between organized social life and types of personalities found in it. Examples will be drawn from contemporary as well as historical situations.

SOC 190 2C 0.5
Sociology of Deviant
A study of social change and innovation from the perspective of the role of individuals who dissent from the dominant norms and institutions. Jesus, Conrad Grebel, Marx, Woodsworth and King will be considered among others. Offered at Conrad Grebel College.

SOC 200 F.W 2C 0.5
Marriage and the Family
A survey of sociological perspectives on marriage and the family in urban-industrial societies. Special attention is given to marriage and the family in Canada. Comparisons with U.S. and Britain will be undertaken. Prereq: SOC 101 or consent of instructor. Also offered at St. Jerome's College.

SOC 204 F.W 2C 0.5
Sociology of Adolescence
The social definitions of adolescence in cross-cultural and historical perspective. Social roles of adolescence in the institutional structures of urban-industrial societies with special emphasis on the family, education, and the economy. The relationship of adolescents' social roles to processes of social change and stability. Prereq: SOC 101 or consent of instructor.

SOC 206 F.W 2C 0.5
Sex Roles
An examination of male and female roles in contemporary Canadian society. Current and past roles of both sexes in different societies are considered. Selected topics of interest include sex role identity and its development, male role change, media images of men and women and men's and women's liberation. Prereq: SOC 101 or consent of instructor.

SOC 207 S.F 2C 0.5
Sociology of Education
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. Offered at Conrad Grebel College.

SOC 208 F.W 3C 0.5
Education and Native Peoples
An examination of some of the limitations and alternatives to formal schooling employed mainly by Canadian and Australian indigenous groups (Indian, Inuit, and other aboriginal groups). Special emphasis is placed on skill training and the group's search for identity. Offered at St. Jerome's College.

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 2C 0.5
Social Inequality
Analysis of social classes in society including their basis for development, composition and consequences for society. Special attention is given to social stratification in Canada. Prereq: SOC 101 or consent of instructor.

SOC 219 3C 0.5
Catholic Sociological Thought
An analysis of the distinctive emphasis and perspectives which characterize contemporary sociological theory in Catholic cultures. The course will focus on theories of the family, the community, human sexuality, politics and the economy. Offered at St. Jerome's College.

SOC 220 F 2C 0.5
Sociology of Business Management
A study of the structure, stratification and social roles in the organization, operation and management of small businesses. Attention will also be given to decision making, labour-management relations, the institutionalization of value systems, and job satisfaction. Offered at Conrad Grebel College.

SOC 222 F.W 2C 0.5
Juvenile Delinquency
A systematic analysis and criticism is presented of biological, psychological, psychoanalytical and sociological theories of juvenile delinquency. Attention is given to statistics and contemporary research with special emphasis on the distribution and types of delinquent subcultures. Prereq: SOC 101 or consent of instructor.

SOC 223 S,F 2C 0.5
Deviance: Perspectives and Processes
The deviance-making process is examined in a variety of social contexts. Examines the emergence of rules and control agencies, the processes by which persons become involved in deviant activities, and the contingencies affecting persons' careers as deviants. Prereq: SOC 101 or consent of instructor. Also offered at Renison College.

SOC 224 2C 0.6
Law and Order: Regulating Deviance
Focusing on the 'processes and problems of social control', this course examines the conditions affecting the emergence of legal norms; the enforcement of criminal law; and the processing of offenders. Prereq: SOC 101 or consent of instructor.

SOC 225 S.W 3C 0.5
 Sects, Cults and New Religious Movements
An analysis of minority religions considered deviant by the dominant society such as the Amish, Mormons, and Jehovah's Witnesses, with special consideration of the recent new religious movements including Unification (Moonies), Scientology and Krishna consciousness. Cross-listed as RS 221. Offered at Conrad Grebel College.
SOC 227 2C 0.5
Crime and Society
An analysis and criticism of the major theories of criminal behaviour. Emphasis is given to the relationship between social structure and criminal behaviour; types of criminal behaviour such as drug addiction statistics and contemporary research. Special attention is given to Canadian data. Prereq: SOC 101 or consent of instructor.

SOC 228 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 249 3C 0.5
Sociology of Mental Illness
An examination of sociological research and theory in the field of mental illness, especially as it relates to the family. Such topics as psychiatric hospitals, public attitudes and social stigma, aftercare and rehabilitation, and the epidemiology of mental illness will be examined. Prereq: SOC 101 or permission of the instructor.

SOC 250 2C 0.5
Migration and Society
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. Prereq: SOC 101 or consent of instructor.

SOC 251 2C 0.5
Population in Canadian Society
Study of the basic demographic processes in the population of Canada. Demographic implications for selected social institutions. Use of Canadian enumeration and registration data. Emphasis on immigration and immigration policy. Prereq: SOC 101 or consent of instructor.

SOC 252 2C 0.5
Comparative Social Structure
General theoretical and methodological issues facing comparative sociology; comparative methods at work in the treatment of Western and non-Western societies (including Canada). Prereq: SOC 101 or consent of instructor.

SOC 253 2C 0.5
Third World Development
An analysis of issues of social and economic development in selected areas of the Third World, including Africa, Asia, and Latin America. Prereq: SOC 101 or consent of instructor.

SOC 254 2C 0.5
Ethnic and Racial Relations
Relations between different racial and cultural groups, analysis of majority-minority group status with special reference to Canada. Prereq: SOC 101 or consent of instructor. Also offered at St. Jerome's College.
SOC 264 2C 0.5
Sociology of Religion
Religion is defined broadly and its relation to phenomena like totalitarian movements, psychoanalysis, and drug experience examined. The features common to all religions are explained, viz., myth, dogma, church, ritual, ethics, and religious experience.
Prereq: SOC 101 or consent of instructor.
Also offered at St. Jerome's College.

SOC 265 2C 0.5
Political Sociology
The sociological analysis of the institutionalization of power, political movements, parties, conflict and its accommodation.
Prereq: SOC 101 or consent of instructor.

SOC 267 2C 0.5
Sociology of the Contemporary University
How have recent demographic and economic changes in North America affected the organization and goals of higher learning? This course explores organizational crises and various attempts at containing and managing them.
Prereq: SOC 101 or consent of instructor.

