The Undergraduate Calendar

Except where otherwise indicated, the information in this Calendar applies to the 1989-90 academic year which commences in May, 1989.

The University of Waterloo publishes:

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

And booklets on the following:

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

Those marked * appear in the WATBOX.

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

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

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

Students with Disabilities

The University has developed a number of services to assist students with disabilities. More information is on page 1:14 of this Calendar.

Inquiries

Inquiries and formal applications for admission should be directed to:
The Registrar,
University of Waterloo,
Waterloo, Ontario, Canada N2L 3G1

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

Federated and Affiliated Church Colleges:

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

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

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

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

Page Numbering System

Pages are numbered sequentially in the General Information section. In the subsequent chapters, the digits preceding the colon indicate the chapter number and the digits following the colon indicate the page number within the particular chapter.
**Undergraduate Calendar 1989-90**

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*These programs normally fulfill the academic requirements for registration in the related professions. See the Undergraduate Program section of this Calendar.
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</table>

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

*These programs normally fulfill the academic requirements for registration in the related professions. See the Undergraduate Program section of this Calendar.
Glossary of Terms

Academic Program
A series of courses, a number of which may be mandatory and of a specialized nature, leading toward a particular degree. Details of the several types of programs offered such as Honours, General, Pass, Preprofessional, Professional are given in the Calendar.

Antirequisites
Courses with significant overlap. Degree credit cannot be obtained for both the antirequisite and the course(s) naming it as such.

Corequisite
A course required to be taken concurrently with, or passed prior to registration in, another course which lists it as a corequisite.

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.)

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 by successful completion of a course. A credit weight of 0.5 is normally assigned to a one term course. Credit weights are used in the calculation of averages for academic standing. Most courses have credit weights of 0.5, but some have weights such as 0.25, 1.0, 2.0. Further explanation is on p. 1:7.

Cross-Listed Courses
Courses which are listed under two departments and which can be taken for 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 specified courses at another university to be considered for credit toward a particular University of Waterloo degree.

Major
The area(s) of academic emphasis selected in either an Honours or a General program. Details of course and average requirements are given in academic program sections of the Calendar.

Minor
A group of approved courses taken by an honours student in a subject outside the "major" area. Details of course and average requirements are given in academic program sections of the Calendar.

Option
A specified combination or 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).

Practicum
Supervised placement time in a work setting exercising practical routines and techniques related to a particular academic program or option.

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

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

Term
A particular four-month period of academic 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.
## Academic Calendar – 1989

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<td>Preregistration Ends – Undergraduate Programs – Fall Term</td>
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<td>Meeting – Board of Governors Executive Committee</td>
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<td>Lectures End – Spring Term</td>
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*Some University Departments may be open for limited service on these days.
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<td>End of Course-Change Period – Fall Term – See Individual Faculty Chapters</td>
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*Some University Departments may be open for limited service on these days.*
# Academic Calendar

## New Year's Day – University Holiday
- **January 1, Monday**

## Final Examination Results Due – Fall Term
- **January 2, Tuesday**

## Registration Begins – Undergraduate Programs – Winter Term
- **January 2, Tuesday**

## Registration – Graduate Studies – Winter Term
- **January 2, Tuesday**

## Meeting – Senate Executive Committee
- **January 2, Tuesday**

## Lectures Begin – Winter Term
- **January 3, Wednesday**

## Course-Drop or Withdrawal Deadline – Correspondence – Fall Term
- **January 3, Wednesday**

## Registration Ends – Undergraduate Programs – Winter Term
- **January 4, Thursday**

## Start of Late Fees – Winter Term
- **January 5, Friday**

## Meeting – University Senate, 7:30 p.m.
- **January 15, Monday**

## Meeting – Board of Governors Executive Committee
- **January 23, Tuesday**

## Examinations – Correspondence – Fall Term
- **January 27, Saturday**

## End of Course-Change Period – Winter Term – See Individual Faculty Chapters

## Meeting – Senate Executive Committee
- **February 5, Monday**

## Meeting – Board of Governors, 3:30 p.m.
- **February 6, Tuesday**

## Application Deadline for New Students – Correspondence – Spring Term
- **February 9, Friday**

## Application Deadline for Returning Students – Correspondence – Spring Term
- **February 23, Friday**

## Meeting – University Senate, 7:30 p.m.
- **February 19, Monday**

## Study Break – Engineering
- **February 19, 20, Monday, Tuesday**

## Study Week Begins – Other Faculties
- **February 19, Monday**

## Examination Results Due – Correspondence – Fall Term
- **February 23, Friday**

## Meeting – Senate Executive Committee
- **March 5, Monday**

## Preregistration Begins – Undergraduate Programs – Fall Term
- **March 5, Monday**

## Preregistration Ends – Undergraduate Programs – Fall Term
- **March 9, Friday**

## Campus Day
- **March 13, Tuesday**

## Meeting – University Senate, 7:30 p.m.
- **March 19, Monday**

## Meeting – Board of Governors Executive Committee
- **March 20, Tuesday**

## Lectures End – Engineering Courses – Winter Term
- **March 30, Friday**

## Course-Change Deadline – Correspondence – Spring Term
- **March 30, Friday**

## Meeting – Senate Executive Committee
- **April 2, Monday**

## Lectures End – Other Courses – Winter Term
- **April 3, Tuesday**

## Meeting – Board of Governors, 3:30 p.m.
- **April 3, Tuesday**

## Examinations Begin – Winter Term
- **April 6, Friday**

## Good Friday – University Holiday
- **April 13, Friday**

## Meeting – University Senate, 7:30 p.m.
- **April 16, Monday**

## Course – Drop or Withdrawal Deadline – Correspondence – Winter Term
- **April 18, Wednesday**

## Examinations End – Winter Term
- **April 21, Saturday**

## Final Examinations Results Due – Winter Term
- **April 27, Friday**

## Winter Work Term Ends – Co-operative Programs
- **April 27, Friday**

## Spring Work Term Begins – Co-operative Programs
- **April 30, Monday**

## Registration Begins – Undergraduate Programs – Spring Term
- **May 1, Tuesday**

## Registration – Graduate Studies – Spring Term
- **May 1, Tuesday**

## Lectures Begin – Engineering Courses – Spring Term
- **May 1, Tuesday**

## Lectures Begin – Other Courses – Spring Term
- **May 2, Wednesday**

## Registration Ends – Undergraduate Programs – Spring Term
- **May 3, Thursday**

## Start of Late Fees – Spring Term
- **May 4, Friday**

## Examinations – Correspondence – Winter Term
- **May 5, Saturday**

## Meeting – Senate Executive Committee
- **May 7, Monday**

*Some University Departments may be open for limited service on these days.*
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<td>End of Course-Change Period – Spring Term – See Individual Faculty Chapters</td>
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<td>Spring Convocation (Arts)</td>
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There are two routes to the UW Campus from Hwy. 401. The first route is to take exit 278 to Hwy. 8 west to Kitchener; enter the Conestoga Pkwy. by following Hwy. 7 East signs; then follow the Pkwy. and exit at University Ave. West; drive in a westerly direction on University Ave. to University of Waterloo. The second route follows the first route to the Conestoga Pkwy.; enter the Pkwy. following Hwy. 7 & 8 West Stratford; continue on the Pkwy. and exit at Fischer-Hallman Rd. Turn left at the Fischer-Hallman Rd. traffic lights and continue north west until you reach University Ave. Turn right on to University Ave. and drive easterly until you reach the University of Waterloo.
The University of Waterloo
The Undergraduate Calendar

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

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

The Calendar is arranged in chapters which fall into four divisions. The first division describes the various services offered at the University. The second division outlines the undergraduate programs and the third division describes the courses offered in these programs. The fourth division of the Calendar lists the membership of the governing bodies of the University and the officers of the various administrative units.

Except where otherwise indicated, this Calendar applies to the 1989-1990 academic year, which commences in May, 1989. More specific information on effective dates for tuition and other fees, admission requirements, and course and program offerings may be found in the relevant chapters.

The University

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

The Campus

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

Since the opening of the first permanent structure on campus in 1958, the University has expanded steadily. More than 40 teaching and service buildings presently on campus include a Computing Centre, a Physical Activities Building, an ice arena, extensive library facilities, two theatres, and a variety of modern residential accommodation in University and Church College residences.

University Colours

The Official colours of the University of Waterloo are gold, black and white.

University Arms and Motto

The Arms and Motto for the University of Waterloo, as first adopted in October 1961, and as officially granted in August 1987, by the Lord Lyon King of Arms, are described as follows:

Or, on a chevron Sable three lions rampant Gules a Chevron Argent. Above the Shield is placed an Helm suitable to an Incorporation (VIDELICET: -- a Salade Proper lined Gules) with a Mantling Sable doubled Or, and on a Wreath of the Liveries is set for Crest between two maple branches in saltire a trillium displayed and leaved all Proper, and in an Escol or the same this Motto "CONCORDIA CUM VERITATE".

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.
The University of Waterloo
Academic Organization

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

Enrolment for each Faculty including church colleges and off-campus students as of November 1, 1988:

<table>
<thead>
<tr>
<th>Faculty of Arts</th>
<th>Full Time</th>
<th>Part Time</th>
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<tbody>
<tr>
<td>Faculty of Engineering</td>
<td>2844</td>
<td>325</td>
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<tr>
<td>Faculty of Environmental Studies</td>
<td>1265</td>
<td>321</td>
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<tr>
<td>Faculty of Human Kinetics and Leisure Studies</td>
<td>1148</td>
<td>390</td>
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<tr>
<td>Independent Studies Program</td>
<td>49</td>
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<tr>
<td>Faculty of Mathematics</td>
<td>3009</td>
<td>469</td>
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<tr>
<td>Faculty of Science</td>
<td>2286</td>
<td>1326</td>
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<tr>
<td>Total Undergraduate Enrolment</td>
<td>14583</td>
<td>8543</td>
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<tr>
<td>Graduate Student Enrolment</td>
<td>1426</td>
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The Church Colleges
There are four church-related colleges associated with the University.

University of St. Jerome's College
In 1865, two years before Canada achieved nationhood, St. Jerome's College was founded by the Congregation of the Resurrection to meet the demand for higher education in Waterloo County.

Over the years the College grew in size and occupied various locations in the Kitchener-Waterloo area. In 1959, through an Act of the Ontario Legislature, St. Jerome's College was granted independent university status. The name was changed to the University of St. Jerome's College to reflect new university powers and the authority to grant degrees.

A short time later, the University of St. Jerome's College entered into federation with the young and growing University of Waterloo. In the federation agreement, the College waived its degree-granting rights so that now, students of St. Jerome's earn Bachelor of Arts or Bachelor of Mathematics degrees of the University of Waterloo.

Today, St. Jerome's College adds to the breadth of the University of Waterloo the institutional presence of a Catholic milieu in which Christian sources provide added matter for study and investigation. With nearly 900 full and part-time students, a men's and women's residence accommodating 280 students, a faculty and staff of over 50 men and women, St. Jerome's College is a dynamic community.

The College teaches courses in English, history, religious studies, psychology, French, Italian, mathematics, sociology and philosophy and offers three special summer programs in Learning Disabilities, Family Life Education and Theological Renewal.

From its local roots in Waterloo County, St. Jerome's has grown and today serves a much wider constituency. The College teaches undergraduate students from high schools throughout the province of Ontario and beyond. Educators, health care professionals, pastoral care workers and others take advantage of our special programs for professional upgrading and development.

The College brings its campus to the community in many ways, most notably through lectures and mini-courses sponsored by the St. Jerome's Centre for Catholic Experience and through the quarterly publication *Grail: An Ecumenical Journal*. Both *Grail* and the Centre heighten public awareness and understanding of the major social and religious issues of the day.

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

Academic offerings at Renison serve students registered in:

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

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

The College has two residences accommodating 74 men and 94 women.

Conrad Grebel College
Conrad Grebel College is a Mennonite church sponsored school providing residential, teaching, research and community education programs from a Christian perspective. The residence accommodates 113 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. The chapel program is central to the religious life of the College. Students from all backgrounds and world-views are welcome, subject to their willingness to abide by the College's values. Additionally, an
The University of Waterloo
Degrees Offered
Systems of Study

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 Accounting (MAcc)
- Master of Arts (MA)
- Master of Applied Environmental Studies (MAES)
- Master of Applied Science
- Master of Mathematics (MMath)
- Master of Philosophy (MPhil)
- Master of Science (MSc)
- Doctor of Philosophy (PhD)

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

Honorary Degrees

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

- Doctor of Divinity (DD)
- 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 is provided in Chapter 5.

Part-Time Studies, Correspondence Courses, and Continuing Education

The Teaching Resource and Continuing Education (TRACE) Office, under the direction of Dr. Christopher Knapper, is responsible for major policy development and co-ordination of activities related to correspondence courses, continuing education and to part-time studies in general. The organizational structure of the office is outlined in Chapter 17.

The University of Waterloo, which offers a wide variety of options for learning outside the traditional classroom, encourages students to continue their education through credit or non-credit courses; in a classroom or by distance education; during the day or in the evening.

Credit courses are available to students who are either physically remote from the campus or whose schedules do not permit them to attend class on a regular schedule. Distance education students enrol in UW correspondence courses for a variety of reasons: to study for a university degree, undertake professional upgrading or certification, and to achieve personal learning goals.

For most purposes students will deal with the administrative staff located in a building off-campus at 156 Columbia Street (corner of Columbia and Phillip Streets). General inquiries, admission/registration questions and information on the resources and opportunities available to part-time students can be handled during the usual working hours of 8:30 a.m. - 4:30 p.m. During the first week of classes each term, the office is open until 7:00 p.m.

No academic distinction is made between part-time and full-time students, either in admission standards, grading practices or promotion policies.

The great majority of part-time students are adults, and most are considered for admission under UW’s Adult Student Admission Policy. Tuition fees are assessed on a per course basis.

The Part-Time Studies Calendar, published annually, lists all courses offered in the late afternoon and evening and provides complete details of admission requirements, registration procedures, and general services for part-time students. The Correspondence Calendar describes the University’s extensive range of distance education courses and also provides other relevant administrative details concerning the program.

Correspondence Courses — Distance Education
The University of Waterloo operates one of the largest university-level distance education programs in Canada. More than 300 university credit courses are offered over the fall, winter, and spring terms. Students should obtain a Calendar from the Correspondence Office to acquaint themselves with the offerings, the method of operation, fees and the application deadlines.

For application deadlines see also p. 2:8 of this Calendar.

General degrees in Arts, Environmental Studies, and Science may be earned entirely through correspondence. In working towards a degree, students may combine on-campus and off-campus courses with distance education courses. Fees for correspondence courses are the same as for courses offered on and off campus, except that a refundable deposit is required on the audio tapes used for lectures and on other special materials that may be required.

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

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

Part-Time Studies off Campus
Several University of Waterloo credit courses are now offered each year in community centres such as Kitchener and Waterloo, Cambridge, Simcoe and Stratford. 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 apply them toward a degree along with credits earned on campus or through correspondence study.

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

Part-Time Studies on Campus
Part-time students often enrol in classes scheduled in the evening or in late afternoon. However, part-time students are welcome to enrol in daytime classes as well. Students may earn most degrees entirely through part-time studies or by a combination of part-time and full-time attendance. For some programs in HKLS, Math, and Science, required courses are available only during the day. Students may pursue their studies in the fall, winter, or spring terms or during the summer sessions.
Mature Student Services
The Mature Student Services office provides both academic information and support services for students who have been away from formal education for some years. Help with application for admission, pre-registration, course changes and withdrawals is available, as well as up-to-date information on university services and regulations.

Services include a course information file, a learning skills package, a library of cassette tapes, and a monthly Newsletter. Throughout the year, the office organizes a variety of events that are geared to the needs of older students.

Appointments for individual advice and counselling can be made by phone (ext. 2429) or by visiting the office in the Modern Languages Building, Rooms 224 and 225. Office hours are 8:30 a.m. to 4:30 p.m., Monday through Friday.

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

Certified Employee Benefit Specialist Program
For individuals in the employee benefits field, the University offers evening courses leading to the designation of Certified Employee Benefit Specialist. Emphasis in these courses is on the fundamental principles underlying the design and operation of employee benefit plans. Additional details are available from Part-Time Studies, 888-4002.

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

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

Continuing Professional Education in Planning and Kinesiology
During the year, various courses and workshops are conducted for professionals working in the fields of Urban Planning and Kinesiology. For details on the current year's offerings, call 888-4002.

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

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

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

Other Continuing Education Opportunities
The University of Waterloo offers a variety of continuing education opportunities including the following:

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

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

- Appraisal Institute of Canada
- Canadian Credit Union Institute Fellows’ Program
- Canadian Hospital Association Course in Health Services Management
- Canadian Institute of Certified Administration Managers Program (CAM)
- Canadian Institute of Traffic and Transportation
- Certified General Accountants Association of Ontario (CGA)
- Institute for Certified Professional Secretaries
- Institute of Chartered Accountants of Chartered Accountants of Ontario (CA)
- Insurance Institute of Canada Fellowship Program
- Ontario Hospital Association Certified Health Consultant Program
- Ontario Municipal Management Development Program
- Purchasing Management Association of Canada
- Real Estate Institute of Canada (FRI)
- Society of Management Accountants of Ontario (FIA)

Non-Credit Courses
The University offers some non-credit courses throughout the year. Previous courses have included Understanding Microcomputers, and Effective Business Writing.
Inquiries
Inquiries concerning part-time studies, off-campus courses, diploma programs and continuing education opportunities should be directed to:

Part-Time Studies
University of Waterloo
Waterloo, Ontario N2L 3G1
(519) 888-4002

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, and grading systems 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.

Assigned Common Assigned
Letter Weighting Percentage
Grades Factors* Grades*
A+ 95 90-100
A 89 85-89
A- 83 80-84
B+ 78 77-79
B 75 73-76
B- 72 70-72
C+ 68 67-69
C 65 63-66
C- 62 60-62
D+ 58 57-59
D 55 53-56
D- 52 50-52
F+ 46 42-49
F 38 35-41
F- 32 0-34

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

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

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

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

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

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

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

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

Examination Regulations

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

Standard Practices with Respect to Illness

Illness may constitute an acceptable reason for not
writing an examination. Students who miss
examinations because of illness should inform their
instructors and provide a medical certificate
documenting the precise period of absence and the
nature of the illness. Where circumstances warrant
special consideration, instructors may submit an AEG
documenting the precise period of absence and the
nature of the illness. Where circumstances warrant
special consideration, instructors may submit an AEG

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.

Study Breaks

Each term the formal lecture period, as defined by the
dates shown on pages 7-10 of this Calendar, normally
ends two or three days before final examinations
begin. The periods between the end of the formal
lecture period and the beginning of final examinations
shall be ones in which no instructor shall be permitted
to administer, and no student shall be required to sit
for, examinations, tests or lectures.

Final Examinations

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

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

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

Other Tests and Examinations

Instructors are encouraged to hold other tests or
examinations during the regularly scheduled class
times for their courses. An instructor who chooses to
schedule a test or examination to be held outside of,
or to extend beyond, the regularly scheduled class
time will be required to provide suitable alternative
time arrangements for any students with legitimate
conflicts.

Normally instructors may not hold major term tests
in the last five teaching days of the lecture schedule in
any term. Major term tests are those which account for
more than 25% of the final course grade. Exceptions
to the above must be approved in advance by the
instructor’s Department Chairman and the Associate
Dean (Undergraduate) of the Faculty concerned.

Requests for an Alternative Final Examination Time

A student requesting an alternative time for a final
examination will be granted that request only in
exceptional circumstances. Such circumstances
include illness (with medical certificate) or other
mitigating circumstances outside the control of the
student. Elective arrangements (such as travel plans)
are not considered acceptable grounds for granting an
alternative examination time.
The decision whether to grant a student’s request for an alternative examination time lies with the instructor of the course concerned as does the responsibility for making the alternative arrangements. This policy may also be applied at the discretion of the instructor to tests and examinations other than final examinations.

Student Access to Final Examination Papers
For many courses final examinations are a major component of student assessment and often contribute substantially to the final grade awarded. In addition, final examinations may serve an important educational purpose in indicating to students what, and how well, they have learned in the course. A course instructor may choose to use a final examination for one or both of these objectives.

The instructor may informally review the final examination paper with a student who requests it but not before the term grade reports are issued. Although this is not mandatory, instructors are encouraged to follow this practice. Where such an informal review process cannot be arranged, the following procedure is available to any student who wishes to obtain access to his or her final examination papers:
1. Every student may formally appeal a final grade in accordance with established Faculty appeal procedures.
2. Every student, as part of the process of appealing a grade, will be able on request to obtain supervised access to a copy of his or her final examination paper, to read only.
3. The student may provide written comments which will be forwarded, along with the examination paper, to the faculty member for consideration in responding to the appeal.
4. Faculties may broaden the privileges provided above but may not be more restrictive in their implementation of this proposal.

In this policy statement ‘final examination paper’ means the final examination question paper and the paper submitted by the student.

Academic Regulations and Student Discipline

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

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

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

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

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

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

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

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

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

2. Computer programs written or partially written by a student in support of a project, thesis, or other original work, may have potential value as a marketable intellectual property. The University acknowledges the student's ownership rights in the same manner as for other copyright material, with the following exceptions:
   a) Students may be participating in software development as part of a process of research and development within a research group or department. In such circumstances, students may be asked to sign a waiver or assignment of software rights to the University, or to the supervising faculty member or research group.
   b) The University assumes a non-exclusive, paid-up, royalty-free license to use, for the University's administration, education and research activities, all software written using University facilities or written in support of academic work at the University. This license does not include the right to sublicense the software to third parties for commercial purposes, but may be extended in this sense by means of a written agreement between the student and the University.
   c) Students acquire no rights to software written under supervision in the course of employment by the University, for example as a research assistant or during a co-op work term. In cases where students are employed by faculty, or by recognized research groups, they should inquire into the software policy of that particular professor or group involved before undertaking extensive software development.

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

Student Academic Records

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

Student and Administrative Services

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

Federation of Students

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

Objects

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

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

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

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

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

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

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

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

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

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

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

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

The International Student Board acts as the student body responsible for promoting international student activities and issuing and maintaining relations between the international students and the Canadian students at the University of Waterloo.

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

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

Other Federation Services include WORDS - a Word Processing Service, the Record Store, Campus Shop, Post Office, Used Books Store, the Bombshelter Pub and Patio, Federation Hall, Chinese Library, and access to a non-pay phone (For local calls only).

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

Campus Centre

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

The Student Newspaper (Imprint)

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

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

Imprint can be reached from 9:00 a.m. to 5:00 p.m. at 888-4048 or University ext. 2331 Monday through Friday. Inquiries should be directed to the Editor.

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

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

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

Open Door Gift Shop
Located across from the Book Store. Crested items and gifts are available.

Theatre Centre
Room 161, Hagey Hall of the Humanities
Entertainment is available on campus throughout the fall and winter terms in UW's two attractive theatres, with special discounts for students.

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 by community organizations such as local dance schools, the Kiwanis, the Gilbert and Sullivan Society and others. The City of Waterloo uses the two theatres as venues for their professional theatre season which includes drama, comedy, and music. The UW Theatre Centre general offices are located in Room 161, Hagey Hall of the Humanities, at Ext. 2126 or 2127. Free brochures and tickets are available on campus, or call 885-4280 for immediate mail services. The UW Theatre Centre box office is a Ticketmaster (formerly known as BASS) ticket outlet, supplying tickets to the Humanities Theatre, the Theatre of the Arts and any event on the Ticketmaster system. Visa and Mastercard are accepted.

Counselling Services
Room 2060, Needles Hall
Professionally trained counsellors are available to help students with educational and career decisions as well as personal and social concerns. Individual interviews, group counselling and study skills classes are some of the services which Counselling offers to students. Appointments can be made by calling extension 2655 or by dropping into the offices on the second floor of Needles Hall. Hours are 9:00 a.m. to 5:00 p.m., Monday through Friday.

Career Resource Centre
Room 1115, Needles Hall
The Centre provides information which can help students in choosing a career, as well as with all aspects of the job search: resume and letter writing, employer information and creative job search strategies. Summer and part-time jobs are also handled by the Centre. For more information see page 59.

Health and Safety Department
Health and Safety Department Building
The Health and Safety Department is the Medical clinic centrally located, across from the Campus Centre. It provides comprehensive care to all students and emergency care to others on campus. Physicians, nurses and counsellors are on staff at the clinic which is open Monday to Friday from 8:30 a.m. to 5:00 p.m. For emergencies, there is a doctor on call who can be reached 24 hours a day by dialing 888-4096. Physicians' fees at Health Services, as well as laboratory work, x-rays, and most referrals are paid by the Ontario Health Insurance Plan or other provincial health plans. More details are given in The Ontario Health Insurance Plan Guide available at the Health and Safety Department. All full-time students are also covered by a Student Supplementary Health Insurance Plan sponsored by the Federation of Students which provides partial payment for prescriptions and other services.
Mature Student Services
The Mature Student Services office provides both academic information and support services for students who have been away from formal education for some years. Help with application for admission, pre-registration, course changes and withdrawals is available, as well as up-to-date information on university services and regulations.

Services include a course information file, a learning skills package, a library of cassette tapes, and a monthly Newsletter. Throughout the year, the office organizes a variety of events that are geared to the needs of older students.

Appointments for individual advice and counselling can be made by phone (ext. 2429) or by visiting the office in the Modern Languages Building, Rooms 224 and 225. Office hours are 8:30 a.m. to 4:30 p.m., Monday through Friday.

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

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

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

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

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

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

4. Research Involving Animals: The Committee on Animal Care reviews University research proposals involving animals according to the requirements of The Animals for Research Act and the Canadian Council on Animal Care Guide. The Coordinator of Animal Care monitors the facilities on-campus and reports to the Dean and to the Committee on 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. Financial administration and logistical assistance is provided in the Office of Research.

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.

7. Commercial Development Office (CDO). Operating out of the Office of Research, and initially funded by IDEA Corporation, an Ontario Crown Corporation, the office has been established to facilitate the identification of commercially significant research-based technologies. The CDO also assists the University research community in technology-transfer and commercialization of research spin-off technologies, including assistance in patenting, licencing, and the sale and protection of technologies on behalf of the researcher and the University.
8) **National Research Council (NRC):** To assist small and medium companies, NRC has made arrangements with the university to accommodate and support a Field Advisory Service representative on the campus as an adjunct to the Office of Research.

**Residences**

Accommodation is available at the University for approximately 5,200 students. There are two large undergraduate residences, Village I and Village II; a townhouse complex; 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, townhouses, and Minota Hagey write:

- Housing Office, Village I, University of Waterloo, Waterloo, Ontario N2L 3G1 or phone (519) 884-0544

For off-campus information write:

- Off-Campus Housing Office, Village I, University of Waterloo, Waterloo, Ontario N2L 3G1 or phone (519) 884-4408

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) 888-4040

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

**Facilities for Disabled Students**

The University has developed a number of services to assist students with disabilities. All buildings on campus have at least one wheelchair-accessible entrance. Most buildings have wheelchair-accessible washrooms or are linked to a building that does. Improvements are continually being made to improve campus accessibility.

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

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

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

The Co-ordinator of Services for Disabled Persons will assist disabled students to access campus services and facilities. For information or assistance, call 888-4635. Off-campus TTY/TDD users may call 888-4044. On-campus TTY/TDD users call ext. 4044.

**International Student Office**

The International Student Office (ISO), located on the second floor of Needles Hall (within Counselling Services), aids international 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, English conversation class, English tutors, TOEFL preparation courses, temporary housing, emergency loans and U.S. visas.

All students from outside Canada are invited to visit the International 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 (TRO) of the University of Waterloo was established in 1976, following the recommendation to the Undergraduate Council of Senate by the Vice-President Academic "that the University appoint a person to act as a teaching consultant to the Faculties." Terms of reference for the Teaching Resource Person include providing assistance to individual faculty members in improving their teaching performance, offering assistance to departments on teaching methods and evaluation of learning (including advice on the training of teaching assistants), and keeping the University community informed about developments and innovations relevant to teaching and learning in higher education. In 1985 the TRO became part of the new Teaching Resources and Continuing Education Office (TRACE) which also has responsibility for the University's continuing education offerings, part-time studies, and the correspondence program. The office is presently located in the Math and Computer building, room 4055 (ext. 3132). A library of computer-catalogued resource materials on teaching is held in the TRACE office.

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

Although students are welcome to visit the campus at any time, regular tours are not scheduled from May to August, nor is the Visitors Reception Centre open for this term. Students may tour the campus on their own or call the appropriate faculty office if they wish to make special arrangements. The Secondary School Liaison Office will assist, if necessary, with these arrangements.
Admissions
General Information

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

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

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

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

Applicants are advised to outline thoroughly their educational background in order to facilitate the admission process. The admission information and requirements set forth in the Calendar are applicable for admission beginning in May, 1989.

Authority to Admit

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

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

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

St. Jerome's College

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

Admissions

General Information

General Admission Requirements

Inquiries and correspondence should be directed to:

The Registrar, St. Jerome's College.

Renison College

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

Inquiries and correspondence regarding admissions should be directed to:

The Registrar, Renison College.

General Admission Requirements

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

Applicants educated outside of Ontario must submit evidence of having obtained a level of education equivalent to that required of applicants from Ontario (see chart on pages 2.5-2.7) as well as meeting average requirements.

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

English Proficiency Test

Applicants whose 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.

Notice of Nondiscriminatory Policy as to Students

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

Applicants to Year 1

A) Applicants From Ontario Secondary Schools
See the 1989-90 Admission Requirements for Year One Programs on pages 2:5-2:7 for general admission requirements and specific program requirements.

B) Equivalent Certificates
All applicants are required to hold the specific subject requirements indicated on pages 2:5-2:7 in addition to the equivalent level of education.

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

Applicants from Other Canadian Provinces

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

Applicants from Other Countries

Countries following a "British" System of Education
General Certificate of Secondary Education or equivalent with Passes in at least five subjects, two of which must be at the Advanced Level.

International Baccalaureate
Passes in at least six subjects, three Higher Level and three 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 five subjects, two of which must be at the Advanced Level. (Applicants with three or more University of Hong Kong Advanced Level subjects will also be considered.)

Chinese University of Hong Kong First Year standing with courses appropriate to program.

Europe
Maturity or Matriculation Certificate.

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

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

Countries Using French System
Baccalauréat Passable.

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

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

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

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

Mature Student Admission
Individuals who do not meet the normal requirements for admission but who can offer clear evidence of their ability to undertake and manage university studies and who have been away from formal education for some time, in no case less than two years, may be considered for admission as a mature student.

Although the University of Waterloo does not automatically offer admission to mature applicants, the Faculty Admissions Committees carefully consider previous academic records, resumes and other biographical material before determining admissibility. For example, Admissions Committees for faculties where there are specific subject requirements in the areas of Mathematics and Science will expect confirmation that the applicant has a background equivalent to that provided by OAC or Grade 13 Mathematics and Science courses. Admissions Committees for less technical programs will review the applicant’s personal and professional development, formal training, work experience and community service before making a decision.

Applicants who do not qualify for full-time degree studies may be considered for admission to a part-time non-degree program in any faculty but the Faculty of Engineering.

Applicants applying as mature students are advised to contact the Assistant Registrar of the desired faculty to discuss admissibility and appropriate qualifying work.

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

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

<table>
<thead>
<tr>
<th>Faculty/Program</th>
<th>Required University-Entrance Subjects and Minimum Averages</th>
<th>Recommendations</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Ontario Universities’ Application Centre (OUAC) codes for the various programs are given below to assist applicants in completing their applications.</td>
<td>The following recommendations are intended to provide additional academic advice which applicants should consider when planning their university preparation programs. Courses listed here are not required for admission but are recommended because applicants may find this preparation beneficial during their university studies.</td>
<td>The following comments are intended as guidelines only. Competition for available places each year may result in changes to the factors which affect admission decisions. Competition is keen for all programs because the number of places available is often considered in the admissions decision. Students who are interested in particular programs are encouraged to apply regardless of their expected average. Students are encouraged to achieve as much breadth of preparation as possible in the course of their secondary school studies.</td>
<td></td>
</tr>
</tbody>
</table>

#### Arts

| Arts Regular OUAC codes: University - WA St. Jerome’s - WJA Repton (Social Development Studies) - WRS Repton (Other Arts Programs) - WRA | Six Ontario Academic Course or Grade 13 credits including English and one other Arts-related course. | Along with the credit in English, preferably a course that stresses writing skills, applicants should take university-entrance level courses such as History and languages other than English. A Mathematics course is recommended for applicants who are considering social science programs. | In recent years, most students admitted have had averages of 80% or higher. A number of students with lower averages, however, are admitted on the basis of other indicators, including information provided on the Arts Admission Information Form. Preference is given to applicants who have at least two Arts-related OAC or Grade 13 courses such as languages, social sciences, fine and performing arts. Admission to departmental programs, including Co-op, occurs following Year One. An exception is Social Development Studies which normally admits students at the beginning of the first year. |

| Co-op (Accountancy Studies) OUAC code: WAA | Six Ontario Academic Course or Grade 13 credits including English. | Along with the credit in English, preferably a course that stresses writing skills, applicants should take a broad range of courses such as History, Mathematics, a second language, and Science. | Applicants with averages over 80% will be given first consideration. Students will register in either Co-op Management Accountancy or Co-op Management Accountancy Studies which normally admits students at the beginning of the first year. Admission to Arts Accountancy Studies Co-op will be considered for admission to Arts Regular (WA) or Arts Co-op Applied Studies (WQ) where interest in these alternatives is well-supported. Students are encouraged to achieve as much breadth of preparation as possible in the course of their secondary school studies. |

| Co-op (Applied Studies) OUAC code: WQ | Six Ontario Academic Course or Grade 13 credits including English and one other Arts-related course. | Along with the credit in English, preferably a course that stresses writing skills, applicants should take a broad range of courses such as History, Mathematics, a second language, and Science. | In recent years, most students admitted have had averages of 80% or higher. A number of students with lower averages, however, are admitted on the basis of other indicators, including information provided on the Arts Admission Information Form. Applicants are expected to have at least two Arts-related OAC or Grade 13 courses such as languages, social sciences, fine and performing arts. Applicants not admitted to Arts Co-op (Applied Studies) will be considered for the Arts Regular program. Students enrolled in Arts Regular or Co-op (Applied Studies) may apply to departmental Co-op programs, except Accounting, following Year One. |

*NOTE: Ontario secondary school students seeking admission, must present the Secondary School Honour Graduation Diploma (SSHGD) or Ontario Secondary School Diploma (OSSD) including a minimum of six Ontario Academic Course or Grade 13 credits. An overall average of 60% on six Ontario Academic Course or Grade 13 credits is the minimum required for consideration, but higher averages may be required for admission to individual programs in which the demand for places by qualified applicants exceeds the supply of places available in those programs. The actual averages required for admission to particular programs are determined each year on the basis of the number of applicants and the marks of those applicants. The admission average is calculated using the best six marks which include marks for courses required for admission. The Secondary School Honour Graduation Diploma and the Ontario Secondary School Diploma will normally be considered equivalent for admission purposes. The length of time taken by an applicant to complete the secondary school program will not of itself be a determining factor in the admission decision providing the student has proceeded normally through the program without repeating any courses or credits. As the Ontario Academic Course curriculum guidelines are implemented, it is expected that some specific subject requirements for admission will change. Changes which have been determined to date are summarized in the Supplementary Chart on page 28. The University reserves the right to withdraw the offer of Early Admission made to an Ontario secondary school student if the applicant fails to complete diploma requirements with a minimum final overall average of 60% in six Ontario Academic Course or Grade 13 credits or any specific final average or condition stated on the Offer of Admission.
## Admissions
### Specific Faculty Program Recommendations and Requirements

<table>
<thead>
<tr>
<th>Faculty/Program</th>
<th>Required University-Entrance Subjects and Minimum Averages</th>
<th>Recommendations</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering</td>
<td>Six Ontario Academic Course or Grade 13 credits, Refer to the Supplementary Chart on page 28.</td>
<td>Since Engineering requires considerable writing of reports and reviews, as well as the reading of books, articles and journals, the sixth credit for admission should be a subject requiring literary skills such as English, History, or Geography. English (OAC) is a required credit if OAC credits in Mathematics are presented. It is also recommended that applicants include a Computer Science course in their secondary school background. It is important that applicants complete and return promptly the 'Personal Information Form' sent to them with the acknowledgement of their application. Students not offered admission to the program of their first choice will be considered for the alternative engineering programs that have indicated on the 'Personal Information Form'.</td>
<td>Year One enrolment is limited. Approximately 85% of these places are filled by Ontario Secondary School students. In recent years, most students admitted have had averages of 75% or higher. If applicants have an average lower than 75%, they may be admitted if other evidence indicates they have had extensive involvement in extracurricular activities and that they have an aptitude and interest in Engineering. Applicants with high numeric overall standing who are missing one or two of the five specific requirements must contact the Admissions Officer no later than December, for admission the following September. Applicants will be evaluated and advised on the courses of action required to meet the specific requirements.</td>
</tr>
<tr>
<td>Environmental Studies</td>
<td>Six Ontario Academic Course or Grade 13 credits including English.</td>
<td>A course in Finite Mathematics is strongly recommended for students who take Algebra and Geometry (OAC).</td>
<td>Selected applicants are normally required to come to the University for an interview as part of the admission process. Selection for the interview is based on Grade 12 and university-entrance level academic records. Admission is based on the results of the interview (including a required portfolio), an English pre-test exercise designed to test skills of analysis and expression, and on secondary school academic achievement. In recent years, most students admitted have had averages of 75% or higher.</td>
</tr>
<tr>
<td>Architecture (pre-professional program)</td>
<td>Six Ontario Academic Course or Grade 13 credits including English.</td>
<td>Applicants are encouraged to take at least one Grade 12 or university-entrance level Science. A course in Relations &amp; Functions or Finite Mathematics is recommended.</td>
<td>Applicants with an average of 70% or higher are given first consideration. A 'Personal Information Form' is required.</td>
</tr>
<tr>
<td>Geography (Regular)</td>
<td>Six Ontario Academic Course or Grade 13 credits including English.</td>
<td>Applicants are encouraged to take university-entrance level Geography, and one of Algebra, Calculus, Relations &amp; Functions or Finite Mathematics.</td>
<td>Applicants with an average of 70% or higher are given first consideration.</td>
</tr>
<tr>
<td>Geography (Co-op)</td>
<td>Six Ontario Academic Course or Grade 13 credits including English.</td>
<td>Applicants are encouraged to take university-entrance level Geography, and one of Algebra, Calculus, Relations &amp; Functions or Finite Mathematics.</td>
<td>Applicants with an average of 75% or higher are given first consideration. Students not offered admission to the Co-op program will be considered for the Regular program, and should not enter both choices on the application form.</td>
</tr>
<tr>
<td>Urban and Regional Planning</td>
<td>Six Ontario Academic Course or Grade 13 credits</td>
<td>Applicants are encouraged to take one of university-entrance level Algebra, Calculus, Relations &amp; Functions or Finite Mathematics. Of the recommended Mathematics course, Calculus is preferred.</td>
<td>Applicants with an average of 70% or higher 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 university-entrance level academic records. Admission is based on the results of the interview, letters of reference, a 'Personal Information Form', and secondary school academic achievement.</td>
</tr>
<tr>
<td>Human Kinetics &amp; Leisure Studies</td>
<td>Six Ontario Academic Course or Grade 13 credits</td>
<td>Applicants are encouraged to include English in their university-entrance level program.</td>
<td>Applicants living within a reasonable commuting distance of Waterloo must attend an audition on May 24, and arrange an interview with the Undergraduate Officer regarding admission to the program. If this date is unsuitable, an alternate arrangement may be made with the Undergraduate Officer. If applicants are unable to travel to Waterloo, they must submit at least one letter of reference from their dance instructor confirming their current level of technique training. Certificates from the R.A.D. or L.S.T.D. will also be considered.</td>
</tr>
</tbody>
</table>
### Admissions

**Specific Faculty Program Recommendations and Requirements**

<table>
<thead>
<tr>
<th>Faculty/Program</th>
<th>Required University-Entrance Subjects and Minimum Averages</th>
<th>Recommendations</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Studies</td>
<td>Six Ontario Academic Course or Grade 13 credits including Biology and Chemistry. Applicants should include university-entrance level Calculus in their program as preparation for first-year Chemistry.</td>
<td>Students planning to enter the joint Health Studies/ Kinesiology must fulfill the Kinesiology admission requirements.</td>
<td></td>
</tr>
<tr>
<td>Kinesiology</td>
<td>Six Ontario Academic Course or Grade 13 credits including Calculus, Chemistry, one Science from Biology or Physics. Physics is especially recommended.</td>
<td>The Kinesiology program includes required university courses in Biology, Calculus, Chemistry, Computer Science, Physics, Psychology and Sociology.</td>
<td></td>
</tr>
<tr>
<td>Recreation and Leisure Studies</td>
<td>Six Ontario Academic Course or Grade 13 credits. Applied should include one of university-entrance level Algebra, Calculus, Relations &amp; Functions or Finite Mathematics.</td>
<td>Applicants with overall averages above 70% are given first consideration.</td>
<td></td>
</tr>
<tr>
<td>Independent Studies</td>
<td>Admission is determined by an Admissions Committee composed of faculty and students which interviews applicants. Applicants should be capable of doing university-level work, should be strongly motivated to work on their own, and should be planning studies that can be done at the University of Waterloo.</td>
<td>An IS degree is obtained only through full-time university studies.</td>
<td></td>
</tr>
<tr>
<td>Mathematics</td>
<td>Six Ontario Academic Course or Grade 13 credits. Refer to Supplementary Chart on page 2.B. In developing its admissions requirements, the Faculty of Mathematics has attempted to leave students maximum flexibility in their choice of courses for a secondary school diploma. Accordingly, students are encouraged to develop as much breadth as possible by choosing courses from the arts, humanities, social sciences and physical sciences. In particular, it is recommended that if students are considering a mathematics and accounting program, they should include at least one Accounting course as part of their secondary school program. Furthermore, although Finite Mathematics is not a specific requirement, and lack of it will not adversely affect consideration for admission, it is strongly recommended that students include this course in their selection. A consequence of planning course selection to incorporate the above advice may be that students exceed the minimum number of courses required for admission.</td>
<td>The Faculty of Mathematics makes every effort to ensure that those students who are best prepared are admitted. It is recognized that school grades are the primary indicator of preparedness, and the majority of admitted students have averages of 75% or higher. The Admissions Committee also gives close attention to evidence indicating an exceptional aptitude and interest in mathematics, teachers' recommendations, performance in the Descartes Mathematics Contest, the number and variety of O.A.C. or Grade 13 credits and involvement in extracurricular activities. Any combination of these may considerably enhance an applicant's possibility of admission. Students not offered admission to the program of their choice are considered for all other Mathematics Programs. Students wishing to pursue a program which combines Computer Science and Accounting should apply to the WIN (Mathematics - Co-op Accounting Options) category.</td>
<td></td>
</tr>
</tbody>
</table>

**Science**

| All Programs                      | Six Ontario Academic Course or Grade 13 credits including two Science credits from Biology, Chemistry, Physics, Calculus, and one Mathematics credit from Algebra, (Gr. 13), Relations & Functions (Gr. 13), Finite Mathematics (O.A.C.). Students planning to major in Biology, Chemistry, Biochemistry, Optometry or other Earth Sciences programs, must include university-entrance level Chemistry and Physics. Students planning to major in Physics programs must include university-entrance level Physics. Applicants should include both university-entrance level Chemistry and Physics if they are applying to any Science program. A course requiring writing skills would be an asset. For Co-operative Applied Chemistry and Physics, both university-entrance level Relations & Functions (Gr. 13) or Finite Mathematics (O.A.C.) and Algebra (Gr. 13) or Algebra and Geometry (O.A.C.) are recommended. For the Geophysics Option within Co-operative Applied Earth Sciences, university-entrance level Algebra (Gr. 13) or Algebra and Geometry (O.A.C.) is recommended. | The most recent minimum average of successful applicants to Regular Science has been in the mid to high 60s, and to all Co-operative programs, low to mid 70s. Minimum marks required for the following Co-operative programs are: Biochemistry and Applied Chemistry: 70% in Chemistry and 70% in Mathematics. Applied Physics: 75% overall required in Physics & Mathematics, with at least 70% in Physics and 70% in Calculus. Students not admitted to the program of their choice are automatically considered for other programs in Science for which they qualify. |                                                                          |
| OUAC codes:                       |                                                                                                                             |                                                                                |                                                                          |
| Co-op Biology — WY                |                                                                                                                             |                                                                                |                                                                          |
| Co-op Applied Chemistry — WH      |                                                                                                                             |                                                                                |                                                                          |
| Co-op Applied Earth Sciences — WYS|                                                                                                                             |                                                                                |                                                                          |
| Co-op Applied Physics — WY        |                                                                                                                             |                                                                                |                                                                          |
| Honours Science (Regular) — WS   | (Application is made after completion of Year One Science.)                                                                 |                                                                                |                                                                          |
## Supplementary Chart

<table>
<thead>
<tr>
<th>Faculty/Program</th>
<th>Admission Requirements for Those Studying Mathematics from the Grade 13 Curriculum Guidelines*</th>
<th>Admission Requirements for Those Studying Mathematics from the Ontario Academic Course (O.A.C.) Curriculum Guidelines*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Engineering</strong></td>
<td>Six Ontario Academic Course or Grade 13 credits including Algebra (Gr. 13) Calculus (Gr. 13) Relations &amp; Functions (Gr. 13) Chemistry Physics</td>
<td>Six Ontario Academic Course or Grade 13 credits including Algebra and Geometry (O.A.C.) Calculus (O.A.C.) Chemistry Physics English</td>
</tr>
<tr>
<td>OUAC Codes for Engineering (Co-op):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemical — WC</td>
<td></td>
<td></td>
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<tr>
<td>Civil — WE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer — WWJ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical — WWF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geological — WWG</td>
<td></td>
<td></td>
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<tr>
<td>Mechanical — WWH</td>
<td></td>
<td></td>
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<tr>
<td>Systems Design — WD</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mathematics</strong></td>
<td>Six Ontario Academic Course or Grade 13 credits including Algebra (Gr. 13) Calculus (Gr. 13) Relations &amp; Functions (Gr. 13) Mathematics courses</td>
<td>Six Ontario Academic Course or Grade 13 credits including Algebra and Geometry (O.A.C.) Calculus (O.A.C.) English with a minimum grade of 60% in each of the required courses</td>
</tr>
<tr>
<td>OUAC Codes:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accounting Options (Co-op) — WN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Co-op (Including Computer Science) — WT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regular (Including Computer Science) — WM</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Applicants presenting a combination of Grade 13 and O.A.C. credits in meeting mathematics requirements will be considered on an individual basis.

## Application Procedures

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

2. a) Applicants who wish to pursue degree studies on a part-time basis or non-degree or post-degree studies should contact the Registrar's Office for the appropriate application forms.
   
   b) Applicants who wish to take courses by correspondence should write to the Correspondence Program, University of Waterloo, Waterloo, Ontario N2L 3G1 or call (519) 888-4050.

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

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

3. **Application Dates**

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

<table>
<thead>
<tr>
<th>Term starting</th>
<th>Last date for application</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 1989</td>
<td>March 1, 1989</td>
</tr>
<tr>
<td>July 1989</td>
<td>June 1, 1989</td>
</tr>
<tr>
<td>*September 1989</td>
<td>July 1, 1989</td>
</tr>
<tr>
<td>January 1990</td>
<td>November 1, 1989</td>
</tr>
</tbody>
</table>

**Correspondence Program**

<table>
<thead>
<tr>
<th>Students not previously registered at UW</th>
<th>Students previously registered at UW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Term</td>
<td>Fall Term</td>
</tr>
<tr>
<td>August 4, 1989</td>
<td>August 18, 1989</td>
</tr>
<tr>
<td>Winter Term</td>
<td>Winter Term</td>
</tr>
<tr>
<td>October 13, 1989</td>
<td>October 27, 1989</td>
</tr>
<tr>
<td>Spring Term</td>
<td>Spring Term</td>
</tr>
<tr>
<td>February 9, 1990</td>
<td>February 23, 1990</td>
</tr>
</tbody>
</table>

*Applications and all supporting documentation must be received no later than May 1, 1989 for all Year One 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 1.

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

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

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

All Ontario Secondary School applicants will be notified on or after June 16, 1989 of the status of their application for admission. Ontario Secondary School applicants who do not receive an offer of admission at this time will have their applications deferred until the final marks are received by the University. When these marks have been received, qualified applicants will be admitted until the remaining places are filled. Ontario Secondary School applicants who complete their studies in the Fall semester will be considered when final grades are received.

Ontario Secondary School applicants who receive an early offer of admission on June 16, 1989 are encouraged to confirm as soon as possible, but are not required to respond before June 30, 1989.

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

Release of Academic Information

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

Registration and Fees

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

Fees and Registration
Preregistration, Registration, Fees

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

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

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

Payment
A) TIMING AND AMOUNTS DUE
   All fees are due and payable by the end of the registration period. See pages 8-11 for appropriate dates. Students must pay or arrange fees by these dates, whether or not a final class schedule has been received.

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

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

   2. In Person
      For students who cannot register by mail, a registration period is held on campus at the beginning of each term. See pages 8-11 for dates.
C) GENERAL INFORMATION

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

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

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

   Apply for OSAP early (Allow 60 days processing time). OSAP funds not received by start of term cannot be used as a means to register.

4. The University will accept post-dated cheques as an arrangement for the payment of fees. Post-dated cheques can be dated up to the Friday immediately prior to registration.

<table>
<thead>
<tr>
<th>Term</th>
<th>First Day of Registration</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 1989</td>
<td>1 May 1989</td>
</tr>
<tr>
<td>September 1989</td>
<td>5 September 1989</td>
</tr>
<tr>
<td>January 1990</td>
<td>2 January 1990</td>
</tr>
<tr>
<td>May 1990</td>
<td>1 May 1990</td>
</tr>
</tbody>
</table>

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

6. 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.

7. 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.

8. 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:

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

See pages 8-11 for dates when late fees start.

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

<table>
<thead>
<tr>
<th>Term Starting</th>
<th>Last Date to Register</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 1989</td>
<td>30 June 1989</td>
</tr>
<tr>
<td>July 1989</td>
<td>31 July 1989</td>
</tr>
<tr>
<td>September 1989</td>
<td>31 October 1989</td>
</tr>
<tr>
<td>January 1990</td>
<td>31 January 1990</td>
</tr>
<tr>
<td>May 1990</td>
<td>29 June 1990</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 four to seven of a term (second week of Summer Session) will receive a refund of 50%.
   d) Refunds are not provided to students after week 7 of a term (week two of Summer Session).

The specific withdrawal dates are included in the registration information package sent to students each term.
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.

The Intercollegiate Athletic Fee, the Co-op Fee, and the Internship Fee are refundable upon withdrawal on the same basis as tuition fees.

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.

The Recreational Facility Fee and Federation Hall Fee are not refundable.

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

Drop/Adds
For students assessed on the per course basis, net drop/add activity may change the fee assessment. In general, a net add is assessed at the full rate while a net drop is assessed on the same basis as a withdrawal. It is the student's responsibility to ensure the necessary payment for added courses is made promptly. Failure to do so will result in penalty charges being assessed. Refunds for dropped courses are mailed after week seven of a term (week two of Summer session).

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

### Schedule of Fees

**PRELIMINARY Schedule of Fees – Undergraduate Programs – Tuition and Incidentals for all Years**

- **Canadian Citizens and Permanent Residents**

These fees have not been approved by the Board of Governors. They are estimated based on information available in late January 1989. A schedule of fees approved by the Board of Governors will be included with student registration information.

Foreign students on Student Authorizations should refer to page 3:6 for fee information.

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Basic Fee (Notes 1,3)</th>
<th>Co-op Fee (Note 2)</th>
<th>Total Tuition Fees</th>
<th>Total Incidental Fees</th>
<th>Total Fees</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Architecture</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Year 1</td>
<td>823.00</td>
<td>280.00</td>
<td>1113.00</td>
<td>107.37</td>
<td>1220.37</td>
</tr>
<tr>
<td>- Upper Year, Co-op</td>
<td>837.00</td>
<td>280.00</td>
<td>1117.00</td>
<td>107.37</td>
<td>1224.37</td>
</tr>
<tr>
<td><strong>Arts</strong></td>
<td>759.00</td>
<td>926.00</td>
<td>1685.00</td>
<td>1019.41*</td>
<td>2704.41</td>
</tr>
<tr>
<td>- Regular</td>
<td>759.00</td>
<td>926.00</td>
<td>1685.00</td>
<td>1019.41*</td>
<td>2704.41</td>
</tr>
<tr>
<td>- Accountancy Studies Regular</td>
<td>759.00</td>
<td>926.00</td>
<td>1685.00</td>
<td>1019.41*</td>
<td>2704.41</td>
</tr>
<tr>
<td>- Accountancy Studies Co-op</td>
<td>773.00</td>
<td>280.00</td>
<td>1053.00</td>
<td>107.37</td>
<td>1160.37</td>
</tr>
<tr>
<td><strong>Engineering</strong></td>
<td>837.00</td>
<td>280.00</td>
<td>1117.00</td>
<td>115.37</td>
<td>1232.37</td>
</tr>
<tr>
<td>- Co-op</td>
<td>837.00</td>
<td>280.00</td>
<td>1117.00</td>
<td>115.37</td>
<td>1232.37</td>
</tr>
<tr>
<td><strong>Environmental Studies</strong></td>
<td>759.00</td>
<td>1053.00</td>
<td>1152.00</td>
<td>1160.37</td>
<td></td>
</tr>
<tr>
<td>- Regular</td>
<td>759.00</td>
<td>1053.00</td>
<td>1152.00</td>
<td>1160.37</td>
<td></td>
</tr>
<tr>
<td>- Co-op</td>
<td>773.00</td>
<td>280.00</td>
<td>1053.00</td>
<td>107.37</td>
<td>1160.37</td>
</tr>
<tr>
<td><strong>Human Kinetics and Leisure Studies</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Regular</td>
<td>759.00</td>
<td>1053.00</td>
<td>1152.00</td>
<td>1160.37</td>
<td></td>
</tr>
<tr>
<td>- Co-op</td>
<td>773.00</td>
<td>280.00</td>
<td>1053.00</td>
<td>107.37</td>
<td>1160.37</td>
</tr>
<tr>
<td><strong>Independent Studies</strong></td>
<td>759.00</td>
<td>128.00</td>
<td>887.00</td>
<td>1168.37</td>
<td></td>
</tr>
<tr>
<td>- Regular</td>
<td>759.00</td>
<td>128.00</td>
<td>887.00</td>
<td>1168.37</td>
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</tr>
<tr>
<td><strong>Mathematics</strong></td>
<td>759.00</td>
<td>1053.00</td>
<td>1152.00</td>
<td>1160.37</td>
<td></td>
</tr>
<tr>
<td>- Regular</td>
<td>759.00</td>
<td>1053.00</td>
<td>1152.00</td>
<td>1160.37</td>
<td></td>
</tr>
<tr>
<td>- Co-op</td>
<td>773.00</td>
<td>280.00</td>
<td>1053.00</td>
<td>107.37</td>
<td>1160.37</td>
</tr>
<tr>
<td><strong>Optometry</strong></td>
<td>823.00</td>
<td></td>
<td>823.00</td>
<td>97.41</td>
<td>920.41</td>
</tr>
<tr>
<td>- Regular</td>
<td>823.00</td>
<td></td>
<td>823.00</td>
<td>97.41</td>
<td>920.41</td>
</tr>
<tr>
<td><strong>Science</strong></td>
<td>759.00</td>
<td>1053.00</td>
<td>1152.00</td>
<td>1164.37</td>
<td></td>
</tr>
<tr>
<td>- Regular</td>
<td>759.00</td>
<td>1053.00</td>
<td>1152.00</td>
<td>1164.37</td>
<td></td>
</tr>
<tr>
<td>- Co-op</td>
<td>773.00</td>
<td>280.00</td>
<td>1053.00</td>
<td>111.37</td>
<td>1164.37</td>
</tr>
<tr>
<td><strong>Summer Session</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Half Course (0.5 credits)</td>
<td>170.00</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>- Full Course (1.0 credits)</td>
<td>340.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Unit Course Fee (Note 4)</strong></td>
<td>170.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*The total fee for the Professionally Accredited Stream (PAS) of this program includes the required Internship Fee of $167.00 per term.

Schedule of fees effective May 1, 1989.
Fees and Registration
Schedule of Fees

Fees for Foreign Students with Student Authorizations (see also Note 5)
These fees have not been approved by the Board of Governors. They are estimated based on information available in late January 1989. A schedule of fees approved by the Board of Governors will be included with student registration information.

For an undergraduate student on Student Authorization:

a) Registration in an undergraduate program* in Architecture, Engineering, or Optometry:
   Regular program fees are $4663.00 per term plus incidental fees as shown below. The Unit Course Fee is $932.60 per Term Course.

b) Registration in any other undergraduate program:
   Regular program fees are $2860.50 per term plus incidental fees as shown below. The Unit Course Fee is $572.10 per Term Course.

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

Incidental Fees
The following incidental fees are compulsory:

<table>
<thead>
<tr>
<th>Service</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interuniversity Athletics</td>
<td>$26.46</td>
</tr>
<tr>
<td>Health Insurance (See Note 6)</td>
<td></td>
</tr>
<tr>
<td>- Regular</td>
<td>$15.95</td>
</tr>
<tr>
<td>- Co-op</td>
<td>$29.91</td>
</tr>
<tr>
<td>Recreational Facilities (See Note 7)</td>
<td>$10.00</td>
</tr>
<tr>
<td>Federation Hall (See Note 8)</td>
<td>$ 7.50</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Service</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>WPIRG (See Note 11)</td>
<td>$ 3.00</td>
</tr>
<tr>
<td>Sandford Fleming Foundation (See Note 12)</td>
<td>$ 3.00</td>
</tr>
<tr>
<td>Radio Waterloo (See Note 13)</td>
<td>$ 4.00</td>
</tr>
<tr>
<td>Imprint (See Note 14)</td>
<td>$ 3.00</td>
</tr>
<tr>
<td>Science Foundation (See Note 15)</td>
<td>$ 3.00</td>
</tr>
</tbody>
</table>

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

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

In offering Co-operative programs, the University incurs significant extraordinary costs in the academic departments, as well as in the Department of Co-operative Education and Career Services, the Registrar’s Office, and other departments which serve the students. These costs are not provided for in the operating grants received from Government.
The University recovers a portion of the extra costs of Co-operative programs by collecting a special Co-op service fee from students registering in these programs. The Co-op fee is set in accordance with the methodology approved by the Ministry of Colleges and Universities and distributes the cost recovery over all terms of the Co-operative programs in which the student pays fees.

Note 3 – Tuition Rates for Co-op Students
Tuition for Co-op students is set at a rate of $14.00 per term higher than the corresponding rate for non-Co-op students. This additional fee will recover the academic-related costs of marking work reports and is calculated in accordance with guidelines approved by the Ministry of Colleges and Universities.

Note 4 – Unit Course Fee (1989-90)
The fee assessed at $170.00 for each term course at a weight of 0.5; and at a prorated value for other course weights. The Unit Course Fee for Foreign Students with Student Authorization is shown above.

Note 5 – 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 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 dependent or a member of the staff of any such diplomat, consular officer, representative or official; or a member of a foreign military force or of a civilian component thereof admitted to Canada under the Visiting Forces Act, and any dependents of such personnel.
4. A dependent of a visitor who is admitted to and remaining in Canada under clause 10(c) of the Immigration Act, 1976 for the purpose of engaging in employment;
5. A person admitted to and remaining in Canada who is officially recognized by the Employment and Immigration Commission of Canada as a Convention refugee within the meaning of the Immigration Act, 1976;
6. A person admitted to and remaining in Canada under clauses 10(a) and 10(b) of the Immigration Act, 1976 who is sponsored and financially assisted by one of the following: the Canadian International Development Agency, the International Development Research Centre, the World Bank, and 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, who is sponsored by a foundation: which is a recognized international charitable foundation; and which is registered as a charitable organization either in Canada or another industrialized country; and whose particular aid program is international in scope and aimed at low-income developing countries; and which provides full support to the student including travel, living expenses, tuition fees, etc.; and where prior approval of the Minister has been secured.
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 the spouse of that person and any unmarried son or daughter of that person or of the spouse of that person who is in full time attendance at an Ontario university or related institution.

The foregoing is a condensed version of the “Foreign Student Fee Differentials and Exemptions.” For further details, contact the Office of the Registrar.

Note 6 – 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 $21.67 for a Regular student per term and $40.63 for a Co-operative student at each registration.
This plan does not include the premium or benefits of the Ontario Health Insurance Plan. It is the student's own responsibility to ensure that such personal coverage is obtained. Further details are available from Health Services.

Note 7 - Recreational Facility
A non-refundable fee approved by student referendum for construction of the Columbia Ice Field (Ice Arena North Campus).

Note 8 - Federation Hall
This non-refundable fee assessed starting Fall term 1984 was approved by student referendum in 1983.

Note 9 - Federation of Students
Payment of the Federation of Students fee is required at registration, but a student who does not wish to participate may obtain a refund by applying to the Federation of Students within three (3) weeks after the start of lectures as indicated on pages 8 to 11 of this Calendar.