SOC 271 2C 0.5
Introductory Sociological Theory
An examination of the object and function of sociological theory in social research. Types of sociological theories. Discussion of selected classics of sociological theory.
Prereq: SOC 101 or consent of instructor.

SOC 275 F 2C 0.5
The Mennonites as a Sociological Community
A case study of the Waterloo County Mennonites as a social system. Attention is paid to a methodology for studying a religious-cultural group by engaging in direct field studies. The community, charter resources, integration, family system, life ceremonies, adaptation to change, and survival techniques will be examined.
Prereq: An introductory social science course.
Offered at Conrad Grebel College.

SOC 280 2C, 2L 0.5
Social Statistics and Social Indicators
A first course in sociological statistics, sampling, central tendency, probability, covariance, as illustrated in specifically sociological data.
Prereq: SOC 101 or consent of instructor.

SOC 281 F C 0.5
Methods I
An introductory survey of the research techniques employed by sociologists. The formulation of research designs appropriate to various kinds of intellectual problems in social science is stressed.
Prereq: SOC 101 or consent of instructor.

SOC 282 W 2C 0.5
Methods II
Continuation of Methods I. The course involves a field project, together with classroom work emphasizing the critical evaluation of research reports.
Prereq: SOC 101 or consent of instructor.

SOC 286 W 2C 0.5
Sociology of Ecology
A study of the interaction between social organization and ecological factors such as pollution, energy and land resources.
Offered at Conrad Grebel College.

SOC 302 2C 0.5
Comparative Sociology of Youth
The aim of this course is mainly to study the prevailing patterns and resulting problems connected with the ways in which different societies react to the emergence of new generations. Concentrates on an analysis of the 1960s.
Prereq: SOC 101 or consent of instructor.

SOC 287 W 2C 0.5
Problems in Contemporary Education
A study of problems arising from the interplay between institutionalized education and the forces of rapid social change in the contemporary society. It emphasizes the changing roles of the learners and instructors and social dimensions of newer learning theories and programs. Themes will be selected and studied in depth on a seminar basis.
Prereq: SOC 101 and 207.
Offered at Conrad Grebel College.

SOC 326 W 2C 0.5
Issues in Third-World Development
A study of, and sensitization for possible careers in, Third-World development and modernization with special emphasis on poverty issues, minority group problems and the roles of governmental and voluntary agencies.
Prereq: SOC 325 or permission of the instructor.
Offered at Conrad Grebel College.

SOC 329 2C 0.5
Crime as Business
Examines the inter-relatedness of crime and business, looking not only at the extent to which (1) crime represents business for its practitioners and (2) the criminal activities of legitimate business people, but also (3) the agencies regulating crime.
Prereq: SOC 101 and one Sociology course in the 220 series.

SOC 333 2C 0.5
Canadian Multiculturalism
A seminar dealing with multicultural attitudes and beliefs in Canadian society, especially within the majority English and French Canadian populations.
Prereq: An introductory course in Social Science.

SOC 336 2C 0.5
Sociology of Professions
An examination of the distinctive nature of professions, professional recruitment, socialization and identification; professional careers; the professionalization of occupations; relationship to government; professional specialization; status, power and mobility of professionals.
Prereq: SOC 101.

SOC 340 2C 0.5
Complex Organizations
Examines the role of large-scale organizations in industrial society, and their impact and influence. Illustrations will be drawn from commerce and industry, as well as education, health services and government.
Prereq: SOC 101 and SOC 242.

SOC 342 2C 0.5
Sociology of Industrial Relations
Using sociological concepts and theories, the course will examine the nature of the relationship between
employers and employees, current issues facing unions and management, and the character of accommodation which may be realized between the two. 
Prereq: SOC 101 and SOC 242.

SOC 343 2C 0.5
Sociology of Health Care
Examination of the organizations which provide health care, including assumptions under which they operate, interactive roles played by all members, including patients, alternative arrangements for providing health care, and the social positions held by health professionals. 
Prereq: SOC 101 and SOC 248

SOC 344
Sociology of Aging
An introduction to individual and population aging. Topics discussed include: aging from a historical and comparative perspective; aging in subcultures; aging and the social structure; aging and social processes; aging and the environment; work and retirement; and aging and leisure patterns.
Prereq: SOC 101 and one other 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. 
Prereq: Two term courses in sociology. Cross-listed as REC 301.

SOC 348 3C 0.5
Sport in Society
An introduction to the sociology of sport. Utilizing the major frames of reference of the social sciences, the function of sport in contemporary society is examined. 
Prereq: SOC 101 and one other Sociology course. Cross-listed as REC 303 and KIN 452.

SOC 349 3C 0.5
Sport in Society
An introduction to the sociology of sport. Utilizing the major frames of reference of the social sciences, the function of sport in contemporary society is examined. 
Prereq: SOC 101 and one other Sociology course. Cross-listed as REC 303 and KIN 252.

SOC 354 2C 0.5
World Population Problems
Comparative Analysis of population problems across societies. Focus is on social institutions and their relationships to population. Emphasis on fertility and family planning. 
Prereq: SOC 101 and SOC 253.

SOC 364 2C 0.5
Social Change
A systematic review and analysis of sources, patterns, processes, and consequences of social change in developing countries, the role of ideas, and the breakdown and reorganization of social structure. 
Prereq: SOC 101 and 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 370 F 2C 0.5
Sociology of Law
Special attention will be paid to the growing public awareness of the failure of law to provide justice or social control in a 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 or by permission. Offered at Conrad Grebel College.

SOC 371 3C 0.5
Philosophy of Social Science
Problems about the fundamental methods and aims of the social sciences generally, the problems specific to Psychology, Sociology, Political Science, etc., and their relations to one another will be considered. 
Prereq: Some previous work in a Social Science or in Philosophy. Cross-listed as PHIL 362.

SOC 377 J 2C 0.5
Studies in the Sociology of the Mennonites
This seminar will devote attention to research methods, sociological theory and interdisciplinary approaches to the study of Mennonite communities and culture. 
Prereq: Permission of the instructor. Offered at Conrad Grebel College.

SOC 380 2C 0.5
Qualitative Methods: Field 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 260.

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.
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 Complutenis (Madrid)

Assistant Professor
E. Barón, BA, MA PhD (Montreal)

Participating Adjunct Faculty at Wilfrid Laurier University

Professors
N.H. Taylor, President and Vice Chancellor Emeritus, Wilfrid Laurier, BA, MA PhD (Toronto)
A.A. Borras, BA (Kentucky), MA (Indiana), PhD (Pennsylvaniia State)

Assistant Professor
M. Rainhille, BA, MA (Carleton), PhD (Toronto)

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

SPAN 101 F W 3C, 0.5 Introduction to Spanish 1
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. Cannot be taken concurrently with SPAN 111.
(WLU 71/151-40)

SPAN 102 W S 3C, 0.5 Introduction to Spanish 2
A continuation of SPAN 101. Prereq: SPAN 101 or consent of Department.
(WLU 102/152-04)

SPAN 111 F 3C, 0.5 Conversational Spanish
Intensive oral and aural training with particular emphasis on comprehension and speaking. Intended for students with no knowledge of Spanish. Limited to a maximum of 20 students. Cannot be taken concurrently with SPAN 101.
(WLU 111/161-40)

SPAN 201A F 3C, 0.5 Intermediate Spanish 1
For students with some knowledge of Spanish. Seeks to reinforce the language, both oral and written, through selections from literary works and grammar review. Language laboratory also used to increase understanding and speaking skills. Prereq: SPAN 102 or consent of Department.
(WLU 121/171-30)

SPAN 201B W 3Cl, 0.5 Intermediate Spanish 2
A continuation of Spanish 201A. Prereq: SPAN 201A or consent of Department.
(WLU 122/172-03)

SPAN 203 F 3C, 0.5 Spanish Civilization 1
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 205 F 3C, 0.5 Survey of Spanish Literature 1
Readings of major authors and study of the main literary trends from the middle ages to the eighteenth century. Prereq: SPAN 201B.
(WLU 205/255-30)

SPAN 206 W 3C, 0.5 Survey of Spanish Literature 2
A continuation of SPAN 205 from the eighteenth century to the present. Prereq: SPAN 205.
(WLU 206/256-03)

SPAN 217 F 3C, 0.5 Spanish American Civilization 1
A survey of the geography and history of Spanish America from pre-Columbian times to the present. Taught in English.
(WLU 223/273-30)
Course Descriptions
Spanish

SPAN 218 W 3C 0.5
Spanish American Civilization 2
A survey of the art, music and literature of Spanish America from pre- Columbian times to the present. Taught in English.
(WLU 232/263-03)

SPAN 227 F 3C 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 227.
(WLU 208/258-30)

SPAN 228 W 3C 0.5
Survey of Spanish American Literature 2
A continuation of SPAN 227.
Prereq: SPAN 227.
(WLU 209/259-03)

SPAN 251A F 3C 0.5
Composition and Conversation 1
Intensive language study based on literary texts, including vocabulary, grammar and syntax. Essay writing, discussion.
Prereq: SPAN 218 or consent of the Department.
(WLU 211/261-30)

SPAN 251B W 3C 0.5
Composition and Conversation 2
A continuation of SPAN 251A.
Prereq: SPAN 251A
(WLU 212/262-03)

SPAN 266 W 3C 0.5
The Spanish American Short Story
Selected stories from outstanding writers of the nineteenth and twentieth centuries in Spanish America.
(WLU 214/264-03)

SPAN 304 F 2C 0.5
Romanticism in Spain
Drama: preliminary study of Moratin's Neo-Classic 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.
(WLU 305/355-02)

SPAN 311 Y 2C 1.0
Applied Spanish Stylistics
A workshop-type course designed to develop advanced oral-aural skills; consecutive translation and composition. Written and oral translation of journalistic material. Frequent class presentations are required of students.
Prereq: SPAN 311A/311B.
(WLU 311/461-22)

SPAN 324 F 2C 0.5
Contemporary Spanish Theatre and Poetry
(WLU 324/474-20)

SPAN 325 W 2C 0.5
Contemporary Spanish Novel
Influences on the novel and literary tendencies, with stress on Céa, Matute, Lafont, Angel de Lera and Carlos Rojas.
Prereq: 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 García, Herrera, Gongora, 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: Gariñet, Maragall, Masis, Pidal, D'Ors. with special consideration of Madariaga, Unamuno and Ortega.
Prereq: SPAN 306.
(WLU 316/466-02)

SPAN 333 F 2C 0.5
Modern Spanish American Poetry
A study in depth of major poet 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.S 2T 0.5
Special Topics in Hispanic Studies
By special arrangements, an individual student or a small group of students will follow a course of study under the supervision of a faculty member.
(WLU 317/467-02)

SPAN 351A F 2C 0.5
Advanced Composition and Conversation I
Writing of essays and discussion based on literary texts, including vocabulary, grammar and syntax. Essay writing, discussion.
Prereq: SPAN 218 or consent of the Department.
(WLU 301/351-20)

SPAN 351B W 2C 0.5
Advanced Composition and Conversation 2
A continuation of SPAN 351A.
Prereq: SPAN 351B.
(WLU 302/352-02)

SPAN 387 F 2C 0.5
Women and Spanish American Literature
A study of selected works by women from the Baroque to the twentieth century with focus on their literary quality and the varying positions of women from early times to the present.
(WLU 320/370-20)
## Course Descriptions

### Spanish

#### Systems Design Engineering

**SPAN 445 W 2C 0.5**

**History of the Spanish Language**

Origins and development from pre-Roman substratae through vulgar Latin to old Spanish and thence to modern Spanish. Basic sound and grammatical changes as well as word order and vocabulary.

Prereq: SPAN 351A

(WLU 312/462-20).

**SPAN 495 W 2C 0.5**

**The Novel in Mexico**

This course will trace the development of the Mexican Revolution of 1910.

Prereq: SPAN 227

(WLU 328/478-20).