Note 10 - Society Fees
Payment of the Society Fee is required at registration, but a student who does not wish to participate may obtain a refund by applying to the respective society within three (3) weeks after the start of lectures as indicated on pages 8 to 11 of this Calendar.

Note 11 - WPIRG (Waterloo Public Interest Research Group)
A student funded environmental and social research group:
This fee is voluntary, refundable, and not a requirement for registration. Requests for refunds or questions concerning WPIRG should be directed to the on-campus WPIRG office within three (3) weeks after the start of lectures as indicated on pages 8 to 11 of this Calendar.

Note 12 - Sandford Fleming Foundation (S.F.F.)
An organization dedicated to the development of co-operative engineering education.
This fee applies to Engineering students only and is voluntary, refundable and not a requirement for registration. Requests for refunds should be directed to the on-campus Engineering Society office, within three (3) weeks after the start of lectures for the term as indicated on pages 8 to 11 of this Calendar.

Fees and Registration
Schedule of Fees

Note 13 - Radio Waterloo
The on-campus student radio station.
This fee is voluntary, refundable, and not a requirement for registration. Requests for refund should be directed to the Radio Waterloo office within three (3) weeks after the start of lectures for the term involved as indicated on pages 8 to 11 of this Calendar.

Note 14 - Imprint
The student newspaper.
This fee is voluntary, refundable and not a requirement for registration. Requests for refunds should be directed to the Imprint office within three (3) weeks after the start of lectures for the term involved as indicated on pages 8 to 11 of this Calendar.

Note 15 - Faculty of Science Foundation Fee
This fee applies to Science students including Optometry and is voluntary, refundable and not a requirement for registration. Requests for refund should be directed to the Faculty of Science Foundation, within three (3) weeks after the start of lectures for the term as indicated on pages 8 to 11 of this Calendar.

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

Miscellaneous Fees
Re-examination fee (Engineering only) $25.00
Returned Cheques - Handling charge (plus late registration penalty as applicable) $15.00
Duplicate Tax Receipt $5.00
Letter of Verification of Registration $5.00
Replacement of lost or stolen student Photo Identification Card $20.00
Replacement of lost or stolen student Health Insurance Card $5.00
Transcript of Record
– $3.00 for first copy
– $1.50 for each additional copy ordered at the same time as the first copy.
Letter of Permission
To Whom It May Concern Letters
– $3.00 for first copy
– .50 for each additional copy ordered at the same time as the first copy.
Residence
Residence fees are payable by term and are due in full on or before the day of residence registration. Students who have received a Notice of Assistance under any awards program may apply to residence fees only those funds which are received during the term in question.

Income Tax Receipts
Receipts for income tax purposes for fees paid covering the calendar year 1989 will be available after 1 March 1990.
- 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.
(Notifcation of pick-up location(s) will be published in the University of Waterloo Gazette, prior to 1 March 1990.)
Awards and Financial Aid
Awards 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.

Definitions
The term "Award" is a general designation applied to any scholarship, prize, medal, fellowship or grant of money assigned to a student. Within this designation, awards are further defined as follows:

Scholarship: A monetary award, based solely on outstanding overall academic performance or excellence in a specific subject or group of subjects.

Prizes and Medals: A monetary award of small value or a non-monetary award (eg. book prize or medal) given in recognition of academic performance or excellence in the area to which the award pertains.

Work-term Report Award: A monetary award based on writing skills demonstrated in work-term reports.

Bursary: A monetary grant based primarily on financial need.

Regulations Governing University of Waterloo Undergraduate Awards

1. Unless otherwise stated in the terms of reference of the awards, eligibility for entrance and upper year awards is normally restricted to students who register for a full course load (minimum 5 half credits per term).

2. Awards with a monetary value are normally paid during terms when the recipient is registered as a full-time student.

3. The first charge against any award payment will be for tuition and fees.

4. Awards valued at more than one-term tuition will normally be paid in two term instalments.

5. A student may not hold more than one major University of Waterloo award in one academic year. (A major award is defined as having a value equal to one-term full-time tuition at the University of Waterloo).

6. If a student withdraws or otherwise fails to complete the term(s) covered by an award, the award will be pro-rated.

7. If no qualified applicant is found for a particular award in any year, the University reserves the right to withhold the award.

8. 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.

University of Waterloo Entrance Awards

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
Students must write the CHEM 13 NEWS Competition.

Mathematics
Students must write the Descartes Mathematics Competition.

Physics
Students must write the Sir Isaac Newton Physics Competition.

Engineering
Students must write the Descartes Mathematics Competition.

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

FACULTY OF ARTS AWARDS

The Faculty of Arts is offering several entrance scholarships in recognition of academic excellence. Entrance scholarships, awarded on the basis of secondary school performance, have values of $2100 of which $1200 is allocated for first year and an additional $900 for second year, if the student maintains an A average. The Faculty also offers numerous Arts Scholar Awards valued at $100.

Arts Alumni Entrance Scholarships
A number of one year scholarships with a value of $1,200 are offered annually to students entering Arts Regular or Applied Studies in recognition of academic excellence in secondary school studies.
Federal-Provincial-Conference Simulation Entrance Award
One award valued at $100 is given annually by the Political Science Department to a student entering the first year of full-time studies at the University of Waterloo who has been a participant in the annual Federal-Provincial Conference Simulation sponsored by the Department and the History Heads Council of the Waterloo County Board of Education.

Catherine E.B. Hanna Accounting Entrance Scholarship
The Catherine E.B. Hanna Accounting Entrance Scholarship valued at $1000 is named in recognition of Mrs. Hanna's support of and interest in accounting education. The award is made annually to a student entering an Accounting Program within the Faculty of Arts at the first year level. In addition to overall academic excellence, the student will have attained high levels of success in humanities subjects at the high school level.

RJR MacDonald Accounting Entrance Scholarship
This scholarship, valued at $4,000 over four years is awarded annually to an outstanding student entering the first year of the Honours Accountancy Studies program in the Faculty of Arts. Continuance of the award beyond Year One is dependent on the student maintaining an 80% overall average in the Honours Accountancy Studies program.

J. Sayer Minas Entrance Scholarship
The award, valued at $1500 in the first year and renewable at $1200 for three years, if the student maintains an A average, is given to the most outstanding student entering first year in the Faculty of Arts.

Mary Rosenthal Entrance Scholarship
One scholarship, valued at $400 is presented to a top student from Wellington County entering the Faculty of Arts.

W.J. Schlatter Scholarship
This $500 scholarship is awarded annually to an outstanding high school student entering an Accounting Program in the Faculty of Arts. This scholarship is in honour of Dr. William Schlatter who, during his long career, instilled a search for knowledge and a broad interest in life in students and colleagues, many of whom now teach at Waterloo. The recipient will have demonstrated the breadth of interests beyond accounting that Dr. Schlatter values so highly. The scholarship is awarded on the basis of academic performance and information provided by the applicant on the Arts Accountancy Studies Admission Information Form.

Waterloo Accounting-Alumni Association Entrance Scholarships
Two scholarships of $500 each are available annually to outstanding high school students entering an undergraduate accounting program in the Faculties of Arts or Mathematics.

FACULTY OF ENGINEERING AWARDS
The Faculty of Engineering offers three types of scholarships: (1) a large number of one-term tuition awards (2) a small number of one or two year awards each with a total value of $1100 to $2900 (3) one or two awards valued at $2000 for Year One and renewable for Years Two, Three and Four each having a total value of $4200. A term average of 80% is required for renewal of entrance scholarships. Scholarships are awarded on the basis of Secondary School average, the results of the Descartes Mathematics Competition, information supplied on the Personal Information Form for Applicants and letters of reference. To be eligible for scholarship consideration, students must write the Descartes Mathematics Competition.

Alfred Armbrust Memorial Scholarship
This scholarship is awarded annually to an outstanding student entering the Faculty of Engineering. It is awarded in conjunction with Engineering Faculty Entrance Scholarships.

Association of Professional Engineers Entrance Award
The Association of Professional Engineers of the Province of Ontario provides a $1000 entrance Award to an outstanding student who is entering an accredited Engineering program at the University of Waterloo.

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

Colonel Hugh Heasley Engineering Entrance Scholarship
One award of $500 is given to an outstanding student entering the Faculty of Engineering from Annandale High School or Glendale High School, Tillsonburg, Ontario. Preference will be given to students entering Systems Design.

Hilliker Engineering Entrance Award
One award of $500 is given to an outstanding student entering Engineering, Mathematics or Science from Pauline Johnson Collegiate and Vocational School, Brantford, Ontario. Preference will be given to students entering Engineering.

Sullivan Entrance Award
One award of $1000 is awarded to an outstanding student entering Engineering, Mathematics or Science from Math Science and Engineering High School, Belleville, Ontario. Preference will be given to students entering Engineering.
FACULTY OF ENVIRONMENTAL STUDIES
AWARDS
Awards are available in varying amounts for one year. All students with an Ontario Secondary School average of 80% or better are considered.

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

Environment and Resource Studies
Awards are offered on the basis of comments on the supplementary information form and academic standing.

Planning
Awards are offered on the basis of comments made on the personal information form and academic standing.

FACULTY OF HUMAN KINETICS AND LEISURE STUDIES AWARDS
Awards are available in varying amounts for one year. All students with an Ontario Secondary School average of 80% or better are considered.

FACULTY OF MATHEMATICS AWARDS

Rene Descartes Scholarships, Fellowships and Bursaries
The René Descartes Foundation offers 200 annual awards ranging in value from $300 in Year One to $10000 distributed over four years. One hundred of these have values of $1000 or greater. All applicants to the Faculty of Mathematics are candidates if they have written the Descartes Mathematics Contest and have submitted the applicant supplementary information form. Preference is given to those who have made the Faculty of Mathematics their first choice of program.

K.D. Fryer Entrance Scholarship
This award is given in recognition of an incoming freshman student's excellent high school record and a sustained superb performance on the Math contests (including the Descartes Contest) as conducted by the Canadian Math Competition Office of the Faculty of Mathematics. The recipient will also have demonstrated an interest in extracurricular activities, such as student government or sports, or a devotion to the development of additional talents in music or the arts. The student will receive a $12000 scholarship in support of an entire undergraduate Math program at Waterloo.

Waterloo Accounting Alumni Association Entrance Scholarships
Two scholarships of $500 each are available annually to outstanding high school students entering an undergraduate accounting program in the Faculties of Arts or Mathematics.

Awards and Financial Aid
University of Waterloo Entrance Awards

FACULTY OF SCIENCE AWARDS

Biology
Biology offers several awards valued at $1350 for Year One and renewable for Year Two for a total value of $2000. Students must maintain an 83% average at the end of Year One for renewal.

Biochemistry
as above, provided by the Departments of Biology and Chemistry.

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

Chemistry Scholarships
Two scholarships valued at $4000 may be offered for Year One and renewable for Year Two, Three and Four for a possible total of $10000. Several scholarships valued at $2000 for Year One and renewable for Year Two, Three and Four for a possible total of $5,000 will also be offered. A year average of 83% is required for renewal of entrance scholarships.

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

UNIVERSITY-WIDE AWARDS

University of Waterloo — Waterloo County Entrance Scholarships
One entrance scholarship per school is awarded to an outstanding student entering the University from a Waterloo County Secondary School. A small number of two-year special entrance scholarships may also be awarded with eligibility for the second year being dependent on the student maintaining an average of 80%.
Ford S. Kumpf Scholarships
Through a bequest of the late Ford S. Kumpf of Waterloo, a number of scholarships are awarded annually to outstanding students entering the University from secondary schools in the Regional Municipality of Waterloo. The awards are made in conjunction with Waterloo County Entrance Scholarships.

Gladys and Norman 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.

Hong Kong Alumni Association Entrance Awards
Awards of $500 are made available by donations from University of Waterloo alumni living in Hong Kong. Outstanding students of Hong Kong origin entering any full-time program at the University of Waterloo are eligible, provided they are willing to pledge to return to Hong Kong after graduation. Scholarships are not awarded on the basis of academic excellence alone; other factors such as personality, initiative, and community involvement will also be considered. Applications must be submitted to the Student Awards Office by the beginning of May.

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 Awards

FACULTY OF ARTS AWARDS
One-term upper year scholarships of varying amounts are awarded to full-time and part-time students on the basis of overall average.

Fine Arts Art History Option Scholarship
One award is presented annually to a deserving Fine Arts major who has completed with distinction 3 years of Art History studies and elects to continue in the fourth year of the Honours Art History Program.

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

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

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

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

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

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

INDEPENDENT STUDIES AWARDS
A limited number of upper year scholarships in varying amounts are made available each year.

FACULTY OF MATHEMATICS AWARDS

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.
**L. Fejer 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.

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

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

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

**FACULTY OF SCIENCE AWARDS**
A limited number of scholarships may be awarded to students in General Science.

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

**CHEM 13 NEWS Research Assistantships**
The Department of Chemistry offers CHEM 13 NEWS Research Assistantships to recognize academic excellence in students proceeding to a degree in Chemistry. The awards are made for 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 Years One, Two, Three and Four in the School of 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 $750, $600, $450, $300 in each year. (These scholarships may be subject to the condition that no other scholarships are held concurrently).

**Undergraduate Awards**
Where required, 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.

**Allergan Prize - For Excellence in Anatomy of the Eye and Visual System**
A cash award of $500 plus a plaque is awarded to a student beginning second year in the Optometry program, on the basis of performance in the first year anatomy courses.

**Allergan Research Scholarship**
The Allergan Research Scholarship is awarded to a student entering the third professional year of the Optometry program who has demonstrated academic excellence in physiological optics and who wishes to undertake research in this field during the summer. The candidate for this award will be selected by the graduate committee of the School of Optometry.
### Ambassador of Austria Book Prizes
These prizes are awarded annually to outstanding students in German language and literature.

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

### Arthur Andersen Management Consulting Scholarship
Two annual awards valued at $400 each are given to students entering their 3A term in either the Faculty of Engineering or a Co-operative Mathematics Program. Selection of recipients will be based on academic achievement, active participation/leadership in extracurricular activities, ability to communicate and career objectives of implementing change through Application Systems Development and/or Manufacturing Process Improvement. Relevant work-term experience will also be considered. Applications should be submitted to the Student Awards Office during the 2B term.

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

### Arts Student Union Award
One award is offered by the Arts Student Union each term to an undergraduate Arts student who has been actively involved in University student affairs and who has a minimum overall average of 70% or better. Applications should be submitted at the beginning of each term.

### Association of Professional Engineers Gold Medal for Academic Achievement Award
The Association of Professional Engineers of the Province of Ontario makes this award to the student in the fourth year of an accredited Engineering program who, having received honours, has obtained the highest standing in the final examinations of the current academic year.

### Association of Professional Engineers Undergraduate Scholarship
The Association of Professional Engineers of the Province of Ontario offers three annual scholarships of $500, 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.

### Dr. Howard A. Backman Scholarship
The Dr. Howard A. Backman Scholarship for Physiological Optics is 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.

### Arts and Financial Aid

#### Undergraduate Awards

<table>
<thead>
<tr>
<th>Award Name</th>
<th>Details</th>
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<tbody>
<tr>
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</tr>
<tr>
<td><strong>T.T. Beattie Medal</strong></td>
<td>The bequest of T.T. Beattie is awarded to the final-year student in the School of Optometry ranking highest in Orthoptics or Visual Training. The award is made as funds permit.</td>
</tr>
<tr>
<td><strong>Bell Canada Engineering and Computer Science Awards</strong></td>
<td>The value of these awards is tuition for the final undergraduate year plus an offer of work-term employment with Bell Canada, although acceptance of employment</td>
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is not a condition of the award. The awards are available to third-year Engineering or Computer Science students who rank in the top half of their class, have an interest in telecommunications or related fields and have been involved in on-campus or community activities. Applications should be submitted during the third year Spring or Fall terms.

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 a minimum average of 75% in the previous term’s or year’s examinations.

Canada Packers Inc. Post Secondary Awards
A Canada Packers Inc. - Research And Development Division Award of $800 is available to an undergraduate student in Chemical Engineering who has a high academic standing during the first and second year and is continuing in that program. Positive evidence of leadership and contribution to university and/or community life is also given strong consideration. Applications should be submitted during the 2B term.

A Canada Packers Inc. - Edible Oils and Dairy Division Award of $1400 is available to an undergraduate student in Chemistry Co-op Option who has high academic standing during the first and second year and is continuing in the program. Positive evidence of leadership and contribution to university and/or community life is also given strong consideration. Applications should be submitted during the 2B term.

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

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

Canadian Hospital Engineering Society’s Combined National and Ontario Scholarship
Two awards of $500 each are given to students entering fourth year Engineering who have an interest in the health care field, have achieved a high level of academic excellence, exhibited leadership qualities and demonstrated an interest in extra-curricular activities. Applications should be submitted during the 3B term.

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 are awarded in sequence until the fund is exhausted each year.

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

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

Canadian Optical Supply Co., Montreal, PQ
Luxottica Canada Inc., Mississauga, ON
Menrad Canada Inc., Mississauga, ON
Opal Optical Ltd., Georgetown, ON
Professional Optical Co., Ltd., Willowdale, ON
Rodenstock Canada Inc., Toronto, ON

Canadian Society for Chemical Engineering Prize
One award, to a Chemical Engineering student, is made annually by the society. The award valued at $50, an engraved medal and a Certificate of Merit, is given to the student with the highest standing in the penultimate year of his/her course.

Canadian Society for Chemistry Prize
One award, to a Chemistry student, is made annually by the society. The award consisting of an engraved medal and a Certificate of Merit, is given to the student with the highest academic standing in the penultimate year of his/her course.

Canadian Society for Mechanical Engineering Gold Medal
The Canadian Society for Mechanical Engineering provides a gold medal and certificate to be presented to a graduating student in recognition of outstanding academic achievement in Mechanical Engineering.

Carousel Dance Centre Entrance Award
The Carousel Dance Centre has an award fund of $1000 per year which it may allocate to students in amounts ranging in value from $200 to $500. Students who have participated in the full curriculum of Carousel for a minimum of three years and who are enrolled full time in first year Dance at the University of Waterloo...
Awards and Financial Aid
Undergraduate Awards

will be considered for the awards by the Directors of the Carousel Dance Centre.

Keith Carr Memorial Award
An annual award to a student in third or fourth year Chemical Engineering who has an excellent academic record and has demonstrated strong leadership abilities both at the university and in the outside community.

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.

Central Optical Award
An award of $1500 is given to two or three final-year Optometry students who have achieved excellence in their special studies.

Certified General Accountants Association of Ontario Award for Excellence
An annual award of $1000 composed of a cash award of $150 plus a credit of $850 to be drawn down as and when the successful candidate wishes, for the purpose of defraying any fees related to courses in the CGA study program. The award is made to an outstanding graduating student who has displayed achievement in accounting. No application necessary.

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

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

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

E.J. Chisholm Memorial Scholarship
This $250 Scholarship, established in memory of the late E.J. Chisholm, is awarded annually to the third-year student who demonstrates highest academic and clinical proficiency in Pediatric Optometry.

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

Classical Studies Correspondence Prize
A prize of $75 is awarded annually to an outstanding Correspondence student who is majoring in Classical Studies.

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

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

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

Auggie Corvino Memorial Award
In memory of the late artist Auggie Corvino, his friends have established an award to be presented annually to a distinguished second year student of the Fine Arts program, studio option.

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

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.
Awards and Financial Aid
Undergraduate Awards

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

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

Digital Equipment of Canada Ltd. Award of Merit
A certificate and a cash award of $250 is presented each year to an outstanding third-year student in Computer Science or Computer Engineering.

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

George Dufault Medal for Excellence in Communication
The George Dufault Medal is awarded annually to the graduating student in the 4B term in Engineering who has demonstrated excellence in communication ability through the submission of outstanding work-term reports and the oral presentation of one of these reports in a competition held during the last (4B) term of the academic program. The award was established by the family of the late George Dufault in recognition of his contribution to the University as its first co-ordinator and first head of the Department of Co-ordination, now the Department of Co-operative Education and Career Services, and later as a lecturer in Physics and a professor of Electrical Engineering.

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

J.W. Dyck Honours Scholarship
An annual award of approximately $1000 is provided to a student entering the second year of a German and/or Russian program. Interested students should apply to the Department of Germanic and Slavic Languages and Literature during the Winter term of their first year.

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

Electrohome 75th Anniversary Scholarship
Established by the Victor Company of Japan Ltd. and Kanematsu-Gosho Ltd. in recognition of the 75th Anniversary of Electrohome Ltd., one scholarship of $2000 is awarded to an outstanding undergraduate entering the final year of Computer Science. The award will be based on academic performance in several Computer Science courses. Applications should be submitted during the third year or 3B term.

Elgin County Scholarship
Elgin County offers 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 Optometry student with excellent academic standing in the areas of Geometrical, or Optometrical Optics.

Federation of Chinese Canadian Professionals (Ontario) Education Foundation Scholarship
Two annual awards of $250 each are awarded, one to the student achieving the highest mark in Accounting 441 (Accounting Information Systems) and one to the student achieving the highest mark in Computer Science 486 (Introduction to Artificial Intelligence).
William Feinbloom Low Vision Award
A Low Vision Trial Set is awarded to the final-year Optometry student who has shown excellence in both the didactic and the clinical aspects of Low Vision care.

Scott Kelsey Fevreau Memorial Award
A $500 award has been established in memory of Scott Kelsey Fevreau, a first-year Mathematics student. The award is to be presented to a second-year Honours Co-op Mathematics student, based on high academic achievement, extra-curricular activities and personal characteristics.

Fine Arts Art History Scholarship
One award presented annually to a deserving Fine Arts major who has completed with distinction 3 years of Art History studies and elects to continue in the fourth year of the Honours Arts History Program.

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

John Fisher Award For Leadership
The Sandford Fleming Foundation has established the John Fisher Award for Leadership in recognition of the outstanding contributions made towards the work of the Foundation by its former chairman, Dr. John Fisher. The award, consisting of a citation and a honorary of $1000, is made from time to time to a graduating Engineering student who has made significant contributions to Co-operative Engineering Education. Nominations, which can originate from student groups or faculty members, should be directed to the Waterloo Chapter Awards Committee Chairman of the Sandford Fleming Foundation.

Sandford Fleming Debate Awards
The Sandford Fleming Foundation has established the Sandford Fleming Debates in order to encourage the art of debate among Engineering undergraduates. The Debates are held each term and 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 Excellence
The Sandford Fleming Foundation has established six medals for graduating students, one in each of the following Engineering programs: Chemical, Civil, Electrical, Mechanical, Systems Design Engineering and Management Sciences. In each department, the award is made for outstanding overall performance in both the work-term experience and the academic program of co-operative engineering education. The nominees are selected jointly by the Academic Faculty and the Department of Co-operative Education and Career Services.

Mark Forster Memorial Scholarship
This scholarship was established by friends, relatives and classmates of Mark Cameron Forster B.Sc. in recognition of his contributions to the Kinesiology and Athletics programs at the University of Waterloo. The awards will be presented annually to a third or fourth year Kinesiology student who has achieved a minimum B average, has participated in varsity athletics, has a high level of involvement in the athletics program, and has contributed to the Kinesiology program as a Kinesiology Student Association member or through other activities.

Andrea Fraser Memorial Scholarship
This scholarship was established by classmates, relatives and friends in memory of Andrea Louise Fraser, B.Sc. The award is presented to a 3rd or 4th Kinesiology student who holds a minimum B average, who is in need of financial support to continue studies and who has an interest in the data communications industry. Students in 1B or above are eligible to apply.

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

Gandalf Data Limited Award
An annual award of $1000 is available to an outstanding undergraduate graduate student in Electrical, Systems Design or Computer Engineering who is in need of financial support to continue studies and who has an interest in the data communications industry. Students in 1B or above are eligible to apply.

Michael Gellner Memorial Scholarship
An award is presented annually to a Health Studies or Kinesiology student entering her/his fourth year. This award is to be given to a deserving student with an excellent academic record, who will complete a degree in either of the above programs. Applications should be submitted in 3B or the 2nd term of third year Regular.

General Motors of Canada Limited Co-operative Student Awards
Up to five new awards per term are offered to cover tuition and an allowance for books and materials. All Co-op students who have successfully completed at least three school terms and 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 Council, College of Optometrists of Ontario is awarded to the final-year student in the School of Optometry ranking highest in general proficiency.

**Robert E. Gobeil Auditing Scholarship**
The Robert E. Gobeil Auditing Scholarship valued at $500 has been established by Alcan and many friends of Mr. Gobeil at the University of Waterloo, where Mr. Gobeil was a founding member of the University’s Accounting Advisory Council. The scholarship is awarded annually, based on academic excellence, to a student entering Professionally Accredited Studies in Accounting who intends to pursue a career in either internal or external auditing. The emphasis on internal or external auditing was based on Mr. Gobeil’s considerable interest and service to both the Institute of Internal Auditors and to the chartered accounting profession in Canada.

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

**Governor General’s Academic Medal**
The Governor General of Canada provides one silver medal annually to the undergraduate student graduating with the highest academic standing.

**Dr. Michael Gutwein Memorial Award**
This $500 award and plaque has been made possible by contributions from classmates and friends in memory of Dr. Michael Gutwein. The award, which is not based on academic criteria, will be given to a final year Optometry student who actively encourages fellow students to participate in athletic and social affairs.

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

**Awards and Financial Aid**
Undergraduate Awards

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

**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 One, School of Optometry. Six scholarships are available, each of a total possible value of $2000, being $500 per year over the four professional years (Years One, Two, Three, and Four) 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 three students who are residents of the Western provinces. The various Provincial Optometrical Associations are consulted in awarding these Bursary scholarships. Applications should be submitted to the Student Awards Office before September 15 of each year.

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

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

**Lynn Holmes Memorial Award**
An award of $500 is presented annually to a Fine Arts student who has completed with distinction three years of studio work and elects to continue in the fourth year of the Honours program.

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

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

William F. James Sr. Debate Awards
The Faculty of Science Foundation has established the William F. James Sr. Debates competition in order to encourage the art of debate among Science undergraduates. Awards of $100 are made to each member of the winning team and $50 to each member of the runner-up team.

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

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

W.W. King Exchange Fellowship
Undergraduate Engineering students who participate in one of the active exchange programs between the University of Waterloo and overseas engineering schools, are eligible for financial assistance through the W.W. King Exchange Fellowship. Recipients must be on the Dean's Honours list prior to the exchange, and before receiving the fellowship. The maximum amount per student is $500.

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

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

James D. Leslie Prize
This $100 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.

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

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

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

McDonald's Second Year Fine Arts Scholarship
McDonald's Restaurants of Canada has made available a scholarship with a value of approximately $200 to be awarded to a full-time Fine Arts Major on the basis of performance in first-year courses and presentation of a portfolio.

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

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

Harry McLeod Co-op Chemistry Scholarship
A scholarship is normally awarded annually to a high-ranking student entering Year Four of the Co-op Chemistry program, selected on the basis of academic performance in 3A and 3B terms. No application is necessary.
Mediacom Inc. Scholarship
An annual scholarship of $400 is awarded to a third or fourth-year student in Urban and Regional Planning based on high academic standing and an interest in planning.

Jerome T. Miller Memorial Prize
A $50 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 cash prize is 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, Ltd. Award
Two awards of $600 each are given to students entering fourth-year Electrical or Computer Engineering based on outstanding performance in courses related to analog circuit design and measurement. Applications should be submitted during the 3B term.

Herb Nemeth Scholarship
A $200 scholarship is awarded to a student entering third or fourth year who has achieved the highest marks in three regional geography courses and who has an average of over 75% in all Geography courses.

New Brunswick Association of Optometrists Scholarship
The New Brunswick Association of Optometrists presents a scholarship in the amount of $250 to a resident of New Brunswick who is entering the first professional year of Optometry.

Noreen Energy Computer Science, Geological and Chemical Engineering Awards
Three awards of $1,200 are awarded to outstanding undergraduate students entering year two or above in Computer Science, Geological Engineering and Chemical Engineering. Awards will be allocated to students who have demonstrated a strong interest in extra-curricular activities and have evidence of leadership qualities. Consideration may be given to financial need. Applications should be submitted by October 30th each year.

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.

Awards and Financial Aid
Undergraduate Awards

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

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

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

Ontario Hydro Electrical Engineering Award
An annual award of $1700 is made to a student entering third-year Electrical Engineering who has good academic standing, strong written and oral communications skills, has demonstrated leadership ability and has been involved in extra-curricular activities within the university or community. Applications should be submitted during the 2B term.

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

Optometry Faculty Summer Research Scholarships
The faculty of the School of Optometry provide funds for these scholarships to support summer research by optometry students. These scholarships are awarded on the basis of merit using the same criteria as the Natural Sciences and Engineering Research Council of Canada uses to award Undergraduate Student Research Awards.

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

Marcel Pequegnat Scholarship
A $1200 scholarship may be awarded to a full-time student who has completed the third year of study in resource management or a related field and who intends to continue in this program. Foundation applications are available in the Student Awards Office and must be submitted during the 3B term or the third year of the Regular program.
Plastic Contact Lens Outstanding Achievement Award
This award of $1000 and an engraved plaque is presented annually by the Plastic Contact Lens Company to the student completing the third-year professional program in Optometry who attains the highest mark in Optometry 347 and demonstrates clinical proficiency.

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

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

QUANTUM Information Resources Limited Award(s)
Six awards valued at $1,000 each are available for full-time Co-op Computer Science students entering Year Two. The Awards are based on financial need as well as academic standing. Applicants should have a minimum overall academic average of 75% or higher at the end of Year One to be considered. Completed application forms must be submitted to the Student Awards Office during the first month of the 2A term.

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

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

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

Richard B. 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 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.

Lorne H. Russwurm Memorial Scholarship
An annual scholarship valued at $600 has been established in memory of Lorne Russwurm, an internationally known researcher and a Professor of Geography from 1967 until his death in January 1987. Professor Russwurm was highly regarded by students for his excellence as a teacher and advisor. The recipient will normally be an undergraduate geography student entering second, third or fourth year who began studies as a mature student. No application necessary.

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 $200 award is presented to an Architectural student who has been elected to serve on one of the School committees and who combines academic proficiency with a contribution to student affairs and student life in the School of Architecture.

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

- Alfred Babineau
- Nancy O. Bray
- Nicola Duthie
- Anne Fiedtkou
- Roman Guzowsky
- David Lamb
- Wade Mecher
- Mary R. Mitchell
- E.J. (Ted) Mulrooney
- Robert G. Somerville
- Michael Souliere

Stanley E. Slipper Award
The Canadian Society of Petroleum Geologists makes available one award consisting of a certificate and a one-year membership in the Society. The award is presented to a student in Earth Sciences who has demonstrated competence in petroleum geology or the related fields of Stratigraphy, sedimentology, paleontology, or structural geology.
Awards and Financial Aid
Undergraduate Awards

**Smale Fellowship**
The award of $600 is based on work in the fourth year (BArch) program, leadership ability and academic and design excellence.

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

**Society of Manufacturing Engineers Awards**
Four awards of $150 each are available to students in Mechanical, Electrical, Chemical and Systems Design Engineering. The awards are given on the basis of an outstanding written report or project related to the field of Manufacturing Engineering.

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

**H.A. Stein Scholarship**
A $500 scholarship is 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 is awarded to an outstanding student who is entering the third year of the Honours Actuarial Science program. Applications should be submitted during the 2B term.

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

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

**John Hin Chung Tsang Memorial Scholarship**
A scholarship of $750 is available annually to a student entering second year of a four-year Honours Mathematics program. Selection of candidates is based on academic achievement. The award has been endowed by Mrs. Pauline Tsang, through the Education Foundation of the Federation of Chinese Canadian Professionals of Ontario, in memory of Mr. John Hin Chung Tsang.

**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**
One or more awards, based on academic excellence, are made each year to outstanding students in the Honours Psychology program.

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

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

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

**Tom York Memorial Award**
The Tom York Memorial Award was established in memory of Dr. Thomas L. York (1940-88), writer, scholar, adventurer, and pastor, who served the University of Waterloo and Wilfrid Laurier University as Chaplain from 1985 until his death. The award will be given for prose fiction creative writing. Undergraduate or graduate students in any faculty, program or year, full or part time, may apply for this award by sending an item of prose unpublished, to TYMA Selection Committee, c/o Dr. Pauline Greenhill, St. Paul's United College, Westmount Road, North, Waterloo, Ontario N2L 3G5.
Work-Term Report Awards

All of the following are awards for work-term reports judged best for writing skills. The technical content of the report is important but not the most important factor. The awards are made each term and the winners will be determined by the Department of Co-operative Education and Career Services 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 or Computer 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.

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

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

George J. Dufault Awards
The George Dufault Awards arise from a fund established by the Sandford Fleming Foundation from contributions made by faculty, staff, students and friends in memory of the late Professor George Dufault of the Department of Electrical Engineering. Awards of $100 each are given to undergraduate students in Electrical and/or Computer Engineering for the best work-term reports in their class. Up to four awards are given in each calendar year.

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

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

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

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

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

Institute for Improvement in Quality and Productivity Award
Six awards of $100 each to second, third or fourth year Engineering, Mathematics or Arts Accounting students.

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

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

Kerr Addison Mines Limited Work-Term Report Award
Three awards of $100 each to second, third or fourth year Science 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.

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

Morrison Beatty Limited Award
Awards of $100 each to second, third or fourth year Geography students.

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

Bursaries

Northern Telecom Canada Ltd. Work-Term Report Award
Nine awards of $100 each to second, third or fourth year Electrical or Computer Engineering, Systems Design Engineering and Computer Science/Information Systems Option students.

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

QUANTUM Information Resources Ltd. Award
Three awards of $100 each to second, third or fourth year Computer Science students.

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

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

Thorne Ernst & Whinney Work-Term Report Awards
Three awards of $100 each to second, third and fourth year Arts or Mathematics/Chartered Accountancy Option students.

Waterloo-Wellington Chartered Accountants Association Awards
Three awards of $100 each to second, third or fourth year Arts or 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 (see Barkley's of Avonmore Bursary and Foreign Student Bursary). Students in a Regular program should apply by January 30th. Co-op students may be considered 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.

Jerzy W. Anders Memorial Award
A $500 award has been established in memory of Jerzy Anders, a Graduate of the University of Waterloo. The award is given to mature individuals who were forced to interrupt their University education due to financial difficulties or family obligations and are now experiencing financial hardship re-entering the academic world. Mature students experiencing financial difficulties should write to the Student Awards Officer detailing their circumstances.

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

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

Barkley's of Avonmore Bursary
One bursary is awarded annually to a student from a Third World Country. Foreign students must complete a special bursary application form and arrange an appointment with the Student Awards Officer.

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 Sciences students of good academic standing who need financial assistance.

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

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

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

Campus Recreation Bursary
A bursary may be awarded to a student who has displayed an involvement in the Campus Recreation program either as a leader or participant or both and who is in good standing with Campus Recreation. The recipient must have achieved a minimum of 65 percent overall average in the previous term. The award is open to any full-time University of Waterloo student.

Canadian Federation of University Women — Kitchener-Waterloo Bursaries
The Canadian Federation of University Women has established a bursary fund at the University of Waterloo to assist one or more women, studying full
time in second, third or fourth year who have attained second class standing and are in need of financial assistance. Preference will be given to women not holding tuition scholarships. Mature female students meeting these requirements are encouraged to apply.

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

**Credit Valley Conservation Authority Foundation Bursary**
One bursary of $200 is awarded annually to a Geography or Urban and Regional Planning student whose permanent address is within a member municipality of the Credit Valley Conservation Authority.

**John Dobson Foundation Bursary**
Bursaries are made available by the Foundation to deserving undergraduates. The bursaries are awarded in conjunction with University of Waterloo Bursaries.

**Shelley Ellison Memorial Award**
An award is made to a third-year Planning student who has maintained a B average, has financial need and can document a commitment to Professional Planning and to the spirit of friendship within the School. Preference will be given to female applicants. Special application is required by November 30th.

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

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

**Foreign Student Bursary**
A $50 bursary has been established by the Committee for Emergency Relief for Foreign Students. Foreign students experiencing financial difficulties should complete the bursary application and arrange an appointment with the Student Awards Officer.

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

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

**William H. Gale Bursary**
One bursary of $250 is awarded annually to a second, third or fourth year student in Co-op Applied Economics.

**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, are 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.

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

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

**Kitchener-Waterloo Community Foundation Bursary**
A bursary of $500 may be awarded annually to a full-time student from the Kitchener and Waterloo area registered in a visual Arts or Music program, Kinesiology, Recreation, Architecture, Arts or Math/Chartered Accountancy Option.

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

Mature Student Alumni Bursary Fund
Undergraduate, part-time students, studying on campus and encountering financial difficulties should arrange to speak with the Student Awards Officer regarding assistance from this source. Students must complete the bursary application.

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

Mike Moser Bursary Fund
Bursaries are awarded to deserving third and fourth year students who have financial need, an exemplary academic record, and who have achieved a high level of accomplishment in extra-curricular activities. A bursary application plus a resumé and letters of reference should be directed to Neil Widmeyer, Faculty of Human Kinetics and Leisure Studies. Special application is required.

Natural Log Bursary
A bursary fund has been established by the Math Society for undergraduate Mathematics students. Special consideration is given to Mathematics students who have been involved in extra-curricular activities. A minimum overall average of 60% is required, as well as a demonstrated need.

Ira G. Needles Memorial Bursary Fund
A bursary fund has been established in memory of Ira George Needles, one of the founding fathers of the University of Waterloo, Chairman of the Board of Governors from 1956 to 1966 when he was named Chancellor. Bursaries are awarded to full-time undergraduate students experiencing financial difficulties and who have maintained a B average.

A.C. Nielsen Company of Canada Ltd. Bursary
A.C. Nielsen Company of Canada Ltd. has made available two bursaries each in the amount of $500, to be awarded to two Computer Science students at the University of Waterloo. The awards are presented on the basis of financial need and academic standing.

Ontario Credit Union Charitable Foundation Bursary
One $250 bursary is awarded annually to a second, third, or fourth year student in Business Management courses in Accounting, Economics or Management Studies.

Phillips Cables Limited Bursary
One bursary of $700 is awarded to a Computer Science student who has financial need and satisfactory scholastic proficiency for the previous year of studies.

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

Pink Tie Bursary
A bursary fund has been established by the Math Society for undergraduate Mathematics students. Special consideration is given to Mathematics students who have been involved in extra-curricular activities. A minimum overall average of 60% is required, as well as a demonstrated need.

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

Rockwell International of Canada Limited, Collins Canada Division Bursary
Bursaries totalling $500 are 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.

Abraham Rosenberg Memorial Bursary
A bursary fund has been established in memory of Abraham Rosenberg a former member of University of Waterloo's Board of Governors.

Serendipity Bursary
A bursary fund has been established by Samuel Malenfant, Bachelor of Integrated Studies 1976. The bursary is awarded to a full-time undergraduate registered in Independent Studies.
Alan W. Shattuck Memorial Bursaries
Two bursaries of $500 are awarded annually on the basis of academic standing and financial need to students in fourth year Civil Engineering. The funds were made available by associates of Mr. Shattuck in recognition of his contribution in both pollution and water control resources.

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

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

- **Accounting Alumni Emergency Loan Fund**
  Loans up to $200 for a maximum of 90 days are available to full-time undergraduate Honours Accountancy Studies or Honours Math/Accounting Program students experiencing short-term financial difficulties.

- **Alpay, Elligsen, Nicoll Memorial Loan Fund**
  This fund was established by the Sandford Fleming Foundation in memory of Robert Elligsen, a Masters graduate of the Department of Mechanical Engineering (1985) and Professors Alpay and Nicoll, Department of Mechanical Engineering, from funds contributed by faculty, staff and others. Emergency loans are made available to students in the Faculty of Engineering.

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

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

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

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

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

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

- **Engineering Memorial Loan Fund**
  The Federation of Students has established an interest-free, short-term loan fund in honour of deceased students of the Faculty of Engineering. Loans are normally to a maximum of $300 for 90 days and are available to first-year Engineering students. To date, contributions have been received in memory of: Marc Cayouette.

- **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 Student Loan Fund**
  This fund was established by the Faculty of Engineering. Loans up to $300 for a period of up to 90 days are intended for Engineering students who have been faced with unexpected expenses during their academic term.

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

- **John Faber Memorial Fund**
  This fund was established by the Circle K Club at the University of Waterloo in memory of John Faber, former club member. Short term loans are offered to full-time students at the University of Waterloo.
Sandford Fleming Foundation Loan Fund
This loan fund was established by the Sandford Educational Press to provide emergency short-term loans to Engineering undergraduate students. The loans are normally for $200 or $300, and interest-free for up to 90 days. The Sandford Educational Press is the textbook publishing division of the Sandford Fleming Foundation, and the loan fund has been established from the proceeds of sales of its textbooks.

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.

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

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

Peter H. Nash Student Loan Fund
This loan fund was established by the Faculty of Environmental Studies to mark the retirement of Peter H. Nash, the founding Dean of the Faculty. The fund represents contributions received on this occasion and also in memory of the late Inez Frost Nash. Emergency Loans are made available to students in the Faculty of Environmental Studies. Maximum loans are $300 with repayment terms extending up to 90 days.

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

School of Optometry Emergency Loans
This fund has been established by the School of Optometry from monies donated by the profession, to provide interest-free loans to Optometry students who have completed or are about to complete third year, registered or not, who are experiencing severe financial hardship. Appointment with the Student Financial Aid Officer is necessary.

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 five plans:

1. Under the Ontario Study Grant Plan, Ontario students may apply for non-repayable grant assistance without having to borrow money first.
2. The Canada Student Loans Plan provides assistance in the form of interest-free loans to students who wish to pursue post-secondary studies who are not eligible for any, or sufficient, grant assistance.
3. The Ontario Student Loans Plan makes interest-free loan assistance available to students whose needs are not fully met by the Ontario Study Grant and the Canada Student Loans Plan.

Awards and Financial Aid
University Loan Funds
Government Assistance Programs
University of Waterloo Foreign Student Emergency Loan
Undergraduate foreign students in their final year of studies encountering financial difficulties should arrange to speak with either the Foreign Student Officer or the Financial Aid Officer regarding assistance from this source.

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

University of Waterloo Staff Association Emergency Loan Fund
The University of Waterloo Staff Association has established an emergency loan fund for full-time undergraduate students experiencing short-term financial difficulties. Preference will be given to students with affiliation to the University of Waterloo Staff Association. Loans up to $200 for a maximum of 90 days are available.

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

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

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

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

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

Canada Student Loans Program

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

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

NOTE
Students from provinces other than Ontario should approach the provincial assistance authority in their home provinces concerning the possibility of assistance from that source. Applications and/or addresses are available from the Student Awards Office, Needles Hall.

Tuition Assistance for Senior Citizens

The University will consider applications for financial assistance from Canadian citizens or permanent residents age 60 years or over who find payment of the required tuition fees a hardship. In such cases, applicants should write a letter, indicating the reasons for their inability to meet the cost of tuition, to: The Student Awards Officer, Office of the Registrar.
The Department of Co-operative Education and Career Services
Department of Co-operative Education and Career Services

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M.E. Flett, BE (TUNS)
B.L. Fretz, BA (Goshen)
R. A. Grant, BSc (Queen's), PEng
D. S. Harris, BEng (McGill), PEng
J.C. Henschaw, BASc (Toronto), PEng
J.W. Holland, BASc (Toronto), MBA (Western Ontario), PEng
R. Louw, BSc (Toronto)
A. F. MacKinnon, BComm (Acadia)
J. Martin, BA (Windsor)
R. Mateyk, BASc (Toronto), PEng
P. J. Mazzei, BSc, MSc (Queen's), PEng
W.B. Moore, BA (McGill)
G. C. Murphy, PEng
R. Parker, BSc (Montreal), MBA (Toronto)
L. I. Pinaud, BSc, MSc (Queen's)
A. M. Prins, BA (McMaster)
R. H. Roach, BSc (Waterloo)
H. Screaton, BA (Queen's)
P. V. Solomonian, BMath (Waterloo), MBA (Wilfrid Laurier)
V. E. Sparrow, BA (Waterloo)
G. Subasic, BASc (Washington), PEng
C. J. Webster, BASc (Guelph)
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Special Projects Co-ordinator
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O. F. Naase, BA (Waterloo)

Co-operative Education and Career Services

Placement Advisors
A.F.H. Bieth
R.A. Hawes, BRE (Emmanuel)
J. L. Metz
B.A. Robertson, BA (Toronto)

The Co-operative Education unit of the Department is responsible for the work-term aspect of all co-operative programs. The staff includes professional personnel who have extensive business and industrial experience.

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

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

Operation of the Plan
Necessary arrangements for integrating work terms, securing potential employers, arranging interviews, and generally managing the employment process are the responsibilities of the Co-operative Education unit. 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 One students enrol in September and spend the first term together at the University. In some programs, 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. Other programs provide several academic/work term sequences as shown on pages 5:3 and 5:4. Variations may be requested due to academic or work situations in upper years. The dates for the beginning and end of academic terms are shown in the Academic Calendar. Precise start and finish dates for work terms are established in consultation with Co-operative employers.
# Work/Study Sequence

## Program (By Faculty)

### Arts

<table>
<thead>
<tr>
<th>Program (By Faculty)</th>
<th>1A</th>
<th>1B</th>
<th>2A</th>
<th>2B</th>
<th>3A</th>
<th>3B</th>
<th>4A</th>
<th>4B</th>
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<tr>
<td>Applied Studies with admission to Honours French, Teaching Specialization</td>
<td>1A</td>
<td>1B</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
<td>off term</td>
<td>4A</td>
</tr>
<tr>
<td>Accountancy Studies</td>
<td>1A</td>
<td>1B</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
<td>4A</td>
<td>4B</td>
</tr>
<tr>
<td>If admitted to Honours BA/MAcc, PAS</td>
<td>1A</td>
<td>1B</td>
<td>2A</td>
<td>3A</td>
<td>3B</td>
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<td>4B</td>
<td>4B</td>
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<td>Stream 8</td>
<td>1A</td>
<td>1B</td>
<td>2A</td>
<td>3A</td>
<td>4A</td>
<td>4B</td>
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<td></td>
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<tr>
<td>If admitted to Honours BA/MAcc, PAS</td>
<td>1A</td>
<td>1B</td>
<td>2A</td>
<td>3A</td>
<td>4A</td>
<td>4B</td>
<td>4B</td>
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<tr>
<td>Stream 12</td>
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<td>3A</td>
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<td>4B</td>
<td>4B</td>
<td></td>
</tr>
<tr>
<td>If admitted to Honours BA/MAcc, PAS</td>
<td>1A</td>
<td>1B</td>
<td>2A</td>
<td>3A</td>
<td>4A</td>
<td>4B</td>
<td>4B</td>
<td></td>
</tr>
<tr>
<td>Management Accountancy Studies</td>
<td>1A</td>
<td>1B</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
<td>4A</td>
<td>4B</td>
</tr>
<tr>
<td>If admitted to Honours BA/MAcc, PAS</td>
<td>1A</td>
<td>1B</td>
<td>2A</td>
<td>3A</td>
<td>4A</td>
<td>4B</td>
<td>4B</td>
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</tr>
<tr>
<td>Stream 8</td>
<td>1A</td>
<td>1B</td>
<td>2A</td>
<td>3A</td>
<td>4A</td>
<td>4B</td>
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<tr>
<td>If admitted to Honours BA/MAcc, PAS</td>
<td>1A</td>
<td>1B</td>
<td>2A</td>
<td>3A</td>
<td>4A</td>
<td>4B</td>
<td>4B</td>
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<tr>
<td>Economics (Applied)</td>
<td>Regular</td>
<td>off term</td>
<td>2A</td>
<td>2B</td>
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<td>3B</td>
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<tr>
<td>English</td>
<td>Regular</td>
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<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
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<td>4B</td>
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<tr>
<td>English-Rhetoric and Professional Writing</td>
<td>Regular</td>
<td>off term</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
<td>4A</td>
<td>4B</td>
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<tr>
<td>Anthropology, Political Science, Psychology, Sociology</td>
<td>Regular</td>
<td>off term</td>
<td>Reg</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
<td>4A</td>
<td>4B</td>
</tr>
<tr>
<td>Engineering</td>
<td>Chemical, Civil, Computer *; Electrical, Mechanical, Systems Design, Stream 8</td>
<td>1A</td>
<td>1B</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
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<tr>
<td>GeoSciences</td>
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<td>4A</td>
<td>4B</td>
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<tr>
<td>Environmental Studies</td>
<td>Architecture</td>
<td>Regular</td>
<td>off term</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
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<td>3B</td>
<td>4A</td>
<td>4B</td>
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<tr>
<td>Geography</td>
<td>Regular</td>
<td>off term</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
<td>4A</td>
<td>4B</td>
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<tr>
<td>Urban and Regional Planning</td>
<td>Regular</td>
<td>off term</td>
<td>Reg</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
<td>4A</td>
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<td>Human Kinetics and Leisure Studies</td>
<td>Health Studies, Kinesiology, Recreation and Leisure Studies</td>
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<td>1B</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
<td>4A</td>
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</table>

### Notes

- **Math Teaching Option**
  - This four-month term is spent at the University of Western Ontario, Faculty of Education, London.
  - French Teaching Specialization
  - Term of study for BEU at Brock's College of Education
  - Students seeking admission must normally have satisfactorily completed two work terms in another Co-op Math program.
  - Teaching work term.
  - Optional teaching term
  - French Teaching Specialization teaching practicum term.

- **V Admission occurs by January for the 2B term.
- **W Admission occurs after first term.
- **X Although the Co-operative program begins in 2A, admission is made to the program at the time of the initial application to the University.

### Additional Information

- Although the Co-op program begins in 2A, admission occurs at the time of initial application and also following Year One.
- Admission occurs at the time of selection of second year courses. Students cannot be admitted to Co-op in first year.
- Following the 4A academic term, students may take the 4B academic term or the subsequent work term in either Jan/Apr or May/Aug periods.
- **Stream 6 only**
- **Stream 4 only**
- **Pre-Professionally Accredited Stream phase of the Honours BA Accountancy/MAcc program**
- **Optional Work Term**
- **Internship in Honours BA Accountancy/MAcc, PAS program**
- **PAS phase of Honours BA/MAcc**

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**Note:** The letters A and B denote academic terms. * denotes work term.
## Work/Study Sequence

**Note:**
The letters A and B denote academic terms. * denotes work term.

### Program (By Faculty)

#### Mathematics

<table>
<thead>
<tr>
<th>Stream 8</th>
<th>1A</th>
<th>1B</th>
<th>2A</th>
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<td>Stream 4</td>
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<td>3A</td>
<td>3B</td>
<td>4A</td>
<td>4B</td>
</tr>
</tbody>
</table>

#### Applied Math, Applied Math with Computer Science, Applied Math with electives in Engineering, Pure Math, Pure Math with Computer Science or Statistics
- 1A * 1B * 2A * 2B * 3A * 3B * 4A * 4B

#### Math/Chartered Accountancy
- Math/Chartered Accountancy/Computer Science
- Math/Management Accounting
- Math/Management Accounting/Computer Science

<table>
<thead>
<tr>
<th>Stream 8</th>
<th>1A</th>
<th>1B</th>
<th>2A</th>
<th>2B</th>
<th>3A</th>
<th>3B</th>
<th>4A</th>
<th>4B</th>
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<tbody>
<tr>
<td>Math Teaching Option</td>
<td>1A</td>
<td>1B</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
<td>4A</td>
<td>4B</td>
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#### Science
- Biology, Biochemistry, Applied Chemistry

<table>
<thead>
<tr>
<th>Stream 8</th>
<th>1A</th>
<th>1B</th>
<th>2A</th>
<th>2B</th>
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<tbody>
<tr>
<td>Stream 4</td>
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<td>1B</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
<td>4A</td>
<td>4B</td>
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</tbody>
</table>

#### Applied Earth Sciences
- 1A * 1B * 2A * 2B * 3A * 3B * 4A * 4B

#### Applied Physics
- Stream 8
- Stream 4

### Psychology
- Regular off term
- Psych 2B 3A 3B 4A 4B

### Math Teaching Option
- * This four-month term is spent at the University of Western Ontario, Faculty of Education, London.
- French Teaching Specialization
- Term of study for BEd at Brock’s College of Education.
- U Students seeking admission must normally have satisfactorily completed two work terms in another Co-op Math program.
- Teaching work term.
- Optional teaching term.
- French Teaching Specialization teaching practicum term.
- V Admission occurs by January for the 2B term.
- Y Admission occurs after first term.
- X Although the Co-operative program begins in 2A, admission is made to the program at the time of the initial application to the University.

### Co-operative Education and Career Services

- W Although the Co-op program begins in 2A, admission occurs at the time of initial application and also following Year One.
- Z Admission occurs at the time of selection of second year courses. Students cannot be admitted to Co-op in first year.
- Following the 4A academic term, students may take the 4B academic term or the subsequent work term in either Jan/Apr or May/Aug periods.
- Stream 0 only
- Stream 4 only
- Pre-Professionally Accredited Stream phase of the Honours BA Accounting/MAcc program.
- Optional Work Term.
- Internship in Honours BA Accounting/MAcc, PAS program.
- PAS phase of Honours BA/MAcc
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-operative Education and Career Services. Students may not seek employment directly with a Co-operative employer unless specific arrangements are made with the Department. Students who wish to arrange their own work term assignment must have the position evaluated by the Department before it may be considered for credit. Students intending to find their own jobs may not take part in the normal application and interview process arranged by the Department. Non-compliance with the above may result in a student being placed “On Own – University Imposed”.

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

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

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

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

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

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

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

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

Work Terms

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

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

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

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

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

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

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

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

Performance Evaluation
Evaluation grades are recorded on the "Employer Evaluation of Co-operative Student" form or on a special form developed in conjunction with a professional licensing body. The student should ensure that the employer has sent a completed evaluation to the University.

Academic Record for a Student Enrolled in a Co-operative Program
The Student Examination Report for the student’s last academic term will be sent to the Co-operative employer unless the student notifies the Department of Co-operative Education and Career Services to the contrary prior to the commencement of each work term.

Failure to Report to Employer
Failure to report to an employer will be recorded on the Co-operative Student Record as "Failed work term – refusal to honour previous agreement". Withdrawal from the program may also be required.

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

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

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

On Own
This condition 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-operative Education and Career Services. However, "On Own" conditions do not count toward the minimum requirements for graduation.

Performance Evaluation
Evaluation grades are recorded on the "Employer Evaluation of Co-operative Student" form or on a special form developed in conjunction with a professional licensing body. The student should ensure that the employer has sent a completed evaluation to the University.

Academic Record for a Student Enrolled in a Co-operative Program
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Commitment
A minimum of two consecutive work terms with an employer is expected. Provision is, however, allowed for such situations as one-term jobs and economic uncertainty. In all cases, failure to obtain approval from the appropriate Co-ordinator to not return for a
Co-operative Education and Career Services
Work Reports
Graduation Requirements for
Co-operative Programs

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

Standings and Appeals
Applicable to information on pages 5:5 and 5:6. The Department of Co-ordination and Placement which administers these Regulations and Procedures will first present any notation of “Failed Work Term”, “On Own – University Imposed”, or “Required to Withdraw” (as a result of unsatisfactory work-term performance) to the appropriate Faculty examinations, promotions or standings committees for a decision. The student is notified by letter of the final decision made by the committee. The decision may be appealed through the normal appeal channels within the Faculty.

Work Reports

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

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

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

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

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

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

Graduation Requirements for Co-operative Programs

WORK TERMS

Quantity
See p. 5:5.

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

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

WORK REPORTS

Quantity and Grading
In most programs the submission of a minimum of four work reports graded “Satisfactory” or better is a requisite for graduation. Provision is usually made for students to upgrade unsatisfactory reports or submit new reports. Special arrangements may be considered for cases such as those for which there are less than four work terms available to the student, and other special situations which might arise.
Registration Through Final Term
All work terms must be completed before the final academic term and the last work report must be submitted no later than the beginning of the final academic term. In all Co-operative programs, students must be registered as full-time students in the program in all terms from point of entry through to the final academic term. The only exception occurs in programs on a credit system in which a student may have sufficient credits to be able to register as a part-time student in the final term, provided all full-time term requirements of the faculty have been met.

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

Waterloo Advisory Council
The Waterloo Advisory Council of the University of Waterloo was established in 1958 to bring guidance from business, government and industry to the University. The Council meets twice a year to discuss and make recommendations on items related to all aspects of the University.

P.A. McLagan (President)
DMR Group Ltd.
F. G. Brown (Past President)
IBM Canada
R. T. Mahler (Vice-President)
Amdahl Limited
R.D. Colling (Secretary)
CNCP
S. H. Cornforth (Public Relations Chairman)
Price Waterhouse
P. B. Patterson (Membership Chairman)
Mercantile and General Reinsurance Company
N.A. Best
Best & Storey Associates
C. S. Boyce
3M Canada Limited
D. J. Cash
Niagara Region Development Corporation
G. E. Cooper
Noranda Exploration Company Limited (Retired)
P. Davies
Consumers Gas Company Limited
Career Services

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

Co-ordinator, Career Services
F. M. Ruszer, BA, MSc (Guelph)

Career Advisors
M. Bryan, BA (Waterloo)
L. Kling, BA (Waterloo), BEd (Western)

Alumni Placement Advisor
D. Hudspeth

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

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

Each year, several hundred employers are invited to conduct on-campus interviews for all graduating students. Employers interested in hiring graduates interview students during a four-week period in January/February. Summer and part-time employment opportunities are also available for non Co-op students.

The Alumni Referral Service is offered year-round to alumni seeking short-term or permanent employment. Resumes are forwarded on behalf of alumni to employers who are seeking candidates for open positions in their organizations.

The Career Services offices are located on the first floor of Ira G. Needles Hall.

Student Vocational Advisor Program (SVA)
Student Vocational Advisors are students trained in career planning and job search who are available in the Fall and Winter terms to act as peer resource persons. SVAs have regular office hours three hours a week and conduct workshops of special interest to students in the various faculties. Watch posters for office locations and times or check for information in the Career Services office, Needles Hall, room 1001, ext. 2494.
The following is a list of employers who participated in Waterloo's Co-operative programs in 1988. The list does not acknowledge the many individual departments within some of the organizations who participated.

Abitibi Price Inc.  
Accugraph Corporation  
ACF Flexible Inc.  
Acres International Ltd.  
Actel Resources Inc.  
Actrex Partners Ltd.  
Adam Scott Collegiate & Vocational Institute  
Adamsen Associates  
Adcom Electronics  
Addiction Research Foundation  
Adult Occupational Centre  
Advanced Scientific Computing Ltd.  
A.E.G. Bayly Inc.  
Aetna Canada  
AFG Glass Inc.  
AGF Management Ltd.  
Agri Services Laboratory Inc.  
Ainley & Associates Ltd.  
Air Canada  
Akit & Swanson  
Akler Melottek & Frimet  
Leo Alaire & Sons Ltd.  
Alberta Gas Chemicals Ltd.  
Alberta Gas Ethylene Company Ltd.  
Alberta Research Council  
Alberts & Associates Ltd.  
Air Canada  
Alden Bradley Canada Ltd.  
Alltech Ltd.  
Alluson Exports Ltd.  
Allen-Bradley Canada Ltd.  
Lotus A. Allen & Co.  
Allinson-Ross Corporation  
Allstate Insurance Company of Canada  
Alpha Roof Truss  
Alber Ireland Architects  
Anvac Ltd.  
Amberon  
Ambico Ltd.  
Amdahl Communications Ltd.  
American Cinflex  
American Express Canada Inc.  
AMP of Canada Ltd.  
Amphenol Canada Corp.  
AMS Canada Inc.  
Arthur Andersen & Company  
H.H. Angus & Associates Ltd.  
Annau Associates  
Antel Optronics Inc.  
Apple Canada  
Appledoo Heights Secondary School  
Artek International Inc.  
Architech Microsystems Inc.  
Arcop Associates  
Arcop Architects Inc.  
Armstrong Szweczyk Klayman Chartered Accountants  
Armetec - A Division of Jannock Steel Fabricating Company  
Arrell Observation & Detention Home for Children  
Arisschraft Corporation  
Artex Precast Ltd.  
Arvak Management Inc.  
Aseco Automation Systems Ltd.  
Ashland Chemicals  
Assayiers Ontario Ltd.  
Associated Engineering  
Association of Municipal Clerks & Treasurers of Ontario  
Assumption Mutual Life Insurance Company  
ASW Computer Systems Ltd.  
ASYST Technologies Inc.  
Atkinson Tremblay & Assoc. Ltd.  
Atlantic Packaging Products Ltd.  
Atlantic Flight Research  
Atlas Supply Company of Canada Ltd.  
Atomic Energy of Canada Ltd.  
AT & T Canada Inc.  
Au & Chan Architects  
Ault Dairies Ltd.  
Aurora Family Leisure Complex  
Australian Mutual Provident Society  
Automation Tooling Systems Inc.  
Avery Label Systems  
Aviscar Inc.  
Babcock & Wilcox Canada  
Railay Centre  
Bailey Hoogovens Canada Inc.  
Bakelite Thermosets Ltd.  
Balderson Mielke & Co.  
Daldwin & Franklin  
Bank of Canada  
Bank of Montreal  
Bank of Nova Scotia  
Bapco  
Barclay's Bank of Canada  
Barkin Naiman & Glassman  
Barr Associates  
Barrday Inc.  
Barrie Welding & Machine Ltd.  
Basf Canada Inc.  
Bateman & Battaglia  
Bathurst Pain & Sports Medicine Clinic  
Batten Graphics  
Batronics Inc.  
Bauer Industries  
The Bay  
Baycoat Ltd.  
Baycrest Hospital  
Bayview Glen Daycaump  
Bayview Wildwood Resorts  
Beak Consultants Ltd.  
Beaton Wills & Jefferson  
Beavery Lumber Company Ltd.  
Bechtel Engineers Ltd.  
Becker Milk Company Ltd.  
Beclawat Canada Inc.  
Bell Canada  
Bell Cellular Inc.  
Belleville PUC  
Bell-Northern Research  
Bel-Tronics  
Bendix Electronics Ltd.  
Berner & Company Inc.  
Bingeman Park  
Binstock, Green and Associates Ltd.  
Biokinetika and Associates Ltd.  
Biotechnica Canada Inc.  
Biotechnology Research Institute  
Bird Archer Inc.  
Birnbaum Prenick Siekel & Co.  
Bishop Strachan School  
Bit Slice Software  
H.L. Blachford Ltd.  
Black & McDonald Ltd.  
Blackstone Equip Ltd.  
Blood Hughes Architects  
Bloorview Children's Hospital  
Blue Cross of Atlantic Canada  
Blue Giant Equipment of Canada Ltd.  
BMB Compsucence Canada ltd.  
Boehringer Ingelheim  
Boeing of Canada Ltd.  
Joseph Bogdan  
Boise Cascade Canada Ltd.  
Booijm Research Ltd.  
Borden Chemical Co. (Canada) Ltd.  
Borg-Warner (Canada) Ltd.  
Bouris Wilson Scott & Proctor  
Boyle-Midway (Canada) Ltd.  
Boyne River Natural Science School  
Bramalea Limited  
Bramalea Software Systems  
Brampton Centennial Secondary School  
Branchton Camp  
Branden & Loder Architects  
Brant County Board of Education  
D.H. Braun Consulting Engineers Ltd.  
Brekin Scorgie Wasyko Architects Inc.  
Breslube Ltd.  
Briestensky Architect Ltd.  
Bribbin Book Beynon Architects  
Bristol-Myers Manufacturing  
British Columbia Forest Products Ltd.  
 Brockville Psychiatric Hospital  
C.W. Bulplock & Associates  
Burns Fry Ltd.  
R.J. Burns & Associates Ltd.  
Burstein & Company Chartered Accountants  
Burtch Correctional Centre  
Busby Bridge Architects  
Stan H. Butcherd  
John O. Butler Co.  
Butcot Ltd.  
BYTE  
The Cabinet Office  
Edmund Cachia & Co.  
Cactus Machinery Inc.  
Caudry Schweppes Canada Inc.  
Mott's Division  
Cadence Computer Corporation  
CAE Electronics Ltd.  
CAE Webster Ltd.  
Caledon Laboratories  
Calmos Systems Inc.  
Cainet Electronics  
Cambrian College of Arts and Technology  
Camco Inc.  
Cametor Ltd.  
Cami Automotive Inc.  
Campbell Lawless  
Camp Tawingo
Co-operative Education and Career Services
Organizations Employing Co-operative Students

Camp Wahanowin
Canada Brick Company
Canada Cement Lafarge Ltd.
Canada Colors & Chemicals Ltd.
Canada Broadcasting Co.
Canada Packers
Canada Post Corporation
Canada Publishing Corporation
Canada Spool & Bobbin Co. Ltd.
Canada Square Resins Ltd.
Canada Systems Group
Canada trust
Canada Wire & Cable Ltd.
Canadiana Outdoor Products Inc.
Canadian Astronautics Ltd.
Canadian Blower/Canada Pumps Ltd.
Canadian Broadcasting Corporation
Canadian Cancer Society
Canadian Depository
Canadian Energy Research Institute
Canadian Forest Products
Canadian General Life Insurance Company
Canadian General Tower Ltd.
Canadian Gypsum Co. Ltd.
Canadian Hearing Society
Canadian Imperial Bank of Commerce
Canadian Institute Steel Construction
Canadian Marconi Company
The Canadian National Institute For The Blind
Canadian National Railways
Canadian Pacific Ltd.
Canadian Pacific Forest Products Ltd.
The Canadian Press
The Canadian Red Cross Society
Canbar Products Ltd.
Canmate
Canstar
Canutil Inc.
Cannox Inc.
Canveon Systems Inc.
Canviron Consultants
C.A.P. Communications Ltd.
Capasco Software Canada Ltd.
Capsco Worldwide Software Marketing Co. Inc.
Carbochem inc.
Carborundum Abrasives Inc.
Carmine
Carleton Board of Education
Carley & Phillips Architects Inc.
Carling O'Keefe Ltd.
Carion Industries Ltd.
Carruthers Shaw and Partners Ltd.
Carruthers & Wallace Ltd.
Casba Metals Ltd.
Casco Company
Catoleum Pty Ltd.
Cawthra Park Secondary School
CCL Industries Inc.
Ceeco Group
Celtic Sports & Art Centre
Cemcorop
Centerline (Windsor) Ltd.
Central Dynamics Ltd.
Centralla College
Century 21 Heritage Ltd.
Certified Brakes
Cevaxx Corp.
Chambul Chiropractic Group
Choi & Co.
Championship Matten Browett & Welton Chartered Accountants
Chasson & Greenglass
Chateau-Gai Wines Ltd.
Chateau Lake Louise
Chedoke-McMaster Hospitals
Chemacryl Plastics Ltd.
Chembond Ltd.
Chemetics International Company
Chenery Glenn & Graydon
Chemikat Gottlieb & Co.
Cheeseborough-Ponds (Canada) Ltd.
Chevron Canada Resources Ltd.
Chicopee Manufacturing Ltd.
Chinook Chemicals Corporation Ltd.
Chipman Inc.
Chrysler-Canada Ltd.
Chibe-Celgie Canada Ltd.
Cidtech Research Inc.
CIL Ltd.
Citadel General Assurance
Citibank Canada
City of Elgin
City of Brampton
City of Brantford
City of Brockville
City of Calgary
City of Chatham
City of Kitchener
City of London
City of Mississauga
City of Niagara Falls
City of North York
City of Owen Sound
City of Peterborough
City of Sarnia
City of Sault Ste. Marie
City of Scarborough
City of St. Catharines
City of Stoney Creek
City of Sudbury
City of Toronto
City of Waterloo
City of Windsor
City of York
Clarke Darling Downey Architects
Clarke Henning & Co. Chartered Accountants
Clarke Institute of Psychiatry
Clarke Starke & Diegel
Clarkston Gordon Chartered Accountants
Clifford & Lawrie Architects Inc.
Clifford & Lawrie Chartered Accountants
Coldwell-Banker Canada Inc.
Cole Sherman & Associates Ltd.
Collgeate-Palmolive Canada
Collingwood District Family Y
Collins Bowes Chartered Accountant
Collins Bowes Mohco Nova Scotia
Color Your World Inc.
Colson Casters
Combustion Engineering Superheater Ltd.
CoDev Ltd.
Cominco Ltd.
Communication Solutions Inc.
Communications Engineering Services Ltd.
Communications Security Establishment
Computing Devices Company
Comshare Ltd.
Conchom
Concordia University
Concord Plastics
Conestoga College
Conestoga-Hovers & Associates
Conestogo Mechanical Ltd.
Confederation Life Insurance Company
Conlin Engineering & Planning Ltd.
Connaught Research Institute
Connelly & Kochy Chartered Accountants
Consolidated Bathurst Inc.
Constellation Assurance
Construction Meritas
Consumers Distributing Co. Ltd.
Consumers Glass Company Ltd.
Consumers Glass Co. Ltd.
Continental Can
Control Data Canada Ltd.
Control Services Group Inc.
Cooper Canada Ltd.
Co-operators Data Services Ltd.
Co-operators General Insurance Company
Cooper Millson & Foster
W.I. Cooper and Assoc.
Corel Systems Corporation
Coremark Animal Clinic
Corporate Foods Ltd.
Corrigan Manufacturing
County of Hastings
County of Huron
County of Renfrew
County of Victoria
Cox Hyatt & Co. Chartered Accountants
CPRI
John Crane Canada Inc.
Crang and Boake Inc.
Crawford Smith & Swallow
Crawley Films Ltd.
Credit Valley Conservation Authority
The Credit Valley Hospital
Crestwood Secondary School
Criminal Intelligence Services of Ontario
Ernest A. Cromarty
Cron Geophysics Ltd.
Crothers
Crown Life Insurance Co.
Crowtek Inc.
G.G. Cunningham & Associates
Custom Trim Ltd.
Cyanamid Canada Inc.
Cyberworks Inc.
Dagmar Construction Ltd.
Dalsa Inc.
D'Angela Sorrenti Canale & Palombo
Darby Place
Data General (Canada) Inc.
Datapoint Canada Inc.
Dataspire Corporation
N.J. Davenport & Assoc.
Davidson Yuen Partners
Davis Engineering
Davis Martindale
Dayco Products
DGP Canada Inc.
Docsoft Systems Ltd.
The De Havilland Aircraft of Canada Ltd.
Delhi Metal Products Ltd.
Co-operative Education and Career Services
Organizations Employing Co-operative Students

Dow Chemical Canada Inc.
Donn Canada Ltd.
Donn Canada Ltd./Ltee.
The Donwood Institute
Dono Heritage Crossroads
Donovan Ltd.
Dow Chemical Canada Inc.
Dow Corning Canada Inc.
Downs/Archambault
Dowty Canada Electronics Ltd.
Dowty Equipment of Canada Ltd.
Dresser Canada Inc.
Dufferin Aggregates
Dufferin Construction Co.
The Dufferin-Peel Roman Catholic Separate School Board
Dukop Farrow Atkin Cansfield
Dunwoody & Company Chartered Accountants
Dupont Canada Inc.
Durham Board of Education
Durham Region Non-Profit Housing Corporation
Dy-Lite Ltd.
Dy-4 Systems Inc.
Eagle Precision Technologies
East York Board of Education
Eaton’s
E.C.E. Group
Eckler Partners Ltd.
Economical Mutual Insurance Co.
E.B. Eddy Forest Products Ltd.
EDS of Canada Ltd.
Harry Eweues Associates Ltd.
Efo Inc.
Eicon Technology Corporation
Wm. Eisenberg & Company
E.L.B. Associates Inc.
Electrohome Ltd.
Elgin-St. Thomas Health Unit
Eli Lilly Canada Inc.
Ellis-Don Ltd.
Elwood School
Fenix Software
Encon Insurance Managers Inc.
Enermodal Engineering Ltd.
Enershare Technologies Inc.
Engineering Interfaco Ltd.
England Naylor Engineering Ltd.
Arthur Erickson
Esco Ltd.
Esso Chemical Canada
Esso Minerals Ltd.
Esso Petroleum Canada
Esso Resources Canada ltd.
Ethiblocke Board of Education
Evans Martin & Co.
Eveready Canada Inc.
Everich Imports
Exco Engineering
The Exolon-Esk Co. of Canada Ltd.
Esters & Chemicals International
Export Development Corporation
Fabricated Steel Products Ltd.
Fairview Munenotte Home
Falconbridge Ltd.
Family Service Association
Famme & Co. Chartered Accountants
Famous Players Ltd.
Federation of Ontario Naturalists
Feet First
Fenco Engineers Inc.
Ferranti-Packard Ltd.
Fiberglas Canada Inc.
V.K. Fierke & Company
Financial Life Assurance Company of Canada
Financial Models Co.
M.B. Finney Ltd. Consulting Engineer & Architect
Firestone Canada Inc.
First Brands Industries Corp.
Fisher Controls of Co. of Canada Ltd.
Flakt Canada Ltd.
Flanagan Berestord & Patteson
Fleet Technology Ltd.
Flemingdon Medical Laboratories
Flyss Gates McGowan Easton
Ford Electronics Manufacturing Corporation
Forest Heights Pool
Fortinette Canada Corp.
Gerald L. Forseth Architect Ltd.
Fortress Scientific
Fortwell Ltd.
Foseco Canada Ltd.
Foster Associates
Foundation Company of Canada Ltd.
Fox Glicksman & Company
Frankel Steel Ltd.
Fraser Inc.
Freepoint Hospital
FRI Information Services Ltd.
Fryetti Shifflett Associates
Fuchs-Montgomery Company Inc.
Fullerton Sherwood Engineering Ltd.
Gabor & Popper Architects
Galnet of Canada
Gamsby & Mannerow Ltd.
Gandalf Canada
Ganett Hoists Ltd.
Garrett Canada
Trevor Garwood-Jones
Garwood Jones Van Nostrand Architects
Gastops Ltd.
Gatemian Milloy
Gaviller & Company
G.B.B. Associates Ltd.
GFAC Computers International Inc.
GEC Canada Ltd.
Gellman Hayward & Partners Ltd.
General Chemical Canada Ltd.
General Electric Canada
General Foam & Cushion
General Mills Ltd.
General Motors of Canada Ltd.
General Refrigeration
Genetic Microchip National Semiconductor
Gernium Corporation
Geo Acoustics Inc.
Geocanex
Geological Survey of Canada
Geophysicson Ltd.
George Weston Ltd.
Geoselca Consultants Ltd.
Geovision Corporation
Gibson & Associates
Giffels Associates Ltd.
Gilmore Walsh & Co.
Ginsburg Gluzman Fage & Levitz
Glaxo Canada Ltd.
Glegg Water Conditioning Inc.
Glunayre Electronics Ltd.
Glenforest Secondary School
Go Computer Center Inc.
Goebelle MacAdam Alexander
The Gold Disc Inc
Golder Associates
Goldman Group
Golds Gym
Goodylll Consultants Inc.
Steven A. Goodman Chartered Accountant
B.F. Goodrich Canada Inc.
J.E. Goodwin P.C.
Goodyear Canada Inc.
Gordon Graydon Memorial Secondary School
Gore & Storrie Ltd.
GO Transit
Government of Canada
Agriculture Canada
Atmospheric Environment Service
Canada Centre for Inland Waters
Canadian Aviation Safety Board
Canadian Coast Guard
Canadian Forestry Service
Canadian International Development Agency
Canadian Transport Commission
Dept. of the Auditor General
Dept. of Communications
Dept. of Consumer & Corporate Affairs
Dept. of Customs & Excise
Dept. of Energy, Mines & Resources
Dept. of Finance
Dept. of Fisheries & Oceans
Dept. of Indian and Northern Affairs
Dept. of National Defence
Dept. of National Health and Welfare
Dept. of Public Works
Dept. of Regional Economic Expansion
Dept. of Supply & Services
Dept. of Treasury Board
Employment & Immigration Canada
Environment Canada
International Joint Commission
Parks Canada
Revenue Canada
Rideau Veterans’ Home
Solicitor General Canada
Statistics Canada
Transport Canada
Government of Northwest Territories
Grant Waferboard
Greater Canada Colour Printing
Greater Niagara General Hospital
Great West Life Assurance Co.
Green Acres Farm and Outdoor Centre
Green Box Agriculture Ltd.
Griff Harendorf Lebane Hoffman & Merrick
Co-operative Education and Career Services
Organizations Employing
Co-operative Students

Waltec Sinkware
Walter Fedy McCargar Hachborn
Walters Consulting Corporation Consulting Engineers
Wardair Canada (1975) Ltd.
Ward Mallette Chartered Accountants
Ward Mallette Professional Services Ltd.
Waltcom Products
Watcom Systems Inc.
Waterloo Arts Research Group
Waterloo County Board of Education
Waterloo Distance Education Inc.
Waterloo Information Systems Ltd.
Waterloo Microsystems Inc.
Waterloo Minor Baseball
Waterloo North Hydro
Waterloo Regional Separate School Board
Waterloo Regional Police
Watsun Simulation Laboratory
Weall 8 Cullen Nurseries
Geo. A. Welch & Co.
Wellesley Hospital
Wellington County Board of Education
Wellington Insurance Co. of Canada
Westbury Life Insurance Co.
Western Quebec Regional School Board
Westinghouse Canada Inc.
Westmin Resources Ltd.
Westmount Golf & Country Club
Weston Bakeries Ltd.
Whitby Hydro Commission
White Johnson Hyde & Company
Wig-a-Mog Inn
Wilderness Tours
Wilkinson & Company
Dr. Baxter Willis
R.E. Winter & Associates Ltd.
Woodbridge Foam Corporation
Wood Gundy Inc.
Woodingford Lodge
Woods Gordon
W.C. Wood Company Ltd.
Workers' Compensation Board
The Wyatt Company
Wynford Technologies Inc.
Yorke Rosenberg Mardall Architects
& Planners
Yorklea Children's Centre
York Region Board of Education
York Region Separate School Board
York South Association For Community Living
R.H. Young Architect
Young & Wright Architects
YWCA Calgary
Gary W. Zebroski
Zenon Environmental Inc.
Zitrer Sibbin Stein Levine & Co.
Zurich Insurance Co.
YMCA Kitchener-Waterloo
YMCA Orillia
YM-YWCA Peel County
The University Library
The University Library

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

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

Co-ordinator, Library Administrative Services
L. Beattie, BA (Loyola of Montreal), MA, PhD (Waterloo)

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

Librarian
R. Lamb, BA (Guelph), MLS (Western Ontario)

Assistant to the Librarian, Development Programs
M. Buchanan-Hannay, BA (Western Ontario)

Business Administrator
J. Jorgensen, BA (Toronto)

Co-ordinator, UW Press
G. Smith, ARCT (Toronto), BA (McMaster)

Public Services Division

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

Co-ordinator, User Education
L. Leger, BSc (Toronto), MLS (Western Ontario)

Co-ordinator, User Services
S. Routliffe, BA (Carleton), MLS (Western Ontario)

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

Cataloguer (University Map and Design Library)
A. Chan, BA (Hong Kong), MLS (Western Ontario)

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

Head, Arts Reference & Collections Development Department
G. Draper, BA, MA, PhD, MLS (Western Ontario)

Reference & Collections Development Librarians
M. Aquan-Yuen, BA, MLS (Toronto), MA (Waterloo)
D. Binkley, BA (Toronto), MLS (Western Ontario)
M. Rink, BA (Waterloo), MLS (Western Ontario)
R. Crusz, BA (Ceylon), BLS (Toronto), MA (Waterloo)
M. Ferguson, BA, MA (Waterloo), MLIS (Western Ontario)
D. Fitzpatrick, BA, MA (Windsor), MLS (Toronto)
A. Lakos, BA (Jerusalem), MLS (British Columbia)
S. Moskal, BSc, (Wisconsin-Madison), MLS (Western Ontario)
E. Murphy, BA (St. Mary’s), MLIS (Dahousie)
S. Rahman, BA, MA (Punjab), MA (Waterloo), MLS (Indiana)

Head, EMS Reference & Collections Development Department
Joan Macdonald, BSc, BEd (Dahousie), MLS (Western Ontario)

Reference & Collections Development Librarians
J. Cummings, AB, MLS (California, Berkley)
D. Harding, BSc (Guelph), MLS (Western Ontario)
A. Hansen, BEng (McGill), MLIS (Dahousie)
W. Macpherson, BSc, MLS (Dahousie)
J. Parrott, BSc (Queen’s), MSc, BLS (Toronto)
C. Stephenson, BSc (Guelph), MLS (Western Ontario)

Co-ordinator, Industrial and Business Information Service
F. Abrams, BA (Sir George Williams), MLS (McGill)

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

Collections Division

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

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

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

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

Cataloguers (Materials Acquisition Department)
T. Canini, BA, MA (Helsinki), MLS (Western Ontario)
J. Kuhn, BA, MA (Creighton), MLS (Western Ontario)

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

Collections Development Librarian
J. Beglo, BA (Waterloo Lutheran), BA (Waterloo), MA, MLS (Toronto)
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 Library, and the Davis Centre Library; one branch library, the University Map and Design Library; and one reading room, the Optometry Reading Room.

The Dana Porter Library, ten stories high and situated in the centre of the campus, is the focal point of the University. The lower floors house the main public services and support services. Public services located on the first floor include a large Reserve Reading Room with seating for 100 readers, the Doris Lewis Rare Book Room, the microform collection, and sight typing cubicles. The second or main floor contains the catalogue, the Circulation Counter and the Information Desk. Also on the main floor is the interlibrary Loan Office, the Copy Centre and the Reference Collection. The periodical and newspaper collections are located on the third floor. Government publications are located on the fifth floor. Floors six through ten house the circulating book collection and contain seating accommodation for more than 700 library users.

The Dana Porter Library houses collections to support programs in the social sciences and humanities. The collection numbers over 2,100,000 items including books, pamphlets, theses, microforms, documents, reports, sound recordings and other material. The Library subscribes to over 6,000 serials and over 50 newspapers.

The Davis Centre Library is located on the main floor of the William G. Davis Computer Research Centre. The three principal public areas - the Catalogue, the Circulation and Information Desks - are visible from the entrance to the Library. Seating is provided for 800 readers.

The Davis Centre Library collection numbers over 100,000 items including books, microforms, government publications, technical reports and maps. The Library subscribes to over 4,000 current serials.

The University Map and Design Library is located on the main floor of the Environmental Studies I Building. It is the principal centre on campus for the provision of service relating to cartographic and architectural design materials. The collection consists of more than 24,000 items including maps, air photographs, books, theses, and periodicals.

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

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

WATCAT, the online catalogue, is the central record of the library’s catalogued holdings. Catalogue terminals are located throughout the Libraries. WATCAT may also be searched from any terminal on campus or from any location off campus using a terminal and a modem.

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

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

The Federated and Affiliated colleges (St. Jerome’s, Conrad Grebel, St. Paul’s and Renison) have their own libraries which are accessible to University of Waterloo students, staff, and faculty. Conrad Grebel College Library has approximately 25,500 items which include a special collection on Peace Studies. It is also the home of a Mennonite Archive which consists of church records and documents of the Mennonites of Ontario. St. Jerome’s College Library has a collection of about 35,000 volumes. The 5,000 volumes in the Renison Library serve the College’s Social Development Studies Program and its courses in Third World Studies and General Arts. A small section deals with Anglican theology.

The University of Waterloo, Wilfrid Laurier University, York University, the University of Western Ontario, Brock University and the University of Guelph Libraries have reciprocal borrowing agreements which allow students, faculty and staff of one institution to borrow monographs from the other Libraries. Wilfrid Laurier University’s collection is particularly strong in the fields of Christian Religion, Business, Social Work, and Music. The University of Guelph has large holdings in Agricultural Science, Family and Consumer Studies, and Veterinary Medicine. Collection strengths at York include Social Sciences (especially Canadian History, Psychology and Sociology), Literature, Fine Arts (principally twentieth century, but some strength in the nineteenth century), Physical Education and Law. The University of Western Ontario has strong holdings in Law, Medicine, Education and Canadiana.
The staff of the University Library is engaged in obtaining material, processing it for the collections, and providing access to the collections. During the day and evening, reference and user services staff are on duty to assist in the use of collections, facilities and services. The libraries remain open after reference and user services close.

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

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

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

DEPARTMENT OF COMPUTING SERVICES

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

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

The Department of Computing Services 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, including special software to handle mathematical symbols, automatic typesetting, other applications’ packages and specialized environments such as APL are all available.

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

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

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

ARTS COMPUTING OFFICE

Manager
V. G. Neglia, BSc (Waterloo)

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

The ACO operates a VMS system on a VAX 785 computer and a network of IBM PC microcomputers. The VMS system is connected to the CMS system operated by the Department of Computing Services, enabling file transfer and electronic mail services between these systems.

Both undergraduate and graduate students registered in the Faculty of Arts may apply for a computer account with which they may do word processing. This account is available over and above any computer access provided by a specific course. Draft quality documents may be printed on a high speed line printer or a matrix printer which are available on a self-serve basis. Documents requiring high quality may be printed on an Apple Laser printer or a Diablo 630 ESC daisy wheel printer.

Public terminals and microcomputer workstations reserved for use by members of the faculty are located in PAS 1098, PAS 1080, PAS 1084, PAS 1087, HH 236 and HH 237. Printer facilities are located in HH 236, HH 237, PAS 1099 and PAS 1077.
ENGINEERING – WATSTAR MICROCOMPUTER NETWORK

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

The Faculty of Engineering operates an extensive network of microcomputers within Engineering called the WATSTAR network. The total network consists of 13 file servers and over 300 workstations with common access to all facilities. The Engineering WATSTAR network currently hosts over 4300 user accounts. WATSTAR serves the general computing needs of academic courses and programs within Engineering. The system has good mid-range documentation production facilities and students are encouraged to use these resources for report writing in addition to general computing and specific course-related work. All students registered in Engineering are given an account. WATSTAR also provides a message and mail facility between individual user accounts and a broadcast capability between group and system accounts. Mail can also be sent to any other on or off-campus address. Sytek access is available at specific stations located in E2-13028 using MSKERMIT.

In addition to regular full-time staff, WATSTAR also employs a part-time Co-op student each term who is available during scheduled hours for consulting purposes. As consulting times vary each term, students are advised to contact the WATSTAR office directly for up-to-date times (ext. 2965).

ENGINEERING EDUCATION RESEARCH CENTRE

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

The Engineering Education Research Centre reviews ways of improving the quality of undergraduate engineering education at UW through the use of appropriate technology. It undertakes or oversees projects ranging from innovative computing installations, to studies of different learning styles. It has initiated a number of pilot projects, some of which have grown to be permanent facilities.

ENVIRONMENTAL STUDIES MAPPING, ANALYSIS AND DESIGN COMPUTING

Director
R. T. Newkirk, BA, MSc, PhD (Western Ontario)

Assistant to the Director
M. Dumancic, BA (Waterloo)

Digital Image Systems Manager
J. Piwowar, BA, MA (Waterloo)

Manager, Instruction and Information Systems
To be announced

Office Manager
M. Ruehlshie

The Mapping, Analysis and Design (MAD) Facility provides a wide range of computing and consulting support for students, faculty and staff of Environmental Studies. All students are provided with authorization to use basic or very advanced computing equipment as required by their studies. Access is provided free of charge to data sets on deposit with the Data Resource Centre.

MAD supports two networks of microcomputers in addition to many computer terminals for accessing central services (IBM CMS) and Faculty computers (VAX VMS). Computing workrooms for graduate students (132 ES1) and for undergraduate students (163 ES2) are available on a drop-in basis throughout the week.

Computer graphics equipment (high resolution and colour) is available for mapping and design courses and research. Specialized equipment (Dipix Aries III and Perceptron) image processing systems supported by a VAX 11/785 and several microVAX systems are available for research in remote sensing.

Training sessions and consulting are provided on a regularly scheduled basis by the staff in MAD. Access to the services in MAD is arranged by visiting the MAD general office in room 163B ES2.

HUMAN KINETICS AND LEISURE STUDIES FACULTY COMPUTING

Associate Dean for Computing and Special Projects
E. M. Avedon, BSS (William and Mary), MA, EdD (Columbia)

HKLS Computing Consultant
T. O. Stewart, BA, MA (Waterloo)

The Faculty of Human Kinetics and Leisure Studies makes computing available to undergraduate students in a variety of ways. A nineteen workstation JANet network is provided in three locations in Burt Matthews Hall. Many courses are supplemented by commercial and custom software accessible on this network. Lap-top computers for instructional use are loaned to students in some courses. In a few courses, the IBM mainframe network is the vehicle for instructional computing.

Specialized computers and lab equipment are available to undergraduates for use in collecting and analyzing data for their own course and research work. For example, the WatScope system converts analog measurements to digital data for time-series and other analysis; the WatSmart system collects data in three-dimensional space for use in the study of human movement.
Dedicated workstations with up-to-date word processing software are also provided on the JANet network for undergraduate wordprocessing needs.

**MATHEMATICS FACULTY COMPUTING FACILITY**

**Director**
J. W. Wong, BS, MS, PhD (California - Los Angeles)

**Manager - Hardware**
K. L. Martin, BSc (New Brunswick), PEng

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

**Manager - Operations**
G. P. Embro

The Mathematics Faculty Computing Facility (MFCF) has a dual mandate: to supply a research tool for computer science research, and to provide all departments of the Mathematics Faculty with computing services supplementary to those available from the Department of Computing Services. The principal service provided to meet this mandate is general purpose time-sharing.

Primarily, the systems operated by MFCF include:
- four VAXes (an 8650, three 11/785's)
- eleven microVAX II's
- two SUN 3/160's
- a SUN 3/280
- a network of thirteen SUN 3/50's connected to a SUN 3/180 server
- four Iris colour graphics workstations
- a Sequent S27 parallel computer system with 6 processors.

The VAXes run Berkeley UNIX, and the SUN workstations run SUN's version of Berkeley UNIX. The Iris workstations and the Sequent also run their respective versions of Unix. Software includes several text editors, electronic mail, user-controlled archiving, plotting, text formatting, and a wide range of general and special-purpose languages. Communication between machines is primarily implemented with Ethernets. High-speed dedicated links provide communication between the VAXes, and the IBM mainframes (operated by the Department of Computing Services). Traffic between machines consists primarily of file transfers, electronic mail, print requests, and remote logins (between UNIX systems). MFCF participates in the UNIX-based USENET which provides news and computer conferencing between on-campus UNIX systems and a world-wide collection of participating sites. Electronic mail connections exist (directly or indirectly) to several global networks, e.g. CSNET, CDNNET, BITNET, and ARPANET.

Users at terminals may access machines operated by MFCF via a campus-wide Sytek local area network, Gandalf modems, dial-up telephone lines, or Datapac. Most public terminals are connected to the Sytek network. Hard-copy output can be obtained from a variety of devices, e.g. line printers, laser printers, and a linotronic 300 phototypesetter.

MFCF operates a real time programming lab (equipped with model trains and a robot), a microsystems lab (for a computer hardware course), a Maple instructional lab (used by students in calculus, algebra, and other courses), and a CS 131/132 lab (equipped with 60 Macintosh II's and used by students in the first-year computer science courses).

**MICROCOMPUTER INFORMATION CENTRE**

This centre (located in the Math and Computer building, room 2018C) has products from Apple, IBM, Olivetti, Toshiba and Zenith, all of which are available for demonstration and sale. In addition, the Computer Software and Information Centre (Math and Computer building, room 2018) has a variety of software, for IBM PC's and compatibles as well as for Apple Macintosh computers, available for sale. These products are available for purchase by any UW full- or part-time student.

**SCIENCE FACULTY COMPUTING**

**Associate Dean for Computing**
C. I. Mayfield, BSc, and PhD (Liverpool)

**Computer Liaison Officer**
A. Fleming, BMath (Waterloo)

The Faculty of Science has a broad range of different computer facilities available to undergraduates. Many courses are taught using the IBM mainframes and each student in those courses is issued an account. In addition, there is a JANET network in each of the four departments and the School of Optometry and these networks are used by students in many courses. The JANET networks typically have eight to 32 IBM-PC microcomputers linked to a central "file server" unit. Students are allocated disk space on this unit according to the requirements of the courses. Students will also encounter computers in many of the laboratories since they are used as data acquisition and analysis systems for scientific apparatus. In the Microcomputer Interface Laboratory in the Department of Physics, students gain "hands-on" experience in both the hardware and software aspects of such interfacing. Plans are underway to provide software support for student-owned microcomputers.

**OTHER FACILITIES**

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

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

Degrees

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

ADMISSION

1. General Requirements

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

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

Applicants who wish to study on a part-time or non-degree basis or through correspondence courses may obtain application forms from the Part-Time Studies and Continuing Education Office at the University of Waterloo.

2. Transfer Credit

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

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

Arts Programs

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

GENERAL PROGRAMS

1. With a Major

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

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

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

- Anthropology
- Classical Studies
- Drama
- Economics
- English
- Fine Arts
- French
- Geography
- History
- Latin
- Medieval Studies
- Music
- Philosophy
- Political Science
- Psychology
- Religious Studies
- Russian
- Science
- Sociology
- Spanish

There are no minors or double majors in General Programs.

2. Non-Major

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

1. Regular Programs
   An Honours Bachelor of Arts (BA) degree is offered by the University in the following disciplines:
   - Accounting
   - Anthropology
   - Classical Studies
   - Drama and Theatre Arts
   - Economics
   - English
   - Fine Arts
   - French
   - Geography
   - German
   - History
   - Latin
   - Medieval Studies
   - Music
   - Philosophy
   - Political Science
   - Psychology
   - Religious Studies
   - Russian
   - Slavic Studies
   - Social Development
   - Studies
   - Sociology
   - Spanish

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

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

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

   The following Co-operative programs are now offered:
   - Applied Studies Co-op (See Note 1)
   - Co-op Honours Anthropology
   - Co-op Honours Applied Economics
   - Co-op Honours Chartered Accountancy Studies
   - Co-op Honours English
   - Co-op Honours English (Rhetoric and Professional Writing Option)
   - Co-op Honours Management Accountancy Studies
   - 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.

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

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 ten term courses in the Minor discipline with an overall cumulative average of 65% in those courses. Students should consult with departmental undergraduate advisors for details of more specific requirements.

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

INTERDISCIPLINARY OPTIONS

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

   Option Administered by the Faculty of Arts
   Speech Communication (see page 8:41)

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

Studies in Sexuality, Marriage and the Family (Option or Minor, see Chapter 15)
Women's Studies (Option, see Chapter 15)

Note:
Normally a student may not double-count any course for more than one option or minor.
Students who intend to have an interdisciplinary option recognized on their transcripts must communicate that intention to the director of that program by the start of Year 3.

SELECTION OF YEAR 1 PROGRAMS
All Year One 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 Two. The first year is a broad exploratory year, and students should select programs of courses that keep as many options as possible open for advanced work. Students admitted to Arts Co-op must select several required courses in Year One (see "Applied Studies," Departmental Programs). Students in Year One General Arts usually choose five term courses in both the fall and winter terms. In each term, students usually select two courses from disciplines in Group A and two from disciplines in Group B (see Degree Requirements), with one or two more courses as electives. In choosing courses, students are encouraged to select courses in any discipline in which they may hope to major. The Faculty of Arts recommends that its students take at least one course in mathematics and/or science.

Notes:
1. From time to time, due to space limitations, students admitted to the University or continuing students in good standing, cannot be granted course and program selections of their choice.
2. Each student's program must be approved on or before registration date by a faculty advisor from the Faculty of Arts.
3. Students interested in Social Development Studies should consult the Undergraduate Officer at Renison College before selecting a Year One 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 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 specified periods, courses may be added or dropped only with the permission of the Examinations and Standings Committee acting on the recommendation of the instructor of the course and the Undergraduate Officer of the student's major Department, and only if the student can support his/her case with reasons showing that such a change in his/her program will serve his/her academic interests.
4. Courses offered during the Summer Session may be added or dropped during the first three days in which the course begins only with the signature of the Undergraduate Officer of the student's major Department, and thereafter only with the permission of the Examinations and Standings Committee.
5. A course that has not been dropped officially (i.e. recorded in the Registrar's Office) will receive a grade and be counted in the student's average.

It is important that students settle down in their schedule of courses 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, three- or four-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
Degree Requirements

In order to earn a BA, a student must complete, with the necessary cumulative averages, the required number of prescribed and elective courses for either the General or the Honours program. It is the student’s responsibility to ascertain that all requirements for graduation have been met. Any exceptions in graduation requirements requested by a student must be approved in writing by the Examinations and Standings Committee of the Arts Faculty.

General Major Program
Students in the 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

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

and

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

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

1. a minimum of 16 term courses beyond the 100 level,
2. a minimum of 15 term courses in the Faculty of Arts,
3. the Faculty of Arts Group A and B requirements (see below).

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

Honours Program
Students in an Honours program must complete 40 to 48 term courses (as specified in a Departmental Honours program), of which 16 term courses or their equivalent must be beyond the 100 level, with a passing mark in each and an overall cumulative average in the honours discipline of at least 75%. The Faculty of Arts Group A and B requirements (see below) must also be met. Students are asked to refer to “Departmental Programs” for other departmental requirements.

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

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

All students whose initial registration in degree programs in the Faculty of Arts was Fall 1977, or thereafter, must demonstrate competence in written English in order to qualify for the Bachelor of Arts degree. Students may fulfill this requirement by achieving a mark of at least 60% on the English Language Proficiency Examination or by demonstrating this competence in their Writing Clinic assignments.

Students who receive a mark below 60% on the English Language Proficiency Examination should attend the Writing Clinic. Students who do not fulfill the English Language Proficiency requirement by the beginning of their second year must attend the Writing Clinic.

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

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

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

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

In order to complete the Group A and B requirements an Arts student must complete with passing marks a minimum of 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. A student may take more than two term courses in a specific discipline in Group B but only two of them will be applied to meet the four course requirement. 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).
- a minimum of two term courses from any of the subjects listed in A(i), A(ii) or A(iii).

**Notes:**

1. **R S 105:** Elementary Biblical Hebrew, R S 106: New Testament Greek and R S 201: New Testament Greek may be used to meet the Group A (iii) requirement.

2. Arts students should note that they may elect to meet the Group A (ii) requirement in their second or subsequent years by completing with passing marks two of the following courses: FR 291, FR 292, GER 271, GER 272, RUSS 271, RUSS 272, SPAN 217, SPAN 218, CLAS 201, CLAS 202, or ITAL 291, ITAL 292. These courses are taught in English and are not open to first year Arts students. These courses are the only approved alternative to the A (ii) requirement.

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

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

Examinations and Standings

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

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

**Final Examinations**

1. The Faculty of Arts constitutes the examining body for all examinations. When a final written examination is required it is normally held at the end of the course. Oral examinations may be required at the discretion of individual departments. The normal time for written examinations is 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 fails to write for medical reasons, a Doctor’s certificate, covering the precise period of absence must be filed in the Registrar’s office within a reasonable period of time after the examination should have been written.

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

5. Normally instructors may not hold major term tests in the last five teaching days of the lecture schedule in any term. Major term tests are those which account for more than 25% of the final course grade.
Grading System

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

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

Overall standing is determined by the cumulative average of grades assigned for all courses taken at the University (at any time, whether passed or failed) while registered in a degree program 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 six term courses with a grade of Credit (Cr) in courses outside their major. Students in Honours Programs may present up to eight 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 the 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.

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

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

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

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

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

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

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

<table>
<thead>
<tr>
<th>Set A - Basic Statistics Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARCH 103*, BIOL 460, ECON 221, ENV S 271*, ENV S 277, ISS 250R, KIN 222, P SCI 214, PSYCH 201*, PSYCH 292, REC 270*, REC 371A, SOC 202*, SOC 280, STAT 202, STAT 204, STAT 210*, STAT 221, STAT 231</td>
</tr>
<tr>
<td>* No longer offered</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Set B - Advanced Statistics Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 461, PSYCH 202*, PSYCH 391, STAT 205*, STAT 304, STAT 321</td>
</tr>
<tr>
<td>* No longer offered</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Set C - Research Methods Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>* No longer offered</td>
</tr>
</tbody>
</table>
**Course Load**
Students will normally be limited to five courses (General and Non-Major programs) and six courses (Honours programs where required) per term. Courses may be added only by petition to the Examinations and Standings Committee.

Students may petition to take one or more courses above their normal course load per term (up to a maximum of seven courses) with the consent of the Undergraduate Officer of the student’s major department.

**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 most General and Honours Programs) by enrolling in one or two regularly scheduled courses meeting in either the day or evening. In addition, courses may be taken in the six week summer program or by correspondence. A number of programs are available by correspondence (see the University of Waterloo Correspondence Calendar). There is no distinction between part-time and full-time students as to admission requirements, grading practices, or promotion policies.

**Standing**

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

2. To be considered in good standing in an Honours program, a student must maintain a cumulative overall average of at least 60%, as well as an average of at least 75% in all courses taken in the Honours discipline (unless the department specifies a higher average). A student in a Joint Honours program must maintain a cumulative average of 75% in all courses taken in the two Honours disciplines (unless the departments specify other averages).

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

3. Even while otherwise in good standing, a student who fails four or more term courses in any academic year (ten term courses or fewer) 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, previous course work does not count in the cumulative average; however, all previous course attempts remain recorded on the student’s University transcript.

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

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

**Dean’s List**
To recognize outstanding academic achievement the Arts Faculty has established a Dean’s List. To be eligible for the Dean’s List a student:
1. must have completed a minimum of ten UW courses which count in the cumulative average,
2. must have a cumulative overall average of 83.0 or higher,
3. may not have any INC’s or NMR’s.

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 an Arts student wishes to appeal a grade in a course administered by the Arts Faculty, 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 the appeal.

If an Arts student wishes to appeal a grade in a course administered by a faculty other than Arts, the student should attempt to work the matter out informally with the course instructor. If the problem cannot be resolved in this way, a written appeal may be made to the Arts Faculty's Examinations and Standings Committee. The Committee will refer the appeal to the appropriate committee in the other faculty.

Students registered in faculties other than Arts who wish to appeal a grade in a course administered by the Arts Faculty should try to work the matter out informally with the instructor concerned. If the problem cannot be resolved in this way, a written appeal may be made to the Arts Faculty's Examinations and Standings Committee. The Committee will refer the appeal to the appropriate committee in Arts.

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

2. The review procedures adopted by departments and colleges in the Arts Faculty 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 an Arts 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 honors 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 reasons for them shall be reported to both the appellant and the Examinations and Standings Committee.

Departmental Programs

School of Accountancy

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

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

Recommended Program - Honours Accountancy Studies

<table>
<thead>
<tr>
<th>Term 1A</th>
<th>Term 1B</th>
<th>Term 2A</th>
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<tbody>
<tr>
<td>ACC 101</td>
<td>ACC 131</td>
<td>ACC 281</td>
</tr>
<tr>
<td>ECON 101</td>
<td>CS 100</td>
<td>ECON 201</td>
</tr>
<tr>
<td>MATH 113A*</td>
<td>ECON 102</td>
<td>ECON 221</td>
</tr>
<tr>
<td>ENGL elective</td>
<td>MATH 111B*</td>
<td></td>
</tr>
<tr>
<td>Two Group A or B electives</td>
<td>Two Group A or B electives</td>
<td>Three electives</td>
</tr>
</tbody>
</table>

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<th>Term 2B</th>
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</tr>
<tr>
<td>ACC 291</td>
</tr>
<tr>
<td>ECON 202</td>
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<tr>
<td>PSYCH 101</td>
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<td>One elective</td>
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<table>
<thead>
<tr>
<th>Term 3A</th>
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</thead>
<tbody>
<tr>
<td>ACC 351</td>
</tr>
<tr>
<td>ACC 371</td>
</tr>
<tr>
<td>ACC 392</td>
</tr>
<tr>
<td>Two electives</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Term 3B</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACC 372</td>
</tr>
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<td>ACC 381</td>
</tr>
<tr>
<td>ACC 441</td>
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<tr>
<td>Two electives</td>
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<table>
<thead>
<tr>
<th>Term 4A</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACC 382</td>
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<tr>
<td>ACC 401</td>
</tr>
<tr>
<td>ACC 481</td>
</tr>
<tr>
<td>Two electives</td>
</tr>
</tbody>
</table>

continued
Honours Accountancy Studies – Co-operative Program
(Honours Chartered Accountancy Studies and Honours Management Accountancy Studies)

Students may apply for direct admission to Year One Honours Accountancy Studies Co-op. Continued enrolment in this program is limited, based on academic performance.

There are five work terms available in the Co-operative program: students complete one, two or three terms on campus and then alternate work terms and academic terms until the program is completed (see p. 5:3 for specific sequences). Work-term placements are in accounting settings in the public and private sectors. Because of the nature of the Honours Accountancy Studies Co-operative program, which requires work experience, admission to this program requires Canadian Citizenship or Permanent Residence Status in Canada.

Eligibility for the degree of Bachelor of Arts in the Honours Accountancy Studies Co-op program requires:

1. Successful completion of a minimum of 42 term courses including the Faculty of Arts Group A and B requirements with an overall cumulative average of at least 60% and a cumulative average of at least 70% in all required courses listed under 2 below, and all electives labelled accounting (ACC).

2. The following courses are required for both CA and CMA:
   a) ACC 101, 131, 231, 281, 291, 351, 371, 372, 381, 382, 392, 401, 441, 461, 462, 491;
   b) ECON 101, 102, 201, 202, 221;
   c) MATH 113A, MATH 111B, and;
   d) either
      Specialization A - (Honours Chartered Accountancy Studies)
      ACC 132
      or
      Specialization B - (Honours Management Accountancy Studies)
      M SCI 211 or PSYCH 333

3. Those interested in qualifying as a Chartered Accountant should complete Honours Chartered Accountancy Studies Co-op by electing Specialization A above. At the end of this program the student will have completed most of the formal university courses required at present by the Institute of Chartered Accountants of Ontario (ICAO). The other principal requirements for the qualification as a CA, as stated by the ICAO, are work experience with a public accounting firm, passing of the ICAO’s admission examinations, successful completion of the ICAO’s Professional Summer School (offered in May-June by the ICAO) and successful completion of the Uniform Final Examinations.

 Those interested in qualifying as a Certified Management Accountant should complete Honours Management Accountancy Studies Co-op by electing Specialization B above. Of the 18 course requirements of the Society of Management Accountants of Ontario (SMAO), students can presently qualify for 15 complete course and examination exemptions. Two others qualify as SMAO course exemptions. The remaining course is offered by the SMAO. Students must write the SMAO’s Final Accreditation Examinations in these last three courses. They are offered twice yearly, once in early January and once in early July. The other principal requirement for qualification as a CMA is the completion of a minimum of two years of acceptable work experience.

Professionally Accredited Stream (PAS)
The Professionally Accredited Stream (PAS) commences in Year Three of the Bachelor of Arts, Honours Accountancy Studies program and concludes with the Master of Accounting degree.

It is a limited enrolment program which provides an integrated sequence of accounting, auditing, taxation and related studies. Year Three and Year Four required courses are set out below.

### Year Three and Year Four Required Courses - PAS

<table>
<thead>
<tr>
<th>Term</th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
<th>Required</th>
<th>One-Year</th>
<th>Fall</th>
<th>Term</th>
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<tr>
<td>3A</td>
<td>ACC 231</td>
<td>ACC 351</td>
<td>ACC 372</td>
<td>Sept.-Aug.</td>
<td>ACC 401</td>
<td>ACC 462</td>
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<tr>
<td>3B</td>
<td>ACC 291</td>
<td>ACC 381</td>
<td>ACC 382</td>
<td>Internship 4B</td>
<td>ACC 463</td>
<td>ACC 463</td>
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<td>ACC 371</td>
<td>ACC 392</td>
<td>ACC 441</td>
<td>ACC 491</td>
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<td>ACC 481</td>
<td>ACC 432</td>
<td>ACC 451</td>
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<td></td>
<td>STAT 311</td>
<td>ACC 443</td>
<td>ECON 201</td>
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<td></td>
<td>ENGL 210</td>
<td>ACC 462</td>
<td>or 202</td>
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</table>

Admission to the Professionally Accredited Stream (PAS)
The PAS is a limited enrolment program. To be eligible for admission students must have completed at least two years of university studies which include the following courses:

Two term courses in Introductory Economics
One term course in each of:
- Financial Accounting
- Managerial Accounting
Statistics
Computing
Calculus (beyond Grade 13 or Ontario Academic Course in Ontario)
Algebra (beyond Grade 13 or Ontario Academic Course in Ontario)
Psychology or Sociology
English
Humanities elective (English, History, Philosophy or a foreign language)
Intermediate Macro or Microeconomics

In addition, at some point within the PAS program, students must complete PSYCH 333 and PHIL 215.

In addition, students must ordinarily have achieved an excellent academic record in their university studies. In unusual situations, where warranted, consideration may be given to such factors as maturity and experience.

Special Recognition by the Accounting Profession of the Professionally Accredited Stream

This course of study is the only one in Ontario that has been accredited by the Institute of Chartered Accountants of Ontario as being sufficiently complete to justify special status for its graduates. Graduates are granted exemption from all ICAO education requirements (including the accounting, auditing and taxation admission examinations and the ICAO Professional Summer School) except the Uniform Final Examinations (UFE) which can be written at the first opportunity following graduation from the PAS.

Similarly, students receive maximum possible exemptions from the Society of Management Accountants of Ontario; the course of study is unique in Ontario in that students are exempted from all but the three Final Accreditation Exams (FAE).

Anthropology

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

Three Year General Anthropology

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

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

ANTH courses must include:
   a) 101, 201, 202, 260, 352;
   b) 102A or 102B;
   c) 103 or 283 or 290.

Four Year General Anthropology

Eligibility for graduation with a Four Year General degree in Anthropology includes the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts group requirements with a cumulative overall average of at least 60% and a cumulative major average of at least 65%.
2. At least 16 term courses must be in Anthropology and must include the courses required in the Three Year General program.

Honours Anthropology

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

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 20 term courses must be in Anthropology.

ANTH courses must include:
   a) 101, 201, 202, 260, 300, 352, 499A/B;
   b) 102A or 102B;
   c) 103 or 283 or 290;
   d) one additional 400-level term course.

Anthropology Joint Honours Program

Joint Honours programs have been approved for Anthropology and:

Classical Studies  Geography
Drama and Theatre  German
Arts  History
English  Political Science
Environment and  Psychology
Resource Studies  Religious Studies
French  Sociology

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

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 14 term courses must be in Anthropology.

ANTH courses must include:
   a) 101, 201, 202, 260, 300, 352;
   b) 102A or 102B;
   c) 103 or 283 or 290;
   d) one 400-level term course.
e) 499A/B (the Anthropology Honours Essay) is recommended, but is optional if an Honours Essay is written in the Joint discipline.

Honours Anthropology (Co-op)
Co-op Anthropology students will pursue a normal first year Arts program, taking ANTH 101 and either ANTH 102A or 102B. In the second year and thereafter the student is required to pursue a normal Honours program. It is strongly advised that ANTH 300 be taken in the second year.
Students are admitted to the program in their 2A term. Their first work term follows 2B. Work terms and study terms alternate after that. A student must complete four successful work terms.

Honours Anthropology (Applied Studies Co-op)
Students may combine an Honours Anthropology program with Applied Studies Co-op. The requirements in Anthropology are identical to the Honours requirements listed above. The Applied Studies requirements are listed on pages 8:12 and 8:13.

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

Applied Studies Co-op.
A student in the Applied Studies Co-op program must maintain good standing in an Honours program in Arts and must complete 14 to 16 term courses in the area designated Applied Studies. These courses are intended to provide the student with a basic and practical general education and with the skills appropriate to a wide range of careers. Specifically, they are intended to ensure that students in the program are:

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

Following Year One, six work terms alternate in regular sequence with six study terms. A special non-credit seminar (Co-op 000 AS), which is designed to prepare students for their Co-op employment experience, is offered during the two terms preceding the first work term at the end of Year One.

Required Program

Year 1A
A second language
ACC 131
CS 100 or CS 102 or ARTS 198
Co-op 000 AS

Year 1B
A second language
ACC 132
ENGL 109
Co-op 000 AS

Year 2A
HIST 253 or P SCI 260A
ACC 121

Year 2B
HIST 254 or P SCI 260B; and PHIL 145
A Computer Science or approved Applied Studies course

Year 3A
Two approved courses in Applied Studies

Year 3B
An approved Applied Studies course

Year 4A
An approved Applied Studies course

Year 4B
An approved Applied Studies course

Notes:
1. Students must normally have an overall average of 75% in their Applied Studies courses in the first term of Year One (1A) to remain in the program.
2. Once a major has been chosen at the end of Year One, students must maintain an average of at least 75% both in the major field of specialization and in the Applied Studies courses.
3. Arts Administration and French Teaching
specializations are available for qualified applicants
at the beginning of the 2A term. Details in ML 119.

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

5. Double-counting courses for credit in Applied
Studies and the major subject is not allowed except
when a course is a specified requirement for both.

Double-counting courses for credit in Applied
Studies and a minor or option is allowed to a
maximum of one-third of the total number of
courses required for that minor or option.

6. Upon successful completion of the 44 term courses
required in this program and a minimum of four
successful work terms, a student is granted an
Honours degree in the major discipline with an
Applied Studies Co-operative program designation.

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Classical Studies
(Latin, Greek, Classical Studies)

Three-Year General Programs
Eligibility for graduation in the General Latin, Greek or
General Classical Studies program includes fulfillment
of the following requirements:

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

2. At least ten term courses must be in the major
field. In the Latin or Greek programs, normally not
more than two of the ten may be in Classical
Studies. In the Classical Studies program, normally not
more than two of the ten may be in Latin or
Greek; the ten must also include CLAS 251/252,
265 or 266, and at least two term courses at the
300 level. Knowledge of neither Latin nor Greek is
required to obtain a General degree in Classical
Studies.

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

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

2. At least 14 term courses must be in Classical
Studies, including CLAS 251/252, 265 or 266, and
at least two term courses at the 300 level. Normally
not more than four of the 14 term courses may be
in Latin or Greek.

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Note
All CLAS courses and general programs were formerly
designated C CV.

Honours Programs
Eligibility for graduation in the Honours Classical
Studies, Classical Studies (Languages Option) or Latin
program includes fulfillment of the following
requirements:

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

2. At least 20 term courses must be in the major field.
In the Latin program, normally not more than six of
the 20 term courses are Classical Studies courses.
In the Classical Studies program, the 20 term
courses must include: CLAS 251/252; 265 or 266;
one senior seminar; at least seven term courses in
LAT and/or GRK, including one at the 300 level;
CLAS 490A/B (Senior Honours Thesis) or two
equivalent term courses in Directed Study (see
Notes). In Classical Studies (Languages Option),
the 20 term courses must include: CLAS 251/252;
at least 14 term courses in LAT and GRK,
including one 300 level term course in both, and a
400 level term course in one; CLAS 490A/B (Senior
Honours Thesis) or two equivalent term courses in
Directed Study.

Honours Classical Studies
Recommended Program

<table>
<thead>
<tr>
<th>Year One</th>
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<tbody>
<tr>
<td>Two of CLAS 100/101/102</td>
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<tr>
<td>LAT 100A/B or GRK 100A/B</td>
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<tr>
<td>Six additional term courses</td>
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<table>
<thead>
<tr>
<th>Year Two</th>
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<tbody>
<tr>
<td>CLAS 251/252; 265 or 266</td>
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<tr>
<td>One additional CLAS</td>
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<td></td>
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<tr>
<td>Two 200-level term courses in LAT/GRK</td>
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<tr>
<td>Four additional term courses</td>
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<th>Year Three</th>
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<tbody>
<tr>
<td>One 300-level term course in LAT/GRK</td>
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<tr>
<td>Two additional term courses in LAT/GRK</td>
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<td></td>
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<tr>
<td>Three CLAS or Directed Study</td>
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<tr>
<td>Four additional term courses</td>
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<tr>
<th>Year Four</th>
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<tbody>
<tr>
<td>Two CLAS including one senior seminar</td>
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<td></td>
</tr>
<tr>
<td>CLAS 490A/B or Directed Study</td>
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<tr>
<td>Six additional term courses</td>
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</tbody>
</table>
Honours Classical Studies (Languages Option)

Recommended Program

Year One
LAT 100A/B or LAT 203/204
GRK 100A/B
Six additional term courses

Year Two
Two LAT, two GRK
CLAS 251/252
Four additional term courses

Year Three
Four term courses in LAT/GRK, including one 300-level term course in each
Two additional CLAS or LAT/GRK, or Directed Study
Four additional term courses

Year Four
CLAS 490A/B or Directed Study
One 400-level term course in LAT/GRK
One additional term course in CLAS or LAT/GRK
Six additional term courses

Honours Latin

Recommended Program

Year One
LAT 100A/B or 203/204
Eight additional term courses

Years Two, Three, Four
Four term courses in LAT
Four term courses in CLAS
Four additional term courses

Honours Classical Studies or Latin
(Appplied Studies Co-op)

A student may combine an Honours Classical Studies or Latin program with Applied Studies Co-op. The requirements in Classical Studies or Latin are identical to the Joint Honours requirements listed below. The Applied Studies requirements are listed on pages 8:12 and 8:13.

Joint Honours Programs

Eligibility for graduation in the Joint Honours Classical Studies, Classical Studies (Languages Option) or Latin program includes fulfilment of the following requirements:

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

2. At least 16 term courses must be in the major field.
   In the Latin program, normally not more than four of the 16 term courses are Classical Studies courses. In the Classical Studies program, the 16 term courses must include: CLAS 251/252; 265 or 266; at least five term courses in LAT/GRK; CLAS 490A/B or Directed Study (see Notes), or a senior Honours thesis in the other discipline. In Classical Studies (Languages Option), the 16 term courses must include: at least 12 term courses in LAT/GRK, including at least four term courses in each language; CLAS 251/252; CLAS 490A/B or Directed Study, or a senior Honours thesis in the other discipline.

Joint Honours Classical Studies

Recommended Program

Year One
Two of CLAS 100/101/102
LAT 100A/B or GRK 100A/B
Six additional term courses

Year Two
CLAS 251/252; 265 or 266
Two term courses in LATlGRK
Seven additional term courses

Year Three
One term course in LATlGRK
Three CLAS (one may be Directed Study)
Eight additional term courses

Year Four
CLAS 490A/B or Directed Study
One additional CLAS
Seven additional term courses

Joint Honours Classical Studies (Languages Option)

Recommended Program

Year One
LAT 100A/B or LAT 203/204
GRK 100A/B
Six additional term courses

Year Two
Two LAT, two GRK
CLAS 251/252
Six additional term courses

Year Three
Three term courses in LAT/GRK
One additional term course in LAT/GRK or CLAS or Directed Study
Eight additional term courses
Arts
Drama and Theatre Arts

Year Four
CLAS 490A/B or Directed Study
Eight additional term courses

Notes for All Honours Classical Studies Programs
1. Students in Classical Studies may take more LAT/GRK courses than the prescribed minimums. The decision whether to graduate in Classical Studies or in Classical Studies (Languages Option) may be left until registration in the final year.
2. Beginning in the second half of third year, students may with the help of the Assistant Undergraduate Advisor design proposals for Directed Study. Between two and five term courses in CLAS/LAT/GRK may be taken by Directed Study (between two and three in the case of Joint Honours), of which two would take the place of CLAS 490A/B (Senior Honours Thesis). For further details consult the Department.
3. In CLAS 490A/B a grade of B- or higher must be achieved; in Directed Study an average of B- or higher must be achieved in the equivalent of two 400-level courses.
4. CLAS courses were formerly designated C CIV.

Minor Programs
Minor programs are offered in Classical Studies, 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

General Drama and Theatre Arts
Eligibility for graduation in the General Drama and Theatre Arts program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least 12 term courses must be in Drama and Theatre Arts, including:
   a) DRAMA 101A, 101B and 102 must be taken in the first year;
   b) any three of DRAMA 251, 252, 253, 254, 255, 258, 259, 301, 302, 351, 352, 353, 355, 356, 357, 358, ENGL 362, 363;  
   c) DRAMA 243, 244, 371 or 372, 409.

Honours Drama and Theatre Arts
The Honours Drama and Theatre Arts program is designed so that a student can work through a particular sequence of courses in one field (acting, academic, directing, technical) which would in effect become an area of specialization. The DRAMA 499 project in the fourth year would then presumably be centred on this specialization. Eligibility for graduation in the Honours Drama and Theatre Arts program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 20 term courses must be in Drama and Theatre Arts including:
   a) DRAMA 101A, 101B and 102 must be taken in the first year;
   b) six of DRAMA 251, 252, 253, 254, 255, 258, 259, 301, 302, 351, 352, 353, 355, 356, 357, 358, ENGL 362, 363;
   c) DRAMA 243, 244, 371, 372, 409, 499A/B.

Honours Drama and Theatre Arts
(Applied Studies Co-op)
A student may combine an Honours Drama and Theatre Arts program with Applied Studies Co-op. The requirements in Drama and Theatre Arts are identical to the Honours requirements listed above. The Applied Studies requirements are listed on pages 8:12 and 8:13.

Drama and Theatre Arts Joint Honours Program
Eligibility for graduation in the Joint Honours Drama and Theatre Arts program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 15 term courses must be in Drama and Theatre Arts including:
   a) DRAMA 101A, 101B and 102 must be taken in the first year;
   b) any three of DRAMA 251, 252, 253, 254, 255, 258, 259, 301, 302, 351, 352, 353, 355, 356, 357, 358, ENGL 362, 363; 
   c) DRAMA 243, 244, 371 or 372, 409.
b) three of DRAMA 251, 252, 253, 254, 255, 256, 259, 301, 302, 351, 352, 353, 355, 356, 357, 358, 362, 363;

c) DRAMA 243, 244, 371, 372, 409;

d) DRAMA 499A/B or 2 other DRAMA courses may be taken if the other department of the Joint Honours program does not have a Senior Seminar. If the other department requires the equivalent of a Senior Seminar of its Joint Honours students the Drama Group would waive the 499 requirement, and the student would take two other Drama classes.

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

Speech Communication Option
See page 8:41. Limited enrolment; early registration advised.

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

Economics

Prerequisite
It is desirable that students planning to enter Economics should offer one OAC in mathematics (preferably calculus) or the equivalent.

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

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements, plus a minimum of 16 term courses beyond the 100 level, with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least ten term courses must be in Economics. Four of these ten term courses must be at the 300-level or above. ECON courses must include:
   a) 101 and 102 or (1.50) 201, 202, 211, 221, 231, 301, 302, 321, 401, 402;
   b) 310 or 361;
   c) Three additional term courses at the 300 level or above. (ECON 410 is recommended but not mandatory.)