**Not Offered 1983-84:**

- SPAN 204 Spanish Civilization 2
- SPAN 285 The Spanish Short Story
- SPAN 354 The Spanish American Essay
- SPAN 388 Aspects of Contemporary Spanish American Theatre
- SPAN 389 Women in Contemporary Spanish American Theatre
- SPAN 446 Medieval Spanish Literature
- SPAN 497 The Novel in South America

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### Department of Systems Design Engineering

**Professor, Chairman**

- K. Huseyin, MSc (Istanbul), PhD (London), DSc (Eng.),(London), PEng

**Professor, President of the University**

- D.T. Wright, BASc (Toronto), MS (Illinois), PhD (Cambridge), DEng (Carleton), LLB (Brock), DSc (Memorial), LLB (Concordia), PEng

**Professor, Associate Dean, Undergraduate Studies**

- P. H.O.N. Roe, BASc (Toronto), MASC Ph.D (Waterloo), PEng

**Associate Professor, Associate Chairman, Graduate Studies**

- K. Singhal, B.Tech (IIT Kharagpur), MS, EngScD (Columbia), PEng

Associate Professor, Associate Chairman, Undergraduate Studies

M. Chandrashekar, B.Tech (IIT Kanpur), MASC, PhD (Waterloo), PEng

Professors

- T.M. Fraser, MB, ChB (Edinburgh), MSc (Ohio State), LMCC, FACPM, PEng
- H.K. Kesavan, BSc, BE (Mysore), MS (Illinois), PhD (Michigan State), PEng
- S.S. Sengupta, MA, DPhil (Calcutta)
- G.N. Soulsi, BASc (Toronto) PEng
- D.A. Winter, BSc (Queen's), PhD (Dalhousie), PEng
- A.K.C. Wong, BSc, MSc (Hong Kong), PhD (Carnegie), PEng

Associate Professors

- K.W. Hipel, BASc, MASC, PhD (Waterloo), PEng
- M.E. Jernigan, SB, SM, PhD (Massachusetts Institute of Technology), PEng
- G.F. Reibideau, BA, MA (Wisconsin), PhD (Purdue)
- G.I. Savage, BASc, MASC, PhD (Waterloo), PEng
- P.L. Seeley, BASc (Toronto)
- S. Toida, BS (Tokyo), MSc, PhD (Illinois)
- B.L. Willis, BASc, MASC, PhD (Waterloo), PEng

Assistant Professors

- C.K.G. Hahn, MASC, MSc (Waterloo)
- H.C. Shen, BMaths (Hong Kong), MSc (Toronto), PhD (Waterloo)

**Adjunct Faculty**

- M.L. Constant, BSc (Toronto)
- M. Kamel, BSc (Alexandria), MSc (McMaster), PhD (Toronto)

Faculty members holding cross appointments to Systems Design Engineering from:

- Biomedical engineering

**Course Descriptions**

**Introductory Notes**

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 field of the subject matter of the course, according to the following codes:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Topics in applied mathematics</td>
</tr>
<tr>
<td>2</td>
<td>Computer systems</td>
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<tr>
<td>3</td>
<td>Socio-economic systems</td>
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<tr>
<td>4</td>
<td>Human systems</td>
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<tr>
<td>5</td>
<td>Physical systems</td>
</tr>
<tr>
<td>6</td>
<td>The design of engineering systems</td>
</tr>
<tr>
<td>7</td>
<td>Communication and information systems</td>
</tr>
<tr>
<td>8</td>
<td>Engineering sciences</td>
</tr>
<tr>
<td>9</td>
<td>Laboratories</td>
</tr>
</tbody>
</table>

The majority of Systems Design courses are offered 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.

**SY DE 101/102 F.S 1C 0.0**

Tutorials:

Systems Design first year students will meet with a faculty member designated as their class professor. Performance in assignments, conceptual difficulties with courses, interrelation of coursework, later work and engineering practice will be discussed. Non-credit courses.

**SY DE 111 F 3C.1T 0.5**

**Calculus 1**


**SY DE 112 S 3C.1T 0.5**

**Calculus 2**

The use of graphics as an aid to idea questions of systems analysis and design. Principles of approach to value and utility. Solutions, feasibility analysis, solution planning, innovation, creation of design.

SY DE 161 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,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.

SY DE 181 F 3C,1T 0.5
Statics

SY DE 182 S 3C,1T 0.5
Dynamics

SY DE 184 S 2C,1T 0.5
Introduction to Chemical Systems
Concepts of electronic structure, bonding; shapes of molecules, especially in covalent molecules; reactivity, energetics, chemical behaviour as a consequence. Acidity, basicity and buffer solutions. Organic Chemistry - systems of nomenclature, functionality and common relations. Important systems of natural and synthetic polymers and biomolecules.

SY DE 201/202 W,F 1C 0.0
Tutorial
Systems Design second year students will meet a faculty member designated as their class professor. Performance in assignments, conceptual difficulties with courses, inter-relation of coursework, later work and engineering practice will be discussed. Non-credit courses.

SY DE 211 W 3C,1T 0.5
Applicable Mathematics for Systems Design
First order differential equations, integrating factor, higher order differential equations. Complex variables, forced and free solutions to differential equations, transient and steady state solutions, applications. Laplace transforms and applications.

SY DE 212 F 3C,1T 0.5
Applicable Mathematics for Systems Design 2
Models and analysis of linear systems. Discrete time systems, continuous time systems; difference and differential equations; impulse and frequency response. Complex frequency, functions of complex variables, transform domain techniques: Z transform; Fourier analysis, Laplace transform. Transfer function and frequency response, frequency domain analysis of linear systems; sampling theory, stability, and linear filters.

SY DE 213 W 3C,1T 0.5
Theory and Applications of Probability

SY DE 214 F 3C,1T 0.5
Theory and Applications of Statistics

SY DE 252 F 3C,1T 0.5
Physical Systems 1
Component models, interconnection models, systems equations and their rank properties and solutions. These concepts are developed with respect to electrical systems.

SY DE 261 W 1C,3L 0.5
Systems Design Workshop 1
A problem and project oriented course wherein emphasis is placed on designing and presenting creative solutions to real-life problems. The problems are related to cover all disciplines. Both the problems and the student's work are expected to increase in sophistication through the Workshop course sequence.

SY DE 262 F 1C,3L 0.5
Systems Design Workshop 2
A continuation of the Systems Design Workshop sequence.

SY DE 281 W 3C,1T 0.5
Mechanics of Deformable Solids

SY DE 283 W 3C,1T 0.5
Electricity, Magnetism and Networks
Introduction to the fundamental laws of electricity and magnetism; properties of dielectrics, conductors and semiconductors and terminal characteristics of passive and active components;
Kirchoff's laws; step response of first
and second order networks; sinusoidal
steady state analysis using phasors.
Applications.
SY DE 292 F 1C,3L 0.5
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.
SY DE 301/302 S,W 1C 0.0
Tutorial
Systems Design third year students will
meet with a faculty member designated
as their class professor. Performance in
assignments, conceptual difficulties
with courses, interrelation of
coursework, later work and engineering
practice will be discussed. Non-credit
courses.
SY DE 311 S 2C,1T 0.5
Systems Operations 1
Deterministic operations research
models. Topics will include:
mathematical techniques of
unconstrained and constrained
optimization, followed by the
construction, evaluation and
applicability of various models in
allocation, inventory, replacement,
sequencing and related problems.
SY DE 322 W 3C,1T 0.5
Computer Simulation of Systems
System modelling, system simulation
techniques, digital computer methods,
fundamentals of analog computation,
digital simulation and analog
computers; block-oriented languages,
introduction to systems simulation
using hybrid computers.
SY DE 332 W 2C,1T 0.5
Mathematical Programming
Theory and algorithms for non-linear
constrained optimization problems:
convex set, convex functions, convex
programming, Kuhn-Tucker conditions,
duality, quadratic programming, quasi-
Newton methods, geometric
programming, dynamic programming.
SY DE 333 S 3C 0.5
Applied Statistics
Multiple regression analysis.
Assumptions, use of indicator variables,
variable selection techniques, analysis of
variance. Introduction to experimental
design, including block
designs, factorial arrangements of
 treatments.
SY DE 341 S 2C,1T 0.5
Industrial Ergonomics
Man-machine function and human
reliability; human stress and adaptation;
work and skill in industry and the
operational environment; human factors
in industrial safety and occupational
hygiene.
SY DE 351 S 3C,1T 0.5
Physical Systems 2
The subject matter is similar to SY DE
252 except that the development is
based on other physical systems such as
mechanical and hydraulic systems.
Mixed nodal, state formulation and
solution. Relationship to classical
approaches to modelling of systems
from other physical systems.
SY DE 352 W 2C,1T 0.5
Algorithms for Computer-Aided
Systems Analysis
Techniques for tree selection,
manipulation of topological information,
evaluation of the exponential function
of a matrix, etc. The emphasis is on the
algorithms but students will be expect-
ted to implement them on the com-
puters. A survey of the capabilities of exis-
ting programming for system analysis.
SY DE 353 S 3C,1T 0.5
Introduction to Linear Control Systems
Application of systems theory to the
problems of control. The course inte-
grates this study with an exposition of
classical control theory.
SY DE 362 W 1C,3L 0.75
Systems Design Workshop 3
A continuation of the Systems Design
Workshop sequence for third year
students.
SY DE 364 W 3C,1T 0.5
Manufacturing Science
The generation and forming of surfaces.
Concepts and design of tooling for
manufacturing processes. The influence
of materials on processes and choice of
processes on design. The behaviour of
materials in processes. Process limi-
tation, tolerances, accuracy, surface
finish and economics. Costs in
manufacturing.
SY DE 366 W 2C,1T 0.5
Aesthetic and Perceptual Aspects of
Design
Presentation and discussion of appro-
 priate and possible methods for the de-
signing of systems or artifacts in which
aesthetic characteristics and visual form
are primary requirements of the design.
SY DE 372 W 3C,1T 0.5
Introduction to Pattern Recognition
Pattern recognition as a process of data
analysis. Pattern features as compo-
nents in a random vector representa-
tion. Classification techniques; distance
measures in feature space, probabilistic
(Bayesian) decision theory, linear discrimi-
nants. Clustering and feature
 extraction. Applications: optical charac-
ter recognition, speech recognition,
industrial robot vision, medical diag-
nosis, remote sensing and satellite
image analysis, fault detection and
diagnosis in complex systems such as
nuclear reactors.
SY DE 381 S 3C,1T 0.5
Thermodynamics
An introductory course in engineering
thermodynamics structured for students
in Systems Design. Classical
thermodynamics is presented as the
systematic study of energy: its use,
degradation, and waste. Applications
focus on problems of energy and
environment. The concepts of statistical
thermodynamics are introduced briefly
and their connections with information
theory are described.
SY DE 382 W 3C,1T 0.5
Fluid Mechanics
Fundamental concepts in systems using
fluid flow. Basic treatment of statics,
kine matics and dynamics of fluids.
Conservation laws. Similarity and
dimensional analysis. Brief
introductions to boundary layers, lift
drag, ideal and compressible flow.
SY DE 383 S 3C,1T,2L 0.5
Materials Engineering
A introduction to the understanding of
the properties and applications of
engineering materials. Atomic bonding
and packing; crystal defects and
microstructure; elasticity, plasticity,
strength and fracture; strengthening
methods and transformations; fast
fracture, toughness, fatigue and creep;
oxidation and corrosion; case studies of
materials in design.
Course Descriptions
Systems Design Engineering

SY DE 391 S 1C,3L 0.5
Systems Design Laboratory 2
Analog conditioning systems: attenuation; amplification, oscillation, modulation and detection; linear filters. Input-output relationships, transfer functions and frequency response of linear systems. Application to measurement instrumentation.

SY DE 392 W 1C,3L 0.5
Systems Design Laboratory 3
This course serves as a focus for the complete lab program sequence. The emphasis is on major experiments which are themselves complete systems requiring the application of previous acquired knowledge in the areas of sensing, synthesis, control, measurement and evaluation. Experiments are drawn from the digital control or computer control environment and from the analog control environment.

SY DE 401/402 F,W 1C 0.0
Tutorial
Systems Design fourth year students will meet with a faculty member designated as their class professor. Conceptual difficulties, the interrelation of course work and engineering practice will be discussed. Non-credit courses.