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

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements, plus a minimum of 16 term courses beyond the 100 level, with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least 14 term courses must be in Economics. Six of these 14 term courses must be at the 300 level or above plus two term courses must be at the 400 level. ECON courses must include:
   a) 101 and 102 (or 150), 201, 202, 231, 301, 302;
   b) 211 or 221.

Honours Programs

Honours Economics (Regular Program)
Eligibility for graduation in the Honours Economics program includes fulfillment of the following requirements:

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

2. At least 18 term courses must be in Economics, including ECON:
   a) 101 and 102 (or 150), 201, 202, 211, 221, 231, 301, 302, 321, 401, 402;
   b) 310 or 361;
   c) Three additional term courses at the 300 level or above. (ECON 410 is recommended but not mandatory.)

Recommended Program

Year One
ECON 101 and 102 (or 150)
Eight (or nine) additional term courses *
* Students without an OAC in Mathematics or equivalent should select MATH 103, 104 as electives.

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

Year Three
ECON 301, 302, 321
Three additional term courses in Economics
Four additional term courses.

Year Four
ECON 401, 402 *
Two additional term courses in Economics
Six additional term courses.
* ECON 401, 402 need not be taken in the order as listed.
Honours Economics (Applied Studies Co-op)
A student may combine an Honours Economics program with Applied Studies Co-op. The requirements in Economics are identical to the Honours requirements listed above. The Applied Studies requirements are listed on pages 8:12 and 8:13.

Honours Applied Economics (Co-op)
Eligibility for graduation in the Honours Applied Economics (Co-op) program includes fulfillment of the following requirements:

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

2. At least 18 term courses must be in Economics including ECON 101 and 102 (or 150), 201, 202, 221, 231, 301, 302, 310, 321, 361, 401, 402, 403, 410, 421, 422. In addition, students are required to complete one additional term course at the 300 level or above.

3. In addition, the following courses are required:
   a) MATH 111B, 113A
   b) ACC 121, 122
   c) CS 100 or 102.

Recommended Program for Honours Applied Economics (Co-op)

Year One
ECON 101 and 102 (or 150)
CS 100 or 102
ENGL 109 or 150
MATH 111B
Five (or six) additional term courses.

Year Two A
ECON 201, 221, 231
ACC 121
MATH 113A
One additional term course.

Year Two B
ECON 202, 361
ACC 122
Three additional term courses.

Year Three A
ECON 302, 310, 321
Three additional term courses.

Year Three B
ECON 301, 410, 421
Three additional term courses.

Year Four A
ECON 401, 402
One additional term course in Economics at the 300 level or above
Two additional term courses.

Year Four B
ECON 403, 422
Three additional term courses.

Note:
Students enter Honours Applied Economics in term 2A but should apply in term 1B. See Co-op Advisor in Economics.

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

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

2. At least 14 term courses must be in Economics including ECON 101 and 102 (or 150), 201, 202, 211, 221, 231, 301, 302, 401, 402. Students in the Faculty of Mathematics must take at least 12 term courses in Economics including ECON 101 and 102 (or 150), 201, 202, 231, 301, 401, 402, plus three additional ECON courses above the 300 level.

Notes For Joint Honours Programs:

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

2. Economics and Mathematics
   Substitute ECON 311, 321, for ECON 211, 221. Students in Years One and Two may take this program in either Faculty, but at the end of the second year, they will decide whether to continue towards a degree in Arts or a degree in Mathematics. The program must then be approved by the Economics Department and by an appropriate department of the Faculty of Mathematics.

3. Economics and Political Science
   ECON 310 must be taken along with the above core courses.

4. Economics and Sociology
   Students may take either ECON 221 or SOC 280.
**Minor Program in Economics**
A total of ten term courses in Economics must be taken, and must include:
ECON 101, 102, 201, 202, 231;
ECON 211 or 221.

Math students should substitute ECON 211 or ECON 221 with ECON 311 or 321.

**Economics Option**
Students in Honours Earth Sciences may earn an Economics Option upon successful completion of the following six courses with a cumulative average (in Option courses) of at least 65%. Required courses are ECON 101 and 102 (or 150), 201, 355. Two additional courses are required with no more than one from each of the following groups:
ECON 341 or 361
BUS 111 or 121 (WLU)
M SCI 211
a course in entrepreneurship.

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**English**

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

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

2. At least 12 term courses must be in English, including:
   a) two term courses from 102A, 102B, 103A, 103B, 105A, 105B, 108, 190 (see Note 1);
   b) 200A, 200B (Survey of British Literature - see Notes 2 and 3);
   c) 251A, 251B (Practice and Theory of Criticism - see Note 3);
   e) one term course from 313, 314, 315, 316, 343, 344, 345, 346, 347, 445A (North American Literature);
   f) three other English major term courses.

Students in the General program must gain a minimum of 16 term courses beyond the 100 level.

**Four-Year General English**
Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements, with specific English requirements the same as for the Joint Honours Program. Students must maintain a minimum average of 70% in their English major courses and an overall cumulative average of 60%.

**Honours English – Literature**
Eligibility for graduation in the Honours English program includes fulfillment of the following requirements:

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

2. At least 20 term courses must be in English, and these 20 courses are usually divided 2-4-6 among the four years. English courses must include:
   a) two term courses from 102A, 102B, 103A, 103B, 105A, 105B, 108, 190 (see Note 1);
   b) 200A, 200B (Survey of British Literature - see Notes 2 and 3);
   c) 251A, 251B (Practice and Theory of Criticism - see Note 3);
   d) two term courses from 305A, 305B, 306A, 306B, 306C, 306D, 306E (Language and Early Literature);
   e) four term courses from 310A, 310B, 330A, 330B, 350A, 350B, 362, 363, 410A, 410B (British Literature to 1800);
   f) two term courses from 430A, 430B, 451A, 451B, 460A, 460B, 460C (British Literature since 1800);
   g) two term courses from 313, 314, 315, 316, 343, 344, 345, 346, 347, 445A (North American Literature);
   h) four other English major term courses.

**Honours English – Rhetoric & Professional Writing**
The Rhetoric and Professional Writing Option is available only as an Honours program (not as a General program) and may be taken as either a Regular program or a Co-operative program. A student must complete 44 term courses with an average of at least 75% in English courses and 70% in the Intensive Study area. In addition to English courses (English 103A/B is recommended), good course choices for first year include Arts Group B courses, a language other than English, and Computer Science.

The Intensive Study areas can be made up of courses drawn from all faculties except Engineering. The courses will be taken either from a single department (e.g. Biology, Economics) or closely related disciplines (e.g. Biology and Health Studies, Economics and Accounting, Legal Studies). Lists of approved "packages" for Intensive Study may be obtained from the Undergraduate Officer of the Department of English, who also has lists of recommended courses relevant to the program in History, Philosophy, and Political Science.
Students preparing themselves for teaching careers or graduate studies in English may include further courses in literature as part of their electives.

**English Requirements (20 courses)**

a) First Year (two courses): two 100-level English courses (103A, 103B recommended);
b) Literature (eight courses): 200A, 200B; 251A, 251B; four other Literature (at least two at 300- or 400-level);
c) RPW Core Course (one course): 292;
d) Linguistics (two courses): 306A, one other 306 course;
e) Writing and Rhetoric (six courses): two of 209, 210A, 210C, 219; two courses from 309 sequence (including at least one of 309A, 309B); 409A, 409B;
f) Linguistics or Rhetoric (one course): one other course from 306 sequence or 309 sequence.

**Non-English Requirements (24 courses)**

A Language other than English: minimum of two

Computer Science: minimum of two

Arts Group B requirements: four

Intensive Study area: minimum of five

Elective Areas: 11

**Note to RPW students:**

Because most students who choose RPW also choose the Co-op program, the pattern of RPW course selection is set up to accommodate their needs. Co-op RPW students are strongly advised to follow a fully-alternating schedule of academic and work terms. (For the details of this alternating schedule, see p. 5:3 of this Calendar, as well as the term by term models in the RPW advisory materials available from the English Undergraduate Officer.) Co-op RPW students are also strongly advised not to go off-stream.

Students who wish to pursue RPW through a regular program of study, rather than through Co-op, are also welcome to enter the RPW Option. Regular RPW students, however, are strongly recommended, in order to maximize their final-year course choices, to take the two terms of their fourth year in the same sequence as do the Co-op students. (Thus, the first term of the fourth year will be Spring Term and the second term of the fourth year will be Winter Term, with the intervening Fall Term as an off-term.)

**Honours English – Literature or RPW Co-operative Program**

The program leading to the degree of Bachelor of Arts in Honours English (Co-operative Program) is designed for students who intend to enter careers in business, industry, government, or the communications media. Qualified students will ordinarily be admitted to the program after completion of their first 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 a minimum of four 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 (either Literature or RPW). Co-op students must complete, by the start of their 3A term (20 term credits), two term credits in a language other than English and two term credits in computer science at the university level from any faculty.

**Honours English – Literature or RPW Applied Studies Co-op**

Students may combine an Honours English program (either Literature or RPW) with Applied Studies Co-op. The requirements in English are identical to the Honours requirements listed above. Students must complete by the start of their 3A term (20 term credits), two term credits in a language other than English, and two term credits in computer science at the university level from any faculty. The Applied Studies requirements are listed on pages 8:12 and 8:13.

**English Joint Honours Program – Literature**

Eligibility for graduation in the Joint Honours English program includes fulfillment of the requirements listed below.

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

2. At least 16 term courses must be in English, including:

   a) two term courses from 102A, 102B, 103A, 103B, 105A, 105B, 108, 190 (see Note 1);
   b) 200A, 200B (Survey of British Literature - see Notes 2 and 3);
   c) 251A, 251B (Practice and Theory of Criticism - see Note 3);
   d) two term courses from each of:
      iii) 313, 314, 315, 316, 343, 344, 345, 346, 347, 445A (British Literature since 1800);
      iv) 313, 314, 315, 316, 343, 344, 345, 346, 347, 445A (North American Literature);
   e) two other English major term courses.

**English Joint Honours Program – Rhetoric and Professional Writing**

The Joint Honours English Program with Option in Rhetoric and Professional Writing is intended for students who wish to pursue their Intensive Study areas very comprehensively. Students must complete 44 term courses, with an average of at least 75% in English courses.
English requirements (16 courses)
a) First Year (two courses): two 100-level English courses (103A, 103B recommended);
b) Literature (six courses): 200A, 200B; 251A, 251B; two other courses at 300- or 400-level;
c) RPW Core Course (one course): 292;
d) Linguistics (one course): 306A;
e) Writing and Rhetoric (five courses): two of 209, 210A, 210C, 219; one course from 309 sequence (either 309A or 309B); 409A, 409B;
f) Linguistics or Rhetoric (one course): one other course from 306 sequence or 309 sequence.

Non-English requirements (28 courses)
Joint honours area: 14-16
Language other than English: minimum of two
Computer science: minimum of two
Arts Group B: four
Electives: four-six
See note to RPW students above.

Minor Program for Students in Other Disciplines
Ten term courses in English are required, as follows:
1. 200A/B (Survey of British Literature);
2. 251A/B (Practice and Theory of Criticism);
3. two English Major term courses, numbered 300 or above;
4. four other English Major term courses.

Notes for All Programs
1. Students may use only two English term courses at the 100 level to fulfill the minimum English requirements. Some English courses do not fulfill the English Major requirements for a degree in English (see English Undergraduate Course Descriptions). Students not in the Rhetoric and Professional Writing option may take for English Major credit ENGL 335 and 336 and a maximum of two other writing courses at the 200 and 300 levels.
2. Students who have taken ENGL 101 in 1980/81 or earlier will not be required to take ENGL 200A/B. If taken, it will not count as an English Major credit.
3. ENGL 200A, 200B, 251A, 251B are strongly recommended for second year.

Fine Arts

Three-Year General Fine Arts
Eligibility for graduation in the General Fine Arts program (Studio Specialization, Art History Specialization or Film Studies Specialization) includes fulfillment of the following requirements:
1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least 12 term courses must be in Fine Arts. For the different Specializations, the required courses are as follows:
   * **Studio Specialization:**
     a) FINE 110, 111, 120, 121, 220, 222, 224, 225;
   b) four additional Fine Arts courses, two of which must be Art History.
   * **Art History Specialization:**
     a) FINE 110, 111, and six additional Art History courses;
   b) Fine 120 and three additional Studio courses.
   * **Film Studies Specialization:**
     a) FINE 110, 111, 250, 251, 270W, 470, 471;
   b) at least three term courses from: FINE 350, 351, 352, 353, 360, 361;
   c) at least two term courses to be selected in consultation with the Fine Arts Film advisor, from: FINE 252, 253, 255R, 258W, 271W, 359, 380Z, 381Z.

Four-Year General Fine Arts
Eligibility for graduation in the Four-Year General Fine Arts program (Studio Specialization, Art History Specialization, or Film Studies Specialization) includes fulfillment of the following requirements:
1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least 16 term courses must be in Fine Arts. For the different Specializations, the required courses are as follows:
   * **Studio Specialization:**
     a) FINE 110, 111, 120, 121, 220, 222, 224, 225;
   b) four additional Fine Arts courses, two of which must be Art History;
   c) four term courses in Fine Arts at the third or fourth-year level.
   * **Art History Specialization:**
     a) FINE 110, 111, 120, 121, 210, 211, 212, 213, 219, 316;
   b) and three additional term Studio courses;
   c) four term courses in Fine Arts at the third or fourth-year level, two of which must be 390A and 490A.
   * **Film Studies Specialization:**
     a) FINE 110, 111, 250, 251, 270W, 470, 471, 490A;
   b) at least four term courses from: FINE 350, 351, 352, 353, 360, 361;
c) at least four term courses to be selected in consultation with the Fine Arts Film advisor, from: FINE 252, 253, 255R, 258W, 271W, 359, 380Z, 381Z.

Honours Fine Arts
To graduate with an Honours degree in Fine Arts, it is necessary to complete FINE 490/491. Admission to this course is by portfolio, Art History or Film Studies presentation, submitted after successfully completing all required third year subjects, and maintaining an average of 75% in the major. This is to ensure that students are capable of carrying out their proposed course of study.

All other fourth year courses are open to students who have completed third year courses or are otherwise qualified.

Eligibility for graduation in the Honours Fine Arts program (Studio Specialization, Art History Specialization or Film Studies Specialization) includes fulfillment of the following requirements:

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

2. At least 20 term courses must be in Fine Arts. For the different Specializations, the required courses are as follows:

   Studio Specialization:
   a) FINE 110, 111, 120, 121, 220, 222, 224, 225;
   b) six additional term courses in Fine Arts, four of which must be in Art History;
   c) four studio courses on the third year level chosen from: FINE 226, 324, 325, 320, 321, 322, 323;
   d) FINE 490, 491.

   Art History Specialization:
   a) FINE 110, 111, 120, 121, 210, 211, 212, 213, 219, 316;
   b) two additional term studio courses;
   c) six Art History courses on the second or third year level, one of which must be 390A;
   d) FINE 490, 491.

   Film Studies Specialization:
   a) FINE 110, 111, 250, 251, 270W, 470, 471;
   b) two term courses from: Fine 120, 121, 210, 211;
   c) at least five term courses from: Fine 350, 351, 352, 353, 360, 361;
   d) at least four term courses to be selected in consultation with the Fine Arts Film advisor, from: FINE 252, 255R, 258W, 271W, 359, 380Z, 381Z;
   e) FINE 490, 491.

Honours Fine Arts (Applied Studies Co-op)
A student may combine an Honours Fine Arts program with Applied Studies Co-op. The requirements in Fine Arts are identical to the Honours requirements listed above. The Applied Studies requirements are listed on pages 8:12 and 8:13.

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

Minor in Fine Arts (Studio, Art History or Film Studies Specialization)
Eligibility for graduation with a Fine Arts Minor (Studio, Art History or Film Studies Specialization) includes fulfillment of the following requirements:

1. Successful completion of a minimum of ten Fine Arts term courses with a cumulative average in these Fine Arts courses of 65%.

2. For the different Specializations, the required Fine Arts courses are:
   Studio or Art History Specialization:
   FINE 110/111, 120/121.
   Film Studies Specialization:

Note For All Programs
FINE 390, 391, 392, 393, 394, 472, 474 and 475 may be taken only as electives.

Fine Arts Abroad:
In the spring, Fine 394 will be offered abroad, usually in Paris and Burgundy. Alternative locations will be announced.
French

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

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

2. At least 12 term courses must be in French of which at least six term courses must be at the 300 or 400 level. At least one term course must be taken in each of the following areas: 17th, 18th, 19th, 20th century literature, French-Canadian literature, and linguistics. The student must complete five term credits in French language including FR 300 and one course in French or French-Canadian civilization.

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

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

2. At least 16 term courses must be in French of which eight must be at the 300 and 400 levels. Students must complete six courses in French language including FR 300 and FR 400 and one course in French or French-Canadian Civilization. At least one term course must be taken in each of the following areas. 17th, 18th, 19th, 20th century literature, French-Canadian literature, and linguistics.

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

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

2. At least 20 term courses must be in French of which at least ten term courses must be at the 300 or 400 level. At least six term courses must be taken in literature in six of the following areas: Medieval, Renaissance, 17th, 18th, 19th, 20th century French literature or French-Canadian literature. The student must complete one course in linguistics, at least six term credits in language including FR 300 and FR 400 and two courses in French or French-Canadian civilization.

Recommended Program

Year One
FR 195 and FR 196 – prerequisite for upper level literature courses.
FR 192A and FR 192B – recommended.
Six additional term courses.

Year Two
FR 250
At least four additional term courses in French in accordance with requirements.
Additional elective courses.

Year Three
FR 300
At least four additional French courses in accordance with requirements.
Additional elective courses.

Year Four
FR 400
At least four additional French courses in accordance with requirements.
Additional elective courses.

Honours French (Applied Studies Co-op)
Students may combine an Honours French program with Applied Studies Co-op. The requirements in French are identical to the Honours requirements listed above. The Applied Studies requirements are listed on pages 8:12 and 8:13.

French Teaching Specialization
This is a special program of study within the Applied Studies Co-op program. Students graduate with an Honours French (Applied Studies) degree from Waterloo, a B.Ed. degree awarded by Brock University, and certification to teach French and a second subject at the secondary level, and must satisfy the respective requirements.

Candidates apply for admission to the Applied Studies program and are admitted to the French Teaching Specialization in the second year.

The following courses are required in Year One of the Applied Studies Program: ACC 131, ACC 132; one of CS 100, CS 102, ARTS 198; ENGL 109; ARTS 090, ARTS 091; two courses in a Second Language (including French).

After Year One, the requirements of the Specialization differ from those of the regular Applied Studies program. Two courses are required: SOC 207, PSYCH 212 (or one of PSYCH 207, 211, 213). N.B.: SOC 101 and PSYCH 101 are prerequisites for these courses. Students are advised to take these
prerequisites in Year One.
Students who do not already have a native fluency in French are required to spend two terms (normally in Year Three) at a French-speaking University.
Students must complete all the requirements for the French Honours Degree as outlined above, but must also include the following courses: FR 203, 303, 403; 1 course in Quebec civilization if the third year is taken at a university in Europe; a course in French civilization if the third year is taken at a Quebec university.

Recommended Program

Year One
ACC 131, 132; CS 100 or CS 102 or ARTS 198; ENGL 109; ARTS 090, ARTS 091 (Requirements of the Applied Studies Program). FR 195 and FR 196 PSYCH 101, SOC 101.
Two term courses in a proposed second teaching subject.
Two elective term courses.

Year Two
FR 250.
FR 203, FR 275, FR 232.
One of FR 263, FR 273, HIST 203X or another French course as advised. SOC 207; PSYCH 212 (or one of PSYCH 207, PSYCH 211, PSYCH 213).
Two term courses in the second teaching subject. Two elective term courses.

Year Three
Except in the case of exempted Francophone students, this year is spent at a French-speaking university in France or in Quebec. Students should take the equivalent of: FR 300, FR 303, FR 354, FR 363, plus two half-courses in the second teaching subject or two elective half-courses. The courses chosen should be approved by the Department of French and by other departments in whose discipline courses are taken.

Year Four
FR 400.
FR 342, FR 403, one of FR 409, FR 410, FR 421, FR 422
One further half-course in French.
Two half-courses in the second teaching subject. Two elective half-courses. Two non-credit tutorials in teaching techniques.

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

| Anthropology | Environment and Resource Studies |
| Classical Studies | Dance |
| Economics | English |
| History | Latin |
| History | Mathematics |
| History | Philosophy |
| History | Political Science |
| Psychology | Religious Studies |
| Psychology | Russian |
| Psychology | Sociology |
| Psychology | Spanish |

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

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

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 16 term courses must be in French (in the case of Political Science only 14 are required) of which at least eight must be at the 300 or 400 level. Students must take six term credits in language including FR 300 and FR 400 and six term credits in literature, including at least one each from six of the following areas: Medieval, Renaissance, 17th, 18th, 19th, 20th century French Literature or French-Canadian literature.

Recommended Program

Year One
FR 195 and FR 196.
Eight additional term courses.

Year Two
FR 250.
A minimum of four additional term courses in French literature or linguistics. Additional courses.

Year Three
In language, a minimum of FR 300.
A minimum of two additional term courses in French literature or linguistics. Additional courses.

Year Four
In language, a minimum of FR 400.
A minimum of two additional term courses in French literature or linguistics. Additional courses.

Minor Program in French
A minor program in French will consist of 10 term courses in French Language and/or Literature. Students must complete FR 300, FR 151, 152, 155, 156, 198, 199, 291 and 292 may not be counted as credits towards a French minor.
Note for All Programs

Students who wish to major or honour in French are strongly urged to take an appropriate first year level French Language course in addition to Fr 195 and FR 196.

Study in France or Quebec

The Department offers students in an honours program the possibility of studying for a year at the University of Nantes under a special third-year program. As well, students may study at a French Language University in Quebec. More information may be obtained from the Department.

Geography

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

Three-Year General Geography

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

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

2. A minimum of any 12 term courses in Geography which may include ENV S 195, 200, 178, 278.

Four-Year General Geography

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

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

2. At least 18 term courses in Geography which may include ENV S 195, 200, 178, 278, and must include at least four Regional Area term courses. Eligible courses are those listed under the heading Regional Geography (p. 10:20) plus GEOG 203.

Honours Geography

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

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

2. At least 18 term courses in Geography which may include ENV S 195, 200, 178, 278, and must include at least four Regional Area term courses. Eligible courses are those listed under the heading Regional Geography (p. 10:20) plus GEOG 203.

Recommended Four-Year Program – General or Honours

Year One

GEOG 101 Introduction to Human Geography
GEOG 102 Introduction to Physical Geography
GEOG 160 Introduction to Cartography and Map Analysis

One of:

GEOG 125R Introduction to the Third World
GEOG 127 Regional Problems of Europe

Six electives which should include some Arts Faculty Group A requirements.

Year Two

GEOG 202 Location of Economic Activities
ENV S 178 Introduction to Environmental Research Methods or equivalent basic statistics course (see p. 8:7)

Two of:

GEOG 203 Regional Geography
GEOG 204 Soviet Union
GEOG 205 Africa
GEOG 220A The World Region I
GEOG 220B The World Region II
GEOG 221 U.S.A.

One of:

ENV S 200 Field Ecology
GEOG 201 Geomorphology and Soils
GEOG 208 Applied Climatology
GEOG 309 Physical Climatology
Five electives

Year Three

GEOG 381 The Nature of Geography
GEOG 390 Honours Thesis Proposal (Honours Only)
Seven electives

Year Four

GEOG 490A/B Honours Thesis (Honours Only)
Eight electives

Geography Joint Honours

(See p. 10:18)

Minor Program in Geography

A total of ten term courses must be completed in Geography among which may be included ENV S 195 and ENV S 200.
Notes For All Programs

1. Electives: By the end of second year, one course is required from English Group One (p. 16:51). ENGL 109, 129R, 140 or 150 may be taken in Year One; ENGL 209 or 210 may be taken in Year Two. Students are encouraged to take a second year language course and other Arts courses related to a regional specialization or to consider a minor or joint honours program within the Faculty of Arts. In the four year programs, CS 100 is recommended in Year One for students without computer experience in high school.

2. For some courses, extra fees may be required to defray heavy equipment/travel costs. Statements on extra costs will be found with the course description.

3. Students intending to teach in Secondary Schools are advised to take at least four term courses in Regional Geography and at least four term courses in another teachable subject.

4. Students considering graduate work should take at least two term courses in a foreign language related to their field of interest.

5. Up to three term course equivalents may be taken as Independent study courses in Geography.

German

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

Three-Year General Program in German
Honours Program in German
Honours German (Applied Studies Co-op)
Joint Honours Program with German
Minor Program in German

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

Stream A
Students with little or no knowledge of German

First Year
GER 101/102

Second Year
GER 201/202

Stream B
Students with at least Grade 12 standing in German or equivalent

First Year
GER 121/122 and/or GER 251/252

Second Year
GER 351/352
GER 291/292

Three-Year General German

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

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

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

Honours German

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

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

2. At least 20 term courses must be in German.

Honours German (Applied Studies Co-op)

A student may combine an Honours German program with Applied Studies Co-op. The requirements in German are identical to the Joint Honours requirements listed below. The Applied Studies requirements are listed on pages 8:12 and 8:13.

German Joint Honours

A Joint Honours program with German may be taken in combination with any other discipline in which an Honours program is offered, subject to approval by the departments concerned.

The following Joint Honours programs have been approved with German:

Anthropology Mathematics
Classical Studies Music
Drama Philosophy
Economics Political Science
English Psychology
French Russian
Geography Sociology
History Spanish

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

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

2. At least 16 term courses must be in German.
Minor Program in German
Students of all departments may elect German as a Minor field of studies in consultation with the Department of Germanic and Slavic Languages and Literatures. A minor requires the completion of a minimum of ten term courses in German with an overall cumulative average of at least 65% in those courses, of which:

1. not more than four term courses may be chosen from courses at the 100 level, and
2. at least two term courses must be chosen from courses above the 200 level.

Waterloo in Germany Program
The Department offers a yearly program of studies at the University of Mannheim on the Rhine. The program is normally open to students entering third-year courses. In exceptional cases second year students will also be considered. Students of all disciplines may apply, provided they have an adequate knowledge of German. The application deadline for students who wish to begin studies in Mannheim in the Winter Semester (October 15 to February 15) is April 1. The application deadline for those who wish to begin their studies in the Summer Semester (April 15 to July 15) is February 1. Applications should be submitted to "Waterloo in Germany", Department of Germanic and Slavic Languages and Literatures, University of Waterloo, Waterloo, Ontario N2L 3G1.

Notes For All Programs
1. First-year students who wish to major in German are strongly advised to consult the Undergraduate Advisor of the Department.
2. Before graduation all students must complete GER 291/292, normally in Year Two.
3. GER 271/272, GER 355, and GER 391/392 are open to all students. However, these courses will normally count toward the Major or Honours requirement for Stream A students only.

Greek
See Classical Studies.

History
The Department of History offers the following programs:
- Three-Year General Program
- Four-Year General Program
- Honours Program
- Honours History Applied Studies Co-op Program
- History Joint Honours Program
- Minor Program

Three-Year General History
Eligibility for graduation in the General History program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least ten term courses must be in History with at least two above the 250 level and no more than two at the 100 level.

Four-Year General History
Eligibility for graduation in the Four-year General History program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least 14 term courses must be in History with at least two at the 300 level, and no more than two at the 100 level.

Honours History
Eligibility for graduation in the Honours History program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 12 term courses and four Senior Seminars (4.0 credit weights) must be in History. No more than two term courses may be at the 100 level.

History courses must include:
- HIST 250 or 300
- One of HIST 260, 261, 262, 263
- One of HIST 253, 254, 273, 274
- One of HIST 285, 256, 257, 258

3. The 20 term courses in History are usually divided 2-5-5-8 among the four years.
Honours History (Applied Studies Co-op)
A student may combine an Honours History program with Applied Studies Co-op. The requirement in History is ten (10) term courses and four Senior Seminars (4.0 credit weights). The Applied Studies requirements are listed on p. 8:12 and 8:13.

History Joint Honours Programs
Joint Honours programs are currently available between History and the following departments:

- Anthropology
- Classical Studies
- Drama
- Economics
- English
- Fine Arts
- French
- Geography
- German
- Philosophy
- Political Science
- Psychology
- Religious Studies
- Russian
- Spanish
- Sociology

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

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least ten term courses and two Senior Seminars must be in History.

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 65% average in History courses.

Note For All Programs
CLAS 251 and CLAS 252 will be accepted for credit as term courses in History provided that the student does not have credit for HIST 237 or HIST 238.

Italian

Minor Program
Students enrolled in Honours Programs in Arts or other faculties may elect a Minor in Italian, which requires the successful completion of at least 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, 191, 192, 251, 252

Four additional term courses must be chosen from any of the following courses:
- ITAL 291, 292, 311, 312, 391, 392, 396, 397

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

Latin

See Classical Studies.
Medieval Studies

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

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

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

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least 14 term courses must be from an approved list of Medieval Studies or related courses, including at least two term courses from each of four of the eight subject fields specified below.
3. Successful completion of at least six term courses (not all of which need be medieval in content) in one of the subject fields specified below.

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

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 20 term courses in Music, including MUSIC:
   a) 100, 250, 251;
   b) at least three of 253, 254, 353, 354.
3. Participation in at least four terms of Music Ensemble.

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

Music

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

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group Requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least 14 term courses in Music, including MUSIC:
   a) 100, 250, 251;
   b) at least three of 253, 254, 353, 354.
3. Participation in at least four terms of Music Ensemble.

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

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

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group Requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 20 term courses in Music, including MUSIC:
   a) 100, 250, 251, 253, 254, 353, 354, 370, 371, 490A/B;
   b) 466, 467 or two other 300-level courses.
3. Participation in at least six terms of Music Ensemble.

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

Music Joint Honours Program
A Joint Honours program with Music may be taken in combination with any other discipline in which an Honours program is offered, subject to approval by the
The following Joint Honours programs have already been approved with Music:

- Geography
- Psychology
- German
- Recreation and Leisure Studies
- Mathematics
- Social Development Studies
- Philosophy

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

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group Requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 16 term courses in Music, including MUSIC:
   a) 100;
   b) at least three of 253, 254, 353, 354;
   c) at least three of 250, 251, 370, 371;
   d) 490A/B (unless the senior honours essay is written in the other discipline)
3. Participation in at least six terms of Music Ensemble.

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

Minor Program

Eligibility for graduation with a Minor in Music includes fulfillment of the following requirements:

1. At least ten term courses in Music, including MUSIC:
   a) 100, 250;
   b) eight additional term courses selected in consultation with the Music Department.
2. Participation in at least two terms of Music Ensemble.

Note For All Programs

Students electing to take Music Studio must arrange for an audition before the Music Faculty. Normally a level of performance equal to Grade eight standing at the Royal Conservatory of Music of Toronto is expected for admission to Music Studio. Music Studio courses are available only to Music majors and minors.

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Philosophy

Three-Year General Philosophy

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

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least ten term courses must be in Philosophy, including PHIL:
   a) one of 140, 145, 241, 242, 243, or 440A/B;
   b) 221;
   c) any two of 380 - 387.

St. Jerome’s Philosophy students must meet the basic requirements as listed above, and their PHIL courses must include:

- a) one of 200J, 140, 145, 241, 242, 243, or 440A/B;
- b) 218J or 221;
- c) any two of 380 - 387.

Four-Year General Philosophy

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

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 68%.
2. At least 14 term courses must be in Philosophy, and must include the courses required in the Three-Year General program.

Honours Philosophy

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

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group Requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 20 term courses must be in Philosophy, including PHIL:
   a) one of 241, 242, 243, or 440A/B;
   b) 221, 322, 499A/B;
   c) any four of 380 - 387.
St. Jerome’s Philosophy students must meet the basic requirements as listed above, and their PHIL courses must include:

a) one of 241, 242, 243, or 440A/B;
b) 218J or 221;
c) 322;
d) any four of 380 - 387;
e) 499A and either 499B or 499J.

College students are also expected to take 450J.

Honours Philosophy (Applied Studies Co-op)
A student may combine an Honours Philosophy program with Applied Studies Co-op. The requirements in Philosophy are identical to the Honours requirements listed above except that only 16 term courses in Philosophy are required. The Applied Studies requirements are listed on pages 8:12 and 8:13.

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

<table>
<thead>
<tr>
<th>Economics</th>
<th>Political Science</th>
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<tr>
<td>English</td>
<td>Psychology</td>
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<td>French</td>
<td>Religious Studies</td>
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<td>German</td>
<td>Russian</td>
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<td>History</td>
<td>Social Development</td>
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<td>Latin</td>
<td>Studies</td>
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<tr>
<td>Mathematics</td>
<td>Sociology</td>
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</table>

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

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group Requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 14 term courses must be in Philosophy, including PHIL:
   a) one or two of 140, 241, 242, 243, or 440A/B (depending on program);
   b) 221, 322;
   c) any four of 380 - 387;
   d) a Philosophy course which is relevant to the other subject (e.g. Aesthetics for Philosophy and English);
   e) a Senior Honours essay in PHIL 499A/B or in the other subject, if applicable.

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.
at least 60% and a cumulative major average of at least 70%.

2. At least 18 term courses must be in Political science. Sixteen of these 18 courses must be above the 100 level, of which at least two term courses from each of four different fields of discipline listed above must be taken. At least four term courses must be taken at the 300 level or higher.

Honours Political Science

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

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

2. At least 20 term courses must be in Political Science. Eighteen of these 20 courses must be above the 100 level, of which at least two term courses from each of four different fields of discipline listed above must be taken. At least four term courses must be taken at the 400 level.

Recommended Program

Year One

PSCI 101/102
Eight other term courses.

Year Two

Six term courses in Political Science (see Note)
Four other term courses.

Year Three

Six term courses in Political Science (see Note)
Four other term courses.

Year Four

Six term courses in Political Science at least four of which must be at the 400 level (see Note)
Four other term courses.

Honours Political Science
(Administrative Studies Option)

Eligibility for graduation in the Honours Political Science with an Administrative Studies Option includes fulfillment of the following requirements:

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

2. At least 20 term courses must be in Political Science and 14 term courses must be in Administrative Studies. The requirements for an Honours Political Science degree apply for the Honours Political Science with an Administrative Studies Option, plus the following courses must be taken:
   a) ECON 101, 102, PSCI 260A/B, 331;
   b) one of PSCI 332 or 333;
   c) four term courses in Political Science beyond the 100 level which have been designated as Administrative Studies courses by the Department of Political Science;
   d) four term courses not in Political Science, selected from courses which have been designated as Administrative Studies courses by the Department of Political Science.

Other Options

The following study Options are also open to students in Honours Political Science: Women’s Studies, Iberoamerican Studies, Legal Studies, Peace and Conflict Studies, Personnel and Administrative Studies, Canadian Studies.

Co-operative Program in Honours Political Science

The program leading to the Degree of Bachelor of Arts in Honours Political Science (Co-operative program) is designed for students who intend to enter careers in government, the mass media, business, political parties, or public opinion organizations. Qualified students will ordinarily be admitted to the program after completion of their first three academic terms with a minimum average of 78% in at least two Political Science term courses. 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 Two 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.

Interested students should apply to the program in November of the Year Two. Ordinarily qualified students are admitted in January of Year Two. The minimum requirement for admission to the program is a 75% average in three Political Science courses. Admissions decisions are made by the Co-op Officer in consultation with the Undergraduate Affairs Committee.
Honours Political Science (Applied Studies Co-op)
A student may combine an Honours Political Science Program with Applied Studies Co-op. The requirements for Political Science are a minimum of 16 term courses, with at least 14 beyond the 100 level. There must be at least one term course from each of four different fields of the discipline as defined above. At least 4 term courses must be taken at the 400 level. The Applied Studies requirements are listed on pages 8:12 and 8:13. Students planning to enrol in Honours Political Science (Applied Studies Co-op) should consult the Department's Co-op Officer.

Political Science Joint Honours Program
Students who wish to combine a study of Political Science with a broad training in a related discipline such as Sociology or History, or in fact in any other discipline in which they are interested, can do so in a Joint Honours program. Joint Honours programs have been approved between Political Science and:
- Anthropology
- Drama
- Economics
- English
- Environment and Resource Studies
- French
- Geography
- History
- Philosophy
- Psychology
- Sociology

Eligibility for graduation in the Political Science Joint Honours program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 14 term courses must be in Political Science. Twelve of the 14 courses must be beyond the 100 level, of which there must be at least one term course from each of four different fields of discipline as defined above. Two term courses must be at the 400 level.

Recommended Program

Year One
PSCI 101/102
Two introductory term courses in the other discipline.
Six other term courses.

Year Two
Four term courses in Political Science (see Note)
Four term courses in the other discipline.
Four other term courses.

Year Three
Four term courses in Political Science (see Note)
Four term courses in the other discipline.
Four other term courses.

Arts
Political Science
Psychology

Year Four
Four term courses in Political Science, at least two of which must be at the 400 level (see Note)
Four term courses in the other discipline.
Four other term courses.

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% or better. Courses must be selected to meet the following requirements:
- at least one term course in each of three different fields of the discipline;
- the equivalent of at least two term courses above the 200 level.

Note For All Programs
No student in a General, Honours, Joint Honours or Minor program in Political Science may use PSCI 291 or 292 to meet program requirements.

Psychology

Three-Year General Psychology
Eligibility for graduation in the General Psychology program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 30 term courses including the Faculty of Arts Group requirements with a cumulative overall average of at least 60%.
2. At least ten term courses must be in Psychology, including PSYCH:
   - 101;
   - 200;
   - at least one of 203, 206, 207, 261, 271;
   - at least one of 211, 253, 355, 357;
   - at least one of 212, 213, 333, 334, 335, 341;
   - five electives in PSYCH.

A minimum cumulative Psychology average of at least 65% is required.

Four-Year General Psychology
The purpose of this program is to enable Honours Psychology students who have completed their third year in Honours Psychology but who are below the 75% average requirement for Honours Psychology, to receive recognition for a fourth year of study. Students in Honours Psychology who have completed 12 term courses in Psychology, have met Honours requirements a-f, have a cumulative Psychology average of at least 70%, and a cumulative overall average of at least 60%, may transfer to the Four-Year General Psychology program. Students are
advised that the Four-Year General program is not equivalent to the Honours Degree-Thesis Program which is normally expected for admission to graduate programs in Psychology. Also, students may not combine this program with Honours or Minors in another discipline, with Co-op or Applied Studies, or with certain Options.

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

1. Successful completion of a minimum of 40 term courses including the Faculty of Arts Group requirements with a cumulative overall average of at least 60% and a cumulative Psychology average of at least 70%.

2. At least 16 term courses must be in Psychology, including PSYCH:
   a) 101;
   b) 291, 292, 391 (check overlapping courses on p. 8:7 and with the undergraduate secretary);
   c) at least two of 203, 206, 207, 261, 271;
   d) at least two of 211, 253, 355, 357;
   e) at least one of 392, 394, 396, 398;
   f) at least one of 392, 393, 395, 397;
   g) six PSYCH electives

Students may not use PSYCH 392 to satisfy both e and f.

Honours Psychology (Thesis Program/Coursework Program)

Students interested in Honours or Joint Honours in Psychology will normally be admitted at the beginning of their second year of study based on their academic performance in at least ten term courses in Year One, including PSYCH 101 and preferably one additional term course in Psychology. Application for admission to Honours Psychology is made at the time of pre-registration for Year Two. Normally, only students whose Year One cumulative overall average is at least 70% and whose cumulative Psychology average is at least 75% will be admitted. Owing to resource limitations, however, fulfillment of the minimum entrance average requirements will not guarantee students admission to Honours Psychology, and higher averages may be required for admission. To remain in good standing in Honours Psychology, students must maintain a cumulative overall average of at least 60% and a cumulative Psychology average of at least 75%. Conditional status for one academic term only may be granted to students who fall below these criteria.

Students in Honours Psychology may select either the Thesis Program or the Coursework Program. However, students selecting the Coursework Program are advised that a thesis in Psychology is typically required for admission to graduate studies in Psychology.

Thesis Program

Eligibility for graduation in the Honours Psychology-Thesis Program includes fulfillment of the following requirements:

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

2. At least 18 term courses must be in Psychology, including PSYCH:
   a) 101;
   b) 291, 292, 391; (Check overlapping courses on p. 8:7 and with the undergraduate secretary)
   c) at least two Natural Science Courses from 203, 206, 207, 261, 271;
   d) at least two Social Science Courses from 211, 253, 355, 357;
   e) one Natural Science Research Course from 392, 394, 396, 398;
   f) one Social Science Research Course from 392, 393, 395, 397;
   g) two Honours Seminars in PSYCH
   h) three PSYCH electives
   i) 499A/B/C.

Students may not use PSYCH 392 to satisfy both e and f. Students should consider prerequisites for third year courses when selecting their second year courses. PSYCH 291, 292, 391, and two research courses should be completed prior to the beginning of the fourth year of the program.

Recommended Program

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<tr>
<th>Year One</th>
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<tbody>
<tr>
<td>PSYCH 101 and one PSYCH elective</td>
<td>Eight additional term courses</td>
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<tr>
<th>Year Two</th>
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<tbody>
<tr>
<td>PSYCH 291/292</td>
<td>One Natural Science Course</td>
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<tr>
<td></td>
<td>One Social Science Course</td>
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<td></td>
<td>Six additional term courses</td>
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<tr>
<th>Year Three</th>
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</thead>
<tbody>
<tr>
<td>PSYCH 391</td>
<td>One Natural Science Research Course</td>
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<tr>
<td></td>
<td>One Social Science Research Course</td>
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<td></td>
<td>One Natural Science Course</td>
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<td></td>
<td>One Social Science Course</td>
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<tr>
<td></td>
<td>One Honours Seminar in PSYCH</td>
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<td></td>
<td>Four additional term courses</td>
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<tr>
<th>Year Four</th>
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<tbody>
<tr>
<td>PSYCH 499A/B/C</td>
<td>One Honours Seminar in PSYCH</td>
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<tr>
<td></td>
<td>Two PSYCH electives</td>
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<tr>
<td></td>
<td>Four additional term courses</td>
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Coursework Program
Students in the Coursework Program will substitute requirements h and i of the Honours Psychology-Thesis Program with four PSYCH electives and two advanced courses in Psychology (those with prerequisites beyond PSYCH 101 that have not been used to fulfill other Psychology requirements).

Honours Psychology (Applied Studies Co-op)
A student may combine an Honours Psychology-Thesis Program or Coursework Program with Applied Studies Co-op.

Students choosing the Thesis Program will substitute requirement h) of the Honours Psychology-Thesis Program with one PSYCH elective. Students choosing the Coursework Program will substitute requirements h) and i) of the Honours Psychology-Thesis Program with two PSYCH electives and two advanced courses in Psychology (those with prerequisites beyond PSYCH 101 that have not been used to fulfill other Psychology requirements).

Students selecting the Coursework Program are advised that a thesis in Psychology is typically required for admission to graduate studies in Psychology.

Please refer to the Honours Psychology section for application information. The Applied Studies requirements are listed on pages 8:12 and 8:13.

Honours Psychology Co-operative Program
Students who have been accepted to the Honours Psychology BA or BSc programs may apply for admission to the Co-op program in November of the second year. Owing to resource limitations, students will be admitted based on academic standing, a personal interview, and space availability. For those accepted, the first work term will be at the end of the second year. Students then alternate between academic terms and paid work terms to the end of the degree program.

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.

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.

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

- Anthropology
- Classical Studies
- Dance
- Drama
- Economics
- English
- Environment and Resource Studies
- Fine Arts
- French
- Geography
- German
- History
- Kinesiology
- Mathematics
- Music
- Philosophy
- Political Science
- Recreation
- Religious Studies
- Russian
- Social Development Studies
- Sociology
- Spanish
- Statistics

Please refer to the Honours Psychology section for application information.

Students in Joint Honours with Psychology may select either the Thesis Program or the Coursework Program. Students who do not plan to do a Psychology thesis must follow the Psychology Coursework Program requirements. Students are advised that a thesis in Psychology is typically required for admission to graduate studies in Psychology.

Eligibility for graduation in the Joint Honours Psychology program requires successful completion of a minimum of 44 term courses including the Faculty of Arts Group Requirements with a cumulative overall average of at least 60% and a minimum cumulative Psychology average of 75%. In addition, if both majors are in the Faculty of Arts, a joint major average of 75% is required. Please consult the department of your second major for their minimum major average requirement.

Students choosing the Thesis Program will substitute requirement h) of the Honours Psychology-Thesis Program with one PSYCH elective. Students choosing the Coursework Program will substitute requirements h) and i) of the Honours Psychology-Thesis Program with two PSYCH electives and two advanced courses in Psychology (those with prerequisites beyond PSYCH 101 that have not been used to fulfill other Psychology requirements). If both majors require research methods and/or statistics courses, consult the list of overlapping courses on p. 8:7 and the Undergraduate Secretary.

Early Childhood Education and Care Specialization
Admission into this program is no longer possible. Students accepted September 1988 or earlier should consult earlier calendars for program requirements.
Honours Psychology with a BSc Degree

An Honours Psychology degree program is also available in the Faculty of Science on both a Regular and Co-operative basis. Students may select either the Thesis Program or the Coursework Program. The Psychology requirements are the same as for the Honours Psychology BA students. See Chapter 14.

Minor Program in Psychology

Students in an Honours Program in a discipline other than Psychology may choose to minor in Psychology. The minor requirements are the same as the Psychology requirements for the Three-Year General Psychology Program.

Religious Studies

Purpose of the Program in Religious Studies:

1. to expose students to the issues and problems involved in, and to the nature of the questions raised by, the study of religious phenomena and ideas;
2. to enable students to approach, in a methodical way, the study of the major religious traditions living today for the purpose of encountering and understanding the life and the expression of religion through the various religions of the world;
3. to introduce them to the distinctive features of one or more religious traditions and to the methods for their systematic study.

The course offerings of the Religious Studies Department fall into the following five areas:

1. World Religions
2. History of the Christian Tradition
3. Biblical Studies
4. Theology - Philosophy - Ethics
5. Religion, Society and Culture.

Areas of Religious Studies to which courses belong are indicated by the area number below the course description.

Three-Year General Religious Studies

Eligibility for graduation in the General Religious Studies program includes fulfilment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least ten term courses must be in Religious Studies including RS;
   a) 100A, 200, 230, 231;
   b) one other course, from the RS 100A-K sequence;
   c) two term courses at the 300 or 400 level.

Four-Year General Religious Studies

Eligibility for graduation in the Four-Year General Religious Studies program includes fulfilment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least 14 term courses must be in Religious Studies including RS;
   a) 100A, 200, 230, 231;
   b) one other course, from the RS 100A-K sequence;
   c) four term courses at the 300 or 400 level.

Honours Religious Studies

Eligibility for graduation in the Honours Religious Studies program includes fulfilment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 20 term courses must be in Religious Studies including RS;
   a) 100A, 200, 230, 231, 490A/B;
   b) one other course, from the RS 100A-K sequence;
   c) one term course from each of the five RS areas;
   d) at least five term courses at or above the 300 level, not including RS 490A/B.

Honours Religious Studies (Applied Studies Co-op)

A student may combine an Honours Religious Studies program with Applied Studies Co-op. The requirements in Religious Studies are identical to the Honours requirements listed above except the overall number of term courses in Religious Studies is 16 rather than 20. The Applied Studies requirements are listed on pages 8:12 and 8:13.

Religious Studies Joint Honours Program

The Religious Studies Department offers Joint Honours programs with the following Departments:

- Anthropology
- Classical Studies
- English
- Environment and Resource Studies
- French
- Germanic and Slavic
- History
- Music
- Philosophy
- Psychology
- Social Development
- Studies
- Sociology

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

Minor Program 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 is to be determined in consultation with the Undergraduate Advisor of the Department.

Note For All Programs
Students at the University of Waterloo and Wilfrid Laurier University may, with the permission of their advisor, take courses in Religious Studies at either University. For details regarding registration procedures and courses available at Wilfrid Laurier University, consult the Undergraduate Officer, Religious Studies.

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

Three-Year General Program in Russian
Honours Program in Russian
Honours Program in Slavic Studies
Honours Slavic Studies (Applied Studies Co-op)
Joint Honours Program with Russian
Minor Program in Russian
Minor Program in Croatian

Three-Year General Russian
Eligibility for graduation in the General Russian program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least 12 term courses must be in Russian.

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

Honours Slavic Studies
Eligibility for graduation in the Honours Slavic Studies program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 20 term courses must be in Slavic Studies. Of these 20 term courses, 12 will normally be in Russian and eight in Ukrainian and Polish.

Honours Slavic Studies (Applied Studies Co-op)
A student may combine an Honours Russian program with Applied Studies Co-op. This program includes the following requirements:
1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 16 term courses must be in Slavic Studies, of which ten term courses will normally be in Russian and six in the other Slavic languages.

Russian Joint Honours Program
A Joint Honours program with Russian may be taken in combination with any other discipline in which an Honours program is offered, subject to approval by the departments concerned. Listed below are approved combinations with Russian:

Drama  Economics  History
English  Mathematics
Environment and Resource Studies  Political Science
French  Psychology
Geography  Sociology
German  Spanish

Eligibility for graduation in the Russian Joint Honours program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75% in each of the two Honours disciplines.
2. At least 16 term courses must be in Russian.
Minor Program in Russian
Students of all departments may elect Russian as a Minor field of studies in consultation with the Department of Germanic and Slavic Languages and Literatures. A Minor requires the completion of a minimum of 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 at the 100 level, and

b) at least two term courses must be chosen from courses above the 200 level.

Russian Workshop in the USSR
For details see Chapter 16, page 16:78.

Minor Program in Croatian
The Department of Germanic and Slavic Languages and Literature offers a Minor in Croatian which requires the completion of a minimum of ten term courses in Croatian with an overall average of at least 65%.

Social Development Studies
Social Development Studies, administered by Renison College, is an integrated multidisciplinary program providing a liberal education with concentration in certain pure and applied social sciences. The interrelated courses of this Major are used to help the student develop an appreciation of the interdependence of the social sciences and a facility in applying material and perspectives from one discipline to questions in other areas of study. The College offers its own courses for the Major in Interdisciplinary Social Science, Psychology, Social Work and Sociology. Students select their remaining courses from any of the colleges or departments of the University to serve particular needs and interests. In the program, particular attention is given to the development of human personality in the context of the major social institutions and our cultural traditions and to the study of the development of certain contemporary social problems. Courses in Social Work provide an opportunity to study various types of social intervention. The College assists students to find places as volunteers in a number of local agencies. Through this volunteer work students are given an opportunity to increase the experience which they can bring to their studies and to test and apply their theoretical understanding in practical settings. In the case of those following the Diploma in Social Work, a program co-ordinator assists the students and the agencies to fulfill placement expectations.

The Social Development Studies program stands as a sound liberal and general education; however, it also provides an excellent background for further study in Social Work, Education, Religion, the Ministry, Journalism, and for work in various helping professions, community organizations, communications and international service organizations.

Major Courses
Listed below are courses from the four subject areas which combine in the Social Development Studies Major.

<table>
<thead>
<tr>
<th>Interdisciplinary Social Science</th>
<th>Social Work</th>
<th>Sociology</th>
<th>Psychology</th>
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<tbody>
<tr>
<td>ISS 131R SOCWK 120R SOC 120R PSYCH 120R</td>
<td>150R 121R</td>
<td>211R 221R 223</td>
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General Social Development Studies
Eligibility for graduation in the General Social Development Studies program includes fulfillment of the following requirements:

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

2. At least 14 term courses must be from the Major with the following stipulations:

a) in the first year, students must register in the Fall term for SOCWK 120R, PSYCH 120R, and ISS 150R. In the Winter term which follows, students must register in SOC 120R, ISS 131R and PSYCH 121R.

b) in the second year, all students are required to take ISS 250R and 251R.

c) at least four term courses from the Major must be completed in each of the second and third years.

d) the 14 term courses must be distributed over the four subject areas in the Major with a maximum of six term courses within a single area counting towards the requirement.
Four-Year General Social Development Studies
Eligibility for graduation in the Four-Year General Social Development Studies program includes fulfillment of the following requirements:

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

2. Two options are available for completing the Major requirements:
   a) The completion of at least 18 term courses from the Major,
   or
   b) The completion of 14 term courses from the Major plus a four term course package, selected with departmental approval, which thematically links Social Development Studies to other disciplines.

For either option, students must include: ISS 131R, 150R, 250R, 251R, PSYCH 120R, 121R, SOC 120R, SOCWK 120R.

The remaining Major courses must be selected from at least two of the subject areas within the Major.

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

1. Successful completion of a minimum of 42 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative average of at least 75% in the Major.

2. At least 18 term courses must be from the Major, including: ISS 131R, 150R, 250R, 251R, 320R, 499A/B; PSYCH 120R, 121R; SOC 120R; SOCWK 120R, 326R.

3. An additional eight term courses must be taken to explore a multidisciplinary theme area that has been selected in consideration of the students' own needs and plans. In consultation with Renison's Undergraduate Officer, courses are chosen which will explore a topic in depth.

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

- English
- Music
- Philosophy
- Psychology
- Recreation
- Religious Studies
- Sociology
- Recreation
- Religious Studies
- Sociology

Eligibility for graduation in the Social Development Studies Joint Honours program typically includes fulfillment of the following requirements (variations may occur depending on the other discipline being considered):

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

2. At least 14 term courses must be in Social Development Studies including:
   a) four term courses from ISS 131R, ISS 150R, PSYCH 120R, SOC 120R, SOC WK 120R;
   b) ISS 250R, 251R (Methodology);
   c) ISS 320R, plus five term courses beyond the first-year level;
   d) ISS 499A/B (Senior Honours Essay).

The equivalent courses to ISS 250R/251R and ISS 499A/B may be taken in the other discipline, subject to approval by both departments. If such replacement occurs, sufficient Social Development Studies electives must be taken to meet the 14 term course minimum requirement.

3. In addition to the courses taken to fulfill the requirements for the Major areas in Social Development Studies and the second discipline, at least six term courses relating to a chosen theme area must be completed (see number 3 under Honours program).

Course selection for a Joint Honours program with Social Development Studies should only be made after consultation with Renison's Undergraduate Officer.

The Social Work Stream
Within the Social Development Studies program, the College has developed a stream to meet the particular needs of students who plan to pursue graduate studies in Social Work or to follow vocations in Social Work or the related helping professions. The courses in this stream meet the Faculty of Arts requirements for the BA and the College's requirements for the Major (see details in Renison College calendar). Course selection should be made in consultation with Renison's Undergraduate Officer.

Diploma in Social Work
At the end of Year One, students following the Social Work Stream within the Social Development Studies program may be considered for admission to the Diploma in Social Work. During the two years they follow the program, Diploma students are required to complete 400 hours of supervised and evaluated field placement and the following courses: SOCWK 001, 350D, 350E, and ISS 399R (independent study during which students produce a major paper synthesizing their field work with their studies).

An additional fee of $100.00 is assessed for each of the two phases of the Diploma program to cover costs of placement not provided for in the operating grants received from the Government.
Minor Program
A Minor in Social Development Studies consists of ten term courses which have been approved for the Major. Courses may be selected to fill the needs of the individual student, but course selection should only be made after consultation with the Undergraduate Officer for Social Development Studies. The following requirements apply to all Minors in Social Development Studies:

a) ISS 131R, ISS 150R, SOC WK 120R;
b) seven term courses beyond the first-year level including at least two term courses in each of two different disciplines.

Of the ten term courses required for the Minor, no more than six may be taken in any one discipline.

Notes For All Programs
1. For students in Minor programs 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.
2. For further information regarding any of the programs, consult the Registrar, Renison College, Waterloo, Ontario N2L 3G4.

Sociology

Three Year General Sociology
Eligibility for graduation in the General Sociology (three year degree) program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least ten term courses must be in Sociology, including SOC:
   a) 101 (introductory course); 321 (sociological methods course);
   b) one of 305, 405, 406 (sociological theory);
   Students are strongly encouraged to select SOC 280, although this is not required.

Four Year General Sociology
The requirements for the four year general degree are parallel to those for the honours degree (see below) with two exceptions. 499A/B is not required, and the minimum required average for all sociology courses is 68%.

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

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 19 term courses must be in Sociology, including SOC:
   a) 101, 280, 321, 322, 405, 406, 499A/B.

Recommended Program

Year One
SOC 101
One other term course in Sociology.
Eight term course equivalent electives.

Year Two
SOC 280
Four term courses in Sociology.
Five term course equivalent electives.

Year Three
SOC 321, 322
Four term courses in Sociology.
Four term course equivalent electives.

Year Four
SOC 405/406
SOC 499A/B
Two term courses in Sociology.
Four term course equivalent electives.

Honours Sociology Co-operative Program
The Department of Sociology is a participating Department in the Co-operative program in the Behavioural Sciences. This is an Honours program into which students may be admitted at the start of the winter term of their second year. Students interested in applying for admission to this program should consult with the Department’s Co-op advisor sometime in their first year so that they may select their courses to maximum advantage.

Honours Sociology (Applied Studies Co-op)
A student may combine an Honours Sociology program with Applied Studies Co-op. The requirements in Sociology are identical to the Honours requirements listed above except only 16 term courses in Sociology are required. The Applied Studies requirements are listed on pages 8:12 and 8:13.

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

Anthropology
Economics
English
French
Geography
History
Eligibility for graduation in the Joint Honours Sociology program includes fulfillment of the following requirements:

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

2. At least 15 term courses must be in Sociology, and these courses are usually distributed as follows:
   - a) A term course in Introductory Sociology (101);
   - b) A term course in Statistics (280);
   - c) Two term courses in research methods (321/322);
   - d) Two term courses in sociological theory (405, 406);
   - e) The equivalent of seven term courses of electives in Sociology plus 499A/B or the equivalent of nine term courses of electives in Sociology plus the equivalent of 499A/B in the related department.

Note For Joint Honours Program
In the Joint Honours program with French, SOC 280 may be replaced by an elective in Sociology.

Minor Program
Students electing a Minor program in Sociology must complete ten term courses in Sociology with a minimum 65% average for all Sociology courses.

The required courses in Sociology for the General program in Sociology are also required of students choosing the Minor program.

Spanish
(Offered jointly with Wilfrid Laurier University)

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

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

2. At least 12 term courses must be in Spanish of which:
   - a) six term courses are language;
   - b) two term courses are Survey of Spanish Literature.

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

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 70%.

2. At least 12 term courses must be in Spanish of which:
   - a) six term courses are language above the 100 level;
   - b) two term courses are Survey of Spanish Literature;
   - c) two term courses are Survey of Spanish American Literature;
   - d) one term course in Golden Age.

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

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

2. At least 20 term courses must be in Spanish, and ten of these 20 term courses must be in courses as outlined above under the Four-Year General program.

Recommended Program

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

Year Two
A minimum of six term courses in Spanish, including
SPAN 251A/B, (or 201A/B), and 205/206.
Four additional term courses.

Year Three
A minimum of six term courses in Spanish, including
SPAN 351A/B, (or 251A/B), 227/228 and 326 or 327.
Four additional term courses.

Year Four
A minimum of six term courses in Spanish.
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 Joint Honours requirements listed below. The Applied Studies requirements are listed on pages 8:12 and 8:13.

Spanish Joint Honours Program

The Department of Spanish recognizes combined Honours programs in Spanish and the following:

- Classical Studies
- History
- English
- Latin
- French
- Sociology
- German
- Psychology

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

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

- Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
- At least 16 term courses must be in Spanish, and ten of these 16 term courses must be in courses as outlined above under the Four-Year General program.

Recommended Program

**Year One**

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

*Eight additional term courses.*

**Year Two**

A minimum of four term courses in Spanish, including SPAN 251A/B, or 201A/B, and 205/206.

*Six additional term courses.*

**Year Three**

A minimum of six term courses in Spanish, including SPAN 351A/B, or 251A/B, 227/228 and 326 or 327.

*Six additional term courses.*

**Year Four**

A minimum of four term courses in Spanish.

*Six additional term courses.*

Minor Program in Spanish

Students in an Honours Program interested in Spanish is 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.

Notes For All Programs

1. By agreement, students at the University of Waterloo and Wilfrid Laurier University can be expected to take courses in Spanish at either university. While most language courses are taught concurrently every year at both universities, most other courses are taught either at one university or the other, and a few courses may rotate from year to year.

2. With the permission of the Department, students may spend the third year enrolled in an acceptable university in Spain or Spanish America.

3. Students in Years Three and Four must have the permission of the home department to enrol in Spanish courses at the 100 or 200 level.

Speech Communication Option

Co-ordinator of the Speech Communication Option

J. Tomasson Goodwin, BA (British Columbia), MA, PhD (Toronto)

Ours has been labelled the age of communication. Yet few people possess a formal knowledge of what communication is, how it works, and how it can work better. To meet this need, the Speech Communication Option introduces students to speech communication theory, its critical methods and practical applications. The Speech Communication Option is comprised of eight courses. Two of these are core courses, DRAMA 223 – Public Speaking and DRAMA 224 – Interpersonal Communication, required of all students enrolled in the Option. Students also choose two from four other Speech Communication courses: Interviewing, Speech Writing, Debate and Persuasive Communication, Voice and Non-Verbal Communication. Together, these Speech Communication courses satisfy the Speech component of the Option. Students complete their Option package by choosing four courses concerned with communication from other disciplines, either from the following list of recommended courses or in consultation with the Co-ordinator of Speech Communication. Only two of four cognate courses can double count towards the student’s degree and the Speech Communication Option.