SY DE 411 F 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 floor 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 modeling 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 component 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; modelling the field characteristics; formulations and computer solutions; applications of multi-terminal representations.

SY DE 458 W 3C,1T 0.5
Large Scale Engineering Systems
Maximum Entropy Principle (MEP), Jayne's formalism, applications to thermodynamics, derivation of some common probability distributions on the basis of MEP, spectral analysis and state estimation. The intent of the course is to spell out a systems methodology for probabilistic systems from an information-theoretic point of view.

SY DE 461 F 1C,5L 0.5
Systems Design Workshop 4
A continuation of the Systems Design Workshop sequence for fourth year students.
Course Descriptions
Systems Design Engineering
Urban & Regional Planning

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 488 W 3C,1T 0.5
Structures and Design
Structural forms. Structural requirements. Statically determinate and indeterminate structures. Basic theorems of linear elastic structures. Methods of analysis: slope-deflection, moment distribution, etc. 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.

SY DE 525 F,S 3C 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.

SY DE 535 F,S 3C 0.5
Selected Topics for Socio-Economic Systems Design
This course is intended for students who, with little prior background, are interested in enlarging their knowledge of Systems Design. The emphasis is on quantitative methods applicable to the design of engineering systems wherein the criteria concerning social, environmental and economic considerations are important. Both deterministic and probabilistic situations are discussed.

SY DE 543 W 3C 0.5
Human Engineering
Man-machine systems concepts: functional man-machine interfaces; presentation of required operating information; control/display design parameters; workspace configuration and dimensioning; human engineering analysis and simulation; human performance experimentation and human engineering measurements during systems R&D evaluation.

SY DE 544 F,S 3C 0.5
Ergonomics
Significance of ergonomics; man-machine-environment complex; physiology of work, human information processing, fatigue, circadian rhythms and the health consequences of shift work; environmental factors in industry; noise, vibration, vision, illumination, heat, cold, toxic chemicals, industrial safety.

SY DE 555 F,S 3C 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, Telegen's theorem, multi-terminal representations, piecewise analysis of systems through subsystems, multiport representations, formulation and solutions of state models, introduction to advanced topics.

SY DE 565 W 3C 0.5
Design Morphology and Organization

SY DE 567 F 3C 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.

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
G.G. Mulamoottil, BSc (Mysore), MSc (Bombay), PhD (Delhi)

Professor, Associate Dean, Graduate Affairs
L.O. Gertler, BA (Queen's), MA (Toronto), MCIP

Associate Professor, Associate Dean, Special Programmes
L.R.G. Martin, BA (Queen's), MA, MRP, PhD (Syracuse), MCIP

Associate Professor, Undergraduate Officer
S. Herzog, BArch (Toronto), MRAIC

Professional Liaison Officer
H.T. Lemon, FCIP

Professors
H.S. Coblenz, BA Hons (Durham), MRP (North Carolina), MCIP, FRTPI, AICP, FSS, MIES
R.S. Dorney, BSc, MSc, PhD (Wisconsin), MCIP
K. Izumi, BArch (Manitoba), MCP (MIT), ARCA, FRAIC, CMAOP
C.K. Knappar, BA Hons (Sheffield), PhD (Saskatchewan)
R.R. Kruiaer, BA, MA (Western Ontario), PhD (Indiana)
P.H. Nash, BA, MA (UCLA), CE (Granoble), MCP, MPA, PhD (Harvard), AICP, MCIP
L.H. Russwurm, BA, MA (Western Ontario), PhD (Illinois)
J.B. Thoberge, BScA (Guelph), MSc (Toronto), PhD (British Columbia)
S.M. Weaver, BA, MA, PhD (Toronto)

Associate Professors
J.T. Horton, BA (Wheaton), MA (Northwestern)
J. Levy, BA (Waterloo Lutheran), BPE (Waterloo), MSW (Waterloo Lutheran), PhD (Waterloo)

Assistant Professor, Associate Director
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J.B. Thoberge, BScA (Guelph), MSc (Toronto), PhD (British Columbia)
S.M. Weaver, BA, MA, PhD (Toronto)

Associate Professors
J.T. Horton, BA (Wheaton), MA (Northwestern)
J. Levy, BA (Waterloo Lutheran), BPE (Waterloo), MSW (Waterloo Lutheran), PhD (Waterloo)
Course Descriptions

Urban and Regional Planning

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

(Environmental Studies course descriptions (ENV S) begin on page 318.)

PLAN 100 Y 4C 1.0
Introduction to Urban and Regional Planning Concepts and Techniques

An introduction to the regional city; the purpose and scope of urban planning; the planning process and decision-making in a democratic society. Particular attention is directed to geographical aspects of design planning: identification of objectives and constraints, conduct of basic surveys and analysis, plans and policies preparation, evaluation and implementation. 

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 current 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 3Crd 0.5
Graphic for Planning

Basic instruction in graphic techniques used in planning. Emphasis will be placed on the use of graphics for the communication of ideas. 

Prereq: Planning students or consent of instructor. Estimated cost to student: $50.

ENV 8 195A
Introduction to Environmental Studies

ENV S 198B
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. For planning students only.

PLAN 231 F 3C 0.5
Citizen Involvement, Planning and Social Change

The theory and practice of citizen involvement and social change in relation to planning and policy formulation. Included are the ideology of involvement, social change and intervention strategies, policy planning and local area planning. Canadian case materials are emphasized, and there is some skills training. 

Prereq: SOC 101, Planning students; students from other Departments with consent of instructor.

PLAN 232 F 4C 0.5
Rural Planning and Development

Advanced analysis of the process followed for rural planning and development in Canada and other selected countries. Problems and their solutions as noted in various jurisdictions are presented. Emphasis is placed on government approaches to planning and development. 

Prereq: Second year Planning students or consent of instructor.
Course Descriptions
Urban and Regional Planning

ENV S 252
Media Tools for Environmental Studies

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.

ENV S 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 W 2C,2wkshp 0.5
Regional Planning and Development
The relationship of economic planning to regional planning. Theory and practice of regional planning and development to urban-centred, broad socio economic, and frontier regions. A series of workshops focus upon the social and economic problems of a particular Canadian region and the role of federal, provincial and local governments in formulating and applying remedial policies in other nations.
Prereq: One of PLAN 100, 156 or consent of instructor.