The Speech Communication Option is open to undergraduate students in all faculties of the University. It is administered by the Speech Communication Co-ordinator and the Chairman of the Drama Group. Consultation with the Co-ordinator is highly recommended to ensure that students can fulfill all the course requirements during the terms that they are on campus.
Course Requirements:

Core Courses

(Limited enrolment; early registration advised.)

DRAMA 223 Public Speaking
DRAMA 224 Interpersonal Communication

Two from the Optional Speech Communication Courses

DRAMA 323 Speech Writing
DRAMA 326 Voice and Non-Verbal Communication
DRAMA 324 Debate and Persuasive Communication
DRAMA 225 Interviewing

Four from approved Cognate Courses

ACC 432 Communicating Accounting Information for Decision Makers
ACC 443 Creative Thinking, Problem Solving and Decision Making for Accountants
ANTH 103 The Nature of Language
CS 492 Social Implications of Computers
DRAMA 102 Introduction to Acting
DRAMA 221 Intermediate Acting 1
DRAMA 222 Intermediate Acting 2
DRAMA 321 Advanced Acting 1
DRAMA 322 Advanced Acting 2
ENGL 306A Introduction to Linguistics
ENGL 309A Rhetoric: Principles and Practice 1
ENGL 309B Rhetoric: Principles and Practice 2
ENGL 309C Contemporary Rhetorical Theory
ENGL 309D Approaches to Style
FR 250A Advanced Spoken French II
FR 300A Advanced Spoken French III
FR 400A Advanced Spoken French IV
GEN E 062 Introduction to Human Communications Systems
PAS 200 Basic Personnel Administration
PAS 300 Concepts and Issues in Personnel Administration
PHIL 145 Critical Thinking
PHIL 200J Intentional Logic
PHIL 216 Rational Behaviour and Decision-Making
PHIL 243 Conflict, Contract and Choice
PLAN 230 The Small Group in the Planning Process
PSCI 295 Public Sector Management
PSCI 471 Public Opinion and Propaganda
PSYCH 254 Interpersonal Relations
PSYCH 334 Theories of Individual Counselling
PSYCH 344 Theories of Group Counselling
PSYCH 440A/B Group and Individual Counselling
SOC 234 Social Psychology and Everyday Life
SOC 245 Interpersonal Communication
SOC 246 Mass Communication
SOC 310 Seminar in Group Dynamics
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. A substantial part of the work of the first and second years is common to all programs. Students elect one of the seven principal programs of engineering starting with the first year. The curriculum for each of the seven basic programs combines required "core" subjects essential to the field, and "elective" subjects permitting considerable diversity in individual programs of study. An important part of the curriculum is a series of electives in the Humanities and Social Sciences.

A more detailed explanation of the Co-operative program is given in Chapter 5, as well as specific requirements as noted under the examinations and promotions section of this chapter.

Degrees
The Degree of Bachelor of Applied Science (BASc) is awarded by the University in the following undergraduate programs:
- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Electrical Engineering
- Geological Engineering
- Mechanical Engineering
- Systems Design Engineering

The Degrees of Master of Applied Science (MASc) and Doctor of Philosophy (PhD) are also awarded in Engineering. For further details, consult the Graduate Studies Calendar and the list of the particular courses in graduate work in the various departments.

Engineering
The Co-operative Engineering Program
Admission

Admission

All Year One students enrol in September. These 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 two academic terms in sequence at the start of the program and the other having two academic terms in sequence 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.

Electrical Engineering and Systems Design Engineering students start in September with four months of school (Stream 4) before going out on the first work term in January. Computer Engineering and Geological Engineering students start in September with eight months of school (Stream 8) before their first work term which starts in May. Chemical, Civil, and Mechanical Engineering students may be either Stream 4 or Stream 8.

The admission categories, requirements and procedures for all programs are outlined in Chapter 2 of this Calendar. The following emphasize some of the admission requirements which relate specifically to the Faculty of Engineering.

Applicants from Ontario Secondary Schools
Applicants must present six credits, five of which are required courses. See the Admission Requirements chart in Chapter 2 for information about admission requirements. Applicants with high overall standing who are missing any of the required courses must contact the Director of Admissions for Engineering no later than December (for the next September admission). Applicants will be evaluated and advised on possible courses of action required to meet the specific requirements.

Admission as an Adult Student
Applicants must obtain standing in Ontario Grade 13 or Ontario Academic Course Mathematics and Science or their equivalent. The University has developed special pre-university physics and chemistry courses which can be taken by correspondence and which are recommended for Adult Students. To discuss admissibility and appropriate qualifying studies, applicants are advised to contact the Director of Admissions for the Faculty of Engineering.
Admission to Advanced Standing
Due to the co-operative nature of the Engineering program, no student will be admitted above Year Three, term A level. Any student thus admitted will be required to register in the January term and to complete satisfactorily the final four academic terms and the final three University of Waterloo work terms and work reports. The level of advanced admission is determined by an examination of the applicant's academic and work experience.

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

Examinations and Promotions

(These regulations apply to students who will graduate in the class of 1990 or thereafter.)

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

1. Promoted - proceed to next term.
2. Proceed on Probation - proceed to next term, but subsequent progress is contingent upon clearing pending conditions. (Normally, Proceed on Probation will not be awarded for two terms in succession.)
3. Conditionally Promoted - student must clear failed courses before the beginning of the second succeeding academic term.
4. Academic Decision Deferred - may not proceed until conditions cleared.
5. Required to Repeat Term - must stay out two terms before repeating.
6. Required to Repeat from Engineering - readmission possible only through application to Admissions Committee after at least three terms out and with new evidence of ability to succeed. (Except in 1A term - see rule #7, p. 9:4)
7. Recommended for BSc Degree at (Spring/Fall) Convocation - program successfully completed.
8. Promoted (Aegrotat) - student has adequate understanding of the material, but due to illness or other extenuating circumstances, normal evaluation was not possible; proceed to next term.

At the end of each term, the examining Faculty members submit grades for that term's courses. Each department then reviews the performance of students registered in that department and makes recommendations to the Examinations and Promotions Committee. The Examinations and Promotions Committee then considers the evidence on which the departments have made their recommendations and assigns the official academic decision. An appeal of the assigned academic decision may be made directly to the Examinations and Promotions Committee of the Faculty (see rule #15 below). All academic decisions and grades are reported to the student through the Registrar's Office. All recommendations to award degrees must be approved by the Senate of the University.

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

1. To be Promoted in the program, a student must have a term average of 60% or better, with no course below 50%. Students who fail to meet this requirement will be Conditionally Promoted, Required to Repeat the Term, Required to Withdraw from Engineering, allowed to Proceed on Probation, granted Aegrotat Standing, or have the Academic Decision Deferred, according to the conditions identified below.

2. To remain in the program, a student must have a term average of 50% or better. Students who fail to meet this requirement will be Required to Withdraw from Engineering. Except in 1A, a student receiving an average below 50% who has never before had an average below 60% will have the Academic Decision Deferred for two months to allow the student an opportunity to bring forward evidence of extenuating circumstances which affected the term performance.

3. A student who achieves a term average of 60% or better, but who has one or two courses below 50%, will be Conditionally Promoted. The condition may be satisfied, and the promotion confirmed, in one of the following ways, as determined by the student's Department of registration.
   a) A Department may require a student to repeat a course in which a grade of less than 50% was received, and to obtain a grade of at least 50% in such a course. The grade received upon repetition would not affect the student's original term average.
   b) If a subject is failed with a grade of at least 39%, the failure is considered cleared if the student's performance in the immediate next academic term results in an average of at least 60% with no course failures. A credit will then be entered on the student's record for that subject, although the original failing grade does not change. If the following academic term does not clear the failure in this way, then the student will be required to repeat that term.
c) If the failed subject has a grade of 39% or more, a department may require the failure to be cleared by supplementary work. Satisfactory completion of the supplementary work will result in a “Credit” for the failed course, and there is a non-refundable $25.00 fee for such supplementary work.

d) For a failed subject with a grade of 39% or more, the department may require a formal re-examination of the subject by written examination held at a time specified by the department. Such re-examination will not affect the student’s term average. To clear the failure, a grade of at least 50% must be obtained on the supplemental examination within eight months from the original failure, and will be recorded on the Grade Report. There is a non-refundable re-examination fee of $25.00 for each such supplemental examination.

e) A course with a failing grade of 38% or less, or in cases in which a failed course is not cleared by a), c) or d), on the first try, then the subject must be replaced as a condition of promotion. This is done by obtaining at least 50% in an extra course as assigned by the department in the immediate following academic term. The extra course will not be included in the student’s term average. If the extra course in the following term does not clear the failure, then the student will be required to repeat an academic term, as specified by the department.

A student who fails to satisfy these conditions may not proceed further in the program, and no student may obtain the BASc degree without satisfying these conditions for all courses beyond 1A in which a grade of at least 50% has not been achieved.

4. A student who achieves a term average of 50% or better, but less than 60%, or a student who achieves a term average of 60% or better, but who has more than two courses below 50%, will be Required to Repeat the Term.

5. The term No Penalty may be appended to the decision to repeat a term. In this case, the requirement to stay out for two terms before repeating the term is waived and the term is not counted as a repeat term with regard to the number of times a term can be repeated or in the calculation of the total number of terms of full-time study in the program. This condition is normally applied as a result of extenuating circumstances which affected the student’s performance in the failed term.

6. Students repeating a term must achieve an average of 60% or better with no course below 50% or they will be Required to Withdraw from Engineering. Only two repeated terms are permitted in total, with no single term being repeated more than once; otherwise the student will be Required to Withdraw from Engineering. While repeating a term, a student may be excused from repeating individual courses in which a grade of 70% or better has been achieved. If this is permitted, however, other appropriate courses, at the Department’s discretion must be taken, such that a full course load is maintained. In all cases, the program must be completed in no more than ten terms of full-time study.

7. In the 1A term only, students are promoted if they achieve an average of 60%, with no more than two courses having a grade of less than 50%. Students may Proceed on Probation if their term average is 50% or better (but less than 60%) with no more than two courses below 50%. Students who do not satisfy these requirements and are required to withdraw, may request a Qualifying Program for Readmission, and may apply for readmission without waiting the three terms normally required.

8. A student may withdraw voluntarily from the program at any time prior to 4 weeks before the commencement of the final examination period in the term by giving written notification of withdrawal. IN 1A ONLY, a student may withdraw voluntarily from the program at any time prior to the commencement of the final examination period by giving written notification of withdrawal. Should a student who has voluntarily withdrawn wish to re-enter the program, he/she may re-apply to the program directly through application to the Admissions Committee of the Faculty.

9. A student may be Required to Withdraw from Engineering at any time if, in the opinion of the Faculty, the student is unlikely to benefit from further participation in the program or if the student leaves the program without notification and fails to write examinations.

10. Courses taken by students during work terms will not be included in the average for any term. The grades for courses taken at the University of Waterloo or at another university on Letter of Permission, however, will be reported on the student’s transcript. Normally, such courses are considered as enrichment to the student’s program; when the material of such a course is deemed to cover a subsequent course in the program, the student may receive permission to replace the subsequent course by a free elective (technical or non-technical) approved by the Associate Chairman of the department. Courses taken during work terms may not be used to reduce the number of courses taken in any subsequent term. Normally, all students will be expected to register in the minimum number of courses specified in the Calendar for each term of the program.
11. Grades for courses that are in addition to the degree requirements will not be included in the term average but will be reported on the student's transcript. The Faculty of Engineering does not permit students to register in any of its courses on an audit basis.

12. Students who have successfully met all of the requirements of the program and have been recommended for the BASc degree will have First, Second, or Third Class Honours standing designated according to the cumulative 3A-4B average as follows:

   First Class Honours: Average 80-100%
   Second Class Honours: Average 70-79%
   Third Class Honours: Average 60-69%

13. Individual departments may designate additional minimum grade requirements in certain courses. Also, there are individual department rules regarding the grading and averaging of General Studies elective courses.

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

   AEG - Aegrotat. The student was ill according to medical evidence but has satisfactory understanding of the course.
   CR - Credit granted. Performance was satisfactory.
   NCR - No credit granted. Performance was unsatisfactory.
   INC - Incomplete. The course work is incomplete and the student has permission to extend the work beyond the term. If the work is not completed within six months from the end of the term, a grade will be submitted based on the available information.
   DNW - Did not write. The student did not withdraw from the course and was not eligible for an Incomplete grade. The student did not complete a sufficient proportion of the assignments, tests, and examinations for an evaluation to be made.

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

<table>
<thead>
<tr>
<th>Letter</th>
<th>Numerical</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>80</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>58</td>
</tr>
<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>

15. Students who have reason to believe that a grade, term average, or academic decision is incorrect or unjust may launch an Appeal. Reasons in support of the appeal including medical certificates and similar documents must be submitted with the appeal. All appeals should be addressed to the Chairman of the Engineering Examinations and Promotions Committee, Registrar's Office, University of Waterloo. Appeals should be received prior to four weeks after the date of issue of the marks for the term in order to facilitate entry into the immediately following term if so desired by the student. Appeals which are launched later than six months after the end of the term being appealed will not be considered.

   In the Faculty of Engineering, all Examination and Promotion decisions for each individual undergraduate student based on examination reports, work term reports and recommendations from the student's department are made by the Faculty Examinations and Promotions Committee. Appeals of these decisions are considered by the Faculty Examinations and Promotions Committee. A further appeal of a decision of the Examinations and Promotions Committee may be made by the student, any member of the Committee, or the Associate Dean, Undergraduate Studies. This level of appeal is made through the Associate Dean to the Faculty Undergraduate Affairs Committee. A student who has filed a written appeal has the right to present that appeal in person.

   An appeal from the decision of the Faculty Undergraduate Affairs Committee would next be made to the Engineering Faculty Council. An unsatisfied appellant may appeal to the Senate.

16. Changes to the set of courses which a student is taking in a particular term may be permitted at the discretion of the student's department. Such changes must normally be arranged and approved before the end of the normal "Drop/Add" period, which is a period of two weeks at the beginning of each term. After this period, only exceptional cases will be considered.

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

English Language Proficiency Requirements
All students with an initial registration in the Faculty of Engineering in the Fall 1986 term or later must satisfy the English Language Proficiency Requirement before graduation. This requirement may be satisfied by writing and obtaining a grade of 60% or better in the English Language Proficiency Examination (ELPE).

   Students who obtain a grade of less than 50% in the ELPE must attend the Writing Clinic. Students who have not obtained a grade of at least 60% in the ELPE by the beginning of the 2A term, must satisfy the Proficiency Requirement by taking an approved English course and obtaining a grade of 60% (C -), or better. The list of approved courses is maintained by the Director of General Studies of the Faculty of Engineering. (The current list includes the following English courses: ENGL 109, 129R, 150,
210A and 210C). The entry ARTS 000 will appear on both the Student Examination Report and the student’s transcript with a CR grade if the student completes the requirement by passing the ELPE examination, or successfully fulfilling the requirements of the the Writing Clinic.

Challenge for Credit
When students are able in their own time, or through experience in a work-term job, to study the material of a course that they would normally be required to take in their program, they may show evidence as to why they should be excused from taking the course and demonstrate their competence in a manner acceptable to the department offering the course. This process is known as “Challenge for Credit.” Additional information may be obtained from the student’s department.

Undergraduate Co-operative Work-Term Reports
Satisfactory work reports and work terms are recognized formally as part of the requirements for the Bachelor's degree. The regulations related to work-term reports are:

1. Prior to graduation each Engineering student is required to submit a minimum of 4 satisfactory work reports which must be related to the work of the term reported and must have identifiable analytic content. For those students admitted to advanced standing into 2B or 3A with only three work terms remaining, only three 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 may be carried forward to the following calendar term for evaluation, and are not eligible for prizes.

3. Work reports are 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-operative Education and Career Services.

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 additional reports and the evaluations of these reports will be added to their work-term record.

5. Work reports, other than those completed by first year students, shall be evaluated by the Engineering Faculty following the same procedure suggested in Item 3. This shall include reports marked by employers.

6. Work reports rated as unsatisfactory may be rewritten and re-submitted during the academic term. Students with unsatisfactory work reports may be required to take formal instruction in technical report writing.

7. Students with an “NCR” designation on any work report will not be promoted until they have cleared this condition. (See booklet titled Regulations & Procedures for Co-operative Programs.)

8. All required workterm reports must be submitted by March 1, if a student is to be eligible for the convocation in May of the same year.

Dean’s Honours List
To recognize outstanding academic achievement each term, the designation “Dean’s Honours List” will be awarded to exceptional undergraduate Engineering students. To achieve this standing, a student must be unconditionally promoted, and be either in the top 5% of the class or obtain a term average of at least 85%. This designation will be reflected on the student’s mark report and official university transcript. Students not in the top 10% of the class, or not having a term average of at least 80% are normally not eligible.

Students with outstanding records throughout their undergraduate careers in Engineering will “Graduate on the Dean’s Honours List” if they have been on the “Dean’s Honours List” for at least two terms of the six academic terms preceding graduation, and have a cumulative average over these last six terms of their program of at least 80%. An appropriate notation will appear on the student’s official university transcript.

An Alumni Gold medal is awarded annually to recognize the academic excellence of the top undergraduate in Engineering.

General Studies Requirements, Options, and Electives for Engineering Students

Each of the Engineering undergraduate programs consists of the compulsory core program and elective courses, both of which are described below:

1. The compulsory core program within the Department prepares the student for practice in that particular branch of engineering and comprises 70 to 80 percent of the course load.

2. Elective courses comprise 10 to 20 percent of the course load. Of these elective courses a minimum of five must be chosen from subjects outside engineering, the physical sciences and mathematics. This GENERAL STUDIES requirement gives students some breadth of studies related to their role as educated professionals in society. (See General Studies Requirement section of this chapter).

In the elective courses, students with special interests may, with the approval of their department Associate Chairman, structure individual groupings.
However, for reasons of academic continuity and scheduling, particular course groupings have been identified and are recommended to students. Some of these course groupings are pre-scheduled to ensure that courses in the group will not conflict with core courses.

3. The remaining elective courses are usually chosen from engineering departmental courses which give some depth in a particular technical discipline appropriate to a student’s branch of engineering. (See engineering departmental program descriptions for listings of suggested elective course groupings of this type.)

4. Designated options. Certain elective course groupings have been recognized by the Faculty of Engineering or the University as DESIGNATED OPTIONS. Students who complete the requirements of these options will have a designation of completion on their transcripts. At present they are:
   
a) Option in Mathematics (Faculty Option)
   b) Option in Physics (Faculty Option)
   c) Option in Computer Engineering (Faculty Option)
   d) Option in Statistics (Faculty Option)
   e) Option in Water Resources (Faculty Option)
   f) Management Sciences Option (Faculty Option)
   g) Society, Technology and Values Option (University Option)

As Designated Options can require up to eight courses, it may be necessary for students in some departments to take extra courses to complete the required work in some options. To carry extra courses, a student’s academic standing must be such that the extra load will not lead to a high risk of failure, and permission of the Department Associate Chairman must be obtained.

For a designation to appear on the transcript a student must achieve an average of 60% on the Option courses and a grade of 50% on each of the courses in the option. (Details follow later in this section.)

5. Many departments of the University offer “MINORS” in their discipline. A Minor requires a minimum of ten courses chosen from lists prepared by the departments offering the minor. Engineering students who choose a Minor must take extra courses. However, courses in a Minor can often be used to satisfy some of the requirements of the technical elective or general studies courses groupings.

6. It is possible for a graduate with a BASc degree in Engineering to complete the requirements for a non-major General BA in a further two terms of study. Assuming satisfactory grades and the appropriate choice of General Studies Electives, credit for liberal Arts and Science courses (including mathematics and science subjects in Engineering) may be transferred to meet up to two-thirds of the General BA requirement. Students interested in pursuing such a program should consult with their Departmental Associate Chairman or the Director of General Studies for Engineering, and the Associate Dean of the Faculty of Arts for Undergraduate Affairs.

7. The Faculty of Engineering, University of Waterloo, has student exchange programs with Engineering Schools in other countries. These permit Waterloo students to experience study in different cultural environments, and receive academic credit towards their program requirements. Such exchanges are currently active with the L’Universite de Technologie de Compiégne, Technische Universität Braunschweig, the New South Wales Institute of Technology, the New University of Ulster, the University of Paderborn, the University of Nantes, Eindhoven University of Technology, and Tottori University.

Information on these programs is available from Engineering Counselling Services.

GENERAL STUDIES REQUIREMENTS
The requirement that a minimum of five courses must be chosen from outside the engineering, physical sciences and mathematics disciplines can be met by either developing a self-planned grouping of courses or by following a pre-scheduled and recommended course grouping.

Self-Planned General Studies
A student may plan an individual general studies grouping provided it meets these criteria:

1. It should consist of five courses which are clearly not engineering, mathematics or other closely related subjects.
2. It should include courses beyond the introductory level.
3. It is chosen from a University-wide master list of courses approved for engineering students. (Department Undergraduate Associate Chairman have the list.)
4. The choice of courses is approved by the Associate Chairman of the student’s department.

Within the university-wide master list, Department Associate Chairmen have groupings of suggested courses which concentrate on discipline areas such as French, Environmental Studies, History, etc. However these groupings are not pre-scheduled and students who plan their own option package may have considerable difficulty with timetable conflicts.

Many courses are available by U of W correspondence and may be taken during a student’s work term. Also, courses taken at another university during a work term may be eligible for “transfer
credit” if approved by the student’s Associate Chairman.

Pre-scheduled Humanities and Social Sciences Grouping
This grouping consists of a number of courses from the Humanities and Social Sciences which have been chosen to provide some understanding of the wider human and social context within which engineering is practised. There are a number of choices within the grouping, most of which are pre-scheduled so as not to conflict with the engineering core programs.

Students are recommended to take at least two courses from the listed Humanities courses and at least two from the Social Sciences list. The total must be five courses.

Pre-scheduled courses are listed in groups, one course at the introductory level and one or more at the advanced level. A student’s program must include at least two courses beyond the introductory level.

In the following,
(I) indicates introductory level. F - Fall, W - Winter, S - Spring.
(P) indicates courses which will be scheduled into 11:30-12:30MWF, 7:00-10:00M or 7:00-10:00T.

The choices are:

Social Sciences-based Courses
(P) Economics: (I) ECON 102(F,W,S); ECON 202(F,W,S)
(P) Management: (I) MSCI 211(F,W,S); MSCI 311(F,W); MSCI 481(F,W); GEN E 352(W)
(P) Political Science: (I) PSCI 102M(W,S); PSCI 260A(F); PSCI 260B(W,S)
(P) Psychology: (I) PSYCH 101(F,W,S); PSYCH 253(F)
(P) Sociology: (I) SOC 101(F,W); SOC 265(F,W)

Humanities-based Courses
(P) English (I) ENGL 105A(F,W,S); ENGL 214(F,W,S)
(P) French (I) FR 195(F); (I) FR 196(W); FR 275(F); FR 232(W,S); FR 235(W,S)
(P) History: (I) HIST 130(F,W,S); HIST 253(F); HIST 254(W,S)
(P) Philosophy: (I) PHIL 200(F,S); PHIL 200B(W); PHIL 300X(W); PHIL 315(W) (Cross-listed as GEN E 412)

General Engineering: GEN E 411(F,S); GEN E 412(W)
(Cross-listed as PHIL 315)

Other social-sciences and humanities courses are permissible but will not be pre-scheduled. See Department Associate Chairman for the approved list.

Other Pre-scheduled General Studies Groupings
Other groupings which would be scheduled conflict-free are being considered in areas such as Health and Bio-medical Studies, Business Studies and Environmental Studies. Interested students are advised to check with their department Associate Chairman.

Engineering
General Studies Requirements, Options, and Electives for Engineering Students

Notes
1. Options and Electives available to engineering students are subject to change and development. Students are advised to obtain the latest information from their department Undergraduate Office or the Faculty of Engineering Associate Dean’s Office before making final decisions.
2. Students who decide their preferred choices at pre-registration time are most likely to have their choice. Changes at the beginning of a term are likely to cause conflicts and thus not be possible.
3. For descriptions of the content of courses see Chapter 16 of this calendar under the program prefix of the course e.g. CIV E – Civil Engineering, FYIL – Philosophy, GEN E – General Engineering, etc.

DETAILS OF DESIGNATED OPTIONS

Option in Mathematics
The aim of the mathematics option is to provide the student with a broad background in either pure or applied mathematics with an opportunity to take some courses in an area of specialization.

There are six required courses:
MATH 211 Advanced Calculus 1 (or equivalent)
MATH 212 Advanced Calculus 2 (or equivalent)
MATH 234A Linear Algebra 2
MATH 234B Abstract Algebra 1
EL E 316 Probability and Statistics (or equivalent)
AM/PMATH 331 Real Analysis or MATH 332B Complex Variables

A student must additionally take two other mathematics courses. The following, subject to availability and timetable constraints, are suggested.
PMATH 334 Rings and Fields
PMATH 340 Elementary Number Theory
PMATH 360 Geometry
AM/PMATH 365 Differential Geometry and Tensor Analysis
PMATH 367 Set Theory and General Topology
AM/PMATH 380A Introduction to Information Theory
AM/PMATH 380B Applications of Information Theory
PMATH 430A Introduction to Mathematical Logic 1
PMATH 430B Introduction to Mathematical Logic 2
AM 351 Ordinary Differential Equations
AM 353 Partial Differential Equations 1
AM 361 Continuum Mechanics
AM 371C Classical Mechanics
MATH 332B Complex Variables or AM/PMATH 331
C&O 230 Introduction to Combinatorics
C&O 342 Graph Theory 1
C&O 350 Linear Programming
C&O 367 Nonlinear Programming

The list of courses will be subject to change from time to time. For further information contact the option co-ordinator, Professor G. Greig, Department of Systems Design Engineering.

Option in Physics
The physics option is intended for students who want to have a better background in the fundamentals of physical science than is available in the regular program.

There are five required courses:
PHYS 115 Mechanics
PHYS 125 Physics for Engineers
PHYS 234 Quantum Physics 1
PHYS 334 Quantum Physics 2
M E 250 Thermodynamics (or equivalent) or PHYS 358

A student must additionally take three electives from Group A or three electives from Group B or a suitable combination of three electives pre-approved by the Option Co-ordinator and the Undergraduate Officer of the student's department, subject to availability and timetable constraints.

Group A
PHYS 259 Crystallography & X-Ray Diffraction
PHYS 359 Statistical Mechanics
PHYS 364 Mathematical Physics 1
PHYS 365 Mathematical Physics 2
PHYS 434 Introductory Quantum Mechanics
PHYS 435 Solid State Physics
PHYS 442 Structure of Solids
PHYS 443 Continuum Mechanics
PHYS 455 Nuclear & Particle Physics

Group B
PHYS 350 Astrophysics 1
PHYS 364 Mathematical Physics 1
PHYS 365 Mathematical Physics 2
AM 475 Introduction to General Relativity
PHYS 445 Modern Optics
PHYS 476A-Z Special Topics in Astrophysics

The list of courses in Groups A and B will be subject to change from time to time. For further information, contact Professor S.K. Chaudhuri, Department of Electrical Engineering.

Option in Computer Engineering
This is a Designated Faculty Option which is available to students in Electrical Engineering and Systems Design Engineering to give greater training in software and to augment digital hardware capabilities. For details of this option students are referred to the Electrical Engineering and Systems Design sections of this calendar.

Option in Statistics
The aim of the statistics option is to provide the student with a broad background in applied statistics, especially in the areas of multiple regression, quality control, experimental design and applied probability.

STAT 231 Statistics (or equivalent, e.g. SY DE 214, M E 202, CH E 022, CIV E 224)
STAT 331 Applied Linear Models (or equivalent, e.g. SY DE 333)
STAT 335 Statistical Process Control
STAT 333 Applied Probability or STAT 430 Experimental Design

A student must take three (3) additional courses from those listed below.

STAT 230 Probability (or equivalent, e.g. SY DE 213)
STAT 332 Sampling
STAT 333 Applied Probability
STAT 371 Stochastic OR Models (SY DE 411 or M SCI 431 may be substituted)
STAT 430 Experimental Design
STAT 431 Applications of Regression Models
STAT 433 Stochastic Processes
STAT 443 Forecasting

CH E 037 Applied Mathematics 2
CH E 041 Introduction to Process Control
CH E 522 Advanced Process Dynamics and Control
CH E 524 Process Control Laboratory
CIV E 342 Transport Principles & Applications
CIV E 343 Traffic Engineering
CIV E 344 Urban Transport Planning
CIV E 375 Water Quality Engineering
CIV E 440 Transport Systems Analysis
CIV E 473 Contaminant Transport
CIV E 480 Water Resources Management
CIV E 486 Hydrology

M E 340 Manufacturing Process
M E 448 Production Engineering or M SCI 432

M SCI 452 Behavioural Decision Analysis
SY DE 372 Pattern Recognition
SY DE 433 Conflict Analysis

Of the seven courses, five must be taken outside the student's home department. For further information contact Prof. J.B. Whitney, Dept. of Statistics and Actuarial Science, or Prof. K. Hipel, Dept. of Systems Design Engineering.

Option in Water Resources
This option is for students interested in the development, management and protection of water resources. Students are prepared for careers with consulting firms or regulatory agencies. They acquire...
the background to design and evaluate hydraulic structures, pollution control schemes and water management systems. They are also exposed to the social and environmental aspects of use of water resources. A minimum of seven courses is required. However most students in Civil Engineering will probably wish to take more.

There are four required courses:
- CIV E 280 (or equivalent) Fluid Mechanics
- CIV E 375 Water Engineering
- CIV E 381 Hydraulics
- CIV E 486 Hydrology

A minimum of three elective courses are required to be taken from the following list subject to timetable constraints.
- CIV E 422
- M E 559 or SY DE 554
- CIV E 472 Waste Water Treatment
- CIV E 473 Contaminant Transport
- CIV E 480 Water Resources Management
- CIV E 483 Design of Urban Water Systems
- EARTH 456 Numerical Methods in Geoscience
- EARTH 458 Physical Hydrogeology
- EARTH 459 Chemical Hydrogeology
- GEOG 275 Introductory Air Photo Analysis & Remote Sensing
- GEOG 376 Environmental Remote Sensing
- GEOG 471 Advanced Remote Sensing
- M E 304 Numerical Analysis
- M E 362 Fluid Mechanics 2
- M E 566 Fluid Mechanics 3
- CH E 032 Introductory Biotechnology
- CH E 572 Air Pollution Control
- CH E 574 Treatment of Aqueous Inorganic Wastes
- SY DE 321 Numerical Analysis and Computer Methods

Option in Management Sciences
This Designated Option consists of a mixture of courses, some of which are technical in nature, and some of which qualify as general studies courses. The option is available in all engineering programs except Geological Engineering. It is intended for students interested in the issues, concepts and techniques related to managerial problems, particularly in technology-based organizations.

For further information on courses required, see the Management Sciences section in this chapter of the calendar (p. 9:24) or contact the Associate Chairman of the Management Sciences Department. (CPH 4305)
Combined Bachelor’s - Master’s Program
In Engineering

INTRODUCTION
The Faculty of Engineering offers a combined Bachelor’s - Master’s 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.

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 a MASc
degree in the Faculty of Engineering provide an
alternative means, complementary to the existing
undergraduate and graduate programs, for the
attainment of the MASc degree.

The following are some general conditions that all
such combined Bachelor’s - Master’s degree programs
should satisfy:

1. 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:
   a) 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;
   b) the graduate program must include at least four
      (graduate) courses and a thesis, or eight
      courses and a MASc project.
   c) the Co-operative work-term requirements of the
      BASc program must be met.
2. There must be complete freedom of transferability
   from the combined programs to the regular
   programs.
3. 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 if circumstances so warrant, to
   withdraw from the University.
4. 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.
5. A combined program normally functions on the Co-
   operative basis.
6. 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.

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

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.

Course Programs
The courses chosen by the student (with the advice of
the Supervisor and approval of the Associate Chairman)
in the 4A, 4B, 5A, and 5B terms should form a coherent
series which (together with the MASc project or thesis)
complete the requirements of the Bachelor’s and,
ultimately, the Master’s degree.
In each of the 4A and 4B terms one course (normally
600 level) should be chosen for credit to the MASc degree.
in some departments this course may replace one of the
technical electives in each of those terms. Technically, it
is necessary for students to register for these courses as
"extras" in order to avoid counting them towards the
requirements of both degrees.
If a student is proceeding to an MASc with a research
thesis, the balance of courses (2 courses numbered 500
or above) will normally be taken in the 5A (Fall) term. There will be no course requirement for the 5B (Winter) term.

A student who is proceeding to a MASc with a Master's degree project, would normally select 3 courses in each of the 5A and 5B terms (with the advice of the Supervisor and approval of the Associate Chairman).

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.

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.

Granting of Degrees
The BASc degree will be granted at the normal time, i.e. at the Spring Convocation following the 4B term. The program, however, culminates in the MASc, which is normally granted at the Convocation following the 5B term. In some cases, additional time may be required to complete the thesis or project.

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.

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.

Year One Engineering Programs
All students enrolling in Year One are required to choose one of the following programs:
Chemical Engineering
Civil Engineering
Computer Engineering
Electrical Engineering
Geological Engineering
Mechanical Engineering
Systems Design Engineering

Students enrolling in a Year One Engineering program (other than Systems Design) must register in the courses indicated in the following table: (Course descriptions can be found in Chapter 16).

Term 1A
MATH 114
MATH 116 (formerly MATH 110A)
CH E 102
PHYS 115
GEN E 170

and one of
CH E 100, GEN E 163, GEN E 165, GEN E 167
Term 1B
MATH 118 (formerly MATH 110B)
PHYS 125
GEN E 121
GEN E 123*
and one of
CIV E 126, EL E 126, CH E 101, GEO E 126, M E 126
and one General Studies elective (to be chosen from
the list of recommended courses which will be
published each year)
*Computer Engineering students and Electrical Engineering
students must take EL E 123 in lieu of GEN E 123.
*Mechanical Engineering students must take GEN E
124 in lieu of GEN E 123.

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

Chemical Engineering

This is an Honours Co-op program that prepares
Professional Engineers for technical leadership in
industry or other agencies which design, manufacture,
use or regulate processes that transform chemical or
biological materials for the benefit of society.

Technical preparation is provided by training and
education in the application of knowledge and
scientific methods to the analysis and solution of
progressively more difficult problems, culminating in
the design of a unique integrated processing system
and in further study of a core area of specialization
represented by Faculty members in or adjunct to the
Department.

A large number of courses in Chemistry,
Biochemistry, Physics and Mathematics provide the
foundation for the general and theoretical principles
required in subsequent Chemical Engineering courses.

The significant number of General Studies Electives
develops the sensitivity, perspective, social concern
and communication skills expected of those who
aspire to professional status in the community of man.

Courses in economics, statistics, optimization and
the science of management strengthen the graduates’
capabilities for rational application of the fundamentals
of science, engineering and design.

The Department expects that this program, diligently
pursued, will convocate a proud graduate confidently
qualified to enter the Engineering profession, to
proceed to further professional training in Business,
Government, Education, Medicine or Law, or to
continue the pursuit of engineering science in a
graduate program within this Department or
elsewhere.

AREAS OF SPECIALIZATION

Transport Processes
Of basic concern in Chemical Engineering is the
design of equipment which contact, separate or deliver
materials, energy and components of chemical
systems for the transformation process.

Mathematical Analysis and Control
To understand complex systems and to develop
consistent reliable processing plants, mathematical
analysis, simulation and the use of computers are
continuously evolving as sophisticated and integrated
components in design.

Reaction Processes
At the heart of Chemical Engineering is the chemical
or biochemical reaction, for which kinetic pathways
need to be studied, enhanced, altered and even
invented to provide useful and more economical
materials in an everchanging world.

Polymer Science and Engineering
Modern materials invented and structured from
primitive materials continue to be a leading area of
study, and the development of new polymers for
plastics and synthetic fibres is essential if an
industrialized nation is to maintain its prestige,
relevance and usefulness.

Extractive and Process Metallurgy
High-temperature processes, ingenious solution
techniques and electrolytic methods are some of the
various ways in which useful metals are won from the
generous earth, and these are fundamental to
Canada’s technological prosperity.

Industrial Biochemical Technology
Fermentation, biofuels, food processing, organic waste
treatment and utilization are only some of the
advancing areas where enzymes, bacteria, fungi and
other micro-organisms are mobilized and manipulated
to help satisfy the needs and wants of man.

Pollution Control Engineering
A mature society will not abide destruction of quality of
the environment. Many intellectual inventions are
needed in the continuing effort to regenerate, abate or
prevent the pollution of air and water as increasing
demand for production competes for decreasing
resources.

GENERAL STUDIES ELECTIVES (GSE’s)

As for all engineering students, Chemical Engineering
requires five one-term courses in non-technical areas.
Many of these courses are pre-scheduled to be
decision free. These are usually recommended as well
as approved by the Faculty General Studies
Committee. Other courses may be taken with the
approval of the Associate Chairman, Undergraduate,
but scheduling is not guaranteed. A GSE may be satisfied by correspondence or from other institutions on Letters of Permission, but each term's minimum course load must be maintained by substituting an approved "free" elective (technical or non technical). Second or third-level courses are required for GSE's in third and fourth year.

TECHNICAL ELECTIVES (CH E 5XX)
These 500-level courses in the various areas of specialization are normally available in the 4B Winter term only, and two must be taken in one area. A third is required from another area or it may be (with the approval of the Associate Chairman, Undergraduate) a senior level technical course outside the Department.

OPTIONS AND MINORS
Options are fully described in the preceding pages. Example minimum requirements for a degree with the designation BASc in Chemical Engineering - Management Sciences Option, are shown in brackets in the Academic Program outlined below. This popular option requires taking one of the courses as an extra and permits the possibility of entering the MBA program at Wilfrid Laurier University.

Minors are sequences of courses, usually totalling ten, which are arranged in conjunction with another department such as Economics, Biology or Psychology and lead to an appropriately designated degree. Approval from both Chemical Engineering and the other department is required.

COMBINED BASC-MASC PROGRAM
The department encourages students interested in advanced work to consider this program which is described elsewhere in this chapter. This Co-op program can lead to a graduate degree within one year of receiving the BASC degree.
## Academic Program

### Term 1A, Fall

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH E 100</td>
<td>Chemical Engineering Concepts 1 (units and mass balances)</td>
</tr>
<tr>
<td>CH E 102</td>
<td>Chemistry for Engineers (stoichiometry to kinetics)</td>
</tr>
<tr>
<td>MATH 110A</td>
<td>Calculus 1A (derivatives to applications of integration)</td>
</tr>
<tr>
<td>MATH 114</td>
<td>Algebra and Vector Geometry (matrices to vector spaces)</td>
</tr>
<tr>
<td>PHYS 115</td>
<td>Mechanics (statics, kinematics to angular momentum)</td>
</tr>
</tbody>
</table>

### Term 1B, Winter and Spring

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH E 101</td>
<td>Chemical Engineering Concepts II (units and energy balances)</td>
</tr>
<tr>
<td>GEN E 121</td>
<td>Digital Computation (computers and Fortran programs)</td>
</tr>
<tr>
<td>GEN E 123</td>
<td>Electrical Engineering (electricity, circuits and motors)</td>
</tr>
<tr>
<td>MATH 110B</td>
<td>Calculus 1B (power series, O.D.E.'s and multiple integrals)</td>
</tr>
<tr>
<td>PHYS 125</td>
<td>Waves (oscillations, optics and quantum physics)</td>
</tr>
<tr>
<td>GSE XX1</td>
<td>ECON 101K, SOC 101, PSYCH 101, ENGL 105A, FR 196, HIST 130, PHIL 200B, STV 100 or other approved elective</td>
</tr>
</tbody>
</table>

### Term 2A, Fall and Winter

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH E 021</td>
<td>Transport Processes 1 (separation processes)</td>
</tr>
<tr>
<td>CH E 022</td>
<td>Applied Mathematics 1 (statistics)</td>
</tr>
<tr>
<td>CH E 023</td>
<td>Physical Chemistry 1 (thermodynamics to phase equilibria)</td>
</tr>
<tr>
<td>CHEM 026, 026L</td>
<td>Organic Chemistry 1 (aliphatic compounds and preparations)</td>
</tr>
<tr>
<td>MATH 210</td>
<td>Calculus 2 (gradients to integral theorems)</td>
</tr>
</tbody>
</table>

### Term 2B, Spring and Fall

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH E 025, 025L</td>
<td>Transport Processes 2 (fluid mechanics)</td>
</tr>
<tr>
<td>CH E 026, 026L</td>
<td>Physical Chemistry 2 (thermodynamics to kinetics)</td>
</tr>
<tr>
<td>CHEM 036</td>
<td>Organic Chemistry 2 (industrial organic processes)</td>
</tr>
<tr>
<td>MATH 216</td>
<td>Differential Equations (O.D.E.s and Laplace transforms)</td>
</tr>
<tr>
<td>GSE XX2 (M SCI 211)</td>
<td>ENGL 210C or other approved elective</td>
</tr>
</tbody>
</table>

### Term 3A, Winter and Spring

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH E 030</td>
<td>Transport Processes 3 (heat transfer)</td>
</tr>
<tr>
<td>CH E 031</td>
<td>Process Flowsheeting (modelling and CAD)</td>
</tr>
<tr>
<td>CH E 032</td>
<td>Introductory Biotechnology (foods to genetic engineering)</td>
</tr>
<tr>
<td>CH E 033</td>
<td>Chemical Engineering Thermodynamics (applications)</td>
</tr>
<tr>
<td>CH E 034, 034L</td>
<td>Inorganic Process Principles 1 (acids to metallurgy)</td>
</tr>
<tr>
<td>(M SCI 331)</td>
<td>(extra for the Management Science Option)</td>
</tr>
</tbody>
</table>

### Term 3B, Fall and Winter

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH E 035</td>
<td>Transport Processes 4 (mass transfer)</td>
</tr>
<tr>
<td>CH E 036</td>
<td>Chemical Reaction Engineering (theory of reactor design)</td>
</tr>
<tr>
<td>CH E 037</td>
<td>Applied Mathematics 2 (applied ordinary and partial D.E.S.)</td>
</tr>
<tr>
<td>CH E 038, 038L</td>
<td>Inorganic Process Principles 2 (electrolysis to corrosion)</td>
</tr>
<tr>
<td>GSE XX3 (M SCI 311)</td>
<td>Approved elective</td>
</tr>
</tbody>
</table>

### Term 4A, Spring and Fall

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH E 040</td>
<td>Unit Operations Laboratory (separators and reactors)</td>
</tr>
<tr>
<td>CH E 041</td>
<td>Introduction to Process Control (transfer fns. to comp. cont.)</td>
</tr>
<tr>
<td>CH E 043</td>
<td>Individual Research Project begins</td>
</tr>
<tr>
<td>CH E 044 (M SCI 261)</td>
<td>Engineering Economics (money value to optimal analysis)</td>
</tr>
<tr>
<td>CH E 045</td>
<td>Process Equipment Sizing and Selection</td>
</tr>
<tr>
<td>GSE XX4 (M SCI 461)</td>
<td>GEN E 411 or other approved elective</td>
</tr>
</tbody>
</table>

### Term 4B, Winter

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH E 047 or 048</td>
<td>Team Project or continuation of 043</td>
</tr>
<tr>
<td>CH E 5X1</td>
<td>Technical elective from 1 area of specialization below</td>
</tr>
<tr>
<td>CH E 5X2</td>
<td>Technical elective from same area</td>
</tr>
<tr>
<td>CH E 5X3 (M SCI 432)</td>
<td>Technical elective from another area or another department</td>
</tr>
<tr>
<td>GSE XX5</td>
<td>Approved elective</td>
</tr>
</tbody>
</table>

1. **Transport Processes**
   - CH E 512 Separation Processes
   - CH E 514 Fundamentals of Petroleum Production

2. **Mathematical Analysis and Control**
   - CH E 522 Advanced Process Control
   - CH E 524 Process Control Laboratory

3. **Reaction Processes (not offered in 1988)**

4. **Polymer Science and Engineering**
   - CH E 542 Polymerization and Polymer Properties

5. **Extractive and Process Metallurgy**
   - CH E 552 Extractive Metallurgy 1
   - CH E 554 Extractive Metallurgy 2

6. **Industrial Biochemical Technology**
   - CH E 562 Fermentation Engineering
   - CH E 564 Food Process Engineering

7. **Pollution Control Engineering**
   - CH E 572 Air Pollution Control
   - CH E 574 Aqueous Inorganic Wastes

(2 course credits)
Civil Engineering

The complex problems and needs of current and future societies have created challenges for Engineering unparalleled in our history. To interpret and satisfy these needs, Civil Engineers currently direct the spending of more than one tenth of Canada's gross national product – more than any other professional group. The Civil Engineer must deal with the human impact of engineering – the social, moral and legal issues – to a far greater degree than ever before.

Historically, Civil Engineering is the oldest branch of engineering and goes back at least 5,000 years to the profession of “master builder” involving pyramids, temples and irrigation projects. Civil Engineering has become an extremely diverse field with opportunities for graduates in many areas of application. Furthermore, the introduction of new electronic data collection methods and the use of microcomputers has revolutionized the practise of Civil Engineering. Consequently, our curriculum is being constantly reviewed in order to produce graduate engineers who can use advanced aids to solve complex problems.

The Civil Engineering program is designed to provide the necessary fundamentals of mathematics and the natural sciences but also provides perspectives from the fields of the social sciences and humanities. The emphasis is on "problem-solving".

The Department of Civil Engineering at Waterloo is one of the largest in Canada, and therefore elective courses are available in each of the following areas.

Structural Engineering
Deals with the design and construction of all types of structures. Emphasis is placed on a broad foundation in mechanics and behaviour of materials.

Water and Waste Management Engineering
Addresses water and wastewater treatment, surface and groundwater pollution and control, solid and hazardous waste management, contaminant transport and behaviour in the environment. Support areas involving aquatic chemistry, computer modelling, simulation and laboratory experimentation as examples are also stressed.

Transportation Engineering
Deals with the planning, design, construction, traffic operation and evaluation of streets, highways, airports, and transit systems. Emphasis is placed on planning, design, operation and evaluation, particularly as related to demands.

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

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

Water Resources Engineering
Deals with the planning, management, design and operation of water supply and distribution systems, in flood control and flood hazard mapping, in the hydrologic and hydraulic aspects of environmental issues, and in the application of remotely-sensed data to hydrologic and environmental problems. See "Option in Water Resources" in the "Engineering General Studies Requirements" section, p. 9:10.

Experimental Mechanics
Intended for students with an interest in experimental investigations of the static and dynamic response of structures and machines, and in the development of improved techniques to obtain and analyse experimental data.

Materials
Courses in this area are intended to provide the student interested in structural engineering, mechanics or properties of materials with a background in materials science.

Additional Areas of Study
Alternatively, the student can choose a more general pattern of study involving courses from several topic areas, or a program outside the traditional Civil Engineering field. For instance, with the approval of the Associate Chairman for Undergraduate Studies, the student may augment Civil Engineering course programs with elective courses from:

- Public Administration
- Planning
- Management Science
- Business Administration
- Bioengineering
- Environmental Health, and others.

To this end, the Civil Engineering Curriculum has been designed to allow the maximum possible flexibility while still meeting the requirements for the professional degree.

The profession of Civil Engineering is principally involved with the creation, operation and maintenance of structures associated with water resources, transportation, power generation, and a wide range of industrial, commercial and institutional buildings and complexes including whole urban structures. The activities include investigation planning design, construction and evaluation.
Vocationally a Civil Engineer may specialize in one of the following areas: biomechanics, solid mechanics, fracture mechanics, elasticity, building structures, bridges, hydrology, hydraulics, sanitation (public health), industrial wastes, water resource structures, irrigation and drainage, inland waterways, harbours, aerospace, highways (roads and streets), railroads, pipelines, geology, meteorology, soil mechanics, foundations, tunnelling (rock mechanics), surveying and cartography, urban and regional planning and overall project planning. The list is by no means complete. For example, some of our graduates become involved in aquaculture. A Civil Engineering education may also be combined to advantage with another discipline or profession, such as Economics, Law, Medicine or Biology.

The Civil Engineer, regardless of whether he or she is a generalist or a specialist, draws heavily upon the work of the physical and social sciences, other professions and other branches of engineering. Moreover, as engineers have become involved in many interdisciplinary activities over the last decade, the job demarcation between boundaries of engineering has become much less restrictive. Certainly one of the advantages of completing a Civil Engineering program is that it allows professional registration while simultaneously providing a basis for further study and professional development in a large variety of specialized fields.

1. Core Program
   a) Credit Courses

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

   Plus one of:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIV E 313</td>
<td>Structural Concrete Design 1</td>
</tr>
<tr>
<td>CIV E 413</td>
<td>Structural Steel Design</td>
</tr>
</tbody>
</table>

   * In the 3A term one of CIV E 303, 342, 353, or 375 may be delayed to a later term but must be taken before graduation. This would allow the student to take a course prerequisite to senior courses in a non-Civil Engineering option program. The permission of the Associate Chairman for Undergraduate Studies is required.

   b) Non-Credit Courses

<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>

   **Civil Engineering Seminar**

   These seminars are designed to enrich the undergraduate program by providing guest lectures, informal lectures, mock trials and films relating to principles, methods and practice of Civil Engineering and the role of the engineer in society.

   **Electives**

   Each student is responsible for selecting his or her own program of electives, in keeping with the ultimate career objectives after graduation. The program must satisfy the requirements of the Department of Civil Engineering. This includes having to meet minimum requirements in:

   - Mathematical Foundations
   - Basic Sciences
   - Engineering Sciences
   - Engineering Design
   - General Studies

   a) Technical electives**

   Elective courses may be selected from the following list, in accordance with the academic program for the term, and in consultation with the Faculty Advisor. A number of elective courses may be taken from the offerings of other departments including Wilfrid Laurier University.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIV E 306</td>
<td>Mechanics of Solids 3</td>
</tr>
<tr>
<td>313</td>
<td>Structural Concrete Design 1</td>
</tr>
<tr>
<td>343</td>
<td>Traffic Engineering</td>
</tr>
<tr>
<td>344</td>
<td>Urban Transport Planning</td>
</tr>
<tr>
<td>354</td>
<td>Geotechnical Engineering 2</td>
</tr>
<tr>
<td>381</td>
<td>Hydraulics</td>
</tr>
<tr>
<td>401</td>
<td>Civil Engineering Project 3</td>
</tr>
<tr>
<td>403</td>
<td>Structural Analysis 2</td>
</tr>
<tr>
<td>404</td>
<td>Structural Analysis 3</td>
</tr>
<tr>
<td>405</td>
<td>Structural Dynamics</td>
</tr>
<tr>
<td>407</td>
<td>Building Science &amp; Technology</td>
</tr>
<tr>
<td>413</td>
<td>Structural Steel Design</td>
</tr>
<tr>
<td>414</td>
<td>Structural Concrete Design 2</td>
</tr>
<tr>
<td>415</td>
<td>Structural Systems</td>
</tr>
<tr>
<td>422</td>
<td>Finite Element Analysis</td>
</tr>
<tr>
<td>430</td>
<td>Experimental Mechanics</td>
</tr>
<tr>
<td>440</td>
<td>Transport Systems Analysis</td>
</tr>
<tr>
<td>442</td>
<td>Pavement Structural Design</td>
</tr>
</tbody>
</table>
CIV E 454  Geotechnical Engineering 3  
460  Orthopaedic-Bioengineering  
472  Waste Water Treatment  
473  Contaminant Transport  
480  Water Resources Management  
483  Design of Urban Water Systems  
486  Hydrology  
493  Engineering in the Canadian North  
496  Construction Engineering

**With the exception of CIV E 313 and CIV E 413, the offering of these courses is contingent upon sufficient demand and/or available teaching resources.**

b) **General Studies Electives**

Five courses in non-technical subjects, including the General Studies elective in the 1B term, must be taken. The marks obtained in these courses will be included in the calculation of term averages. These courses are organized on a Faculty basis and detailed in this Calendar under the section General Studies in the Faculty of Engineering.

3. **Academic Program for Each Term**

**Term 1A (Fall)**
MATH 110A, MATH 114, CH E 102, PHYS 115, GEN E 115

**Term 1B (Winter and Spring)**
MATH 110B, PHYS 125, GEN E 121, GEN E 123, CIV E 126, one General Studies elective.

**Term 2A (Fall and Winter)**
CIV E 203, CIV E 204, CIV E 221, CIV E 223A, CIV E 224, CIV E 265, CIV E 292, CIV E 298, CIV E 291+

**Term 2B (Spring and Fall)**
CIV E 205, CIV E 222, CIV E 223B, CIV E 253, CIV E 280, CIV E 299; one General Studies elective, CIV E 291+

**Term 3A (Winter and Spring)**
CIV E 300, CIV E 303+, CIV E 342+, CIV E 353+, CIV E 375+, CIV E 398; one General Studies elective. Any one of the courses marked with * may be delayed to another term but must be taken before graduation and must be replaced with another technical course approved by the Assoc. Chairman. (Delaying such a course may deny the student an opportunity to take an advanced course in that subject area later).

**Term 3B (Fall and Winter)**
CIV E 399; four technical electives; one General Studies elective. At least one of CIV E 313 and CIV E 413 must be taken before graduation.

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**Engineering**

**Civil Engineering**

**Term 4A (Spring and Fall)**
CIV E 400, CIV E 498; four technical electives. At least one of CIV E 313 and CIV E 413 must be taken before graduation.

**Term 4B (Winter)**
CIV E 491, CIV E 499; four technical electives. A total of ten courses are required in 4A and 4B.

+CIV E 291 Survey Camp is taken at the commencement of the Fall term, preceding either 2A or 2B.

**Faculty Options**

Complete details of designated options available to engineering students are provided in this Calendar in the Engineering section entitled "General Studies Requirements, Options and Electives". Students who satisfy the option requirements will have the appropriate designation shown on their transcript. The two following options are of primary interest to Civil Engineering students. (Note: To qualify for these options, the student must achieve a grade of at least 50% in each course and must obtain a cumulative average of 60% or more in these courses.)

**Civil Engineering with an Option in Water Resources**
This is a designated Engineering Faculty Option available to Civil Engineering students interested in the development, management and protection of our water resources. Students may choose from the water and waste management elective courses or the water resources engineering elective courses as well as from a list of approved courses from other departments. Students who complete the option will have both a Water Resources and Civil Engineering designation on their transcript. The option is described earlier in this chapter within the "Engineering General Studies Requirements" section, p. 9:10.

**Civil Engineering With an Option in Management Sciences**
This option provides an understanding of the issues, concepts and techniques related to the management of technology. The option consists of a sequence of seven courses. A student who wishes to follow the Management Sciences Option must declare his or her intent before starting the 2B term. For further details see the "Engineering Management Sciences" section, page 9:24.

**Combined Bachelor's - Master's Program in Engineering**
The Faculty of Engineering offers a combined Bachelor's - Master's Program. See "Engineering Combined Bachelor's - Master's Program" section for more details.
Computer Engineering

The Computer Engineering program is controlled and administered by the Department of Electrical Engineering.

Computer Engineering is a branch of engineering that deals with the design and development of computer systems and emphasizes such factors as functions, performance, cost, size, power requirements, reliability, maintainability and societal impact. Intrinsic to computer engineering is the concept of design as it applies to all aspects of a computer system (the hardware, the software and the algorithms used) and the application for which it is intended. As with engineers in other disciplines, the goal of computer engineers is implementation, here to build a computer system for an application environment.

The curriculum in Computer Engineering encompasses the study of mathematics, physics and basic electrical engineering and computer science disciplines. This study is complemented by a thorough education in computer hardware and software.

After the Year One program in Engineering, the program in Computer Engineering consists of prescribed core courses in Years Two and Three. In the fourth year the students must take a minimum of eight technical courses. Seven of these are selected as set out below in the section on Technical Electives.

In addition, students must satisfy Faculty of Engineering general studies requirements by choosing suitable elective courses.

The normal recommended program shown below normal rules of the Co-operative program will apply. By special permission the number of Co-operative work terms may be reduced, but a student must complete at least five work terms (including that done in Year One), unless admitted to advanced standing, as defined in the Calendar (see page 9:3).

Students must register their course load at the start of each term. Departmental permission at the time of registration will be required for departures from the normal load in any one term.

Permission to carry more than the normal load in any one term normally will be given only if the student holds an 80% average or better in the previous term. The promotion criteria will be as laid down in the Faculty rules (see page 9:3).

General Studies Electives

Five courses, including the general studies course in the 1B term, must satisfy the General Studies Program described on page 9:6.

Options in Computer Engineering

The normal Computer Engineering program shown has been designed to offer a well balanced and rewarding education. Students wishing to enrich their education may elect to take one of the three Options available. These Options are described below. Students should be aware that an Option may require additional courses, and may constrain the choice of elective courses. An 80% average is required to enter the Mathematics or Physics Option.

Management Sciences Option

This is a sequence of seven courses (see page 9:24) designed for those students with an interest in the management of technology. Further details are made available at the beginning of the 2A term.

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

Mathematics Option

This is a sequence of eight courses (see page 9:8) designed to give students a broad background in either pure or applied mathematics. Further details are made available during the 1B term.

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

Physics Option

This is a sequence of eight courses (see page 9:9) designed to give students an enriched background in the fundamentals of physical science. Further details are made available during the 2A term.

The successful completion of these courses results in a designation on the transcript "Option in Physics".
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL E 481</td>
<td>Design of Analog and Digital Control Systems</td>
<td>2 1 3*</td>
<td></td>
</tr>
<tr>
<td>EL E 499A</td>
<td>Project</td>
<td>— — 9</td>
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</table>

**Term 4B, Winter**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL E 402</td>
<td>Seminar</td>
<td>C — —</td>
<td></td>
</tr>
<tr>
<td>EL E 456</td>
<td>Database Systems</td>
<td>3 1 3*</td>
<td></td>
</tr>
<tr>
<td>General Studies Elective**</td>
<td></td>
<td>3 — —</td>
<td></td>
</tr>
<tr>
<td>Three Technical Electives from the following:</td>
<td></td>
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</tr>
<tr>
<td>EL E 408</td>
<td>Robot Dynamics and Control</td>
<td>3 — 3*</td>
<td></td>
</tr>
<tr>
<td>EL E 412</td>
<td>Digital Communications</td>
<td>3 1 —</td>
<td></td>
</tr>
<tr>
<td>EL E 413</td>
<td>Digital Signal Processing</td>
<td>3 1 3*</td>
<td></td>
</tr>
<tr>
<td>EL E 429</td>
<td>Computer Structures</td>
<td>3 1 —</td>
<td></td>
</tr>
<tr>
<td>EL E 436</td>
<td>Design of Integrated Circuits and Devices</td>
<td>2 1 3*</td>
<td></td>
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<tr>
<td>EL E 437</td>
<td>Integrated VLSI Systems</td>
<td>2 1 3*</td>
<td></td>
</tr>
<tr>
<td>EL E 439</td>
<td>Analog Electronic Circuits</td>
<td>2 1 3*</td>
<td></td>
</tr>
<tr>
<td>EL E 443</td>
<td>Electrical Networks</td>
<td>2 1 3*</td>
<td></td>
</tr>
<tr>
<td>EL E 459</td>
<td>Sound, Noise and Electromagnetics</td>
<td>2 1 3*</td>
<td></td>
</tr>
<tr>
<td>EL E 464</td>
<td>High Voltage and Insulation Engineering</td>
<td>3 — 3*</td>
<td></td>
</tr>
<tr>
<td>EL E 465</td>
<td>Power Systems</td>
<td>3 1 —</td>
<td></td>
</tr>
<tr>
<td>EL E 473</td>
<td>Microwave Engineering</td>
<td>2 1 3*</td>
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<tr>
<td>EL E 475</td>
<td>Guided Wave Engineering</td>
<td>3 1 3*</td>
<td></td>
</tr>
<tr>
<td>EL E 482</td>
<td>Multivariable Control Systems</td>
<td>2 1 3*</td>
<td></td>
</tr>
<tr>
<td>EL E 485</td>
<td>Computer Control Applications</td>
<td>2 1 3*</td>
<td></td>
</tr>
<tr>
<td>EL E 499B</td>
<td>Project</td>
<td>— — 9</td>
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</table>

**Engineering**

**Computer Engineering**

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Term</th>
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<tbody>
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<tr>
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<td>— — 9</td>
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**Term 4B, Winter**

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Credits</th>
<th>Term</th>
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<tbody>
<tr>
<td>EL E 402</td>
<td>Seminar</td>
<td>C — —</td>
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</tr>
<tr>
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<td>Database Systems</td>
<td>3 1 3*</td>
<td></td>
</tr>
<tr>
<td>General Studies Elective**</td>
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<td>3 — —</td>
<td></td>
</tr>
<tr>
<td>Three Technical Electives from the following:</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>EL E 408</td>
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<td>Digital Communications</td>
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<tr>
<td>EL E 499B</td>
<td>Project</td>
<td>— — 9</td>
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</tbody>
</table>

**Notes:**

1. At least one of EL E 428 or EL E 429 must be selected.
2. With the approval of the department in terms 4A and 4B, students may take technical courses offered by other departments.

---

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

**Of the two General Studies Electives taken in fourth year, at least one must be a 2nd level course or higher.
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 One program in Engineering, the program in Electrical Engineering consists of prescribed core courses and a minimum of eight technical electives (taken during the last two terms). These technical electives include the possibility of working on a design or research project. In addition, students must satisfy Faculty of Engineering general studies requirements by choosing suitable elective courses.

The normal recommended program shown below involves a course load (excluding seminars) of five or six courses per term. Laboratory exercises are compulsory where they form part of a course.

The normal rules of the Co-operative program will apply. By special permission the number of Co-operative work terms may be reduced, but a student must complete at least five work terms (including that done in Year One), unless admitted to advanced standing, as defined in the Calendar (see page 9:3).

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 80% average or better in the previous term.

The promotion criteria will be as laid down in the Faculty rules (see page 9:3).

General Studies Electives
Five courses, including the general studies course in the 1B term, must satisfy the General Studies Program requirements described on p. 9:6.

Options in Electrical Engineering
The normal Electrical Engineering program shown has been designed to offer a well balanced and rewarding education. Students wishing to enrich their education may elect to take one of the four Options available. These Options are described below. Students should be aware that an Option may require additional courses, and may constrain the choice of elective courses. An 80% average is required to enter the Computer Engineering, Mathematics or Physics Options.

Computer Engineering Option
This is a sequence of eight courses designed to give Electrical Engineering students a greater training in software to augment their digital hardware capabilities. Two courses are part of the regular program. The other courses and the terms in which they are taken are:

CS 241 Principles of Computer Science 3 2B
CS 242 Principles of Computer Science 4 3A
CS 340 Data Structures 3B
EL E 427 Digital Systems Engineering 4B

In addition to these courses, two other computer science courses, chosen from a list, will be taken in the fourth year. Further details are made available at the beginning of the 2A term.

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

Management Sciences Option
This is a sequence of seven courses (see page 9:24) designed for those students with an interest in the management of technology. Further details are made available at the beginning of the 2A term.

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

Mathematics Option
This is a sequence of eight courses (see page 9:8) designed to give students a broad background in either pure or applied mathematics. Further details are made available at the beginning of the 2A term.

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

Physics Option
This is a sequence of eight courses (see page 9:9) designed to give students an enriched background in the fundamentals of physical science. Further details are made available during the 1B term.

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

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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.
The 1A term is as described on page 9:12.

<table>
<thead>
<tr>
<th>Term 1B, Spring</th>
<th>C</th>
<th>T</th>
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<tbody>
<tr>
<td>MATH 110B Calculus 1B</td>
<td>3</td>
<td>2</td>
<td>—</td>
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<tr>
<td>PHYS 125 Physics for Engineering</td>
<td>3</td>
<td>2</td>
<td>—</td>
</tr>
<tr>
<td>GEN E 121 Digital Computation</td>
<td>3</td>
<td>2</td>
<td>—</td>
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<tr>
<td>EL E 123 Electrical Engineering</td>
<td>3</td>
<td>1</td>
<td>3*</td>
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<tr>
<td>EL E 126 Electricity &amp; Magnetism</td>
<td>3</td>
<td>1</td>
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<tr>
<td>General Studies Elective</td>
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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>EL E 201 Seminar</td>
<td>1</td>
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<tr>
<td>MATH 211 Advanced Calculus for</td>
<td>3</td>
<td>1</td>
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<tr>
<td>EL E 208 Electronic Circuit Analysis</td>
<td>3</td>
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<tr>
<td>EL E 222 Digital Computers</td>
<td>3</td>
<td>1</td>
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<tr>
<td>EL E 261 Energy Systems &amp; Components 1</td>
<td>3</td>
<td>1</td>
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<tr>
<td>M SCI 261 Managerial and Engineering Economics</td>
<td>3</td>
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<tr>
<td>EL E 202 Seminar</td>
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<tr>
<td>MATH 212 Advanced Calculus for</td>
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<tr>
<td>EL E 206 Electrical Engineers 2</td>
<td>3</td>
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<td>EL E 224 Numerical Methods</td>
<td>3</td>
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<td>EL E 231 Electronic Devices</td>
<td>3</td>
<td>1</td>
<td>3*</td>
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<tr>
<td>EL E 262 Energy Systems &amp; Components 2</td>
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<tr>
<td>EL E 301 Seminar</td>
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<tr>
<td>EL E 316 Introduction to Probability Theory</td>
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<td>EL E 332 Electronic Circuits</td>
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<td>EL E 342 Electrical Networks 1</td>
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<td>EL E 371 Transmission Lines &amp; Basic Field Theory</td>
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<tr>
<td>EL E 302 Seminar</td>
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<tr>
<td>M E 250 Thermodynamics</td>
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<tr>
<td>EL E 318 Communication Systems</td>
<td>3</td>
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<tr>
<td>EL E 323 Digital Circuits &amp; Systems</td>
<td>3</td>
<td>1</td>
<td>3*</td>
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<tr>
<td>EL E 380 Systems &amp; Control</td>
<td>3</td>
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<tr>
<td>EL E 401 Seminar</td>
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<tr>
<td>General Elective</td>
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</tr>
<tr>
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<tr>
<td>EL E 411 Data Communications</td>
<td>3</td>
<td>1</td>
<td>—</td>
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<tr>
<td>EL E 428 Computer Communications Networks</td>
<td>3</td>
<td>1</td>
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<tr>
<td>EL E 435 Semiconductor Devices</td>
<td>3</td>
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</tr>
<tr>
<td>EL E 438 Switching and Digital Circuits</td>
<td>2</td>
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<td>3*</td>
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<td>EL E 446 Linear Systems</td>
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<td>EL E 450 Software Systems</td>
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<td>EL E 463 Power Electronics</td>
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<tr>
<td>EL E 474 Antenna Engineering</td>
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<td>EL E 481 Design of Analog and Digital Control Systems</td>
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</tr>
<tr>
<td>EL E 499A Project</td>
<td>9</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Term 4B, Winter</th>
<th>C</th>
<th>T</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL E 402 Seminar</td>
<td>1</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>General Elective</td>
<td>3</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Four Technical Electives from the following:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EL E 408 Robot Dynamics and Control</td>
<td>3</td>
<td>—</td>
<td>3*</td>
</tr>
<tr>
<td>EL E 412 Digital Communications</td>
<td>3</td>
<td>1</td>
<td>—</td>
</tr>
<tr>
<td>EL E 413 Digital Signal Processing</td>
<td>3</td>
<td>1</td>
<td>—</td>
</tr>
<tr>
<td>EL E 427 Digital Systems Engineering</td>
<td>2</td>
<td>1</td>
<td>3*</td>
</tr>
<tr>
<td>EL E 436 Design of Integrated Circuits &amp; Devices</td>
<td>2</td>
<td>1</td>
<td>3*</td>
</tr>
<tr>
<td>EL E 437 Integrated VLSI Systems</td>
<td>2</td>
<td>1</td>
<td>3*</td>
</tr>
<tr>
<td>EL E 439 Analog Electronic Circuits</td>
<td>2</td>
<td>1</td>
<td>3*</td>
</tr>
<tr>
<td>EL E 443 Electrical Networks 2</td>
<td>2</td>
<td>1</td>
<td>3*</td>
</tr>
<tr>
<td>EL E 459 Sound, Noise and Electroacoustics</td>
<td>2</td>
<td>1</td>
<td>3*</td>
</tr>
<tr>
<td>EL E 464 High Voltage and Insulation Engineering</td>
<td>3</td>
<td>—</td>
<td>3*</td>
</tr>
<tr>
<td>EL E 465 Power Systems</td>
<td>3</td>
<td>1</td>
<td>—</td>
</tr>
<tr>
<td>EL E 473 Microwave Engineering</td>
<td>2</td>
<td>1</td>
<td>3*</td>
</tr>
</tbody>
</table>
Engineering
Geological Engineering

Term 4B, Winter (Continued)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL E 475</td>
<td>Guided Wave Engineering</td>
<td>3</td>
<td>1 3*</td>
</tr>
<tr>
<td>EL E 482</td>
<td>Multivariable Control Systems</td>
<td>2</td>
<td>1 3*</td>
</tr>
<tr>
<td>EL E 485</td>
<td>Computer Control Applications</td>
<td>2</td>
<td>1 3*</td>
</tr>
<tr>
<td>EL E 499B</td>
<td>Project</td>
<td>—</td>
<td>9</td>
</tr>
</tbody>
</table>

Any 600-level courses taken by students in fourth 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.

*Indicates laboratory every second, every third week, or open lab. See Course Descriptions.
†General electives may be General Studies Electives, or if the General Studies requirements have been satisfied, Electrical Engineering technical electives or any course that is approved by the Undergraduate Officer. If two General Studies Electives are taken in fourth year, at least one must be a second-level course or higher. The normal requirement in fourth year is eight technical electives, and two general electives. For students taking an option, it is permissible to take seven technical electives, of which at least five must be from Electrical Engineering, and three General Studies Electives if the requirements of the option forced the delaying of the General Studies Electives until fourth year.

ACADEMIC PROGRAM

Term 2A, Fall
EARTH 231 Mineralogy
EARTH 235 Stratigraphy
EARTH 260 Applied Geophysics I
CIV E 203 Statics
CIV E 204 Mechanics of Solids I
CIV E 221 Calculus 2
CIV E 223A Computer Workshop
CIV E 291 Survey Camp

Term 2B, Spring
CIV E 224 Differential Equations
CIV E 223 Computer Workshop
CIV E 280 Fluid Mechanics
EARTH 221 Geochemistry 1
EARTH 232 Petrography
EARTH 238 Intro. Structural Geology

Term 3A, Winter
CIV E 300 Civil Engineering Project 1
CIV E 353 Geotechnical Engineering 1
EARTH 333 Introductory Sedimentology
EARTH 370 Economic Geology
EARTH 390 Methods in Geological Mapping
EARTH 438 Engineering Geology
(CIV E 375 Water Quality Eng. (subject to Departmental approval)
General Studies Elective
(Secondary Study in Geology))

Term 3B, Fall
EARTH 437 Rock Mechanics
CIV E 224 Probability and Statistics
CIV E 292 Engineering Economics
CIV E 354 Geotechnical Engineering 2
General Studies Elective
One technical elective from:
EARTH 331 Igneous Petrology
EARTH 342 Geomorphology
CIV E 381 Hydraulics

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 Engineers study the origins and properties of earth materials, and learn how to predict the behaviour of these materials. This information is used to design structures in or on soil and rock, design mineral extraction processes in mining and petroleum engineering, explore for and protect groundwater sources, plan and design transportation routes, and so on.

Employment opportunities for Geological Engineers are available in the areas of petroleum geology and engineering, mining geology and mine design, building construction, water supply, geophysics, surveying, highway and airport construction, hydrology, coastal engineering and granular materials supply. Geological Engineering graduates with strength in the geotechnical area find their employment activities most closely associated with public works such as site investigation and design studies for tunnels, roads, railroads, air-strips, shorelines, ports, underground storage, and waste disposal facilities. An increasing amount of activity lies in groundwater studies and environmental impact studies, including hydrologic and geotechnical investigations associated with mining developments, geomechanical aspects of petroleum recovery, both conventional and unconventional such as tar sands development and in situ heavy oil extraction.

The demand for the expertise offered by geological engineers is expanding into many of the resource-development areas that will probably continue to play a major role in the Canadian economy for many decades. Also, the geological engineer is in increasing demand for works of a civil nature, such as tunnels, dams, landfills, and aspects of environmental 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 Mississauga, 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 Faculties of Engineering and Mathematics.

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 research activities of the faculty members include operations research, manufacturing systems and organizational behaviour.

Degrees Conferred
The Department confers degrees only at the graduate level (the MASc and PhD).

The Option in Management Sciences
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
- Computer Engineering
- Electrical Engineering
- Mechanical Engineering
- Systems Design Engineering

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. Students acquire skills which should help widen the scope of their immediate employment. Those 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 seven courses (see course descriptions in Chapter 16). F – fall, W – winter, S – spring

Four required courses or their equivalents

- **M SCI 251** Probability and Statistics (F,W) equivalents CH E 022, CIV E 224, EL E 316, ME 202, SY DE 213
- **M SCI 261** Managerial and Engineering Economics I (F,W,S) equivalents CH E 044, CIV E 292, SY DE 131. (correspondence F,W)
- **+ M SCI 211** Organizational Behaviour (F,W,S) (correspondence F,W)
- **M SCI 331** Operations Research I (F,W,S) equivalent SY DE 311

Plus three of the following or equivalents

- **M SCI 452** Decision Making Under Uncertainty (W) equivalent SY DE 214
Mechanical Engineering

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

Mechanical Engineering Core with an Option in Management Sciences
A student may acquire a BASc in Mechanical Engineering with an Option in Management Sciences by taking, completing and passing seven specific Management Science courses as electives (see elective course listing under Department of Management Sciences). Students interested in this option must carefully plan their choice of general studies courses very early in order to ensure that the general studies requirements will be met. (See note below under elective courses).

1. Core Program

a) Credit Courses
M E 201 Advanced Calculus
M E 203 Ordinary Differential Equations
M E 212 Dynamics
M E 215 Structure and Properties of Materials
M E 219 Mechanics of Deformable Solids 1
M E 220 Mechanics of Deformable Solids 2
M E 250 Thermodynamics 1
M E 262 Introduction to Microprocessors and Digital Logic
M E 304 Numerical Analysis
M E 305 Partial Differential Equations
M E 321 Kinematics and Dynamics of Machines
M E 322 Mechanical Design 1
M E 330 Control of Properties of Materials
M E 340 Manufacturing Processes
M E 351 Fluid Mechanics 1
M E 353 Heat Transfer 1
M E 354 Thermodynamics 2
M E 360 Introduction to Control Systems
M E 362 Fluid Mechanics 2
M E 370 Mechanical Engineering Laboratory
M SCI 251 Probability and Statistics (Equivalent to M E 202)
M SCI 261 Managerial and Engineering Economics 1
EL E 269 Electrical Engineering 2

b) Non Credit Courses
M E 200 Introduction to Mechanical Engineering 1
M E 300 Introduction to Mechanical Engineering 2
M E 400 Introduction to Mechanical Engineering 3

2. Elective Courses

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

b) Technical Electives
Nine technical elective courses are required in addition to the core courses listed above to fulfill the requirements of the Mechanical Engineering program. In the final year, a project course, ME 482, normally a two-term project course, may be taken as a technical elective in each of the 4A and 4B terms. The project requires the student to demonstrate initiative and assume responsibility. Each student is responsible for selecting his own program of electives, and project.

During the term, certain faculty members are designated to give advice to students and to approve their final selection by signing their pre-registration form. A student who has an unusual career goal in mind should discuss choices with one of the designated faculty members, since it is possible to combine courses from different Options, to take courses from other departments and in some circumstances take graduate-level courses. Students who are contemplating graduate study are particularly urged to discuss their plans with the designated faculty member. The designated faculty member must be convinced of the validity of the student’s selection of electives. If the faculty member refuses to sign the pre-registration form the student must reconsider his or her selection or must discuss the choices with the Associate Chairman for Undergraduate Studies.

As a guide, typical lists of electives for the six Option areas available from within the Department of Mechanical Engineering are given below:

i) Fluid Mechanics and Thermodynamics Option:
M E 452 Energy Transfer in Buildings
M E 456 Heat Transfer 2
M E 459 Energy Conversion
M E 463 Tribology 1
M E 557 Combustion 1
M E 559 Finite Element Methods
M E 563 Turbomachines
M E 564 Aerodynamics
M E 565 Gas Dynamics
M E 566 Fluid Mechanics 3
M E 568 Noise Analysis and Control
M E 569 Fluid Mechanics-Design Topics

ii) Environmental Fluid Mechanics Option:
M E 469 Introduction to the Environmental Sciences
M E 559 Finite Element Methods
M E 566 Fluid Mechanics 3
The Mechanical Engineering curriculum structure is summarized in the following table:

**TABLE A - THE MECHANICAL ENGINEERING UNDERGRADUATE PROGRAM**

<table>
<thead>
<tr>
<th>Term</th>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>I (F)</td>
<td>CH E 102, GEN E 115, MATH 110A, MATH 114, PHYS 115</td>
</tr>
<tr>
<td>I (W,S)</td>
<td>GEN E 121, GEN E 124, MATH 110B, MATH 116, PHYS 125, 1 GEN STUDIES ELECT</td>
</tr>
<tr>
<td>II (F)</td>
<td>ME 200, ME 201, M E 202 (M SCI 251), M E 212, M E 219, EL E 269, 1 GEN STUDIES ELECT</td>
</tr>
<tr>
<td>II (W)</td>
<td>M E 203, M E 215, M E 220, M E 250, M E 262, M SCI 261</td>
</tr>
<tr>
<td>III (S,F)</td>
<td>ME 300, ME 304, M E 305, M E 321, M E 330, M E 351, M E 354</td>
</tr>
<tr>
<td>IV (F)</td>
<td>ME 322, M E 340, M E 353, M E 360, M E 362, M E 370</td>
</tr>
<tr>
<td>IV (W)</td>
<td>4 TECH ELECT†, 2 GEN STUDIES ELECT</td>
</tr>
<tr>
<td>IV (S,F)</td>
<td>5 TECH ELECT†, 1 GEN STUDIES ELECT</td>
</tr>
</tbody>
</table>

† A project course, ME 482, may be taken in the 4A and 4B terms as a technical elective for each of these terms.
Systems Design Engineering

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

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

The Engineering Profession
Systems Design Engineering is a unique engineering discipline which is formally accredited by the Association of Professional Engineers of the Province of Ontario (APEO). With two years of work experience beyond graduation (BASc), the Systems Design Engineer may apply for registration as a Professional Engineer. If a Masters degree (MASc) in Systems Design Engineering is expected to work at least 50 hours per week as he or she increases in awareness of the theories of human communication, makes progress in the areas of Systems Theory, Human Systems Engineering, and Socio-Economics Systems, and absorbs the implications of the tremendous growth of electronic computing systems.

Further Information is available from:
Associate Chairman for Undergraduate Studies
Department of Systems Design Engineering
University of Waterloo
Waterloo, Ontario, N2L 3Gl
(519) 885-1211 Ext. 2600

High School Liaison Officer
Department of Systems Design Engineering
University of Waterloo
Waterloo, Ontario, N2L 3Gl
(519) 885-1211 Ext. 3182 or Ext. 2600

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

Engineeering
Systems Design Engineering

engineering. The Systems Design Engineering program satisfies the strict standards of the CEAB and is therefore acknowledged as a fully qualified Engineering Program. In fact, the Department of Systems Design Engineering at the University of Waterloo is the only department of its kind in all of Canada.

The Systems Design Engineering program is specifically oriented towards developing graduates who can solve problems lying at the interface of technology and the human environment. Therefore, if you are technically oriented and also have a strong parallel interest in social and human problems, Systems Design Engineering may be the right program for you.

The Department of Systems Design Engineering also offers programs leading to MASc and PhD degrees, and in the past many Systems Design Engineering students have gone on to successfully complete graduate degrees. The faculty members of the Department are involved in a wide spectrum of research activities such as conflict analysis, pattern recognition, ergonomics, computer engineering, and solar energy. Students who also wish to do research in one of these areas may start at the undergraduate level by entering the combined Bachelor-Masters program at the end of their 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 Engineering program is quite challenging. It is not easy to acquire the tools for resolving the problems of complex systems. Moreover, these tools are becoming more and more sophisticated. Thus, the average student in Systems Design Engineering is expected to work at least 50 hours per week as he or she increases in awareness of the theories of human communication, makes progress in the areas of Systems Theory, Human Systems Engineering, and Socio-Economics Systems, and absorbs the implications of the tremendous growth of electronic computing systems.

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Waterloo, Ontario, N2L 3Gl
(519) 885-1211 Ext. 3182 or Ext. 2600

Footnotes
1 BASc Bachelor of Applied Science
2 MASc Master of Applied Science
3 PhD 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 elective 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 ENGINEERING

The Undergraduate program in Systems Design Engineering encompasses a study of the basic skills required for systems analysis, simulation, optimization and design. In particular the first 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 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).

Systems Design Engineering Undergraduate Core Curriculum
Listing by Terms

1A (Fall Term)
SY DE 101 Tutorial
SY DE 111 Calculus 1
SY DE 113 Linear Algebra
SY DE 121 Digital Computation
SY DE 131 Engineering Economics
SY DE 161 Introduction to Systems Design Engineering
SY DE 181 Statics

1B (Spring Term)
SY DE 102 Tutorial
SY DE 112 Calculus 2
SY DE 122 Introduction to Computer Systems
SY DE 142 Introduction to Ergonomics
SY DE 182 Dynamics
SY DE 184 Introduction to Chemical Systems
1 General Studies Program Elective

2A (Winter Term)
SY DE 201 Tutorial
SY DE 211 Differential Equations
SY DE 213 Theory and Applications of Probability
SY DE 261 Systems Design Workshop 1
SY DE 281 Mechanics of Deformable Solids
SY DE 283 Electricity, Magnetism and Networks
1 General Studies Program Elective

2B (Fall Term)
SY DE 202 Tutorial
SY DE 212 Applied Mathematics for Linear Systems
SY DE 214 Theory & Applications of Statistics
SY DE 252 Physical Systems 1
SY DE 262 Systems Design Workshop 2
SY DF 284 Fluid Mechanics
SY DE 292 Digital Circuits and Systems Laboratory
1 Technical Elective

3A (Spring Term)
SY DE 301 Tutorial
SY DE 311 Introduction to Optimization
SY DE 321 Numerical Analysis & Computer Methods
SY DE 353 Introduction to Linear Control Systems
SY DE 381 Thermodynamics
SY DF. 391 Analogue Circuits and Systems Laboratory
1 Technical Elective
Technical Electives in Systems Design Engineering

Each undergraduate student in Systems Design Engineering must choose a technical elective package by the 3A term. At present the Department regularly offers programs in:

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

Additionally there are Option programs called Management Sciences, Computer Engineering, Mathematics and Physics, offered in conjunction with the Management Sciences, Electrical Engineering, Mathematics and Physics Departments, respectively. Students who elect any 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 elective package to suit his or her own special requirements. This is done by choosing a set of technical elective courses which, if approved by the Associate Chairman of Systems Design Engineering, will constitute an individual technical package for that student.

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

\[
\begin{align*}
3A & : \\
& 6 \text{ mandatory courses} \\
& 1 \text{ technical elective course} \\
3B & : \\
& 4 \text{ mandatory courses} \\
& 2 \text{ technical elective courses} \\
& 1 \text{ General Studies Program elective} \\
4A & : \\
& 2 \text{ mandatory courses} \\
& 3 \text{ technical elective courses} \\
& 1 \text{ General Studies Program elective} \\
4B & : \\
& 2 \text{ mandatory courses} \\
& 3 \text{ technical elective courses} \\
& 1 \text{ General Studies Program elective} \\
\end{align*}
\]

SUMMARY OF THE SYSTEMS DESIGN ENGINEERING TECHNICAL ELECTIVES AND OPTIONS

Design and Human Systems Package

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

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

Problem areas chosen might include:

- Design for extreme human environments
- Design where anthropometric aspects are dominant
- Design of instrumentation for human operators
- Design problems associated with occupational health and safety in industry, transportation, etc.
- Medical design problems involving engineering technology
- Design of consumer products used in recreation and normal living
- Design involving human engineering
- Human aspects of engineering ecology
- Design of human "micro-environments"
- Problems of ergonomics and industrial hygiene

Socio-Economic Systems Package

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 package 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 Package
In this elective package the student is provided an opportunity to study in some depth a unified approach of Physical Systems Theory to mathematical modelling, analysis, simulation and design of a variety of engineering systems such as electrical, mechanical, hydraulic, structural systems and their combinations. Essential concepts and tools from linear systems theory, transform methods, frequency and time domain modelling and analysis, control systems, graph theory and computer simulation techniques are given in the earlier years followed by technical electives dealing with such topics as large-scale systems, algorithms for computer-aided-analysis and design in the final years. Students may also take technical courses in specific areas in other departments.

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

Option in Management Sciences
The Management Science Department of the Engineering Faculty has a course package available whereby a student from another Engineering Department, such as Systems Design Engineering, can obtain a background in Management Science in addition to the Engineering degree. In addition to Systems Design core courses (SY DE 131, 213, 311), the Management Sciences program consists of the following optional courses:

One course from:
M SCI 211 Organizational Behaviour 1
or
PSYCH 333 Industrial/Organizational Psychology

Plus three courses from:
M SCI 452 Behavioural Decision Analysis
SY DE 333 Applied Statistics
*ECON 201 Microeconomic Theory
M SCI 461 Managerial & Engineering Economics 2
M SCI 431 Operations Research 2
SY DE 411 Probabilistic Modelling
M E 448 Production Engineering: Design of Manufacturing Systems
M SCI 432 Introduction to Production Management
M SCI 311 Organizational Behaviour 2

*ECON 201 with a minimum of 73%

In order to successfully complete this option, students are required to obtain a grade of at least 50% in each course and an average of 60% or more on the seven courses.

For more information on this Faculty Option, refer to the earlier section on "General Studies Requirements, Options and Electives for Engineering Students".

Option in Computer Engineering
The aim of this option is to augment the Systems Design Engineering curriculum with technical elective courses from Systems Design Engineering, Electrical Engineering and Computer Science Departments so that students can acquire a strong background in both hardware and software aspects of computer systems. The focus in this option will be on software development, computer interface design and applications.

In addition to the Systems Design core courses which are mandatory for this option, the following technical electives are required:

<table>
<thead>
<tr>
<th>Academic Term</th>
<th>Option in Computer Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>3A S</td>
<td>CS 242 Principles of Computer Science IV</td>
</tr>
<tr>
<td>3B W</td>
<td>SY DE 352 Fundamentals of Data Structures &amp; Algorithms</td>
</tr>
<tr>
<td>4A F</td>
<td>SY DE 423 Computer Algorithm Design and Analysis</td>
</tr>
<tr>
<td>4B W</td>
<td>EL E 427 Digital Systems Engineering</td>
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</tbody>
</table>

Plus four other 300 and/or 400 level courses from Systems Design, Electrical Engineering and Computer Science, as approved by the Computer Engineering Option Advisor of the Department. Some of these courses are:
Options in Mathematics, Physics and Statistics
Faculty options in Mathematics, Physics and Statistics are also available to Systems Design students. Interested students should refer to the earlier section on "General Studies Requirements, Options and Electives for Engineering Students" for further information. Certain courses listed in this section as required for a particular option may be replaced by courses which have been approved as equivalent. This approval is at the discretion of the Associate Chairman for Undergraduate Studies in the Department of Systems design.

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

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

Introduction
The Faculty of Environmental Studies is composed of the Department of Environment and Resource Studies, Department of Geography, 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 mankind, 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 mankind and the environment, through the two main thrusts of research and practical applications.

The academic departments, Environment and Resource Studies and Geography have the interaction of mankind with the environment as their core. Both the Environment and Resource 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/Departments 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 Doctoral (PhD) Degree may be obtained in both Geography, and Regional Planning and Resource Development. A Master of Applied Environmental Studies (MAES) in Industrial Development is offered by the Faculty. In addition, the Environment and Resource Studies and Geography Departments offer joint honours programs with many other Departments in the University (see programs for other details).

Degrees may be obtained in the following program areas:

- BES Pre-professional Architecture (3-1/3 years on rotating work/study co-operative scheme).
- BArch Professional Architecture (2-2/3 years with co-operative work terms following completion of the BES Pre-professional Architecture).
- BES Honours Environment and Resource Studies (4 years).
- BES Honours Co-operative Environment and Resource Studies (4-2/3 years with rotating work/study terms).
- BES Honours Geography (4 years).
- BES Honours Cooperative Geography (4-2/3 years with rotating work/study terms).
- BES Honours Urban and Regional Planning (4 years).
- BES Honours Co-operative Urban and Regional Planning (4-1/3 years with rotating work/study terms).
- MA Geography
- MA Regional Planning and Resource Development
- MAES Industrial 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 Two.

To be selected for the Dean's Honours List, full- and part-time students must attain a minimum cumulative overall average of at least 80% at the completion of each academic term.
Admission

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

Applicants to Environment and Resource Studies, Geography and Planning are required to present a Grade 13 or Ontario Academic Course (OAC) credit in English.

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

Interviews

Students being seriously considered for admission to the School of Architecture are normally required to participate in an interview as part of the admissions process. In addition, a test in the form of a précis will be required of applicants on the day of their scheduled interview. A portfolio of creative work must also be submitted at the time of the interview. Contact the School of Architecture for further details.

Selected applicants to the School of Urban and Regional Planning are normally required to come to the University for an interview as part of the admission process. Selection for the interview is based on Grade 12 and university-entrance level academic records. Admission is based on the results of the interview, letters of reference, a “Personal Information Form”, and secondary school achievement. Contact the School of Urban and Regional Planning for further details.

Transfer Credit

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

Students transferring from Faculties within the University, or former University of Waterloo students returning after an absence, generally have the option of either transferring previous UW courses with 60% (C-) or better without including these in cumulative average or transferring all relevant courses passed and 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 Requirement

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

Examinations and Standings

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

A maximum of 13 first year term courses will be counted towards a BES. For other requirements, see the program section for the Department/School.

Students should note that the Faculty of Environmental Studies operates under a “term course system”, except in Architecture, in which student progress is measured by term courses successfully completed rather than by years. A term course is a course with a credit weight of 0.5. Students who have passed fewer than 10 term courses will be considered Year One students; those who have passed at least 10 but fewer than 20 will be considered Year Two
students; those with at least 20 but fewer than 30, Year Three; and those with 30 or more, Year Four.

Final Examinations
1. 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.

2. Failure to write an examination is ordinarily considered a failure to pass (F–). A student who defaults a final examination, except for a properly certified reason, shall have no make-up examination privileges and may be required to repeat the work in class. If a student fails to write for medical reasons, a Doctor's certificate covering the precise period of absence must be filed in the Registrar's Office within one week of the set examination date.

3. A student will be eligible for make-up examinations only when failure to pass is attributable to extraordinary circumstances. In addition, students:
   a) 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;
   b) must have secured the permission of the professor concerned.

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 Studios Committee.

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.

Environmental Studies
Examinations and Standings

When one of the courses has been taken in a previous term, the current course instructor must be informed by the student of his/her intention of submitting the same course material. The current instructor has the final decision on the extent to which the material is allowed.

Failure of a student to comply with the above regulation constitutes an academic offence.

Standing
1. 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.

2. Except in Architecture, all courses taken from May 1984 to the present whether passed or failed are included in the cumulative overall and major averages except for repeated courses in which case only the latest course attempt and grade are included. The first grade will, however, remain on the student's record. Students (except those in the School of Architecture) should note that their major average is determined by the cumulative average of grades assigned for all courses taken in the student’s major program including those with the Environmental Studies designation.

3. Students receiving an incomplete (INC), did not write (DNW), or no mark received (NMR) standing in any course will be allowed four months from the completion date of the course to clear such standings. Any such standings not cleared within this period will automatically be converted to a grade of F-. In the School of Urban and Regional Planning, this grade cannot be changed without a student appeal to the School. The mark of "IP" or "In Progress" may be assigned temporarily to the first half of what is essentially a year course which is listed as two term courses (i.e. Plan 490A and 490B). The mark indicates that the course is "In Progress" and that when completed, a final grade will be assigned to both the 'A' and 'B' halves of the course (usually the same grade). The mark "IP" will automatically revert to F- after eight months, if a final grade is not submitted.

4. To be considered in good standing in the Honours programs, a student must maintain a cumulative overall average of at least 65.0% and an average in the chosen field of specialization as specified in the regulations of the relevant Department/School. If an Honours program candidate's average falls below the prescribed minimum, the individual can be given conditional standing for two consecutive academic terms if in the opinion of the School or Departmental Promotions Committee the person can attain Honours standing before graduation. If not, the student, upon request, may be considered as a candidate for a degree in the General
To be considered in good standing in the General Geography programs, a student must maintain a cumulative overall average of at least 60.0% as well as an average of at least 65.0% in Geography. If at any time a student's cumulative overall average falls below 60.0% or the average in the major subjects below 65.0%, the individual may be granted conditional status for two consecutive academic terms during which period he/she must obtain good standing or he/she will be asked to withdraw.

The only general programs in the Faculty are the General Geography programs. The BES program in the School of Architecture is a pre-professional program. Full-time students may be enrolled for additional or fewer courses than the normal course load as required in each program only after obtaining the approval of the appropriate Undergraduate Officer.

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

If a student receives a "Required to Withdraw" or a "May Not Proceed" decision, he or she must withdraw from that program for two academic terms; that student is entitled to apply to any other program if the reasons for withdrawal include disciplinary problems, a statement will be placed in the student's file.

Generally, students wishing to graduate with a University of Waterloo Bachelor of Environmental Studies (BES) undergraduate degree must spend a minimum of two years or their final year in residence (full-time on campus). Architecture students wishing to graduate with a University of Waterloo BES degree must spend the equivalent of four terms of full-time study in residence including the final two terms. Architecture students wishing to graduate with a University of Waterloo BArch degree must spend the last two terms in residence. This does not preclude special studies approved in advance. Architecture students who choose to undertake alternate studies to the Waterloo 3B term may not graduate with a BES (pre-professional) degree because of the residence requirements. Students who do not have a BES (pre-professional) degree from Waterloo and wish to return to continue studies here in fourth year will be considered as external applicants.

### Course and Program Changes

1. Students may add and drop courses before and during the first two weeks of classes in the term in which the courses begin.

2. After the two week periods, and before November 1, March 1, and July 1, a student may add courses only with the written permission of the course instructor and the appropriate undergraduate officer.

3. After the two week periods, and before November 1, March 1, and July 1, a student may drop courses only with the written permission of the appropriate undergraduate officer and after demonstrating that such a change is in the student's academic interest.

The mark of "IP" or "In Progress" may be assigned to the first half of what is essentially a year course which is listed as two term courses (i.e. PLAN 490A and 490B). The mark indicates that the course is "In Progress" and that when completed, a final grade will be assigned to both the A and B halves of the course (usually the same grade). The mark "IP" will automatically revert to F after a specified period of time. When the second or B half of such courses is dropped as a result of schedule change or withdrawal, the first half must be dropped.

4. All schedule changes at any time must be submitted to the designated department/school office.

5. Students are encouraged not to register for more courses than their programs require unless exceptional circumstances can be demonstrated.
6. Full-time students may reduce their programs below the specified minimum only upon the recommendation of the undergraduate officer of the major department/school.

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

Voluntary Withdrawals
Students may voluntarily withdraw from their program of study without incurring academic penalty, provided that the appropriate Notice of Withdrawal form is completed, received and signed by the Undergraduate Officer, no later than: November 1 (Fall Term), March 1 (Winter Term), July 1 (Spring Term). After these deadlines, students who withdraw will normally be held responsible for the term’s courses in the same that such courses will be recorded with a grade of "NMR" and subsequently will be recorded as failures. Students who voluntarily withdraw may be eligible for tuition fee and residence refunds depending on the effective date of withdrawal. (See the Calendar of Important Dates).

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

Special Programs
Student exchange agreements between Waterloo and the School of Australian Environmental Studies at Griffith University, Brisbane, Queensland and the environmental studies program at Victoria College, Clayton (near Melbourne), Victoria, have been established. Under these arrangements, a small number of students from the University of Waterloo could take one or two semesters of courses at Griffith or Victoria during their third year which would be credited towards their degree at Waterloo, and vice versa. For additional information, contact the Associate Dean, Undergraduate Studies.

The following statements outline the objectives and nature of the four programs in the Faculty of Environmental Studies.

School of Architecture
Nature of the Program
Architects organize spaces within and about buildings. They determine the shape a total building will take and how it is to be built. They design, at a large scale, with an awareness of the demands of society. They design in detail with attention to the needs and aspirations of individuals and groups. They show understanding of structural technique, construction detail and the sound use of materials. They determine the way in which the building will be built and supervise the construction process.

Architecture is a vast spread of concerns about people and their surroundings, their history, cultures, resources, disciplines and contradictions. The School’s primary concern is the development of design skills in architecture, and it stresses awareness of cultural background and existing environment.

The 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 to the society it serves.

The five years of architectural studies are made up of: a pre-professional, three-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 (Chapter 5) 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. The Waterloo BArch Degree is recognized by the Commonwealth Association of Architects.

Non-Architecture Students
Students not enrolled in the School of Architecture may take any architectural course listed in the recommended core program (depending on availability of space) with the exception of courses in the theme area of Design. Prerequisites indicated in the course descriptions are primarily for Architectural students. For Non-Architectural students, prerequisite evaluation must be carried out by the respective instructors.
Bachelor of Environmental Studies
(Pre-Professional Architecture) Program
The purpose of the BES program is to educate future architects to an understanding of the beliefs and needs of the individual and of society, and to a willingness to take an active role in creating and improving the environment, to a clarification of the interaction of seemingly unrelated disciplines, and to know the principles and values that surround the creation of any artifact; to a comprehension of the many forms of creative expression; and to an understanding of the present as part of an historical process. The program aims to build knowledge and expertise in various aspects of building and architectural design through:

1. The design studio, theories and methods, and practice of architectural design.
2. Approaches in the study of technology including computer, physical and material sciences.
3. Environmental studies, including natural and human ecology.

Theme Area Descriptions

Technology
Courses in this theme area give preparation leading to the application of mathematics, statistics and computer science as tools for analysing quantitative and behavioural problems as prerequisites for ensuing studies; to develop an understanding of the qualities of materials and structural behaviour; to propose alternatives in structural engineering; and to perform independent mathematical checks on simple, statically determinate and indeterminate structures.

Ecology
Courses in this Theme Area prepare the student to understand the structure and function of Man in the pre-existing environment as an individual and as a social animal; to recognize and be critical of the human/physical complex and its management for desirable human goals and quality in the natural and man-made Environments.

Culture
Courses in cultural history give the student a critical and creative understanding of the basic ingredients of all creative work, recognizing the seemingly unrelated forces for change in the cultural history of man, and comprehending the present as part of the historical past. Open to any University student upon consent of instructor. No prerequisites are required for these courses except for Architecture students.

Design
The courses in design studio combine design fundamentals and design concepts, along with the opportunity to involve analysis and synthesis, professional and scientific insights, application of tools and methods for designing artifacts for man, and an awareness of the inherent physical characteristics and limitations of media and materials. The objectives of the studio are: (1) to guide the student in observing aspects of the physical and social environment; to find, categorize and associate the information into fundamental structures and patterns of relationships; (2) to apply theories generated in the lecture courses to situations in the physical environment, implementing by categorizing the courses into behaviour materials, structures and mechanical systems, behaviour of man, and communications; (3) to provide the student with an opportunity to develop skill in using different "techniques" for analyzing and synthesizing problems in the physical environment; (4) to establish a relationship between faculty and students; (5) to provide a vehicle for persons from faculties of different disciplines and from outside of the University to discuss with students their problems and projects from different points of view.

Bachelor of Architecture Program
The Bachelor of Architecture program increases the emphasis on architectural design and professional aspects of architecture. There are opportunities for students to develop their own areas of interest, and the final two terms of the program are normally devoted to a design thesis.

The courses for the Bachelor of Architecture Program are intended to prepare the student to demonstrate professional skill in separating, organizing, and conceptualizing actual problems in the man-made environment in his/her role as an architect, alone and in a team; to synthesize mechanical, structural and functional systems into architectural expressions which adapt to social needs and aspirations of society, user, client and community, alone and with the help of others; to adapt his/her skills to (a) real world constraints; (b) to the evolution of social economic and technological changes, and (c) to influence change both in constraints and environmental problems and know the current methods and procedures in professional practice for defining and solving environmental problems; to organize patterns of behaviour which assure continuing development for professional competence and relevance at all times; and to pass the examination for registration as an architect if he/she aspires to become a practising professional.

Note
Students are expected to defray costs of materials in connection with studio projects. There is a $25.00 studio fee for each term.

See Recommended Core Program for course arrangement, page 10:8.
# PROGRAM FOR THE DEGREE OF BACHELOR OF ENVIRONMENTAL STUDIES

(Pre-Professional Architecture)

<table>
<thead>
<tr>
<th>Year/Term</th>
<th>Technology Theme Area</th>
<th>Ecology Theme Area</th>
<th>Culture Theme Area</th>
<th>Design Theme Area</th>
</tr>
</thead>
<tbody>
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<td>1-A</td>
<td>ARCH 112</td>
<td>ARCH 124</td>
<td>ARCH 142</td>
<td>ARCH 192</td>
</tr>
<tr>
<td>Fall</td>
<td>Mathematics</td>
<td>An Introduction to</td>
<td>Iconography I</td>
<td>Design Fundamentals</td>
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<tr>
<td>Sept-Dec</td>
<td>ARCH 171</td>
<td>Landscape Design</td>
<td>(1 credit)</td>
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<td>CS 100</td>
<td>ARCH 143</td>
<td>ARCH 193</td>
<td></td>
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<tr>
<td>Winter</td>
<td>Introduction to</td>
<td>Iconography II</td>
<td>Design Fundamentals</td>
<td>and Studio</td>
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<td>Computer Usage</td>
<td>(1 credit)</td>
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<td></td>
<td>ARCH 163</td>
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<td></td>
<td>Statics and Structural</td>
<td>Building Construction I</td>
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<td>Analysis</td>
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<td>Off-Term</td>
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<td>arrange employment</td>
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<td>Spring</td>
<td>use the off-term as he</td>
<td>for students in</td>
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<td>May-Aug</td>
<td>wishes. The Department</td>
<td>this term.</td>
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<td>does not provide their</td>
<td>(See Chapter 5)</td>
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<td>their normal services</td>
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<td>2A</td>
<td>ARCH 262</td>
<td>ARCH 246</td>
<td>ARCH 292</td>
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<td>Fall</td>
<td>Strength of Materials</td>
<td>Foundations of</td>
<td>Design Concepts</td>
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<td>Sept-Dec</td>
<td>ARCH 266</td>
<td>Europe</td>
<td>and Studio</td>
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<tr>
<td></td>
<td>Building Construction II</td>
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<td>Co-op Work Term 1</td>
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<td>student may get during the work term may</td>
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<td>include: introduction to office procedures;</td>
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<td>during the preceding</td>
<td>assisting in design presentation and model</td>
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<td>study term by the</td>
<td>building; minor drafting assignments.</td>
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<td>prospective employers.</td>
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<td>2B</td>
<td>ARCH 276</td>
<td>ARCH 225</td>
<td>ARCH 247</td>
<td>ARCH 293</td>
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<td>Spring</td>
<td>Timber: Design,</td>
<td>Patterns of</td>
<td>Renaissance to</td>
<td>Design Concepts</td>
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<tr>
<td>May-Aug</td>
<td>Structure and</td>
<td>Perception: Landscape and</td>
<td>Revolution</td>
<td>and Studio</td>
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<tr>
<td></td>
<td>Construction</td>
<td>Settlement</td>
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<td>Co-op Work Term 2</td>
<td>The type of experience a student may obtain</td>
<td>in preparation and corrections to site plans,</td>
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<tr>
<td>Fall</td>
<td>in this term includes</td>
<td>floor plans, and elevations, and on-site</td>
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<tr>
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<td>assisting in design</td>
<td>measurements.</td>
<td></td>
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<tr>
<td></td>
<td>presentation and model</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>building; assisting</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3A</td>
<td>ARCH 362</td>
<td>ARCH 392</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter</td>
<td>Steel: Design,</td>
<td>Design Concepts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jan-Apr</td>
<td>Structure and</td>
<td>and Studio</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Construction</td>
<td>(2 credits)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>ARCH 372</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Building Services 1</td>
<td></td>
<td></td>
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<tr>
<td>TOTAL 3.5 cr</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Co-op Work Term 3</td>
<td>The type of experience a student may obtain</td>
<td>in preparation of site plans, floor plans, elevations, building</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring</td>
<td>in this term includes</td>
<td>cross-sections.</td>
<td></td>
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</tr>
<tr>
<td>May-Aug</td>
<td>design research;</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>detailed design</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>developments; design</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3B</td>
<td>ARCH 363</td>
<td>ARCH 393</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>Concrete: Design,</td>
<td>Design Concepts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sept-Dec</td>
<td>Structure and</td>
<td>and Studio</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Construction</td>
<td>(2 credits)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>ARCH 373</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Building Services II</td>
<td></td>
<td></td>
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<tr>
<td>TOTAL 3.5 cr</td>
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<td></td>
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<tr>
<td>TOTAL 23 credits</td>
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</tbody>
</table>
## PROGRAM FOR THE DEGREE OF BACHELOR OF ARCHITECTURE

<table>
<thead>
<tr>
<th>Year/Term</th>
<th>Systems and Measures</th>
<th>Culture</th>
<th>Design</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theme Area</td>
<td>Theme Area</td>
<td>Theme Area</td>
</tr>
<tr>
<td>Co-op Work Terms</td>
<td>This period of eight months may serve many objectives. A student after the first degree program has time in which he may travel and decide about his future goals before returning to the School for the second degree program.</td>
<td></td>
<td>Co-op terms wherein he obtains experience in design research; assisting in the development of conceptual designs and schematics, preparation of site plans and details, floor plans, elevations, cross-sections and standard details; assisting the site architect or construction superintendent</td>
</tr>
<tr>
<td>1 &amp; 5 Winter and Spring</td>
<td>During that time a student may continue the</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jan-Aug</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-A Fall</td>
<td>ARCH 348</td>
<td>ARCH 446</td>
<td>ARCH 492</td>
</tr>
<tr>
<td>Sept-Dec</td>
<td>Italian Renaissance Architecture</td>
<td>Italian Urban History ARCH 448</td>
<td>Design Studio (2 credits)</td>
</tr>
<tr>
<td>TOTAL 3½ cr.</td>
<td></td>
<td>Rome and the Campagna</td>
<td></td>
</tr>
<tr>
<td>1-B Winter</td>
<td>ARCH 452</td>
<td>FE</td>
<td>ARCH 493 Design Studio (2 credits)</td>
</tr>
<tr>
<td>Jan-Apr</td>
<td>Specifications</td>
<td></td>
<td></td>
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<tr>
<td>or</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Spring</td>
<td>ARCH 499</td>
<td></td>
<td></td>
</tr>
<tr>
<td>May-Aug</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL 3½ cr.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Co-op Work Terms</td>
<td>This is the last Co-op term of eight months before the final year of study. On the basis of previous experience in a variety of jobs, a student is capable of handling somewhat advanced work in professional offices such as: design research; preparation of design</td>
<td></td>
<td></td>
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<tr>
<td>3 &amp; 7 Winter or Spring, and Fall</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jan-Apr</td>
<td>FE</td>
<td></td>
<td></td>
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<tr>
<td>TOTAL 3½ cr.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-B Winter</td>
<td>ARCH 555</td>
<td></td>
<td>ARCH 593 Design Studio</td>
</tr>
<tr>
<td>Jan-Apr</td>
<td>Architectural Practice</td>
<td></td>
<td>(3 credits)</td>
</tr>
<tr>
<td>TOTAL 3½ cr.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>TOTAL 14 credits.</td>
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</tbody>
</table>

### Electives

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

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

### Notes

1. Department approval is mandatory for a FE.
2. Students enrolled in 4A in Waterloo are required to take three half-credit, approved electives in addition to Architecture studio requirements.
Additional Regulations, Examinations and Promotions

In order to proceed unconditionally from one term to the next in the BES and BArch programs, the student must satisfy each of the following requirements:

1. Maintain a minimum cumulative overall average of C- (60.0) calculated at the end of each term of study.
2. Pass the studio course.
3. 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 period of registration including the 1N Fall and Winter terms and all 'A' and 'B' terms.

**A minimum passing grade in any course is D- (50.0).

While the School reserves the right to make exceptional academic decisions for students who require exceptional consideration, the Promotions Committee will be guided by the following:

Students who satisfy at least two of the above requirements in a given term may be permitted to continue conditionally in the program as outlined in notes 1, 2, 3, 4 and 5.

Promotions decisions for students who satisfy only one of these requirements in any given term will be made on an individual basis by the Promotions Committee.

Students who satisfy one or none of the above requirements in a given term will normally receive the decision "Required to Withdraw."

No supplemental examinations are given by the School of Architecture.

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 1, 2, 3 under "Additional Regulations, Examinations and Promotions."

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 1, 2, 3 under "Additional Regulations, Examinations and Promotions."

6. Course Loads

Normally students of the School are permitted to take only one more or one fewer half-courses than that prescribed for the particular year and term in which they are registered. Any further addition or reduction to the student's program must be approved by the Undergraduate Officer of the School of Architecture.

7. Appeals

See Faculty procedure, p. 10:4.
Co-operative Programs

The Bachelor of Environmental Studies program includes 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 Co-ordination and Placement.

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 nature judgment to assume responsibility for any medium-sized building project.

Department of Environment and Resource Studies

Nature of the Program

The Department of Environment and Resource 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.

The current emphases in research and scholarship among the faculty fall into three major thematic areas:

1. Sustainable Environmental and Resource Systems
2. Environmental, Social and Technological Impact Assessment
3. Natural Area Management

Many of the positions held by graduates of the Department can be described by one of these headings.

An even more important goal of the programs offered by the Department is the development of abilities to think and to analyse which are not artificially constrained by conventional boundaries of academic disciplines. The importance of the ability to analyse environmental situations 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 Environment and Resource Studies programs do not concentrate on one technical or pre-professional field to meet specifications for particular jobs. Rather, by presenting a wide range of subjects and problems inherent in the theme of human-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.

The flexibility of Environment and Resource Studies sets the stage for work in a number of environmentally-related and societal areas.

Some graduates of the Department of Environment and Resource Studies further enhance their qualifications through graduate study.

Graduates holding the BES degree in Environment and Resource 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 Environment and Resource Studies have gone on to post-graduate work in programs such as urban and metropolitan studies, natural resources administration, regional planning, environmental engineering, law, systems design, teacher training, adult education, and communications studies.

The Department is fortunate in having a multi-disciplinary faculty whose formal education and experience range over a number of disciplines in the natural sciences, social sciences and the fine arts. They bring to the program qualifications in such fields as agriculture, biology, communications, economics, geography, law, mathematics, physics, political science, and sociology, as well as a variety of experiences in such diverse areas as ecological research, economic studies, urban affairs, technology assessment, and work with various international organizations.

For the approach used in Environment and Resource Studies, considerable academic innovation has been desirable. Besides lectures and labs, the program emphasizes open-door, personal contact among students and faculty members, 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 Environment and Resource 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. Environment and Resource 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 Environment and Resource Studies.

Bachelor of Environmental Studies (Honours Environment and Resource Studies)

The formal admission requirements of the program are listed beginning on page 2:2 of this Calendar. No specific Grade 13 courses are required, but some science or mathematics would be helpful.

The Faculty of Environmental Studies expects that students enrolled in any of its programs should be able to demonstrate competence in writing. Accordingly, all students newly admitted to the Faculty are required to write the English Language Proficiency Examination during their first term of registration (normally scheduled during registration week in September). The English Language Proficiency Program is recorded on the student's academic record as Arts 000 Y. Because of the necessity of communicating research and project results, both in the program and in careers after graduation, ability in English is particularly important in Environment and Resource Studies.

Applicants who have been out of school for a number of years are considered on the basis of their work experiences and interests in environmental studies as well as their past academic record.

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 environment and resource 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 Environment and Resource 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 five possibilities, as follows:

The Honours Regular and Co-operative Programs
Students take the required core program and whatever sets of elective courses they wish to round out their individual interests and skills.

Themes
Students can specialize in one of three themes within the Department by taking the required core program and the identified electives for one of these themes.

a) Sustainable Environmental and Resource Systems
b) Environmental, Social and Technological Impact Analysis
c) Natural Area Management

A Joint Honours Degree
Students can elect to take a Joint Honours degree with another department, which will require fulfilling the core program of a second department as well as Environment and Resource Studies.

4. A Minor
Students can elect to take a Minor with another department, which requires completion of ten term courses in another department, as designated by that Department.

i. An Option
Students can elect to take one of the recognized Options outside of the department involving choices among sets of courses all bearing on some theme or field of interest. See, for example: Society, Technology and Values (STV), Administration, Canadian Studies, Legal Studies, Management Studies, Peace and Conflict Studies. These are listed in the Calendar under “Interdisciplinary Options”.

6. Field Study Program (FSP)
In 1980, 1983 and 1987, under the direction of a faculty member, ERS students had the opportunity to spend a term in India studying various environment/development issues. Such Field Study Program opportunities in India and elsewhere will continue to be available to ERS students on an intermittent basis.

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 five term courses per term. Each student must have completed 40 term courses or the equivalent before graduation with a cumulative overall average of 65.0; a cumulative average of 70.0 must be maintained in ERS/ENV S courses. There are several evaluation techniques used to determine grades.

The Honours Regular Program

<table>
<thead>
<tr>
<th>Year One</th>
<th></th>
<th>Year Two</th>
<th></th>
<th>Year Three</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENV S 196</td>
<td>Introduction to Environmental Studies</td>
<td>ENV S 200</td>
<td>Field Ecology</td>
<td>ERS 390A/390B</td>
</tr>
<tr>
<td>ERS 100(F)</td>
<td>Issue Analysis and Problem-Solving</td>
<td>ERS 290/291</td>
<td>Seminar-Workshop</td>
<td>ERS 390B</td>
</tr>
<tr>
<td>ERS 101(W)</td>
<td>Issue Analysis and Problem-Solving</td>
<td>ERS 295</td>
<td>Development of Environmental Thought 1</td>
<td>ERS 396</td>
</tr>
<tr>
<td>ERS 150(F)</td>
<td>Environmental Methods &amp; Techniques</td>
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<td></td>
</tr>
<tr>
<td>ENV S 178</td>
<td>Introduction to Environmental Research Methods</td>
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</tbody>
</table>

plus electives for a total of five term courses for the Fall term and five term courses for the Winter term.

Note that 200, and/or 295 may be taken in years other than Year Two.

plus electives for a total of five term courses for the Fall term and five term courses for the Winter term.
Note: Students who would like additional flexibility in fourth year, such as being off campus for the year, MUST take ERS 295 in second year, ERS 396 and ERS 400 in third year.

The Honours Co-operative Program
Terms 1A, 1B, and 4A, 4B are the same as Years One and Four respectively of the Regular program. During Fall term of Year One, those interested may apply to enter the Co-operative program effective with the beginning of Term 1B. The remainder of the Co-operative program is as follows:

Term 2A
ENV S 200  Field Ecology
ERS 290  Seminar-Workshop
ERS 295  Development of Environmental Thought 1
plus electives for a total of five term courses. With consent of Undergraduate Officer, 200 may be taken in Term 3A or Term 3B.

Term 2B
ERS 291  Seminar-Workshop
plus electives for a total of five term courses.

Term 3A
ERS 390A  Seminar-Workshop
ERS 396  Development of Environmental Thought 2
plus electives for a total of five term courses.

Term 3B
ERS 390B  Seminar-Workshop
plus electives for a total of five term courses.

Note 1
The arrangement of academic and work terms, and further information on Co-operative study generally, are given in Chapter 5 of the Calendar.

THE THEME PROGRAMS
1. Sustainable Environmental and Resource Systems
Theme Coordinators: Faculty
This theme is intended to introduce students to the broad range of environmental, social, political and economic factors affecting the development and implementation of resource policy and management in Canada. A particular focus exists on the technical and economic potential for, impacts of, and implementation strategies for conservation alternatives. Other areas of interest include water and solid waste management. The program is as follows:

Year One
Required: Regular Program

Year Two
Required: Regular Program
Theme Core
ERS 218  Introduction to Sustainable Environmental and Resource Systems

Year Three
Required: Regular Program
Theme Core
ERS 318  Case Studies in Sustainable Environmental and Resource Systems
Two elective courses (see note below)

Year Four
Required: Regular Program
Theme Core
ERS 418  Seminar on Strategies for Sustainable Development

Note: Electives are suggested from a range of economic, political science, planning and geography courses. See Theme Coordinators for up-to-date listing.

2. Environmental, Social and Technological Impact Assessment
Theme Coordinators: R. Gibson, S. Lerner, G. Michalenko
This theme prepares students to identify, analyse, manage and monitor the wide range of complex effects that human activities have on natural and social environments. This mix of skills and interests is referred to as technology, environmental or social impact assessment (TA/EA/SIA). The program is as follows:

Year One
Required: Regular Program

Year Two
Required: Regular Program
Theme Core
ERS 241  Introduction to Environmental & Social Impact Assessment

Year Three
Required: Regular Program
Theme Core
ERS 337  Environmental Impact Assessment
ERS 338  Social Impact Assessment

Year Four
Required: Regular Program
Theme Core
ERS 445  Practicum in TA/EIA/SIA
Environmental Studies
Environment and Resource Studies
Geography

Note
Electives in each year are chosen from a variety of courses including some in communication skills, and may be selected to emphasize the social sciences or the natural/physical sciences, depending upon a student's interests. See Theme Coordinators to discuss suggested electives.

3. Natural Area Management
Theme Coordinator: G. Priddle
His theme has been developed for students aspiring to be professional managers of natural areas, that is parks, reserves or recreational areas that require protective management and/or sensitive uses of their major natural features. The theme is as follows:

'Year One
Required: Regular Program

'Year Two
Optional: Regular Program

Theme Core
ENV S 202 Social Science Approaches to Environmental Problems
ENV S 334 Park Management (Cross-listed as REC 334)

'Year Three
Required: Regular Program

Theme Core
ENV S 433 People in Natural Areas (Cross-listed as REC 433)
ENV S 417 Land Use History & Landscape Change

'Year Four
Required: Regular Program

Theme Core
ENV S 434 Ecological Resources of Parks
IEC 410 Planning of Recreation Facilities
GEOG 461 Land Dereliction & Rehabilitation 1
GEOG 462 Land Dereliction & Rehabilitation 2

Note
Students may elect to take one of the recognized Options within the Faculty of Environmental Studies or outside the Faculty in Society, Technology and Values (STV), Legal Studies, Canadian Studies, Gerontology, Iberoamerican Studies, Management Studies, Peace and Conflict Studies, Studies in Personality and Religion of Women's Studies. Consult the Calendar under these headings for more information.

Department of Geography
Nature of the Program
Geography is concerned with both the natural and human environment, studying how it has been shaped according to human need, how patterns of human activities are structured over space, and how these are influenced by environmental factors. Geography is considered both a natural and social science and flourishes in an academic organization where the multi-disciplinary approach is emphasized. The Bachelor of Environmental Studies (BES) programs in Geography (Honours and General) provide students with considerable freedom to choose supporting electives from any department in the University. Students can develop programs to suit their particular interests. Joint Honours programs with a number of other departments are listed on page 10:19.

The four-year Geography programs provide a sound, foundation in the discipline, and prepare the student for specialization at the graduate level in almost any aspect of Geography. The mandatory content courses include a series of integrated courses in both physical and human geography. In the Honours program, the fourth year includes a research project known as the Senior Honours Thesis.

Although the four-year programs are broad in scope, students may concentrate their courses in one or more of the major areas of specialization available in the Department (page 10:19). Students are also encouraged to consider a broadly based program without specialization.

The Honours Co-op program provides for alternate terms of practical work experience and academic study. Students may be admitted to the Co-op program in the first or second year. The first work term is in the winter of the second year.
Co-op Geography students must normally follow the work and study-term sequence outlined on page 10:18. A work-term report is required upon completion of each work term and four of these must be approved for the Co-op degree. Inquiries for additional information regarding Co-operative studies should be directed to the Co-op Undergraduate Officer. Co-op students may transfer to the regular Honours Geography program at any time, if they are in good standing.

The three-year General Geography program provides a liberal education in environmental studies, with less specialization in Geography than in the four-year programs. This program can also be completed by correspondence. In addition to the BES (Bachelor of Environmental Studies) program in Geography a BA (Bachelor of Arts) degree program is also available in Geography (page 8:24).

In all programs there is emphasis on the development of both theory and methodology and on the practical application of geographical concepts to the economic, social and political problems of Canada and other parts of the world. The "applied geography" aspects of the program are enhanced by the availability in the Faculty of elective courses in Architecture, Urban and Regional Planning and Environment and Resource Studies. Graduating students acquire a variety of jobs in education, government, industry and planning agencies; more information on employment possibilities is provided in a Department of Geography publication, Jobs in Geography.

The Department of Geography offers both Master's (MA) and Doctoral (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, cartography, air photo interpretation and remote sensing, urban and economic geography, agricultural geography and rural development, regional planning and development, resources management, Canada and Europe.

Environmental Studies
Geography

BACHELOR OF ENVIRONMENTAL STUDIES

(Geography Program)

A) THREE YEAR PROGRAM

Year One
GEOG 101 Introduction to Human Geography
GEOG 102 Introduction to Physical Geography
GEOG 160 Introduction to Cartography and Map Analysis

Electives: (see notes below)

Year Two
ENV S 200 Field Ecology
GEOG 201 Geomorphology and Soils
GEOG 202 Location of Economic Activities

One of:
GEOG 208 Applied Climatology
GEOG 309 Physical Climatology

One of:
GEOG 203 Regional Geography
GEOG 204 Soviet Union
GEOG 205 Africa
GEOG 220A World Regions
GEOG 221 The United States

and additional courses so that a student should have completed by the end of the second year 20 term courses including one English course from ENGL 109, 129R, 140R, 150, 209, 210.

Year Three
GEOG 381 The Nature of Geography

Additional courses so that a student will have completed at least 30 term courses.