PLAN 270 W 2C 0.5
Concepts and Ideas in Contemporary Urban Planning
An overview of the modern movements and philosophical roots underlying urban planning and civic design. 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 3R 0.5
Readings and Research Planning
Special readings and research on planning topics chosen in consultation with an instructor. This course gives the opportunity for supervised individual reading and study of planning or related topics in which the student is particularly interested.
Prereq: PLAN 100 or consent of instructor.
Prior to registering for this course students must arrange with a faculty member to serve as advisor.

PLAN 300 Y 6wkshp 1.5
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. There is a field trip directly related to the theme content of PLAN 300 including assignments, follow-up discussion, and presentation of research papers.
Prereq: Third year Planning students only.
Estimated cost to student: $500.

PLAN 301 F 4std 0.5
Urban Design
A study of the design of the environment in urban and regional contexts through lectures and studio projects.
Prereq: Planning students or consent of instructor.

PLAN 307 F,W 2C,1D 0.5
Social Survey Techniques
Social research and the planning process; interview and self-administered surveys; questionnaire design; profile data; data processing; sampling, non-survey data; data processing; sampling, non-survey data collection techniques; practical applications. Cross-listed as GEOG 307.
Prereq: Second or third year Planning students with ENV S 271; other ENV S students with consent of instructor.

ENV S 319
Behavioral Studies

PLAN 316 W,S 3S 0.5
Multivariate Statistics
The theory and application of multivariate statistics, with particular emphasis upon the use of the computer. Cross-listed as GEOG 316.
Prereq: ENV S 271 or consent of instructor.

PLAN 317 F 2C,1L 0.5
Nonparametric Statistics
The theory and application of non-parametric statistics with emphasis upon social science problems. Cross-listed as GEOG 317.
Prereq: ENV S 271 or consent of instructor.

PLAN 318 F 3C 0.5
Spatial Analysis
Advanced quantitative analysis of spatial patterns and interactions. Focus on a selection of techniques from gravity models, linear programming, nearest neighbour analysis, Markov chain analysis, graph theory, simulation and trend surface analysis. Cross-listed as GEOG 318.
Prereq: ENV S 271 or consent of instructor.

PLAN 319 F 2C,1L 0.5
Economic and Social Techniques for Regional Planning
Study and critical appraisal of a selection of descriptive and evaluative regional analysis techniques in common use. Reliability and applicability will be reviewed. Emphasis given to economic considerations of regional development. Discussion of input-output analysis; cost-benefit analysis, planning, programming and budgeting systems; and social area analysis. Cross-listed as GEOG 319.
Prereq: ECON 101, 102, or consent of instructor.
Course Descriptions
Urban and Regional Planning

PLN 330 W 2C, 1S 0.5
Urban Social Planning
This course looks at social planning as a way of attacking urban social problems. Will examine the different types of social planning and the relationship between physical and social planning.
Prereq: SOC 101 or consent of instructor.

ENV 333
Parkland Management

PLN 333 F 2C 0.5
The Sociology of Regional Planning
Power structures, basic social institutions, attitudes and values related to the implementation of regional plans; regional development of human natural resources in Canada and abroad.
Prereq: SOC 101 or consent of instructor.

PLN 344 W 2C, 1S 0.5
Recreation Planning
An exploration of the nature and functions of recreation in modern urban-industrial societies and an analysis of alternative approaches to the planning of recreation opportunities in urban-centred regions. Application of the planning process to rural and urban recreation. Historical development of recreation planning; problems, assumptions and myths in recreation planning; recreation use/needs, resources, allocation, evaluation of services/programs; selected recreation planning issues.

PLN 357 F, W 4C 0.5
Conservation and Resource Management
History of the conservation movement; ecological principles of conservation and resource management. Analysis, use and planning of recreational resources. This course is the same as GEOG 357.
Prereq: ENV 300. Estimated cost to student: $10.

PLN 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: PLN 256 or consent of instructor.

PLN 370 W 2C 0.5
Land Development Planning
An examination of planning issues related to the economics and financing of public and private development projects including shopping plazas, residential subdivisions, and new towns. The course focuses on sources of financing, financial programming, effects of planning decisions on land values, and techniques of project evaluation.
Prereq: PLN 255 or consent of instructor.

PLN 371 W 2C 0.5
Land Development Planning

PLN 372 W 2C 0.5
Land Development Planning

PLN 380 W 2C 0.5
Land Development Planning

PLN 390 W 2C 0.5
Land Development Planning

PLN 391 W 2C 0.5
Land Development Planning

PLN 430 F 3C 0.5
Social Policy Planning
A systems approach to change and development of change strategies by integrating social goals, plans, policies and programs. Case studies are used to measure the quality and performance of plans, policies and programs.

PLN 342 W 2S 0.5
Planning with Native Peoples
A seminar course on problems confronting native peoples in Canada with particular emphasis on basic societal conditions and how community planning and development can assist in ameliorating those conditions in a collaborative manner with reference to the development of social policy.
Prereq: Three-months' work experience and equivalent of introductory anthropology, sociology, psychology or political science.

PLN 435 W 2C, 2std 0.5
Site Planning
A design studio workshop involving site planning projects which integrate design and the natural processes of landscape and climate. Topics will vary.
Prereq: PLN 256, 357 or consent of instructor.

PLN 436 F 3C, 3L 0.75
Urban Spatial Management
Urban areas consist of three broad subsystems: human, built and natural. Urban managers are concerned with interactions between these subsystems. Students are introduced to a range of quantitative analysis tools to be used as aids to urban spatial management. Emphasis is on tools that bridge across the subsystems.

ENV 444
Land Evaluation and Resource Management

PLN 449 Y 3C 1.0
Canadian Urban and Regional Planning:
An overview of the evaluation of Canadian urban and regional planning covering the Canadian Planner's heritage, colonial planning, growth stages of post colonial planning, planning principles with an indepth examination of comprehensive planning and zoning, and the scope of planning education especially in our School.
Prereq: Consent of School.