Notes on Three Year Program

1. Minimum Required Credits
Total: 30 term courses. Geography: 12 term courses. Outside of Faculty of Environmental Studies: eight term courses. All Environmental Studies courses are included in the cumulative Geography average but only four can be counted in meeting the minimum required credits of Geography courses.

2. Term Course Load
No more than five courses may be taken in a term without the approval of the Associate Chairman (Undergraduate Studies). Normally, approval for a 6th course will be considered only if the cumulative Geography average is B+ or higher.
3. Average Requirements
   Students must maintain an overall cumulative average of 60% and a major cumulative average of 65%. All required courses must be passed.

4. Other Comments
   See notes 4, 5, 6, and 7 on Four Year programs.

FOUR YEAR PROGRAMS (HONOURS REGULAR AND CO-OP, GENERAL)

Year One
EOG 101 Introduction to Human Geography
EOG 102 Introduction to Physical Geography
GEOG 160 Introduction to Cartography and Map Analysis
JV S 178 Introduction to Environmental Research Methods

Electives including Geography and one of ENGL 109, 109R, 140R, 150 taken in Year One or ENGL 209, 210 ten in Year Two.

Year Two
JV S 200 Field Ecology
EOG 201 Geomorphology and Soils
GEOG 202 Economic and Urban Geography
EOG 275 Introductory Air Photo Analysis and Remote Sensing
ENV S 278 Advanced Environmental Research Methods

10 of:
GEOG 208 Applied Climatology
GEOG 309 Physical Climatology

10 of:
EOG 203 Regional Geography
GEOG 204 Soviet Union
GEOG 205 Africa
EOG 220A World Regions
EOG 221 The United States

If desired, two of the required courses above may be taken in Year Three.

Electives: see notes below.

Year Three
EOG 381 The Nature of Geography
EOG 391 Field Research (not required for Co-op)

One of:
GEOG 307 Social Survey Techniques
GEOG 316 Multivariate Statistics
GEOG 317 Nonparametric Statistics
GEOG 318 Spatial Analysis
GEOG 319 Economic and Social Techniques for Regional Planning

GEOG 360 Preparation of Maps and Illustrations
GEOG 375 Air Photo Interpretation
GEOG 376 Environmental Remote Sensing
ENV S 378 Applications of Computer Programming in Environmental Studies
GEOG 403 Computer Assisted Cartography

Honours students take:
GEOG 390 Senior Honours Thesis Proposal

Electives: see notes below.

Year Four
Honours students take:
GEOG 490A/B Senior Honours Thesis

All students choose:
Electives to fulfill degree requirements.
(See notes below).

Notes on Four-Year Programs

1. Minimum Required Credits
   Total: 40 term courses. Geography: 20 term courses. Outside of Faculty of Environmental Studies: ten term courses. Only four term courses designated Environmental Studies may be counted as Geography courses but all courses designated Environmental Studies are included in the cumulative Geography average.

2. Term Course Load
   No more than five courses may be taken in a term without the approval of the Associate Chairman (Undergraduate Studies). Normally, approval for a 6th course will be considered only if the cumulative Geography average is B+ or higher.

3. Average Requirements
   Students in the General program must maintain an overall cumulative average of 60.0, and a major cumulative average of 65.0. Students in the Honours programs must maintain an overall cumulative average of 65.0 and a major cumulative average of 70.0. All required courses must be passed.

4. Foreign Language Requirement
   Students considering graduate work should take at least two term courses in a foreign language.

5. Secondary School Teaching
   Students intending to teach in Secondary Schools should take at least four term courses of Regional Geography and at least four term courses in another teachable school subject.

6. Materials and Costs
   For some courses, extra fees may be required to defray heavy equipment/travel costs, e.g. GEOG 391 (Field Research). Statements on extra costs, where required, will be found with the course description.
7. Independent Study
Up to three independent study courses (GEOG 475A, B, C) may be taken. These can be taken in different terms or concentrated in fall term, Year Three as part of an independent study term comprising GEOG 390, GEOG 391 and GEOG 475A, B, C. Such a program must be arranged with the Associate Chairman (Undergraduate Studies) and the faculty members involved.

8. Honours Co-operative Program
Students are admitted to the Co-op program in either first or second year and enter their first work term in the winter of the second year. The Honours Co-op program has the same academic requirements as the Honours Regular program.

Co-op Course Scheduling Recommendations

Year One
GEOG 101, 102, 160, ENV S 178

Year Two
Fall Term 2A
ENV S 200 and 278
One of: GEOG 208, 309
Electives, one of which must be ENGL 109, 129R, 140R, 150 taken in Year One or ENGL 209,210A, 210C preferably taken in spring term 2B

Winter Work Term 1

Spring Term 2B
GEOG 201, 202, and one of: 203, 204, 205, 220A, 221
One of: GEOG 307, 316, 317, 318, 319, 360, 375, 376
Electives

Fall Work Term 2

Year Three
Winter Term 3A
GEOG 381
Electives

Fall Term 3B
GEOG 390
Electives

Year Four
Winter Work Term 4
GEOG 490A
Electives

Spring Term 4A
Fall Work Term 5
Winter Term 4B
GEOG 490B

Joint Honours Programs
Joint Honours programs have been arranged between Geography and other disciplines in the University. Detailed programs have been worked out with Anthropology, Biology, Earth Sciences, Economics, English, Environment and Resource Studies, French, German, History, Management Studies, Mathematics, Music, Political Science, Psychology, Recreation, Russian, and Sociology. The program “Geography with Canadian Studies,” is not a Joint Honours program but an Option. These programs lead to degrees in the Faculty in which the student is registered.

The Department of Geography is prepared to work out other programs not listed for Honours students. Geography core requirements in Joint programs are similar to those of the Geography Honours program but equivalent courses in the home department to ENV S 17S, 278 and GEOG 390 and GEOG 490A, B are accepted. Required courses are GEOG 101, 102, 160, 201, 202, 275, a 200 level Regional course (see page 10:17), a 300 level Technique course (see page 10:17), 381 and ENV S 200. If scheduling difficulties arise in meeting required courses, contact the Associate Chairman (Undergraduate Studies) in Geography for possible substitute courses.

Notes on Joint Honours Programs

1. Number of Credits
The minimum number of term courses in Geography/Environmental Studies for students registered in Joint Honours programs is 14.

2. Average Requirements
Geography students taking Joint Honours with another Department must achieve Honours standing as required by the Geography Department (65.0% overall, 70.0% in Geography). The average required in the second major is the minimum Honours standing set by that Department. Students in other Departments taking Joint Honours with Geography must achieve a cumulative average of 70.0% in Geography and Environmental Studies courses. Courses designated as “Environmental Studies” are included with Geography courses in the calculation of the Geography average.

3. Canadian Studies
Students choosing the program Geography with Canadian Studies are referred to the regulations of that program. In addition, the Department of Geography recommends that course selections include at least six courses from those listed for Areas of Specialization under Canadian Geography (see page 10:19).
Areas of Specialization

Listed below are elective second, third and fourth year courses in Geography and other relevant courses in the Department's major areas of specialization. This is not a definitive list; students are encouraged to seek out other specialized courses that meet their needs.

Applied Physical Geography

- GEOG 300 Geomorphology and the Southern Ontario Environment
- GEOG 303 Geographical Hydrology
- GEOG 304 Field and Laboratory Techniques in Geomorphology
- GEOG 308A Physical Climatology
- GEOG 400 Geomorphology 
- GEOG 401 Glacial Geomorphology and Contemporary Applications
- GEOG 406 Tropical Geomorphology
- GEOG 408 Atmospheric Resource Management
- GEOG 409 Energy Balance Climatology
- GEOG 451 Soils Geography
- GEOG 461 Land Dereliction and Rehabilitation 1
- GEOG 462 Land Dereliction and Rehabilitation 2
- ARCH 224 An Introduction to Landscape Design
- BIOL 250 Ecology
- CIV E 353 Geotechnical Engineering 1
- CIV E 493 Engineering in the Canadian North
- EARTH 260 Applied Geophysics 1
- EARTH 342 Geomorphology
- EARTH 370 Economic Geography
- EARTH 438 Engineering Geology
- EARTH 440 Quaternary Geology
- EARTH 441 Introductory Quaternary Paleoecology
- EARTH 458 Physical Hydrogeology
- EARTH 459 Chemical Hydrogeology
- SCI 220 Chemistry of Pollution
- SCI 250 Environmental Geology
- SCI 453 The Seas and Man's Effect Upon Them
- SCI 454 The Inland Waters and Man's Effect Upon Them

Canadian Geography

- GEOG 251 Cities in Canada
- GEOG 300 Geomorphology, Southern Ontario Environment
- GEOG 309 Physical Climatology
- GEOG 311 Regional Industrial Development
- GEOG 315 Agricultural Geography
- GEOG 322 Geographical Study of Canada
- GEOG 352 The Rural-Urban Fringe
- GEOG 359 Geography of Energy
- GEOG 422 Canada

plus other Canadian Content Courses (page 15:4).

Environmental and Resources Management

- GEOG 303 Geographical Hydrology
- GEOG 315 Agricultural Geography
- GEOG 333 Recreation Geography
- GEOG 352 The Rural-Urban Fringe
- GEOG 356 Resources Management
- GEOG 357 Conservation and Resource Management
- GEOG 358 Water Planning and Management
- GEOG 359 Geography of Energy
- GEOG 408 Atmospheric Resource Management
- GEOG 414 Energy Resources Management
- GEOG 452 Problems of Rural Land Use
- GEOG 461 Land Dereliction and Rehabilitation 1
- GEOG 462 Land Dereliction and Rehabilitation 2
- ANTH 330 Cultural Ecology
- CIV E 344 Urban Transport Planning
- CIV E 381 Hydraulics
- CIV E 480 Water Resources Management
- CIV E 486 Hydrology
- EARTH 370 Economic Geology
- ECON 355 Economics of Energy and Natural Resources
- ECON 361 Cost Benefit Analysis and Project Evaluation
- ECON 451 Advanced Topics in Resource Economics
- ENV S 201 Introduction to Environmental and Planning Law
- ENV S 401 Environmental Law
- ENV S 417 History of Landscape Change
- ENV S 433 People in Natural Areas
- ENV S 500 Professional Development in Environmental Management
- ERS 218 Introduction to Canadian Energy Issues
- ERS 220 Introduction to Environmental Economics
- ERS 241 Introduction to Environmental and Social Impact Assessment
- ERS 318 Soft Energy Paths in Canada
- ERS 320 Environmental Economics (ECON 357)
- ERS 351 Organizations and Environmental Management
- ERS 418 Energy Research Seminar
- PLAN 255 Planning Surveys and Analysis
- PLAN 402 Planning Law
- REC 210 Organization and Administration of Recreation Services
- RFC 230 Introduction to Outdoor Recreation
- REC 301 Sociology of Leisure
- REC 302 Travel and Tourism
- REC 331 Outdoor Education
- REC 334 Park Management
- REC 432 Interpretation
- REC 434 Advanced Park Planning and Management
- REC 435 Recreation Resource Policy
### Regional Development

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<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 361</td>
<td>Cost Benefit Analysis and Project Analysis</td>
</tr>
<tr>
<td>ECON 365</td>
<td>Economic Development of Modern Europe</td>
</tr>
<tr>
<td>M SCI 261</td>
<td>Managerial and Engineering Economics 1</td>
</tr>
<tr>
<td>M SCI 418</td>
<td>Managerial and Engineering Economics 2</td>
</tr>
<tr>
<td>PLAN 232</td>
<td>Rural Planning and Development</td>
</tr>
<tr>
<td>PLAN 259</td>
<td>Regional Planning and Development</td>
</tr>
<tr>
<td>PLAN 350</td>
<td>Technology in Urban and Regional Planning</td>
</tr>
<tr>
<td>PLAN 370</td>
<td>Land Development Planning</td>
</tr>
<tr>
<td>PLAN 429</td>
<td>Cross Cultural 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>REC 302</td>
<td>Travel and Tourism</td>
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<tr>
<td>SOC 256</td>
<td>Ethnic and Racial Relations</td>
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### Regional Geography

<table>
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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>GEOG 225R</td>
<td>Urbanization in the Third World</td>
</tr>
<tr>
<td>GEOG 226R</td>
<td>Food, Agriculture, and Integrated Rural Development in the Third World</td>
</tr>
<tr>
<td>GEOG 204</td>
<td>Soviet Union</td>
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<tr>
<td>GEOG 205</td>
<td>Africa</td>
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<tr>
<td>GEOG 220A/B</td>
<td>World Regions</td>
</tr>
<tr>
<td>GEOG 221</td>
<td>The United States</td>
</tr>
<tr>
<td>GEOG 322</td>
<td>Geographical Study of Canada</td>
</tr>
<tr>
<td>GEOG 323</td>
<td>Comparative Regional Problems</td>
</tr>
<tr>
<td>GEOG 325R</td>
<td>Topics in Development of the Third World</td>
</tr>
<tr>
<td>GEOG 332</td>
<td>Topics in Population Geography: Health and Disease</td>
</tr>
<tr>
<td>GEOG 421A/B</td>
<td>Europe and the Mediterranean</td>
</tr>
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<td>GEOG 422</td>
<td>Canada</td>
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<td>GEOG 423</td>
<td>Central and Eastern Europe</td>
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<td>GEOG 424</td>
<td>Soviet Union</td>
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<tr>
<td>GEOG 425</td>
<td>Africa</td>
</tr>
<tr>
<td>GEOG 430A/B/C</td>
<td>Field Research in Regional Geography</td>
</tr>
<tr>
<td>SOC 252</td>
<td>Migration and Society</td>
</tr>
</tbody>
</table>

### Environmental Studies

**Geography**

Students wishing to concentrate on a particular world region should choose relevant courses from history, other social sciences and the languages. Students concentrating on Canada should consider doing the Option, Geography with Canadian Studies (see page 10:19).

### Methods and Techniques

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
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<tbody>
<tr>
<td>GEOG 307</td>
<td>Social Survey Techniques</td>
</tr>
<tr>
<td>GEOG 316</td>
<td>Multivariate Statistics</td>
</tr>
<tr>
<td>GEOG 317</td>
<td>Nonparametric Statistics</td>
</tr>
<tr>
<td>GEOG 318</td>
<td>Spatial Analysis</td>
</tr>
<tr>
<td>GEOG 319</td>
<td>Economical and Social Techniques for Regional Planning</td>
</tr>
<tr>
<td>GEOG 360</td>
<td>Preparation of Maps and Illustrations</td>
</tr>
<tr>
<td>GEOG 375</td>
<td>Air Photo Interpretation</td>
</tr>
<tr>
<td>GEOG 376</td>
<td>Environmental Remote Sensing</td>
</tr>
<tr>
<td>GEOG 403</td>
<td>Computer Cartography</td>
</tr>
<tr>
<td>GEOG 404</td>
<td>Cartographic Production and Design</td>
</tr>
<tr>
<td>GEOG 407</td>
<td>Field and Lab Techniques in Geomorphology</td>
</tr>
<tr>
<td>GEOG 470</td>
<td>Applied Air Photo Interpretation</td>
</tr>
<tr>
<td>GEOG 471</td>
<td>Advanced Remote Sensing</td>
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<tr>
<td>ECON 321</td>
<td>Introduction to Econometrics</td>
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<tr>
<td>ENV S 252</td>
<td>Media Tools for Environmental Studies</td>
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<td>ENV S 378</td>
<td>Applications of Computer Programming in Environmental Studies</td>
</tr>
<tr>
<td>ERS 241</td>
<td>Introduction to Environmental and Social Impact Assessment</td>
</tr>
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<td>PLAN 255</td>
<td>Planning Surveys and Analysis</td>
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</table>

### Urban-Economic Geography

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tr>
<td>GEOG 251</td>
<td>Cities in Canada</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 349</td>
<td>The City as a System</td>
</tr>
<tr>
<td>GEOG 350</td>
<td>Regional Urban Systems</td>
</tr>
<tr>
<td>GEOG 352</td>
<td>The Rural-Urban Fringe</td>
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<tr>
<td>GEOG 359</td>
<td>Geography of Energy</td>
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<tr>
<td>GEOG 411</td>
<td>Geography of Manufacturing Firms and Industries</td>
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<tr>
<td>GEOG 448</td>
<td>Urban Historical Geography</td>
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<tr>
<td>GEOG 450</td>
<td>City and Regional Systems</td>
</tr>
<tr>
<td>GEOG 452</td>
<td>Problems of Rural Land Use</td>
</tr>
<tr>
<td>CIV E 342</td>
<td>Transport Principles and Applications</td>
</tr>
<tr>
<td>CIV E 343</td>
<td>Traffic Engineering</td>
</tr>
<tr>
<td>CIV E 344</td>
<td>Urban Transport Planning</td>
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<tr>
<td>ECON 231</td>
<td>Introduction to International Economics</td>
</tr>
<tr>
<td>ECON 343</td>
<td>Urban Economics</td>
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<tr>
<td>ECON 345</td>
<td>Industrial Organization</td>
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<tr>
<td>ENV S 201</td>
<td>Introduction to Environmental and Planning Law</td>
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<td>PLAN 330</td>
<td>Urban Social Planning</td>
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<tr>
<td>PLAN 370</td>
<td>Land Development Planning</td>
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<tr>
<td>PLAN 402</td>
<td>Planning Law</td>
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</tbody>
</table>
GEOGRAPHY MINOR FOR HONOURS STUDENTS IN OTHER DEPARTMENTS

Any ten term courses in Geography among which can be included ENV S 195 and ENV S 200.

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 development are in the forefront.

To implement this approach, the School of Urban and Regional Planning has gathered a team of faculty with diverse academic and practical planning experience.

The broad aim of the School is to prepare the student for active participation in the planning process. This approach gives equal emphasis to the 'why' and 'how' of planning and requires that a style be adopted that strives for a continuum between classroom and field experience, between planning studies and related disciplines, and between academic studies and future professional practice. Realizing this concept requires integration within the program of selected elements from Geography, social sciences and pure and applied sciences. For this purpose, the School of Urban and Regional Planning has been located in a Faculty with an interdisciplinary approach to a wide range of environmental issues.

The program gives a well-rounded preparation for a wide variety of professional or graduate work in urban planning, regional planning and resource development. Courses on the theory, methods and philosophy of planning provide an integrating framework. The student is also given an opportunity to pursue a special interest in economic, social, and ecological issues in planning, or in planning methodology. This is done through the selection of elective courses. Students are also encouraged to select Senior Honours Essay Topics from these special fields of interest.

The integration of practical work experience into the program is considered an important part of the educational process. Students will be brought into direct contact with the profession and will be exposed to problems typical of those encountered in practice, as well as being introduced to projects and operations far beyond the scope of any university laboratory.

The Honours Co-operative program provides for alternative terms of practical work experience and academic study. Students are admitted to this stream of study at the beginning of their second term of Year Two on the basis of academic standing and interviews. The first work term is in the Spring following completion of second year. Co-op students normally follow the work and study-term sequence outlined on page 10:23. A work-term report is required upon completion of each work term and four of these must be graded as "satisfactory" in order to graduate. Inquiries regarding Co-operative studies should be directed to the School's Co-op Program Coordinator, or the Department of Co-operative Education and Career Services.

The Regular program encourages students to actively seek work experience (Internship) during the summer months of their second and third years.

Because of the importance of effective communication, incoming students are expected to demonstrate proficiency in written English through the English Language Proficiency Examination offered by the English Department at the start of the fall term. If necessary, students will take the appropriate remedial work in addition to normal course and credit requirements. With an increased emphasis in the profession on quantitative techniques, it is highly recommended that students take at least one Grade 13 or Ontario Academic Course credit in Mathematics. Calculus is preferred. Students with deficiencies in these areas can elect to take equivalent or remedial courses in their first year of the program.

Additional Information

The Planning programs are recognized by the Canadian Institute of Planners and an increasing number of employers as a satisfactory preparation for a wide range of careers.

Notes

1. Academic Standing

Students must obtain a minimum average of 65% in the overall average and 70% in the major average (Planning and Environmental Studies courses) throughout the four years of their program. In order to proceed to subsequent years, students must also obtain minimum credits and term courses as follows:

Year One - five credits (ten term courses); Year Two - ten credits (20 term courses); Year Three - 15 credits (30 term courses); Year Four - 20 credits (40 term courses)

Students may be granted conditional or probationary standing at the discretion of the School, which would permit a student to proceed to a subsequent year on a probationary or conditional basis. Should the student be permitted to continue on the basis of "conditional" due to average and/or course credit standing, and if subsequently the required averages are not met this second time, or credit deficiencies not cleared, withdrawal from the program will be required.
2. Course Loads and Sequencing
Year One students must select courses from first year level only. Students in the Planning School are expected to carry a minimum load of ten term courses in each of the four years of the program. However, students interested in taking extra courses are free to take a six term course load in any given term without approval from the School; preregistration for more than six term courses may only be done with the Undergraduate Officer’s approval.

3. First-Year Term Courses
No more than 12 term courses (six credits) at the first year level will be allowed toward the 40 required to graduate (20 credits).

4. Admission to Year 2
To enter Year Two of Urban and Regional Planning from Year One, a student must obtain a minimum cumulative overall average of 65.0 and 70.0 in Planning and Environmental Studies courses and must obtain credit standing in ten term courses. In subsequent years, a student must maintain a cumulative overall average of 65.0 and 70.0 in Planning and Environmental Studies courses, as well as obtain credit standing in an additional ten term courses each year of the program.

It is possible for non-Planning students to gain admission to Year Two. Advanced standing may be obtained through the transfer of credits from other programs and institutions. However, advanced standing will not be granted to transfer students beyond the Year One level (ten term course credits). All transfer students are required to complete a minimum of three full academic years in the program (Years Two - Four) before being eligible for graduation.

All students admitted to the program with advanced standing must have their program for each year approved by the Undergraduate Officer.

5. Joint Honours and Minors
Although the School does not share in Joint Honours programs, Planning students are encouraged to participate in the Minors offered by other Departments. Students choosing Minors in such programs as Canadian Studies, Political Science, and Management Studies are referred to the regulations of those programs. See other faculty and department sections in this Calendar regarding minors available. For example, Planning students interested in completing an Economics Minor must complete ten term courses in Economics as follows: ECON 101, 102, 201, 202, 231 and one of ECON 211 or 221 (or equivalent approved by the Department of Economics); and at least four of: ECON 241, 333, 335, 341, 343, 345, 353, 355.

6. The School reserves the right to make changes to the curriculum as necessary. Please consult the School prior to registration.

A number of important program guidelines and regulations are covered in the Undergraduate Studies Policy Manual available from the Undergraduate Officer. Policy areas covered include: Admission, Courses, Examinations, English Language Proficiency Requirement, Records and Transfers, Registration, Appeals and Discipline, Academic Standing, Senior Honours Essay, and Leave of Absence. Students are expected to refer to this manual in all matters concerning academic conduct.

Co-op Course Scheduling and Sequencing

<table>
<thead>
<tr>
<th>Year One</th>
<th>ARTS 000, PLAN 100 A and B, PLAN 159, PLAN 130 Electives</th>
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</thead>
<tbody>
<tr>
<td>Year Two</td>
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</tr>
<tr>
<td>Fall Term 2A</td>
<td>ENV S 200, PLAN 256A, ENV S 278 Electives</td>
</tr>
<tr>
<td>Winter Term 2B</td>
<td>PLAN 255, PLAN 256B, ENV S 201 Electives</td>
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<tr>
<td>Spring Work Term 1</td>
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<tr>
<td>Year Three</td>
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<tr>
<td>Fall Term 3A</td>
<td>PLAN 300A, PLAN 307 Electives</td>
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<tr>
<td>Winter Work Term 2</td>
<td>PLAN 300B, PLAN 330, PLAN 390 Electives</td>
</tr>
<tr>
<td>Spring Term 3B</td>
<td></td>
</tr>
<tr>
<td>Year Four</td>
<td></td>
</tr>
<tr>
<td>Fall Work Term 3</td>
<td>Winter Term 4A</td>
</tr>
<tr>
<td></td>
<td>PLAN 456A, PLAN 480A, PLAN 490A Electives</td>
</tr>
<tr>
<td></td>
<td>Spring Work Term 4</td>
</tr>
<tr>
<td></td>
<td>PLAN 456B, PLAN 480B, PLAN 490B Electives</td>
</tr>
</tbody>
</table>

For complete listing of electives, see Department Undergraduate Manual.
HONOURS URBAN-AND REGIONAL PLANNING RECOMMENDED PROGRAM (REGULAR AND CO-OP)

YEAR ONE

Required Core Planning Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLAN 100A</td>
<td>Introduction to Urban Planning Concepts and Techniques 1</td>
</tr>
<tr>
<td>PLAN 100B</td>
<td>Introduction to Urban Planning Concepts and Techniques 2</td>
</tr>
<tr>
<td>PLAN 130</td>
<td>Participatory Planning</td>
</tr>
<tr>
<td>PLAN 159</td>
<td>Graphics for Planning</td>
</tr>
<tr>
<td>ARTS 000 Y</td>
<td>English Language Proficiency Exam (no credit)</td>
</tr>
</tbody>
</table>

Required Theme Elective Courses

One term course from each of the six categories in the list of Year One Theme Elective Courses (see below). Before making a final selection in these courses, students should check that prerequisites have been covered for courses which they might take in Years Two, Three and Four.

Year One Required Theme Elective Courses

Theme Areas

1. BIOPHYSICAL
2. ECONOMIC THEME
3. POLITICS THEME
4. PHILOSOPHY & ARTS THEME
5. METHODS THEME
6. GENERAL THEME

For a listing of the courses included under each Theme Area, see the current School Undergraduate Manual.

Note: Required core and elective courses together will total ten term courses – all courses to be at First-Year level.

YEAR TWO

Required Core Planning Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENV S 200</td>
<td>Field Ecology</td>
</tr>
<tr>
<td>ENV S 201</td>
<td>Introduction to Environmental and Planning Law</td>
</tr>
<tr>
<td>ENV S 278</td>
<td>Advanced Environmental Research Methods</td>
</tr>
<tr>
<td>PLAN 255</td>
<td>Planning Surveys and Analyses</td>
</tr>
<tr>
<td>PLAN 256A</td>
<td>Principles of Environmental Design 1</td>
</tr>
<tr>
<td>PLAN 256B</td>
<td>Principles of Environmental Design 2</td>
</tr>
</tbody>
</table>

Required Theme Elective Courses

Two term courses from list of Second Year Required Theme Areas (see below). Recommended Introductory Theme courses are: PLAN 232, 259, 270.

Other

Two term courses from University offerings (as free electives).

Year Two Required Theme Elective Courses

Theme Areas:

1. URBAN THEME
2. REGIONAL THEME
3. RURAL/RESOURCE THEME
4. GENERAL THEMES

For a listing of the courses included under each Theme Area, see the current School Undergraduate Manual.

Note: Required core and elective courses together will total ten term courses.
### Environmental Studies

**Urban and Regional Planning**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Three Required Core Planning Courses</th>
<th>Required Theme Elective Courses</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>THREE</td>
<td>PLAN 300A Seminar/Workshop Project in Urban and Regional Planning 1, PLAN 300B Seminar/ Workshop Project in Urban and Regional Planning 2, PLAN 307 Social Survey Techniques in Planning, PLAN 390 Senior Honours Essay Proposal (no credit weighting).</td>
<td>Three term courses from list of Third Year Required Theme Areas (see below). Recommended Major Theme courses are: PLAN 301, 330, 357, 359</td>
<td>Three term courses from University offerings (as free electives).</td>
</tr>
</tbody>
</table>

**Year Three Required Theme Elective Courses**

**Theme Areas:**

1. URBAN THEME
2. REGIONAL THEME
3. RURAL/RESOURCE THEME
4. GENERAL THEMES

For a listing of the courses included under each Theme Area, see the current School Undergraduate Manual.

**Note:** Required core and elective courses together will total ten term courses.

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Four Required Core Planning Courses</th>
<th>Required Theme Elective Courses</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOUR</td>
<td>PLAN 456A Political and Administrative Processes in Urban and Regional Planning 1, PLAN 456B Political and Administrative Processes in Urban and Regional Planning 2, PLAN 480A The Philosophy and Methodology of Urban and Regional Planning 1, PLAN 480B The Philosophy and Methodology of Urban and Regional Planning 2, PLAN 490A/PLAN 490B Senior Honours Essay.</td>
<td>Two term courses from list of Fourth Year Required Theme Areas (see below).</td>
<td>One term course from University offerings (as free elective).</td>
</tr>
</tbody>
</table>

**Year Four Required Theme Elective Courses**

**Theme Areas:**

1. URBAN THEME
2. REGIONAL THEME
3. RURAL/RESOURCE THEME
4. GENERAL THEMES

For a listing of the courses included under each Theme Area, see the current School Undergraduate Manual.

**Note:** Required core and elective courses together will total ten term courses.
Faculty of Human Kinetics and Leisure Studies
Faculty of Human Kinetics and Leisure Studies

The Faculty of Human Kinetics and Leisure Studies was officially formed in the Fall of 1972. This Faculty has gradually evolved from the School of Physical and Health Education (1966-67) and the School of Physical Education and Recreation (1968-72). Within this Faculty, the Department of Health Studies, the Department of Kinesiology, the Department of Recreation and Leisure Studies, and the Dance Group offer academic programs and conduct research.

The programs of the Faculty have developed rapidly in response to student needs and interests and to the changing needs and demands of society. Ten years ago a Regular stream was added to the Co-operative program to enable students who wanted the programs, but not the Co-operative aspects, to attend the University of Waterloo. At the same time elective courses were introduced into each department making it possible for students to pursue, in some depth, a specific area of Kinesiology, Dance, Health Studies or Recreation and Leisure Studies in which they had a special interest. The future promises even greater opportunities for students to specialize in their studies.

Dance

The Dance program offers students an opportunity to gain the breadth of intellectual and physical skills, as well as the specific expertise, necessary for a range of careers in the world of dance. The Three Areas of Concentration, the History-Culture, the Developmental Foundations for Teaching and the Academic-Professional area, comprise a balance between studio and classroom work. Whether students plan careers as teachers, critics, choreographers, company managers, performers or writers, they will be able to draw upon a thorough knowledge of the art. Joint Honours degrees with History, Psychology and Recreation and Leisure Studies offer further career options. A Dance degree may also lead to graduate work at other institutions in choreography, criticism, history, notation, education or therapy.

Health Studies

Students in the Health Studies program examine important health problems and their causes. Of primary interest are diseases such as lung cancer and heart disease in which behaviour is an important contributing cause. Also of interest are health problems which occur because people do not use preventative health-care services, such as periodic health examinations, vaccinations, and screening procedures, or because they do not comply with prescribed medical treatment.

Opportunities for employment exist in community and government health agencies, community and school health education, and other areas where an understanding of health and health behaviour is required. Graduates also pursue graduate studies in medicine, public health, health administration, environmental health, health education, and related fields.

Kinesiology

The Kinesiology program permits the student to study, in depth, the science of human movement. Many of the course offerings are not found elsewhere. A primary feature of the program is the breadth and depth of preparation in the biological, physical and social sciences. This forms a career foundation for a future which will demand both competence and flexibility.

The program may be customized by selecting specialized electives within the department. Traditional electives (e.g. Anatomy, Physiology, Biomechanics) allow the development of expertise in research-based occupations such as gait analysis in rehabilitation, microgravity or underwater physiology, work-station design and worker efficiency. In keeping with contemporary applied emphases, competence may also be developed in advanced courses including practica in sports medicine and cardiac rehabilitation, project-oriented courses in biomechanics and sport psychology, and clinical studies such as the role of cognitive dysfunction in motor skill. Students with this preparation in Kinesiology find careers in areas such as ergonomics, special education, fitness management, and exercise therapy for the elderly.

Further specialization in graduate schools or in professional programs (e.g. medicine or chiropractic) is also pursued by our top graduands.

The program may be further tailored to individual interests and careers by selecting elective courses in renowned departments on campus, many of which offer Joint Honours degrees with Kinesiology (see Academic Programs section) or a minor (e.g. Chemistry, Biology, Computer Science). Several Option Programs (e.g. Gerontology, Management Studies, Society, Technology and Values) may be taken to broaden the science base and elective specialization of the programs in Kinesiology.

Recreation and Leisure Studies

Recreation and Leisure Studies combines a knowledge of people, environments and management into an academic package that prepares graduates for careers in a variety of public and private agencies. In addition, the program provides a good foundation for future graduate studies.

This Honours Bachelor of Arts degree program encourages students to focus their studies in one or a combination of the following six areas of concentration:

1. Business Management
2. Human Development and Therapeutic Recreation
3. Parks and Outdoor Recreation
4. Cultural Policy and Leisure Behaviour
5. Tourism and Commercial Recreation

Students also have the freedom to complement their Recreation and Leisure Studies program with courses from a broad range of subjects offered outside of the department. Business, dance, geography, gerontology, kinesiology, planning, psychology, public administration, and sociology are popular choices.

Through technical and report writing, group and independent projects, interactions with leading professionals from the field, research, applied computer work, presentations, and case studies, students develop professional skills which are marketable in most employment settings.

The diverse backgrounds of the 13 full-time professors, the variety of courses from which students may choose, and the option to select the Co-operative Regular mode of education, make Recreation and Leisure Studies at the University of Waterloo one of the leading programs of its kind in North America.

Degrees
Health Studies graduates receive an Honours Bachelor of Science degree. Kinesiology graduates receive either an Honours Bachelor of Science degree or a General Bachelor of Science degree. Recreation and Leisure Studies program graduates are granted an Honours Bachelor of Arts degree or a General Bachelor of Arts degree. Those students who graduate from a Dance program receive an Honours Bachelor of Arts degree.

Graduates who have pursued their studies in a Co-operative program and who have successfully completed four work terms, four work reports, and who indeed do finish the Co-operative program, will have the words "Co-operative Program" added to their University diploma.

Systems of Study

Co-operative System
In the Co-operative system of study, after the first eight-month academic year, the student alternates four-month academic terms on campus with four-month terms of related work experience.

Arrangements for work assignments are made through the Department of Co-operative Education and Career Services 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 categories, requirements and procedures for all programs are outlined in detail in Chapter 2 of this Calendar. The following points emphasize some of the admission requirements which relate specifically to programs in the Faculty of Human Kinetics and Leisure Studies.

Application from Ontario Secondary Schools
Applicants to the Health Studies program are required to select a university-entrance level program which includes Grade 13 or Ontario Academic Course credits for both Chemistry and Biology. Chemistry and Calculus are being phased in as admission requirements for Kinesiology. Applicants disadvantaged by this change should write directly to the Undergraduate Associate Chairman, Department of Kinesiology. See Chapter 2 for specific admission requirements.

Advanced Standing
Normally, students transferring to HKLS programs from other universities are granted credit for courses in which they have received a grade of C- (60%) or better. All transfer students will be required to complete at least the equivalent of one half of their program at Waterloo 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-operative Education and Career Services.

Students transferring to the Faculty of Human Kinetics and Leisure Studies from another University of Waterloo Faculty have two options with respect to the assignment of transfer credits. These options are:

**Option One:** All courses, both passed and failed, taken in other Faculties at the University of Waterloo are transferred and are used in the calculation of cumulative and major averages.

**Option Two:** Only courses in which a grade of C- (60%) or better has been achieved will be transferred. These courses will not be used in the calculation of cumulative and overall averages.

English Language Proficiency Requirement
The Faculty of Human Kinetics and Leisure Studies feels that a student in any of its programs should be able to demonstrate competency in writing before qualifying for a degree. Therefore, all students entering an HKLS program must write the English Language Proficiency Examination (scheduled during...
registration week). A grade of 50% or better on the examination will satisfy the requirement. If a student fails the examination, the requirement can be satisfied by 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.

This requirement normally must be met by the end of Year Two.

Examinations and Standings

1. Final Examinations
   a) In all courses each student is required to submit in such form and at such time as may be determined by the instructor, evidence of satisfactory participation in term work. The marks obtained for work during the term are used, in part, in determining standing. The ratio in which marks for term work and written examinations are combined is at the discretion of the individual departments. To pass a course, a student must obtain a minimum of D- in the combined term and examination marks. At the discretion of the chairman of the department concerned and of the Dean, a student may be barred from the final examination if the course requirements are not completed to the satisfaction of the instructor. Some courses and/or instructors may not require final examinations. In such cases term work only will be used in determining a final grade.
   b) Students absent from examinations, except for properly certified reasons, do not have make up privileges, and must repeat the entire course. If a student has a Doctor's certificate covering the precise period of absence, with legitimate medical grounds, it must be submitted to the Associate Dean for Undergraduate Affairs within one week of the scheduled examination.
   c) All examinations which receive a failing grade are automatically re-read.
   d) Examination results are issued to individual students by the Registrar. Appeals against faculty decisions made under these regulations should be made in writing to the Associate Chairman, Undergraduate Affairs, of the student's major department, within one month of publication of the official mark reports. Additional regulations concerning examinations may be found in Chapter 1.

2. Standing
   a) The Faculty has endorsed the letter grade system outlined in Chapter 1 of this Calendar.

   b) Overall standing will be determined at the end of each academic year for Regular programs and upon completion of the B term for Co-operative programs by the cumulative average of all courses taken at the University while enrolled in the Faculty, whether passed or failed.
   c) Students who have successfully completed fewer than ten term courses will be considered Year One; those who have successfully completed at least ten term courses but fewer than 21 will be considered Year Two; those who have successfully completed at least 21 term courses but fewer than 31, Year Three; and those with 31 or more, Year Four.
   d) It should be noted that all programs use the term-course system (see page 1:7 of this calendar for a description of this system). This means that courses with credit weight of .75 offered by other departments will only count as one term course. Similarly, courses with a credit weight of .25 will be considered as one-half of a term course.
   e) Students who are readmitted after being required to withdraw may choose to have their average cleared. See page 11:3 regarding transfer credit options.

The following cumulative averages are required to proceed in the programs of the Faculty:

<table>
<thead>
<tr>
<th>Program</th>
<th>Overall</th>
<th>Major</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kinesiology Honours</td>
<td>63</td>
<td>67</td>
</tr>
<tr>
<td>Health Studies Honours</td>
<td>63</td>
<td>67</td>
</tr>
<tr>
<td>Kinesiology General</td>
<td>53</td>
<td>60</td>
</tr>
<tr>
<td>Recreation Honours</td>
<td>65</td>
<td>70</td>
</tr>
<tr>
<td>Dance Honours</td>
<td>63</td>
<td>67</td>
</tr>
<tr>
<td>Dance General</td>
<td>60</td>
<td>63</td>
</tr>
</tbody>
</table>

Kinesiology, Health Studies and Dance students who receive a grade report with one of F, INC, DNW or NMR in any one academic year are placed on probation for the following academic year. Students enrolled in these programs who receive a grade report with 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." Receilation and Leisure Studies students who receive two grades of F in one year are required to withdraw. Students in this program who receive a final grade of INC or NMR in any courses are placed in Conditional Standing. (The designation F takes into account all failing grades, i.e., F-, F, and F+.)

If a student clears his/her F, INC, NMR, and DNW grades prior to the next term or session, the decision on his/her grade report may be changed. After eight months grades of INC, NMR, and DNW become grades of F-.
All grades awarded to a student are recorded on the transcript. If a student fails a course, then repeats the course and passes it, both courses are shown on the transcript and both marks are counted in the overall and/or major average. The same rule holds for a student who upgrades a course (e.g. from a D to a B) by taking the same course twice.

Students who are required to withdraw are eligible to apply for readmission only after one year’s absence. It is recommended that during this absence, students do some academic work (extension, correspondence, or community college study). Performance in such course work will be taken into consideration in assessing applications for readmission.

3. Honour Roll
To recognize outstanding academic achievement the Faculty has established the Faculty of Human Kinetics and Leisure Studies Honour Roll.

To be included on the Honour Roll, the student must achieve a cumulative 80.0% overall average and a cumulative 80.0% major average. A student with an INC, DNW, NMR or F on his/her 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 five term courses in both Fall and Winter terms. In subsequent terms, a student will normally take at least five 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 eight calendar years from the time the student first enters the program.

Students may complete a segment of their program on a part-time basis but, normally, must successfully complete a minimum of 22 term courses while enrolled in full-time study (i.e. minimum of five 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 seven 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 six years. The Faculty of Human Kinetics and Leisure Studies does not encourage part-time studies but will allow a General degree to be pursued on a part-time or reduced-program basis subject to approval by the Associate Dean of Undergraduate Affairs and the department concerned. Normally, no first-year program for a full-time student may be reduced below the ten courses minimum except in very exceptional circumstances.

Auditing a Course
It is the responsibility of the student to inform the course instructor at the beginning of the course that he or she would like to audit the course. The instructor and student may then form a contract outlining the particular auditing requirements for that course.

Letter of Permission Policy
A student may request permission to take a course(s) at another university for credit at Waterloo. A maximum of ten term courses (or equivalent) can be obtained this way. The Associate Chairman may approve up to five term courses (or equivalent). Requests for approval for additional courses must go to the HKLS Undergraduate Affairs Committee. To obtain any approval the student must obtain a Letter of Permission Request form from the Registrar’s Office and provide the details of the course(s) to be taken, appropriate course descriptions and the reasons for the request. When approved and the appropriate fee paid, the Registrar’s Office will prepare the Letter of Permission and forward it to the student, the host university and the major department concerned.

It will be the student’s responsibility to ensure that an official transcript is sent to the Assistant Registrar, Faculty of Human Kinetics and Leisure Studies, Needles Hall, University of Waterloo, Waterloo, Ontario within two months of the completion of the course(s).

Note
The granting of any Letter of Permission request by the University of Waterloo does not necessarily ensure that the student will be able to enrol in the approved course at the other university. There may be restrictions on class enrolments, etc. at that institution. Students should contact that institution’s Registrar’s Office for procedural details.
Correspondence Courses
For those students who would like to study part time and/or are not able to attend classes on campus, correspondence courses are available to them. In addition, correspondence courses may, under some circumstances, be taken while on a work term. The Associate Chairman for Undergraduate Affairs is the only individual who can grant permission to enrol in a correspondence course. Permission must be granted before the student enrols in the course and/or the course commences.

Course and Program Changes
1. Up to the end of the first two weeks of lectures, the student may drop or add any elective course without approval, provided he or she does not predetermine a section.
2. After the first two weeks of classes any course may be dropped provided the course instructor initials the drop, and either the Associate Chairman or the Associate Dean for Undergraduate Affairs signs the registration form. This policy will permit course drops only up to November 1 in the Fall term, March 1 in Winter term and July 1 in Spring term. In the event that any of the above dates fall on a holiday or weekend, the final drop day will be the last school day prior to the listed date. *
3. Students may withdraw from a program without academic penalty up to November 1 in the Fall term, March 1 in Winter term, and July 1 in the Spring term. In order to withdraw from a program (i.e. the University) a student must complete a standard Student Withdrawal form which is available in the Registrar's Office. This form must be signed by the appropriate Associate Chairman, Undergraduate Affairs.
4. Students should note the financial implications of dropping courses or withdrawing from programs (see page 3.3).

Appeals
Students who wish to appeal a grade received for a course should:
1. Contact the instructor associated with the course and attempt to resolve it within one month of the release of grades.
2. If the student is not satisfied with the discussion, then a written appeal (HKLS Appeal forms can be picked up at each Associate Chairman's Office) to the Associate Chairman, Undergraduate Affairs of the student’s home department can then be made. This appeal will be reviewed and a decision given by the Associate Chairman.
3. An unfavourable ruling at the departmental level can be appealed in writing through the Associate Dean of the Faculty, to the HKLS Undergraduate Affairs Committee.
4. An unfavourable ruling from the HKLS Undergraduate Affairs Committee can be appealed in writing to the Dean of the Faculty of HKLS.

Human Kinetics and Leisure Studies
Program Selection
Academic Programs
Dance
5. An unfavourable ruling from the Dean of HKLS can be appealed in writing to the Academic Vice President of the University.

Academic Programs

Dance
The Dance program at the University of Waterloo enables students to pursue dance as both academic and applied study.

To provide the necessary knowledge for varying career interests, two different degree programs are offered: the Honours Bachelor of Arts and the General Bachelor of Arts. 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. The Honours degree program comprises four years of study with the opportunity to specialize in the History-Culture or the Developmental Foundations for Teaching area of concentration. The third area of concentration, the Academic-Professional area, combines an Honours Bachelor of Arts five-year degree program with the Teacher Training Program at The National Ballet School; the student graduates with both an Honours Bachelor of Arts (Dance) and a Diploma from The National Ballet School.

Areas of Concentration (AOC)
The History-Culture area focuses on the art of dance in the Western world, with a view to fostering an understanding of the nature of the art past and present, as well as the factors which influence its development.

The Developmental Foundations for Teaching area examines the preparation of the dancer and artist within the context of the developmental process, particularly during the critical years of childhood and adolescence.

The Academic-Professional area merges a broad theoretical study of the art of dance with training specific to the teaching of classical ballet. Those interested must consult a faculty advisor for details concerning eligibility and course sequencing.

Joint Honours Degrees
Joint Honours degrees are available with French, History and Psychology. Requirements in the Joint Honours Programs vary and students should consult with the Undergraduate Officer in both departments regarding course sequencing, course or credit requirements, minimum averages and required courses.

Minors
A Minor is a group of approved courses taken by an Honours student in a subject area outside the home
department. The Dance Minor comprises ten approved courses. Minors are available in most departments. Students interested in pursuing a Minor should consult with the Department offering the Minor.

Course Requirements
To be eligible for the Honours BA degree in Dance, students must successfully complete 44 term courses, and maintain an overall cumulative average of 63% and a cumulative average of 67% in their Dance courses. To be eligible for the General BA degree, students must successfully complete 30 term courses and maintain a minimum overall cumulative average of .600% and a minimum cumulative average of 63% in their Dance courses.

Honours Bachelor of Arts Degree Program
1. Required Dance Courses (17)
   DANCE 110, 111, 230, 235, 336, 351 or 353; 241 & 341 or 242 & 324; 410
   Four term courses in area of concentration*
   Four term course equivalents in dance technique
2. Required Outside Courses (10)
   Two of ENGL 109, 110, 140R, 141R, 150, 151, 210C
   MUSIC 100 and 111
   PSYCH 101
   Five term courses in area of concentration*
3. Dance Electives (7)
   Seven term courses in Dance, including up to four term course equivalents in dance technique.
4. Other Electives (10)
   Of the ten term course electives, at least five must be taken within the Faculty of Arts

*Students enrolled in the BA (Hons) must select area of concentration (AOC) courses appropriate to History-Culture, Developmental Foundations for Teaching, or the Academic-Professional area, in consultation with a faculty advisor.

Suggested Course Sequence

<table>
<thead>
<tr>
<th>Year One</th>
<th>DANCE 110</th>
<th>DANCE 111</th>
</tr>
</thead>
<tbody>
<tr>
<td>DANCE 230</td>
<td>DANCE 235</td>
<td></td>
</tr>
<tr>
<td>DANCE technique</td>
<td>DANCE technique</td>
<td></td>
</tr>
<tr>
<td>Required ENGL</td>
<td>Required ENGL</td>
<td></td>
</tr>
<tr>
<td>MUSIC 100</td>
<td>MUSIC 111</td>
<td></td>
</tr>
<tr>
<td>PSYCH 101</td>
<td>Arts Elective</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year Two</th>
<th>DANCE 241 or 242</th>
</tr>
</thead>
<tbody>
<tr>
<td>DANCE AOC</td>
<td>DANCE AOC</td>
</tr>
<tr>
<td>DANCE technique</td>
<td>DANCE technique</td>
</tr>
<tr>
<td>Outside AOC</td>
<td>Outside AOC</td>
</tr>
<tr>
<td>Arts Elective</td>
<td>Arts Elective</td>
</tr>
<tr>
<td>Elective</td>
<td>Elective</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year Three</th>
<th>DANCE 336</th>
</tr>
</thead>
<tbody>
<tr>
<td>DANCE 351 or 353</td>
<td></td>
</tr>
<tr>
<td>DANCE AOC</td>
<td></td>
</tr>
<tr>
<td>DANCE Elective/technique</td>
<td></td>
</tr>
<tr>
<td>Outside AOC</td>
<td></td>
</tr>
<tr>
<td>Arts Elective</td>
<td></td>
</tr>
</tbody>
</table>

Year Four
DANCE 410 | DANCE Elective
DANCE Elective | DANCE Elective
DANCE Elective/technique | DANCE Elective/technique
Outside AOC | Arts Elective
Elective | Elective

Honours Bachelor of Arts: Academic/Professional Area of Concentration*
1. Requirements for Program A** (6)
   DANCE 110, 230, 235, 351, 366 and one other dance course.
2. Requirements for Programs A and B** (30)
   a) Required Dance Courses (8)
      DANCE 111, 241, 264A, 336, 341, 367, 410, 484
   b) Required Outside Courses (8)
      Two of ENGL 109, 110, 140R, 141R, 150, 151, 210C
      PSYCH 101 Five term courses in area of concentration*
   c) Dance Electives (2)
      Two term courses in Dance
   d) Electives (12)
      Of the twelve term course electives, at least five must be taken within the Faculty of Arts.

*The Academic/Professional area of concentration is offered in conjunction with the Teacher Training Program of The National Ballet School. Entrance to Program A is by audition only, at the end of Year One. Students wishing to pursue this program must consult the Undergraduate Officer regarding course selection and sequencing.

**Program A: three years at the University of Waterloo followed by two years at The National Ballet School.
Program B: three years at The National Ballet School followed by two years at the University of Waterloo.

General Bachelor of Arts Degree Program
1. Required Dance Courses (12)
   DANCE 110, 111, 230, 235, 336; 351 or 353; 241 & 341 or 242 & 342
   Four term course equivalents in dance technique
2. Required Outside Courses (5)
   Two of ENGL 109, 110, 140R, 141R, 150, 151, 210C
   MUSIC 100 & 111
   PSYCH 101
3. Dance Electives (3)
   Three term courses in DANCE, including up to two term course equivalents in dance technique.
4. Outside Electives (10)
   Of the ten term course electives, at least five must be taken within the Faculty of Arts.

Suggested Course Sequence

<table>
<thead>
<tr>
<th>Year One</th>
<th>DANCE 110</th>
</tr>
</thead>
<tbody>
<tr>
<td>DANCE 230</td>
<td>DANCE 235</td>
</tr>
<tr>
<td>DANCE technique</td>
<td>DANCE technique</td>
</tr>
<tr>
<td>Required ENGL</td>
<td>Required ENGL</td>
</tr>
<tr>
<td>MUSIC 100</td>
<td></td>
</tr>
<tr>
<td>PSYCH 101</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year Two</th>
<th>DANCE 336</th>
</tr>
</thead>
<tbody>
<tr>
<td>DANCE 351 or 353</td>
<td></td>
</tr>
<tr>
<td>DANCE AOC</td>
<td></td>
</tr>
<tr>
<td>DANCE Elective/technique</td>
<td></td>
</tr>
<tr>
<td>Outside AOC</td>
<td></td>
</tr>
<tr>
<td>Arts Elective</td>
<td>Elective</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year Three</th>
<th>DANCE 241 or 242</th>
</tr>
</thead>
<tbody>
<tr>
<td>DANCE 264A</td>
<td>DANCE 336</td>
</tr>
<tr>
<td>DANCE AOC</td>
<td>DANCE AOC</td>
</tr>
<tr>
<td>DANCE Elective/technique</td>
<td>DANCE Elective/technique</td>
</tr>
<tr>
<td>Outside AOC</td>
<td>Outside AOC</td>
</tr>
<tr>
<td>Arts Elective</td>
<td>Elective</td>
</tr>
</tbody>
</table>
### 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, 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

1. Required Health Studies Courses: (16)
2. Required Kinesiology Courses: (three)
   - KIN 222, 317, 330

#### Required Courses from other departments: (nine)

- BIOL 230, 239, 273
- CHEM 123, 123L, 124, 124L
- CS 316
- PSYCH 101; SOC 101

#### Restricted electives: (four)

- One of: ENGL 109 or 210C (recommended for Year One or Two)
- One of: PHIL 226, 258 (recommended for Year Four)
- Two of: BIOL 211, 240, 241, 437, 441, 454, 455
- HLTH 350, 407

#### Free electives:

- 12 term courses selected in consultation with the student’s advisor.

*If 433 option taken, an additional elective, presumably at the fourth-year level and approved by the student’s advisor, is required.

#### Course Sequence

<table>
<thead>
<tr>
<th>Year One (Co-op and Regular)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td><strong>Winter</strong></td>
</tr>
<tr>
<td>HLTH 101</td>
<td>HLTH 102</td>
</tr>
<tr>
<td>BIOL 230</td>
<td>BIOL 273</td>
</tr>
<tr>
<td>CHEM 123</td>
<td>CHEM 124</td>
</tr>
<tr>
<td>CHEM 123L</td>
<td>CHEM 124L</td>
</tr>
<tr>
<td>SOC 101</td>
<td>PSYCH 101</td>
</tr>
<tr>
<td>One Elective</td>
<td>One Elective</td>
</tr>
</tbody>
</table>

| Regular Program |  |
|----------------|  |
| **Year Two**   |  |
| **Fall**       | **Winter** |  |
| HLTH 220       | HLTH 210   |  |
| HLTH 245       | HLTH 346   |  |
| KIN 222        | BIO 239    |  |
| KIN 317        | KIN 330    |  |
| One Elective   | Two Electives |  |

| **Year Three** |  |
|----------------|  |
| HLTH 341       | HLTH 340   |  |
| HLTH 349       | HLTH 344   |  |
| Four Electives | HLTH 348   |  |
|                | CS 316     |  |
|                | Two Electives |  |

| **Year Four**  |  |
|----------------|  |
| HLTH 431 or 433 | HLTH 432 or elective* |  |
| HLTH 442       | HLTH 443   |  |
| Three Electives | HLTH 445   |  |
|                | Two Electives |  |

| Co-operative Program |  |
|----------------------|  |
| **Year Two**         |  |
| **2A (Fall)**        | **2B (Spring)** |  |
| HLTH 220             | HLTH 346     |  |
| HLTH 245             | HLTH 348     |  |
| KIN 222              | HLTH 349     |  |
| KIN 317              | BIO 239      |  |
| One Elective         | KIN 330      |  |
| One Elective         | One Elective |  |
Health Studies/Kinesiology
Kinesiology/Health Studies
Joint Honours Degree Program
There are significant numbers of students within Human Kinetics and Leisure Studies whose interests potentially encompass both the Kinesiology and Health Studies programs. The following Joint Honours program is offered through both the Regular and the Co-operative format of study to accommodate those students and to best prepare them for jobs that require backgrounds in both Kinesiology and Health Studies.

Degree Requirements for Joint Honours include:
1. 44 term courses including -
   Health Studies required courses (ten):
   HLTH 101, 102, 245, 341, 348, 349, 431/432 or 443/elective*, 442, 445
   Kinesiology required courses (13):
   KIN 102, 103, 200, 222, 252, 255, 300, 317, 321, 330, 335, 354, 470
   Outside Required (12):
   *SCI Division
   Course Substitution
   In the case of PHYS 103 and MATH 106 students may elect to take full-year courses in either subject in the appropriate department.
   Kinesiology Electives: 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.
   Electives: Of the remaining 11 term courses, five 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:
1. Required Kinesiology Courses:
   KIN 102, 103, 200, 222, 252, 255, 300, 317, 321, 330, 335, 354, 431 or 433, 470.
2. Required Courses from other departments:
   *SCI Division
4. Electives: Of the remaining 11 term courses five must be chosen from outside the Department of Kinesiology.
### Course Sequence

**Honours and General Program**

#### Year One  
*(Common to Regular and Co-operative programs)*

<table>
<thead>
<tr>
<th>Term</th>
<th>Course Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>KIN 102, KIN 103, BIOL 230, MATH 106 or 113A, PSYCH 101, Two Electives</td>
</tr>
<tr>
<td>Winter</td>
<td>KIN 255, BIOL 233, PHYS 103</td>
</tr>
</tbody>
</table>

Students may choose a computer science course in place of an Elective in Year One. CS 102 must be completed by the end of 3A or 3N.

#### Regular Program

**Year Two**

<table>
<thead>
<tr>
<th>Term</th>
<th>Course Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>KIN 200, KIN 222, SOC 101, PHYS 105, Elective</td>
</tr>
<tr>
<td>Winter</td>
<td>KIN 252, KIN 321, KIN 335, KIN 354, CHEM 124</td>
</tr>
</tbody>
</table>

#### Year Three

<table>
<thead>
<tr>
<th>Term</th>
<th>Course Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>KIN 300, KIN 317, Five Electives</td>
</tr>
<tr>
<td>Winter</td>
<td>KIN 330†, KIN 335, KIN 354</td>
</tr>
</tbody>
</table>

#### Year Four

<table>
<thead>
<tr>
<th>Term</th>
<th>Course Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>KIN 431† or 433†, KIN 470†, Five Electives</td>
</tr>
<tr>
<td>Winter</td>
<td>KIN 470†, Five Electives</td>
</tr>
</tbody>
</table>

#### Co-operative Program

<table>
<thead>
<tr>
<th>Term</th>
<th>Course Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2A Fall</td>
<td>KIN 200, KIN 222, SOC 101, PHYS 105, Elective</td>
</tr>
<tr>
<td>2B Spring</td>
<td>KIN 252, KIN 300, KIN 321, KIN 335, KIN 354</td>
</tr>
<tr>
<td>3A Winter</td>
<td>CHEM 124, KIN 300, Five Electives</td>
</tr>
<tr>
<td>3B Fall</td>
<td>KIN 317, Four Electives</td>
</tr>
<tr>
<td>4A Spring</td>
<td>KIN 431† or KIN 433†, KIN 470†</td>
</tr>
<tr>
<td>4B Winter</td>
<td>Five Electives</td>
</tr>
</tbody>
</table>

### Note

*All students in Year One are Honours students.†For Honours students only.*

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### Human Kinetics and Leisure Studies

**Kinesiology**  
Recreation and Leisure Studies

### Joint Honours Degrees

Joint Honours degrees with Recreation and Leisure Studies, Psychology, and Economics are available in addition to that with Health Studies (p. 11.9). Students should consult with the Undergraduate Officer in *both* departments regarding specific course sequences, course or credit requirements, and minimum averages.

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### Department of Recreation and Leisure Studies

The Recreation and Leisure Studies program contains a core of courses in leisure studies, research, and management. Recreation and Leisure Studies electives provide students with the opportunity to specialize in an Area of Concentration which reflects a desired academic and career path.

#### Degree Requirements

1. **Recreation courses (minimum of 20):**
   a) **Required (11):**
      - REC 100, 201 or 205, 209, 210, 220, 230, 250, 270, 371, 470, and 471.
   b) **Recreation Electives (minimum of nine):**
      Each student must complete additional Recreation electives to meet the required minimum of 20. Recreation courses.

2. **Courses outside the Department of Recreation and Leisure Studies:**
   a) **Required:** (seven)
      - PSYCH 101  
      - SOC 101  
      - CS 100. Students with computer knowledge may take CS 102 with approval of the Undergraduate Associate Chairman.
      - Select one course from four of the following seven categories (Restricted Electives):
         i) BUS 121 or ECON 101  
         ii) A Fine or Performing Arts or Language course other than English  
         iii) GEOG 101 or ENV S 195  
         iv) A Science Faculty course  
         v) A Health Studies or Kinesiology course  
         vi) A Political Science or History or Philosophy course  
         vii) An English course
   b) **Non-Recreation Electives:** (maximum of 13)

3. **Total number of courses to complete degree is 40.**
## Course Sequence

### Year One (Co-op and Regular)

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>REC 100, 210</td>
<td>REC 230, 250</td>
</tr>
<tr>
<td>SOC 101</td>
<td>PSYCH 101</td>
</tr>
<tr>
<td>CS 100</td>
<td>One Recreation Elective</td>
</tr>
<tr>
<td>One Restricted Elective</td>
<td>One Restricted Elective</td>
</tr>
</tbody>
</table>

### Regular Program

#### Year Two

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>REC 201*, 209, 220</td>
<td>REC 270</td>
</tr>
<tr>
<td>One Restricted Elective</td>
<td>Two Recreation Electives</td>
</tr>
<tr>
<td>One Recreation Elective</td>
<td>One or two Non-Recreation Electives</td>
</tr>
<tr>
<td>One or two Non-Recreation Electives</td>
<td>Two or three Non-Recreation Electives</td>
</tr>
</tbody>
</table>

#### Year Three

<table>
<thead>
<tr>
<th>REC 371</th>
</tr>
</thead>
<tbody>
<tr>
<td>One Recreation Elective</td>
</tr>
<tr>
<td>Two Non-Recreation Electives</td>
</tr>
</tbody>
</table>

#### Year Four

<table>
<thead>
<tr>
<th>REC 470</th>
</tr>
</thead>
<tbody>
<tr>
<td>One Recreation Elective</td>
</tr>
<tr>
<td>Two Non-Recreation Electives</td>
</tr>
</tbody>
</table>

### Co-operative Program

#### Year Two

<table>
<thead>
<tr>
<th>2A (Fall)</th>
<th>2B (Spring)</th>
</tr>
</thead>
<tbody>
<tr>
<td>REC 201*, 209, 220</td>
<td>Two Recreation Electives</td>
</tr>
<tr>
<td>One Restricted Elective</td>
<td>Two Non-Recreation Electives</td>
</tr>
<tr>
<td>One or Two Recreation Electives</td>
<td>One Restricted Elective</td>
</tr>
</tbody>
</table>

#### Year Three

<table>
<thead>
<tr>
<th>3A (Winter)</th>
<th>3B (Fall)</th>
</tr>
</thead>
<tbody>
<tr>
<td>REC 270</td>
<td>REC 205*, 371</td>
</tr>
<tr>
<td>One or Two Recreation Electives</td>
<td>One or two Recreation Electives</td>
</tr>
<tr>
<td>Two Non-Recreation Electives</td>
<td>Two or three Non-Recreation Electives</td>
</tr>
</tbody>
</table>

#### Year Four

<table>
<thead>
<tr>
<th>4A (Spring)</th>
<th>4B (Winter)</th>
</tr>
</thead>
<tbody>
<tr>
<td>REC 470</td>
<td>REC 471</td>
</tr>
<tr>
<td>One Recreation Elective</td>
<td>Two Recreation Electives</td>
</tr>
<tr>
<td>Two Non-Recreation Electives</td>
<td>Two Non-Recreation Electives</td>
</tr>
</tbody>
</table>

*Students must take one of REC 201 or 205.