PLN 454 F 2S 0.5
Professional Practice in Planning
This course is intended for undergraduate planning students in their
final year who will be starting professional practice on graduation. The course discusses professional responsibility, administrative tools and methods, office organization and similar topics. Concepts and techniques in other courses will be dealt with from the point of view of the practitioner.

Prereq: Fourth year Planning students or consent of instructor.

PLAN 456 Y 2C 1.0
Political and Administrative Processes in Urban and Regional Planning
The formulation of urban/regional policy, including planning legislation, in an intergovernmental 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 3S 1.0
Projects, Problems and Readings in Planning
Special planning projects and problems, chosen in consultation with instructor. Prereq: Consent of instructor. A student must arrange with a faculty member to serve as advisor prior to registering for this course.

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.

PLAN 490 Y 2.0
Seniors Honours Essay
Practical experience in the identification of a problem in the planning field. Conduct of individual research into this problem and presentation of the results of this research in a form that meets both professional and academic standards, as further elaborated in a policy statement available from the undergraduate officer.
Prereq: Fourth year Planning students only.

ENV S 500
Professional Development in Environmental Management
Not Offered 1983-84:
PLAN 449 Canadian Urban and Regional Planning

Women's Studies
Assistant Professor, Co-ordinator of Women's Studies
H.S. Fournier, BA (Toronto), MA, PhD (Western Ontario)

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S.K. Johannesen, BA (Evangel College), MA, PhD (Missouri)
G.O. Michalenko, BA, PhD (Saskatchewan)
C.A. Peterson, MS (Alberta), PhD (California-Davis)

Lecturer
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J. Lowe, BSc (Carleton), Recipient of the Distinguished Teacher Award

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Library
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Integrated Studies
D. Dicicco

Participating Faculty, 1982-83

University of Waterloo
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Assistant Professors
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H.S. Fournier, BA (Toronto), MA, PhD (Western Ontario)
A. Myers, BA (Winnipeg), MA, PhD (York)
J. Officer, ARAD (Adv. and ATC) (London) Recipient of the Distinguished Teacher Award

Lecturer
L. Dorney, BA, MA (Louisville) J (Part-time)

Resource person, Integrated Studies
R. Vigier, BIS (Waterloo)
Women's Studies

Core Courses

W S 200
Introduction to Women's Studies
An interdisciplinary survey which introduces students to the questions which have been posed concerning women's nature, roles, problems and accomplishments. Special emphasis will be given to the methodologies which a variety of disciplines in the Arts and Sciences use to examine these questions.

W S 300
Seminar in Women's Studies
A seminar in which students will examine the origins and course of the women's movement from an interdisciplinary perspective, with special attention to topics such as the Canadian woman.

Women's Studies core courses and approved courses are listed in Interdisciplinary Options, Chapter 15.
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vacancy

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G.E. Cross
F.R. McCourt
J.D. Lawson
E. Rhodes
K.D. Srivastava
N. Theberge

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F.W. Simonis
S.W.G. Yip

Graduate Students
N. Goel
W. Halverson

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I.L. Campbell, BA, MSc (Principal, Renison)
F.C. Gérard, MA, BD, STM, PhD (Principal, St. Paul's)

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W.A. McLaughlin, BEng, MS, PhD (Engineering)
J.G. Nelson, BA, MA, PhD (Environmental Studies)
G.S. Kenyon, BPE, MS, PhD (Human Kinetics and Leisure Studies)
J.A. George, MSc, PhD (Mathematics)
R.N. Farvolden, MSc, PhD (Science)
H.H.E. Leipholz, DiplEng, Dr. Ing, Docent HabPEng (Graduate Studies)

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H.F. Davis, PhD (Mathematics)
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K.M. McLaughlin, BA, MA, PhD (St. Jerome's College)
R.J. Sawatsky, BTh, BA, MA, MA, PhD (Conrad Grebel College)
D.P. Crowne, BA, EdM, PhD (At large)
D.A. Davies, BA, PhD (At large)
F.R. McCourt, BSc, PhD (At large)
G.E. Slethaug, BA, MA, PhD (At large)
K.D. Srivastava, BSc, BE, PhD (At large)
R.G. Woolford, BSc, MSc, PhD (At large)
To 1984

J.O. Stubbs, BA, MSc, DPhil (Arts)
G.M. Bragg, BASc, PhD (Engineering)
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B. Forte, PhD, Habil DSc (Mathematics)
G.F. Atkinson, MA, PhD (Science)
J. Theis, BA, MA (St. Jerome's College)
M. Smyth, BA, MA PhD (Ravenson College)
G.E. Cross, MA, PhD (At large)
J.C. Gray, BA, MA, PhD (At large)
B.G. Hutchinson, BE, MSc, PhD (At large)
vacancy, (At large)
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N.J. Ashton, BSc, MS (Human Kinetics and Leisure Studies)
J.D. Lawson, BASc, PhD (Mathematics)
K.A. Woolner, BSc (Science)
P.M. Hinchcliffe, BA, MA, PhD (St. Jerome's College)
R.D. Legge, BA, STB, PhD (St. Paul's College)
I.F. Blake, BSc, MSc, MA, PhD (At large)
M.P. Bryden, BS, MSc, PhD (At large)
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W.U. Ober, BA, PhD (At large)
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To 1983

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D.B. Heath (At large)
S.W.G. Yip (Engineering)
J. McGill, (Human Kinetics and Leisure Studies)

Graduate
N. Goel
A.O. Kostiw

To 1984

Undergraduate
M. Longo, (Arts)
E. Van Groll, (Environmental Studies/Integrated Studies)
vacancy, (Science)
D. Northey (At large)

Graduate
B.C. Reed
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To 1985

vacancy

Board of Governors' Representatives

To 1983

E.I. Macintosh

To 1984

vacancy

To 1985

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  Supervisor
C. Sundberg, RN, PN, BA, MASc
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  Associate Librarian, Systems and Planning
S. Bellingham, BA, MLS
  Rare Books Librarian
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  Assistant to the Librarian, Administration
  vacancy
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  Administrative Assistant to the University Librarian

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  Registrar
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  Associate Registrar, Records
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  Director of Admissions and Student Awards
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P.J. Critchley
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