## Joint Honours Degrees

Joint Honours degrees are available with Geography, Man-Environment Studies, Kinesiology, Psychology, Social Development Studies, Sociology and Music. For Joint Honours programs, where the Department of Recreation and Leisure Studies is the home department, the requirements will be:

1. Department of Recreation and Leisure Studies core requirements (11 term courses)
2. All non-department Restricted Electives (7 term courses)
3. Joint Honours requirements from the second department.
4. Additional Department of Recreation and Leisure Studies Electives (minimum 7 term courses)
5. A minimum of 40 term courses in total
6. Major average requirements for each department must be maintained. (The overall average is that of the home department).

Further information concerning Joint Honours programs may be obtained from the Undergraduate Officer and the student undergraduate handbook.

## Options

An Option is a specified combination or grouping of courses which provides the student with an emphasis in a particular discipline.

Options are available with Business, Canadian Studies, Legal Studies, Public Administration, and Women's Studies. For specific course requirements, consult with the Undergraduate Officer and the student undergraduate handbook.

The Department of Recreation and Leisure Studies has developed a Parks Option for Recreation and Environment and Resource Studies students. The Option consists of five core and three optional term courses.

## Minors

A Minor is a group of approved courses taken by an Honours student in a subject area outside of Recreation and Leisure Studies. Minors are available in most departments at Waterloo. Students interested in pursuing a Minor should consult with the department offering the Minor.
Independent Studies Program
Independent Studies: An Opportunity for the Individual to Develop an Independent Program of Study

Independent Studies is a small undergraduate program formerly known as Integrated Studies. The program serves students who wish to create their own, self-directed, plan of study. In many cases these plans of study include a perspective that goes beyond that of a single discipline. Students enrolling in Independent Studies from high school must spend at least four terms in "pre-degree phase." During this time they study by working individually with I.S. Faculty or Professors, setting up and/or attending seminars, attending conferences and workshops, and perhaps taking courses. At the end of their pre-degree phase, they put together a degree project that they can complete in their final two terms in I.S., when they will be in "degree phase." Each student must find two non-I.S. University of Waterloo faculty supervisors to oversee this project, which must also be approved by the Academic Board of the program. If a student is transferring from another university program or coming back to university as a mature student, academic credits they have obtained before coming to I.S. may reduce their time of enrollment in I.S. to a minimum of four terms.

In addition to the emphasis on self-directed learning, Independent Studies has a tradition of student involvement which ensures student input in decisions which maintain an environment conducive to independent study. Committees include Council, Executive Committee, Joint Committees (Review and Evaluation, Personnel, and Admissions), and In-House Committees such as Compucom (Computers) and Space Committees.

Academic Director
Dr. Anne Innis Dagg
The Academic Director of Independent Studies is a University faculty member who is responsible for administration of the program. She serves as a link between the program and the rest of the university community including the Academic Board. The Academic Director provides students with administrative assistance and academic counselling for their programs of study.

Maurice Constant
Maurice is an Adjunct Professor in the Department of Systems Design Engineering. In addition to engineering, his academic background includes the life sciences (physiology and biochemistry). Professionally, he is also a maker of documentary films and is engaged in projects with the CBC, TV Ontario, the National Film Board and the IMAX Corporation. He founded a Film Production Program at Conestoga College in 1968. As a consultant and designer, his work includes: pavilions at Expo '67, an air traffic control system and a teleconferencing system for the Federal Government and a CAD (Computer Aided Design) system for the Ontario Government. Areas of interest include: human communications (interpersonal, cross-cultural, mass media, human-machine systems); computer-mediated human communication systems (information technology, teleconferencing, automated office) and their impact on society; technology and society; computer graphics, computer animation and computer-generated sound; design methodology; the analytic and creative processes; aesthetics and design; history and philosophy of science; systems theory (the behaviour of complex systems, biological, social, industrial, political, ecological); environmental perception; major exhibition design; film and TV production.

Anne Innis Dagg
Although she is now Academic Director, Anne continues to work academically with students in I.S. as she has for the past nine years. Since she has a PhD in biology, she has met with students interested in areas such as field ecology, the brain, human physiology, reproduction, evolution, and sociobiology. As a writer, she is involved with the Writers' Workshop in which I.S. members bring their poems or stories to be discussed. As a feminist, she helps organize women's groups and encourages discussion on such things as sexist language and women's place in society. Because she has been involved in campus activities since 1959, she is able to direct students to many resources that should prove helpful to them.

Faculty *
M. Constant, BSc (Toronto)
A.L. Dagg, BA, MA (Toronto), PhD (Waterloo)
H. Huertas-Jourda, BA (Florida), MSc (Waterloo)
M. Lippincott, BA, MA (Delaware), PhD (Toronto)
J. Pauwels, Licenciate (Ghent), MA (Toronto), PhD (York)
H. Woodhouse, BA (Exeter), MA (McMaster), PhD (Toronto)

* Faculty members are on definite term, part-time contracts and subject to possible change.
Heidi Huertas-Jourda
Heidi is primarily interested in the interface between mind, body, behaviour, and what we label as external to these. She explores this interest through her work as a marriage and family therapist, in work in dreams and imagery, and in explorations of the political and personal needs of women. Her focus is on the interdependence of the system and how a particular event can change the system. Heidi’s background also includes working with gestalt, psychodrama, neurolinguistics, and women’s groups. Other interests are alternative world views as expressed by Gary Zukov, Fritjof Capra, and Bruce Holbrook. Her current research is in the area of the science question in feminism, feminist theology, and psychology and politics. She enjoys working with students interested in these or related fields.

Mark Lippincott
Mark has a doctorate in political theory, with minor areas in comparative politics, American politics and constitutional law. He takes an interdisciplinary approach to his primary interest in modern political movements, combining elements from ancient philosophy and myth, existentialism, Marxism, aesthetics, psychology and sociology. As well as academic teaching experience, Mark has worked as an editor/researcher for studies in school integration, a community health program and the Bertrand Russell Editorial Project. He has recently completed an essay on the ideology of power in 1984 for an anthology on George Orwell and he is currently working on a book entitled Albert Camus’ Theory of Rebellion.

Jacques Pauwels
Jacques has a Licenciate Degree (MA) and a PhD in History as well as an MA in Political Science, and he is currently working on a Doctorate in the same field, specializing in Public Administration and Policy Analysis. In History his main interests concern social-economic and intellectual developments in Europe in the 19th and 20th centuries, and Nazi Germany in particular. He has published a book, Women, Nazis and Universities: Female University Students in the Third Reich (1984), as well as a number of articles, including one on certain aspects of the Canadian Role in World War II. As for Political Science, he is interested primarily in bureaucratic theory and practice (especially Max Weber’s ideas on bureaucracy), neo-Marxist views of the state, and Canadian foreign investment policy; an essay of his on the Foreign Investment Review Agency (FIRA) was recently published in The Osgoode Hall Law Journal. Jacques would be pleased to work with students in these disciplines, and he is also prepared to help students with foreign language interests and needs, as he is fluent in French, German and Dutch, and has a solid background in Latin.

Howard Woodhouse
Howard has done graduate work in both philosophy and history and philosophy of education, holding a doctorate in the latter. He therefore welcomes students wishing to work in these and other areas. Howard is particularly interested in alternative education (such as I.S. itself), the history of educational thought, the impact of science on university and secondary education, and knowledge and its relation to social institutions in general. Before coming to I.S. Howard taught in an African university and has published numerous articles on African education, culture and dependency, which are ongoing interests of his. He considers one of his tasks as an Academic Advisor is to enable students to acquire the research tools and writing abilities desirable in their chosen disciplines. Vitaly concerned about teaching, Howard also operates an educational consultancy service, one of whose aims is instructional development. Howard is bilingual.

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. Students enrolled in courses offered by other faculties are subject to the rules and regulations of the host faculty governing such matters as course add and drop procedures and deadlines and grading. The latter may include the reversion of marks of “INC” (Incomplete) and “NMR” (No Mark Reported) to F after a specified period of time. Students should consult the appropriate section of this Calendar pertaining to the specific faculty and its requirements.

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 Faculty. This activity has promoted a variety of seminars (for example, alternative education; political and legal issues; gender roles; French Conversation), ongoing meetings such as the Writers’ Workshop and Women’s Groups, and special film series.

Independent Studies
Faculty
Approach to Resources
Term-End Reviews

Students document the structure and pursuit of their studies as their programs develop. At the beginning of each term in their "pre-degree phase" they hand in a Term Plan which outlines what they plan to achieve during that term and how they plan to achieve it. At the end of each term they complete and hand in a Term Performance Report which describes what they actually accomplished. The Term Plans and Term Performance Reports are reviewed by the Review and Evaluation Committee which determines if the student is allowed to proceed in the program. Each student's Term Plans and Term Performance Reports, together with letters describing what other academic work he or she has completed while at I.S., provide an invaluable resource for the preparation of the degree project and the Description of Studies which is included in the B.I.S. Transcript package.

Length of Registration

Students in good standing may register in the Program for up to eight terms. Registration beyond these terms will be at the discretion of the Executive Committee.

Degree Process

While students may take and receive grades for regular university courses, the degree awarded is not based on an accumulation of course credits, but on an evaluation made by the Academic Board and the appointed supervisors during a formal candidacy period. The Bachelor of Independent Studies (B.I.S.) degree is a three-year general bachelor degree. However, each degree program is evaluated on its own merits.

When students are ready to enter the degree phase, they present a written application to the Academic Board for Independent Studies documenting their level of achievement and their plans for their final degree period. The Board, consisting of faculty members of the University appointed by Senate, interviews the applicants to determine their preparedness for degree candidacy.

Accepted degree candidates then work under appointed supervisors (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.

Examples of Individual Studies

Diane became so interested in drama while attending St. Lawrence College in Quebec, that she enrolled in Theatre/Production at Ryerson Polytechnical Institute. She continued to work in theatre after graduating from Ryerson until 1983, when she enrolled in I.S. During her first years here she worked with professors of history, anthropology and fine arts on costume history, decorations, and culture of native peoples. She also attended seminars on I.S. on film production and became familiar with the use of computers. Her B.I.S. project will address the specific question “How has Micmac clothing changed through recorded history?” and will discuss not only changes that occurred because of interactions with other tribes and with Europeans, but also what raw materials were used for clothing and decoration, and how clothing related to gender, age, and lifestyle. The information she collects for her thesis will be invaluable as a resource for costume designers involved with theatre about native people.

Jill spent three terms in the School of Architecture at the University of Waterloo before switching to I.S. She enjoyed the architecture courses, but found that they did not allow enough time to explore her areas of interest in depth. Since she has been at I.S., she has specialized in medieval and renaissance architectural history, taking courses in medieval history, in Italian renaissance art, and in Latin. In 1985, she attended a conference at the Centre for Medieval Studies at the University of Toronto dealing with all aspects of medieval towns. Most of her time, however, has been spent in reading books dealing with her specialized area. She has been guided by a few of the I.S. Academic Advisors and by a professor of planning who will be one of the supervisors for her degree project. She has also discussed her work with professors at York University, Western, and the Pontifical Institute for Medieval Studies. Recently, she spent five weeks in England visiting medieval towns and archives.

Doug's academic career began when he retired two years ago. He joined the Air Force when he was young, and then had to earn a living, so he had never been able to attend university. Doug is interested in the effects, mental and physical, of aging in people.
He believes that the quality of a person's life is important, no matter what his or her age. This ideal led him at age sixty to attempt and succeed at the triathlon athletic event. He now attends fitness classes at the Athletics Building for an hour three times a week. While at I.S., Doug has usually taken three courses, related to gerontology, a term, with extra work on topics that interest him. One such topic is the correlation of quality of sleep with depression. When he completes his academic work this year, he will have both a Bachelor of Independent Studies degree and the Diploma in Gerontology.

Pat learned about Independent Studies while browsing among university calendars in Ottawa. She liked the idea of being able to design her own academic program, something she had not been able to do at high school. Because her long range interests centred on world food problems, especially those in the developing world, her first year she has taken selected courses in economics, geography, environmental studies, history, philosophy, and English. In addition, she has attended five seminars or groups offered by the I.S. program itself. Their subject areas were politics, pre-industrial Europe, systems design, film and video production, and women. She has found the small group discussions in I.S. to be an especially fruitful way of learning.

Before he came to I.S., Shane produced and directed a series of educational and documentary films in countries as far-ranging as Papua New Guinea, Panama, and the Solomon Islands. His interests had also encompassed the field of mental health and psychology, in which he had attended courses at universities in Canada, Brazil, and France. At I.S., he has combined these two areas in studying the use of motion pictures as an educational tool in the field of mental health. He has taken some courses at the university, written an undergraduate thesis, produced a half-hour video on psychotherapy, and worked for a term as a psychology intern in a mental health program in the United States.

I.S. has a new feature, that of students transferring into the program from another area of the campus for a term or two and then transferring out again. This enables them to study some area of interest in depth using our resources without working toward a B.I.S. degree. Teresa is the first person to take advantage of this option. Her studies at the University of Waterloo have led her through two terms in the Co-op Accounting program and five terms in a Philosophy and Russian program. She enjoyed her courses but found that several topics of special interest to her were not discussed in much depth. In preparation for her last year of studies, she felt that within her structured program of studies she had not been able to explore her interests as much as she desired. She therefore decided to transfer for several terms to the Independent Studies Program, where she is pursuing work in mysticism and spiritual healing. Eventually she plans to integrate what she has learned into her philosophy thesis.

### Computing Facilities

The Independent Studies Program has access to all the facilities offered by the Department of Computing Services through four Volker-Craig terminals and two IBM-type machines situated within the program. Students may also use any of the many public terminals on campus. These facilities include the CMS or UNIX time-sharing networks supported by IBM and VAX equipment respectively. A small sample of these facilities includes word-processing, graphics on SUN workstations, programming with all the languages supported by Waterloo, and data-base searches using SPIRES, GEAC and WATMARS. SPIRES allows you to search the university's film library containing in excess of 44,000 entries. The GEAC Library System contains items located in most of the libraries on campus. A similar service, WATMARS (Waterloo machine-assisted reference service) is an online interactive retrieval system used to perform literature searches.

In addition to these computer mainframe systems, the program also provides the students with microcomputers. This includes an IBM AT with a 40-megabyte hard drive, and an IBM XT with a 10-megabyte hard drive. Each has a mouse, a printer, an amber monitor and an ATI Graphics Solution Card. Software includes Word Perfect and Microsoft Windows. They have access to the same mainframe facilities as the Volker-Craig terminals. Two Macintosh Plus machines, one with a 10-megabyte hard drive, are available, with a printer connected through AppleTalk. The system is supported with a variety of software such as MacPaint, MacDraw, Microsoft Word and other useful utilities. Additionally, Independent Studies is participating in Project ARIES, an experiment between several computer manufacturers and the University. Some students may borrow laptop IBM-type machines for use in their studies.
**Video Equipment**

The program offers students an opportunity to use VHS video equipment to make a video production. The facilities are centred around a Hitachi VK-C870 camera and a five head portable Hitachi video cassette recorder (VCR) with three lights, stands, and filters. Using the Zenith VCR and the Hitachi VCR together allows students to edit their work into a rough-cut video. The collection also includes high quality omni-directional and directional microphones and four lapel microphones. These can be mixed onto a single track or into stereo using our six-channel mixer. The program also offers students training in the use of this equipment and access to film courses or seminars on film production techniques.

**Graduate Opportunities**

The responsibility that students in this Program must assume for their studies ensures that graduates will possess a high level of organizational skills, self-discipline and motivation combined with their attested academic development. These capabilities have prepared them well for further endeavours and have proven advantageous in their search for employment. Graduates have been remarkably successful in building upon their degree programs to further their formal education. A sizeable number have gained graduate degrees, many on scholarship, from this and other Canadian universities and institutions as diverse as Columbia Teachers’ College, Massachusetts Institute of Technology, and Cambridge University. In addition many have completed professional training in law, education, medicine, business and other areas. Others have tailored their programs to prepare themselves to meet specific job requirements, or have started their own companies.

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**General Admissions Information**

Students who wish to enter Independent Studies must have academic potential as well as motivation, and must plan to benefit from the resources of the program and the university.

I. Academic Potential

Students must be able to do academic work at university level. Evidence of academic ability may be demonstrated by one or more of the following:

a) The completion of Ontario Grade 13 or equivalent (refer to Chapter 2 for details on admission categories, requirements, and procedures);

b) The successful completion of some university level courses;

c) Written information from a teacher or professor attesting to this;

d) Other evidence such as independent scholarly work.

II. Motivation

Students must be so motivated that they can pursue their academic work independently. The committee would like evidence that a student has worked on his or her own on projects outside of regular work or studies (i.e. started own business, built own computer, worked on social or political issues, prepared original reports). Letters attesting to this motivation are important and should be specific, giving examples of projects undertaken.

III. Plans

Students should be prepared to structure their studies in accordance with Independent Studies’ philosophy and make appropriate use of the resources available on the UW campus. Plans should include:

a) An independent study component which may be supplemented with courses;

b) A major academic component that is not only technical, only creative, or only artistic.
Admissions Process

I. Letter of Application
The most important part of an application to Independent Studies is an autobiographical letter which must be submitted before an admission interview will be scheduled. This letter should deal with the following areas:

a) Previous educational experience (particularly at the senior high school or post-secondary school level), indicating degree of satisfaction with the regular system or a need for an alternative. Applicants with limited formal education are favourably received if they can demonstrate an ability to handle university-level work.

b) Reasons for wishing to enter Independent Studies should include a statement indicating an understanding of the nature of the Program and a need for an alternative in university education.

c) An outline of the type of exploration the applicant proposes to undertake. The Committee does not expect that the proposed studies will be completely formulated; however, applicants should consider carefully what their academic goals are and how they plan to achieve them.

II. Reference Letters
Letters of reference should be submitted from two or more people who can attest to the applicant's ability to work on his/her own.

III. Academic Transcripts
Transcripts from previous educational institutions should be included with the letter of application. If an applicant is currently enrolled at the University of Waterloo, these transcripts need not be submitted but will be obtained from the Registrar.

IV. Independent Work
On the day of the interview the Committee will be pleased to examine examples of academic or artistic work if the applicant so desires.

V. Interview
Once the application has been received, an interview will be scheduled with the Admissions Committee which normally includes several students, several faculty members, a person from the Registrar's Office, and the Academic Director.

Interview questions focus on the autobiographical letter, exploring the applicant's need for an alternative within the university, and the feasibility of the proposed studies.

The Committee has two primary functions: first, to decide who should be admitted, and second, to advise applicants, whether they are accepted or not, on a course of action suited to their stated goals.

The Committee will inform applicants of its decision on the same day as the interview.

Please send information to:
Dr. Anne Innis Dagg
Academic Director
Independent Studies Program
University of Waterloo
Waterloo, Ontario N2L 3G1
Faculty of Mathematics
Faculty of Mathematics

Introduction
Prior to 1967, Honours and General Mathematics programs were offered through the Faculties of Arts and Science. The continued growth and development of these programs led to the formation of the Faculty of Mathematics as a separate faculty in January, 1967. The Faculty consists of the Departments of Applied Mathematics, Combinatorics and Optimization, Computer Science, Pure Mathematics, Statistics and Actuarial Science, and a Division of Mathematics for Industry and Commerce. The degree Bachelor of Mathematics (BMath) is awarded upon successful completion of three-year General and four-year Honours programs.

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.

Faculty Brochure
The Faculty of Mathematics publishes a brochure specifically designed for Ontario secondary school students. Copies are available in school guidance offices, or on request from either the Mathematics Undergraduate Office or the Assistant Registrar, Faculty of Mathematics.

Admission

Current Admission Practices and Standards For Ontario Secondary School Applicants
The objective of any Admissions Committee is to admit the applicants who are best prepared for the program in question. In the Faculty of Mathematics, since there are traditionally more qualified applicants than places available, the admissions process is basically a competition for these places. The majority of students admitted to the Faculty have averages of 75% or higher. Students with lower averages may be admitted, however, if there is additional evidence to indicate an exceptional aptitude and interest in Mathematics.

Obviously, when the Admissions Committee is making its decisions, high grades are important. Academic performance, in particular, represents the single most influential factor in the decision process, and generally speaking, if a student's Ontario Academic Course (OAC) or Grade 13 marks are significantly higher relative to those of other applicants, the Admissions Committee will normally issue an Offer of Admission with only limited reference to other factors. For most applicants, however, the factors influencing the selection process include much more than simply grades from the senior year(s) of secondary school, and these other factors can represent a very important part of the final decision process. The Faculty recognizes, for example, that many excellent candidates for admission have chosen to develop their talents simultaneously in both academic and extra-curricular pursuits, and we feel that it is essential that such students receive every possible consideration for admission. In addition to superior academic performance, the Faculty is looking for students whose activities indicate significant development as well-rounded individuals with potential for leadership. These factors are particularly important for students in Co-op programs, since they are required to present themselves in the most favourable light to potential employers for their Co-op work terms.

All applicants to the Faculty of Mathematics are provided with a Supplementary Information Form as part of the package of materials sent by the University to acknowledge their application for admission. It is most important that applicants return this completed form to ensure that the Admissions Committee can make an informed decision. The information provided on the form, in many instances, allows the Committee to differentiate between applicants whose marks are relatively comparable.

As reflected by the nature of the questions on the Supplementary Information Form, the Admissions Committee takes a wide variety of factors into account during the selection process. The major factors, considered in conjunction with the applicant's OAC or Grade 13 marks, are listed in the Admission Requirements chart on page 2:7. A more detailed description of the entire admission process can be found in the Faculty of Mathematics brochure.

Admission as a Mature 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 a mature student. However, as a minimum, such applicants should have covered all the material in the required OAC or Grade 13 mathematics courses (see page 2:7). It is preferable that these courses be taken through regular day school classes at a local secondary school, but alternatives include night school or summer school classes, or possibly correspondence courses through the Independent Learning Centre of the Ontario Ministry of Education. Applicants are also strongly encouraged to write the Descartes Mathematics Contest, administered by the Faculty of Mathematics for students in their senior year(s) of secondary school, to enhance their chances of admission. (Further details about the Descartes Contest, and how you can arrange to write it, can be obtained by writing to: The Canadian Math Competition, c/o Faculty of Mathematics.) Each application will be considered on its own merits by the Admissions Committee. (See also Part-Time Studies on page 13:4.)
Advanced Standing

1. Applicants From Other University of Waterloo Faculties

Students in other University of Waterloo faculties who wish to apply for transfer to the Faculty of Mathematics may not preregister for a Mathematics program during the normal University preregistration periods. Instead, students in this position are encouraged to preregister for their first-choice program within their own faculty and apply for a transfer to Mathematics following the guidelines below.

Normally, internal transfer applications for on-campus studies in Mathematics are considered only for September admission to Honours programs. When special circumstances warrant, however, exceptions will be considered. Applicants should have high-quality academic records and have demonstrated that they can be successful in an Honours Mathematics program. Because of the traditional discrepancy between the number of applicants and the limited number of positions available for advanced-standing transfers, the selection process for admission is a competitive one. In recent years, the majority of students admitted have had consistent B grades or better in their previous University of Waterloo course work.

Application forms for September admission will be available from the Registrar's Office or Mathematics Undergraduate Office (MC 5115), usually beginning in April each year. Completed application forms and all supporting documentation should be received by the Registrar's Office no later than June 1 in order to guarantee consideration for September admission. Admission decisions will normally be conveyed in writing to applicants before the end of June. Those students offered admission will be required to consult with a Mathematics Faculty Advisor in July to discuss their revised preregistration course selection.

2. Applicants From Other Post-Secondary Institutions

Normally, external applications for advanced-standing admission to on-campus studies in Mathematics from students at other post-secondary institutions are considered only for September admission to Honours programs. When special circumstances warrant, however, exceptions will be considered. Applicants should have high-quality academic records and have demonstrated that they can be successful in an Honours Mathematics program. Because of the traditional discrepancy between the number of applicants and the limited number of positions available for advanced-standing transfers, the selection process for admission is a competitive one. In recent years, the majority of students admitted have had consistent B grades or better in their previous University of Waterloo course work.

Application packages for applicants from other post-secondary institutions can be obtained from the Registrar’s Office at the University of Waterloo, usually starting in November each year. Applicants must apply through the Ontario Universities’ Application Centre and provide supporting documentation directly to the Registrar’s Office at the University of Waterloo. This documentation must include official transcripts from all previous academic institutions. To be guaranteed consideration for September admission, all supporting documentation must be received by the University no later than July 1.

3. Transfer Credits

Once students have been admitted to the Faculty of Mathematics, having transferred from outside or from within the University of Waterloo, they will normally be given transfer credit for relevant courses previously taken if (i) a mark of at least 60% or equivalent has been obtained, (ii) a mark of at least 50% has been obtained in a non-mathematics University of Waterloo course or in a University of Waterloo mathematics course specifically designed for mathematics students. A transfer failure will normally be assigned if a mark is less than 50%. Credit might not be granted for a course covering only part of the material contained in a corresponding UW course which is required of students registered in the Faculty of Mathematics. A maximum of ten transfer half-credits per academic year previously taken will normally be given.

Note

Students transferring to the Faculty of Mathematics from other faculties or other post-secondary institutions must successfully complete at least 12 University of Waterloo mathematics half-credits chosen from those courses which may be taken for credit by a student in the Faculty of Mathematics.

4. Double Counting Of Courses For BMath Degree Credit

The Faculty of Mathematics is prepared to count for BMath degree credit only a limited number of courses that have been used, or are being used simultaneously, to obtain a degree in another UW faculty or at another university. Of courses in this category, students will normally be permitted to count a maximum of ten non-math half-credits toward their BMath degree, with a possibility of exemptions (but not degree credit) in selected math courses.

5. 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.

6. Co-operative Programs
Applicants are not normally considered for admission to a Co-operative program beyond the second-year level. Students applying for admission at the second-year level should normally have credit in courses equivalent to the first-year Calculus, Algebra, and Computer Science courses required of University of Waterloo mathematics students. Applicants who cannot be admitted to a Co-operative program will be automatically considered for the Regular program.

Part-time Studies
Students wishing to work toward a BMath degree on a part-time basis must meet the Faculty’s regular admission requirements. The three-year BMath General degree may be obtained entirely by part-time studies. However, as indicated in Table I on page 13:8, the BMath Honours degree involves extensive on-campus full-time residency requirements.

Although mathematics (i.e. ACTSC, AM, C&O, CS, MATH, PMATH, STAT) courses are not normally offered in the evenings or on Saturdays, many part-time students take courses offered by the Faculty of Mathematics via the University of Waterloo Correspondence Program. (See Chapter 1 for more details of this program. A separate brochure is also available.) As well, a reasonable cross-section of non-math courses is available in the evenings, particularly during the Fall/Winter sessions.

Applicants who do not meet the Faculty’s regular admission requirements may be admitted as non-degree/post-degree part-time students at the discretion of the Admissions Committee. Admission as a non-degree/post-degree student does not carry any commitment from the University beyond permitting entry to the course(s) and term(s) specified at the time admission is granted. There is no guarantee of admission for subsequent terms, although repeat applications on a non-degree/post-degree basis are always considered and have rarely been refused in the past (especially applications to take UW correspondence courses where limited on-campus space is not a factor).

After completing some courses on a non-degree/post-degree basis, usually first-year Calculus and Algebra in the UW Correspondence Program, a student may re-apply for admission as a BMath degree candidate. No special application form is required; simply write to the Assistant Registrar, Faculty of Mathematics, in Needles Hall. The Admissions Committee will then review the applicant’s past academic history, including performance in UW courses taken on a non-degree/post-degree basis, to make its decision. If the admission decision is favourable, any relevant courses taken on a non-degree/post-degree basis will be counted toward the

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Admission

BMath degree. Furthermore, any previous academic work completed prior to commencing UW studies will be assessed for possible transfer credit.

Admission to Specialized Programs in Mathematics
Listed below are the three admission categories for the Faculty of Mathematics, accompanied by the corresponding Ontario Universities’ Application Centre (OUAC) codes:

- Co-op (Accounting Options) – WN
- Co-op (including Computer Science) – WT
- Regular (including Computer Science) – WM

Unlike past years, when Math/Chartered Accountancy applicants applied for the WN Co-op category and Math/Management Accounting applicants applied for the WT Co-op category, there is now only one admission category for Math/Accounting students, namely WN: Mathematics – Accounting Options (Co-op), and it includes applicants for both Chartered Accountancy and Management Accounting. Students wishing to pursue one of the Joint Honours Co-op Math/Accounting/Computer Science programs should apply to the Accounting admission category WN rather than WT for Computer Science.

Students interested in registering in the Faculty of Mathematics through St. Jerome’s College have the opportunity to indicate their intention when they receive the package of materials sent by the University to acknowledge their application for admission. However, the same application categories and admission criteria apply.

Once admitted, students identify with a specific program within the Faculty at different year levels, depending upon admission category and particular program of interest. The only students to be admitted to specialized Honours programs in first year are Co-op students who wish to register in one of the following programs:

- Co-op Actuarial Science
- Co-op Applied Math With Engineering Electives
- Co-op Math/Chartered Accountancy
- Co-op Math/Management Accounting

Students in the above Co-op programs need to be explicitly identified in Year One because of the specialized nature of their work-term employment. All other students register in the Faculty Inter-Departmental Honours program in Year One. In subsequent years, beginning with Year Two, students may wish to enter a specialized program or choose to remain registered in the Inter-Departmental Honours program.

For many specialized Honours programs, admission at the Year Two level is normally automatic for students who have successfully completed Year One. However, in the case of restricted enrolment programs, there is a formal admission process. Academic performance in first year and/or the results of personal interviews are normally the main criteria for admission to restricted enrolment programs.
Restricted Enrolment Mathematics Programs

At present, the restricted enrolment programs in the Faculty of Mathematics consist of the following:

- Co-op Math/Chartered Accountancy
- Co-op Math/Management Accounting
- Co-op Teaching Option
- All Computer Science Major Programs (Co-op and Regular)

The Co-op Math/Teaching Option is considered a "Restricted Enrolment Program" only because students must formally apply for admission after completing Year One and are selected for the program through an interview process, not because of any excessive demand for positions in the program. In fact, at present, the number of Co-op work-term placement opportunities exceeds enrolment in the Teaching Option program. Students with an interest in teaching Mathematics and Computer Science are encouraged to pursue this goal by applying for this program.

"In recent years, because sufficient places have been available to meet student demand, it has been possible to suspend the formal Computer Science admission process and allow all students who successfully complete their Year One studies with at least 60% averages into the Computer Science Major program of their choice. Although this suspension of the admission process cannot be guaranteed for future years, it is expected to continue in effect for students commencing their studies in September, 1989. For further details concerning the formal admission process and ongoing eligibility standards for Computer Science Major programs, please consult page 13:16.

In the foreseeable future, the Faculty does not expect that any of its programs not included in the above list will require a formal admission process beyond that involved with admission to the Faculty of Mathematics. However, because of limited resources and varying demands, it is always possible that occasions may arise when other specific programs within the Faculty are not able to accommodate all academically qualified applicants. Every effort will be made to avoid such situations and to provide acceptable alternatives, but the Faculty cannot guarantee in advance that any specific program will be free of enrolment restrictions.

Programs which have had to restrict enrolment, or appear likely to, will be identified, as far as possible, on an on-going basis, and every reasonable effort will be made to publicize such changes to students who may be affected. Related information will be made available through the Mathematics Faculty Undergraduate Office during (pre)registration periods. Students will be expected to take such information into account when planning their courses of study.

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Admission

Academic Programs and
Degree Requirements

Applicants Holding Student Authorizations

A maximum of 5% of the available freshman seats in the Faculty of Mathematics is open to qualified applicants who hold Student Authorizations (visas). [Please note that this quota on foreign student enrolment does not apply to Permanent Residents in Canada (landed immigrants).] This same 5% quota applies to all restricted enrolment Mathematics undergraduate Honours programs for which formal admission occurs beyond Year One (e.g. Computer Science Major Programs). By this approach the Faculty hopes to preserve an appropriate international mix in its undergraduate student population while responding to the demand for places from highly qualified Canadian students.

For complete information regarding admission categories, requirements and procedures, please consult Chapter 2 of this Calendar.

Academic Programs and Degree Requirements

Undergraduate Degrees: New vs. Old

In recent years, the Faculty of Mathematics has offered undergraduate programs leading to the following Bachelor of Mathematics degrees: four-year BMath Honours degree for successful completion of a 44-half-credit Honours program; four-year BMath General degree for completion of a 42-half-credit General program; three-year BMath Pass degree for completion of a 32-half-credit Pass program. However, in the Fall of 1988, the Faculty received approval from the University of Waterloo Senate to reduce the standard number of half-credits required for a four-year BMath Honours degree from 44 to 40. It also received Senate approval to discontinue its four-year BMath General and three-year BMath Pass programs, and to offer in their place a new three-year General program, requiring 30 half-credits, successful completion of which will lead to a three-year BMath General degree.

New vs. Old Degrees: Who is Eligible for What?

Students registering in the Faculty of Mathematics as degree candidates for the first time in the Fall, 1989 term or thereafter will not be eligible to pursue any of the old BMath degrees, namely the 44-half-credit BMath Honours degree, the four-year BMath General degree, or the three-year BMath Pass degree, but must pursue instead one of the new degrees, either a 40-half-credit BMath Honours degree or the three-year BMath General degree. Clearly, students already registered in the Faculty as degree candidates prior to the Fall, 1989 term will continue to be eligible for any of the old BMath degrees, provided they meet all of the relevant degree requirements specified in an appropriate pre-1989/90 University of Waterloo Undergraduate Calendar. However, under certain
circumstances, outlined in Footnotes 2 and 3 to Table I on page 13:8, a subset of such pre-Fall/89 students will also be eligible to pursue one of the new BMath degrees.

Any students who are uncertain about which degrees they are eligible to pursue should consult with their Faculty Advisor.

Three-year General vs. Four-Year Honours Programs: A Comparison
BMath Honours programs are designed for full-time on-campus students who wish to pursue four years of in-depth studies in the Mathematical Sciences. Honours programs are more demanding than the General program, in that they require more in-depth mathematics courses, a higher proportion of mathematics vs. non-mathematics courses, and a larger total number of courses. The three-year BMMath General program, on the other hand, is intended for students who, while they have a definite interest in Mathematics, may prefer more latitude in the depth and breadth of their course selection, or perhaps simply want to limit their studies at university to three academic years rather than four. The course requirements for a three-year BMath General degree allow students to pursue a more general education and include a larger proportion of non-mathematics courses in their program than is the case with Honours programs, a feature which can often appeal, for example, to students seeking a pre-professional university program. Furthermore, since there are no on-campus full-time residency requirements for a three-year BMath General degree, students can pursue such a program on either a full or part-time basis, either on campus or by correspondence through the University of Waterloo Correspondence Program.

Co-op vs. Regular: Degree Requirements and Programs Available
Most of the Faculty's four-year 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. There are a number of Honours programs, however, that are available only in the Co-operative system of study. In the individual program descriptions that follow on pages 13:12 - 13:31, those programs that are offered only for Co-op students are explicitly indicated as such.

Wherever Honours programs are available in both systems of study, the academic degree requirements are identical for both Co-operative and Regular students. Additional degree requirements, pertaining to work terms and written work-report aspects of Co-operative programs, are included in a booklet, 'Co-operative Student Reference Manual', which is available from the Co-operative Education and Career Services Department.

The three-year BMath General program is available only in the Regular system of study.

Satisfying Basic and Complete-Term Registration Requirements for a BMath Honours Degree
As indicated in Table I on page 13:8, the requirements for a 40-half-credit BMath Honours degree include the stipulation that a student must normally complete a minimum of eight "basic" terms, including at least four "complete" terms. (Please consult Footnotes 11 and 12 to Table I on page 13:9 for the relevant definitions of "complete" and "basic" terms.) Normally, all of these terms are ones in which the student is registered as a University of Waterloo BMath degree candidate. However, for some advanced-standing admissions transferring from other University of Waterloo faculties or other post-secondary institutions, exceptions may be warranted, allowing such students to count all or part of their university-level studies prior to admission to the Faculty toward the basic and complete-term registration requirements for a BMath Honours degree.

Commencing with students admitted to the Faculty of Mathematics for the Fall, 1989 term, advanced-standing transfer students will be informed, at the time of their admission and as part of their BMath transfer-credit assessment, to what extent, if any, the normal minimum basic and complete-term registration requirements for a BMath Honours degree will be reduced, based upon their studies prior to admission to the Faculty. Advanced-standing transfer students, who were admitted to the Faculty prior to the Fall/89 term, if they wish to request that their studies prior to admission to the Faculty be similarly assessed, should address their requests, in writing and as soon as possible, to the Math Faculty Standings and Promotions Committee.

Responsibility for Meeting Degree Requirements
Under the Math Faculty's course-credit system, it is each student's responsibility to be aware of all regulations pertaining to his/her program of study. When all requirements for a particular BMath degree have been met, it is the student's responsibility to submit a completed 'Intention to Graduate' form to the Registrar's Office in Needles Hall.

Common Degree Requirements
The usual course load each term for first-year Mathematics freshmen consists of Algebra, Calculus, and Computer Science, regardless of which particular program may be of potential interest in later years, plus two non-mathematics courses which may depend, but not necessarily, upon the program(s) of potential later interest. This commonality of core curriculum, which continues to a large extent into Year Two, permits considerable flexibility for students to change from one program to another within the Faculty. In fact, if non-math courses are chosen judiciously, this flexibility for change can be extended to many programs in other faculties as well.
Tables I and II on pages 13:8 and 13:10 respectively, and their accompanying footnotes, outline in detail the common aspects shared by all BMath programs. Further, degree requirements and recommendations, which depend upon a particular program, are described on pages 13:12 - 13:31.
### Table I - Degree Requirements Common To All BMath Programs

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Four-Year Honours Programs</th>
<th>Three-Year General Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum total half credits</td>
<td>40², ³</td>
<td>30</td>
</tr>
<tr>
<td>Minimum math half-credits</td>
<td>20 - 28⁶</td>
<td>15</td>
</tr>
<tr>
<td>Minimum non-math half-credits</td>
<td>ten⁷</td>
<td>ten</td>
</tr>
<tr>
<td>Minimum Graduating Math Average</td>
<td>60%</td>
<td>60%</td>
</tr>
<tr>
<td>Minimum Graduating Overall Average</td>
<td>60%</td>
<td>60%</td>
</tr>
<tr>
<td>Maximum course attempts allowed</td>
<td>50 half-credits</td>
<td>40 half-credits</td>
</tr>
<tr>
<td>Maximum total failures allowed</td>
<td>six half-credits</td>
<td>eight half credits</td>
</tr>
<tr>
<td>Minimum number of complete terms</td>
<td>four</td>
<td>none</td>
</tr>
<tr>
<td>Minimum number of basic terms</td>
<td>eight, including the four complete terms required above</td>
<td>none</td>
</tr>
<tr>
<td>English Writing Skills</td>
<td>All BMath degree candidates must satisfy an English Writing Skills Requirement. Please see section (6) on page 13:37 for details.</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** All superscripts in Table I refer to the following Footnotes.

#### Footnotes to Table I

1. Table I, in conjunction with Table II on page 13:10, summarizes the degree requirements which are common to all BMath degree programs. Further specific degree requirements and recommendations for individual programs are described on pages 13:12 - 13:31.

2. Commencing with graduates at the May, 1990 Convocation, all students will be eligible to graduate with a four-year 40-half-credit BMath Honours degree, provided that they have been registered for at least one basic term (see Footnote 12 below for the definition of a ‘basic term’) in 1990 or thereafter and they meet all other relevant degree requirements described in this Calendar (allowing the course substitutions specified in Table IV on page 13:11 for students who registered in the Faculty of Mathematics as degree candidates prior to the Fall, 1989 term. Pre-Fall/89 students should also consult the section, “New vs. Old Degrees: Who Is Eligible For What?”, on page 13:5).

3. Commencing with graduates at the May, 1990 Convocation, all students will be eligible to graduate with a three-year 30-half-credit BMath General degree, provided that they have been registered for at least one term in 1990 or thereafter and they meet all relevant degree requirements described in this Calendar (allowing the course substitutions specified in Table IV on page 13:11 for students who registered in the Faculty of Mathematics as degree candidates prior to the Fall, 1989 term. Pre-Fall/89 students should also consult the section, “New vs. Old Degrees: Who Is Eligible For What?”, on page 13:5).

4. The standard total number of half-credits required for a four-year Honours program is 40. However, for some Double Honours BMath programs combining majors within the Faculty (see page 13:23) and some Joint Honours BMath programs with academic disciplines outside Mathematics (see page 13:24), it may be necessary to complete more than 40-half-credits and/or more than eight terms of study to satisfy all relevant course requirements.
9. The term 'math half-credit' includes courses with prefixes ACTSC (Actuarial Science), AM (Applied Mathematics), C&O (Combinatorics and Optimization), CS (Computer Science), MATH (non-departmental Faculty courses), PMATH (Pure Mathematics, and STAT (Statistics).

The actual minimum number of math half-credits required for a four-year BMath Honours degree varies from one program to another within the range specified in Table I above, except for Double Honours BMath programs combining majors within the Faculty (see page 13:23) where some combinations may require more than 28 math half-credits. Individual program requirements are included with the detailed program descriptions on pages 13:12 - 13:31.

Note that students transferring to the Faculty of Mathematics from other faculties or other post-secondary institutions must successfully complete at least 12 University of Waterloo math half-credits chosen from those courses which may be taken for credit by a student in the Faculty of Mathematics.

7. The term 'non-math half-credit' refers to courses offered by other faculties, as well as those with the course prefix MTHEL offered by the Faculty of Mathematics.

Every BMath degree program requires at least ten non-math half-credits and most programs require no more than ten. Some four-year Honours programs, however, such as the Math/Accounting and Math/Business Options, for example, require more than ten specified non-math half-credits. Unless the specific course requirements in a program's individual description (see pages 13:12 - 13:31) include more than ten specified non-math half-credits, it may be assumed that a total of ten non-math half-credits will suffice for that program.

8. i) The 'Graduating Math Average' is based on the specified minimum number of successfully completed math half-credits required by the student's program. (See Footnote 6 earlier.) 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 total number of successfully completed half-credits (40 for four-year Honours programs, 30 for the three-year General program) submitted for the particular degree. It includes all the math courses on which the Graduating Math Average is based and all required non-math courses.

iii) For the Math/Accounting and Math/Accounting/Computer Science programs, students must also achieve an average of at least 70% in all the courses with prefix ACC which are explicitly required for their program.

iv) The averages in i), ii) and iii) above all exclude failures. If a passed course is repeated, only the better mark is considered. For averages i) and ii), if a student successfully completes more than the minimum number of credits, the 'excess' ones with the lowest grades are excluded.

9. A 'course attempt' refers to a course registration not formally cancelled with the Registrar's Office. (See section 4.8 on page 13:35 re: dropping and adding courses and relevant deadline dates.)

10. A course attempt not successfully completed constitutes a course 'failure'. (See section 3.1 on page 13:33 for a complete list of 'failing' grades.)

11. A 'complete term' is one in which a student successfully completes a minimum of five half-credits, at least two of which must be math half-credits, with no failures that term.

12. A 'basic term' is one in which a student's course load consists of at least four half-credits.
Table II – Four-Year BMath Honours Programs: Required Year One and Two Faculty Core Courses/Typical Course Loads

<table>
<thead>
<tr>
<th>Term 1A</th>
<th>Term 1B</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 135 Algebra</td>
<td>MATH 136 Linear Algebra 1</td>
</tr>
<tr>
<td>MATH 137 Calculus 1</td>
<td>MATH 138 Calculus 2</td>
</tr>
<tr>
<td>CS 131 Principles of Computer Science 1</td>
<td>CS 132 Principles of Computer Science 2</td>
</tr>
<tr>
<td>two non-math half credits</td>
<td>two non-math half-credits</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Term 2A</th>
<th>Term 2B</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 235 Linear Algebra 2</td>
<td>STAT 231 Statistics</td>
</tr>
<tr>
<td>MATH 237 Calculus 3</td>
<td>two math half-credits</td>
</tr>
<tr>
<td>STAT 230 Probability</td>
<td>one non-math half-credit</td>
</tr>
<tr>
<td>one non-math half-credit</td>
<td>one additional half-credit</td>
</tr>
<tr>
<td>one additional half-credit</td>
<td></td>
</tr>
</tbody>
</table>

Each of terms 3A, 3B, 4A, 4B:

- three math half-credits
- one non-math half-credit
- one additional half-credit

Footnotes to Table II

1. Table II includes the Year One and Two Faculty core Honours math courses, in the terms they are normally taken, which are required in all four-year BMath Honours degree programs. (In certain cases, course substitutions for the specific courses listed in Table II may be made to satisfy degree requirements. Please consult Tables III and IV on page 13:11.) Further specific course requirements and recommendations which depend upon a particular program are described on pages 13:12 - 13:31.

2. The term 'math half-credit' includes courses with prefixes ACTSC (Actuarial Science), AM (Applied Mathematics), C&O (Combinatorics and Optimization), CS (Computer Science), MATH (non-departmental Faculty courses), PMATH (Pure Mathematics), and STAT (Statistics).

   The term 'non-math half-credit' refers to courses offered by other faculties, as well as those with the course prefix MTHEL offered by the Faculty of Mathematics.

3. In addition to specifying the common required Faculty core courses, Table II also presents a 'typical' course-load mix of math vs. non-math courses. The particular mix presented yields, over the period of eight full-time terms of study, a total of 24 math half-credits, ten non-math half-credits, and six additional half-credits (which can be any blend between math and non-math courses). It is not intended, however, that the mix presented should be a rigid one applicable to all students. It is included only as a guideline for how a 'typical' student might distribute his/her course load over four academic years of study. The actual mix of courses each term, especially in Years Three and Four, will vary from one program to another, depending upon the minimum numbers of math and non-math half-credits required, and from one student to another, depending upon how they wish to select their 'additional' free-choice courses.
Mathematics Course Substitutions

Table III - Advanced vs. Honours Course Substitutions

The number of mathematics courses are offered at two levels for BMath Honours degree credit to accommodate a variety of students requiring these courses for their academic program. In the first two years of study, the more challenging level, "Advanced," is intended for a relatively small number of exceptionally gifted students. The second level, "Honours," is intended for all students in Honours programs who are not taking the Advanced courses. In the case of the third-year courses listed in the "Advanced" column below, while the distinction is between the more in-depth courses designed primarily for Pure Math Majors and corresponding non-major courses designed for students in other programs, students with strong academic records, regardless of program, are encouraged to take the courses listed as "Advanced." Advanced courses may always be substituted in lieu of the corresponding Honours courses to satisfy BMath Honours degree requirements, regardless of academic program.

<table>
<thead>
<tr>
<th>Honours</th>
<th>Advanced</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 135/136</td>
<td>MATH 145/146</td>
<td>1A/B Algebra</td>
</tr>
<tr>
<td>MATH 137/138</td>
<td>MATH 147/148</td>
<td>1A/B Calculus</td>
</tr>
<tr>
<td>MATH 235</td>
<td>MATH 245</td>
<td>2A Linear Algebra</td>
</tr>
<tr>
<td>MATH 237</td>
<td>MATH 247</td>
<td>2A Calculus</td>
</tr>
<tr>
<td>&quot;AT 220/231</td>
<td>STAT 240/241</td>
<td>Probability/Statistics</td>
</tr>
<tr>
<td>...</td>
<td>PMATH 351</td>
<td>Real Analysis</td>
</tr>
<tr>
<td>AM 331/PMATH 331</td>
<td>PMATH 352</td>
<td>Complex Analysis</td>
</tr>
<tr>
<td>AM 332/PMATH 332</td>
<td>PMATH 344</td>
<td>Rings and Fields</td>
</tr>
</tbody>
</table>

Table IV - 'New' vs. 'Old' Course Substitutions

For purposes of satisfying 40-half-credit BMath Honours and 30-half-credit BMath General degree requirements, the 'old' courses listed below will be considered equivalent to the corresponding 'new' courses for the subset of pre-Fall/89 students who are eligible to pursue the new BMath degree. (Please consult Footnotes 2 and 3 to Table I on page 13:8, and the section on page 13:5 labelled "New vs. Old Degrees: Who Is Eligible For What?") Students should consult with their Faculty Advisor if they have further questions about course substitutions.

<table>
<thead>
<tr>
<th>Old Course</th>
<th>New Course</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 180</td>
<td>CS 131</td>
<td>1A CS</td>
</tr>
<tr>
<td>S 140</td>
<td>CS 132</td>
<td>1B CS</td>
</tr>
<tr>
<td>S 235</td>
<td>CS 230</td>
<td>Year 2 CS (non-specialist)</td>
</tr>
<tr>
<td>CS 250</td>
<td>CS 241</td>
<td>2A CS (Majors)</td>
</tr>
<tr>
<td>CS 240</td>
<td>CS 242</td>
<td>2B CS (Majors)</td>
</tr>
<tr>
<td>S 358</td>
<td>CS 351</td>
<td>Year 3 CS (Majors)</td>
</tr>
<tr>
<td>MATH 134A/D</td>
<td>MATH 135/136</td>
<td>1A/B Algebra</td>
</tr>
<tr>
<td>MATH 130A/B</td>
<td>MATH 137/138</td>
<td>1A/B Calculus</td>
</tr>
<tr>
<td>MATH 144A/B</td>
<td>MATH 145/146</td>
<td>1A/B Algebra (Advanced)</td>
</tr>
<tr>
<td>MATH 140A/B</td>
<td>MATH 147/148</td>
<td>1A/B Calculus (Advanced)</td>
</tr>
<tr>
<td>MATH 224A</td>
<td>MATH 225</td>
<td>2A Linear Algebra (General)</td>
</tr>
<tr>
<td>MATH 220A</td>
<td>MATH 227</td>
<td>2A Calculus (General)</td>
</tr>
<tr>
<td>MATH 234A</td>
<td>MATH 235</td>
<td>2A Linear Algebra</td>
</tr>
<tr>
<td>MATH 230A</td>
<td>MATH 237</td>
<td>2A Calculus</td>
</tr>
<tr>
<td>MATH 244A</td>
<td>MATH 245</td>
<td>2A Linear Algebra (Advanced)</td>
</tr>
<tr>
<td>MATH 240A</td>
<td>MATH 247</td>
<td>2A Calculus (Advanced)</td>
</tr>
<tr>
<td>MATH 230B or 240B</td>
<td>AM 231</td>
<td>Calculus 4</td>
</tr>
<tr>
<td>MATH 234B or 244B</td>
<td>PMATH 336</td>
<td>Group Theory</td>
</tr>
<tr>
<td>MATH 331</td>
<td>AM 331/PMATH 331</td>
<td>Real Analysis</td>
</tr>
<tr>
<td>MATH 332B</td>
<td>AM 332/PMATH 332</td>
<td>Complex Analysis</td>
</tr>
<tr>
<td>PMATH 351A</td>
<td>PMATH 351</td>
<td>Real Analysis</td>
</tr>
<tr>
<td>MATH 351B</td>
<td>PMATH 353</td>
<td>Fourier Analysis</td>
</tr>
</tbody>
</table>


**Departmental Honours Programs: Requirements and Recommendations**

**Actuarial Science**

The Department of Statistics and Actuarial Science offers courses and programs in Actuarial Science which is the application of mathematics and statistics to financial problems with particular emphasis on life insurance, casualty insurance, and employee benefit programs. The courses offered provide theoretical preparation for the courses of the Society of Actuaries and the Casualty Actuarial Society and include studies of such subject areas as Mathematics of Finance, Life Contingencies, Risk Theory, and Casualty Ratemaking. By carefully selecting their non-math courses, students can also gain valuable background knowledge in economics, finance, administration, and law.

**Honours Actuarial Science**

In conjunction with the common degree requirements in Table I on page 13:8, this program requires at least 26 math half-credits. These overall requirements must include the Faculty core courses outlined in Table II on page 13:10 and the following specific courses:

All of
- ACTSC 231 Mathematics of Finance
- ACTSC 232 Introduction to Actuarial Mathematics
- ACTSC 331 Life Contingencies - Single Lives
- ACTSC 431 Risk Theory

One of
- ACTSC 332 Life Contingencies - Multiple Lives
- ACTSC 432 Loss Distributions and Credibility Theory

Six additional half-credits chosen from:
- ACTSC 332 Life Contingencies - Multiple Lives
- ACTSC 335 OR Applications in Actuarial Science
- ACTSC 338 Graduation of Life Tables
- ACTSC 432 Loss Distributions and Credibility Theory
- ACTSC 433 Analysis of Mortality Data
- ACTSC 435 Introduction to Demographic Statistics
- ACTSC 453 Basic Pension Mathematics
- ACTSC 463 Topics in Casualty Insurance
- CS 337 Introduction to Numerical Analysis
- STAT 331 Applied Linear Models

All of
- STAT 330 Statistical Theory and Methods
- STAT 333 Applied Probability

Three additional 400-level math half-credits

All of
- ECON 102 Introduction to Macroeconomics
  (or ECON 150 An Introduction to Micro and Macroeconomics)

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**Mathematics**

**Actuarial Science**

- MTHEL 305A General Life Insurance 1
- MTHEL 305B General Life Insurance 2

Three additional half-credits chosen from:
- ACC 121, 122, 371, 372
- BUS 111W, 121W
- ECON 101 (or 150), 201, 202, 231
- M SCI 211, 311, 441
- PSYCH 101, 253, 254, 333, 339

Honours students in another department in the Faculty of Mathematics wishing a "Double Major" or a "Minor" in Actuarial Science should consult the section "Combination Honours Programs within the Faculty of Mathematics" which begins on page 13:23.

**Post-Degree Diploma in Actuarial Science**

This program is described on page 13:30.

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**Applied Mathematics**

Applied Mathematics is motivated mathematics, or mathematics to a purpose. It reflects the belief that there exists a basic order and harmony in the physical world which can be described by the logical structures of mathematics. Thus, it is no coincidence that some of the greatest mathematicians of the past were also leading mathematical physicists of their time.

This rich, classical tradition of Applied Mathematics is typified by the ongoing work in Theoretical and Fluid Mechanics, General Relativity, and Quantum Theory, at the interface between Mathematics and Theoretical Physics, and covering such diverse areas as the study of supersonic flow, the behaviour of ocean waves, the structure of space-time and cosmology, and the fundamental symmetry properties of the world of atoms and molecules. In addition, newer areas such as Control Theory and Information Theory analyze processes ranging from optimal control of a space vehicle to the measuring, coding, and transmission of information. As scientists find out more and more about the mechanisms that make the world 'tick', we also find that more, often new, mathematics is necessary to systematize, digest, and take advantage of this wealth of knowledge in all scientific areas.

In their first two years, all Applied Mathematics students take the same core courses as other Mathematics students, in order to acquire a sound mathematical background. At the same time, since the application of analytical reasoning to a wide variety of problems is the essence of Applied Mathematics, there is room in the program for introductory courses in scientific disciplines which are heavy users of mathematics, such as Physics or Engineering. In the upper years, the focus is on
courses more specifically related to their chosen area of specialization. It is our belief that graduates from any of our programs will find their career opportunities to be excellent and varied.

The Applied Mathematics Department offers four Honours programs, each consisting of the common requirements listed below, plus specific other requirements as given in the individual program descriptions following.

Requirements Common to All Honours Applied Mathematics Programs

In conjunction with the common degree requirements in Table I on page 13:8, all Honours Applied Mathematics programs must include the Faculty core courses outlined in Table II on page 13:10 and the following specific courses:

All of
- AM 231 Calculus 4
- AM 251 Modelling with Systems of Ordinary Differential Equations
- AM/PMATH 332 Complex Analysis
- AM 351 Ordinary Differential Equations
- AM 353 Partial Differential Equations

All of
- PHYS 121 Introductory Physics 1
- PHYS 122 Introductory Physics 2

A minimum of eight additional non-math half-credits

Recommended
- AM 250 Modelling with Ordinary Differential Equations
- AM 371C Classical Mechanics
- AM/PMATH 331 Real Analysis

Honours Applied Mathematics

In conjunction with the common degree requirements in Table I on page 13:8, this program requires at least 26 math half-credits. These overall requirements must include the courses common to all Honours Applied Mathematics programs as given above and the following specific courses:

Three 400-level AM half-credits

Three additional 300 or 400-level AM half-credits

One additional half-credit chosen from:
- CS 337 Introduction to Numerical Analysis
- AM/PMATH 331 Real Analysis

Joint Honours Applied Mathematics with Computer Science

In conjunction with the common degree requirements in Table I on page 13:8, this program requires at least 28 math half-credits. A maximum of ten CS half-credits at the 300 or 400 level may be included in the 40 half-credits presented for a degree. These overall requirements must include the courses common to all Honours Applied Mathematics programs as given above and the following specific courses:

Three 400-level AM half-credits

Two additional 300 or 400-level AM half-credits

All of
- CS 241 Principles of Computer Science 3
- CS 242 Principles of Computer Science 4
- CS 340 Data Structures

One of
- CS 372 Introduction to Scientific Computation: Numerical Linear Algebra
- CS 374 Introduction to Scientific Computation: Numerical Approximation

One additional half-credit chosen from:
- CS 351 Digital Design and Architecture
- CS 354 Software Systems
- CS 360 Introduction to the Theory of Computing
- CS 372 Introduction to Scientific Computation: Numerical Linear Algebra
- CS 374 Introduction to Scientific Computation: Numerical Approximation
- CS 440 - 498

Two additional 400-level CS half-credits chosen from
- CS 440 - 498

All of
- C&O 230 Introduction to Combinatorics

Honours Applied Mathematics with Electives in Engineering (Co-operative only)

In conjunction with the common degree requirements in Table I on page 13:8, this program requires at least 26 math half-credits. These overall requirements must include the courses common to all Honours Applied Mathematics programs as given above and the following specific courses:

Three 400-level AM half-credits

Three additional 300 or 400-level AM half-credits

All of
- CS 230 Introduction to Computers and Computer Systems

One additional half-credit chosen from:
- CS 337 Introduction to Numerical Analysis
- AM/PMATH 331 Real Analysis

Two additional half-credits chosen from:
- AM/PMATH 331 Real Analysis
- CS 334 Data Types and Structures
- CS 337 Introduction to Numerical Analysis
- C&O 350 Linear Programming
- C&O 370 Deterministic OR Models
PMATH 336 Introduction to Group Theory
STAT 333 Applied Probability
STAT 371 Stochastic OR Models
STAT 433 Stochastic Processes

Non-math courses required in Year One:
Groups D and E require EL E 123 and 126, either both in term 1B, or one each in terms 1B and 2A.
Group F requires CH E 100/101.

Non-math courses required in Years Two, Three and Four:
One course per term from the chosen Engineering Group, normally selected from the following. (Consult the Applied Mathematics Undergraduate Handbook for more detailed listings, including course titles and terms in which the courses are normally taken.)

Group A
M E 219, 220;
Four of M E 351, 354,
CIV E 303, 403, 404, 405, 413,
414, 415.

Group B
SY DE 252, 381; SY DE 281 and/or 543;
Three of SY DE 372, 442, 468, 535,
544, 565, 567.

Group C
M E 219, 250, 351;
Three of M E 353, 354, 452, 456, 459,
469, 557, 563.

Group D
EL E 123, 126;
Five of EL E 208, 231, 261, 262, 318,
332, 342, 371, 380, 411, 412, 435,
436, 438, 443.

Group E
EL E 123, 126, 261, 262, 371, 380;
One of EL E 342, 483, 484, 485, 481,
482.

Group F
CH E 100, 101, 021, 023, 025, 026, 030,
035, 036, 041;
Optional Courses: CH E 033, 034, 038,
CHEM 26, 36.

Honours Applied Mathematics with Physics Electives
In conjunction with the common degree requirements in Table I on page 13:8 this program has the same course requirements as Honours Applied Mathematics, with the following additional specific courses required in the non-math component of the program:

Six half-credits in the physical sciences, normally selected from:

PHYS 252 Electricity and Magnetism 1
PHYS 253 Electricity and Magnetism 2
PHYS 263 Classical Mechanics 1
PHYS 275 Astrophysics 1 - The Solar System
PHYS 354 Atomic and Molecular Physics
PHYS 358 Thermodynamics
PHYS 359 Statistical Mechanics
PHYS 375 Astrophysics 2 - Stellar Astronomy

Mathematics
Applied Mathematics
Combinatorics and Optimization

PHYS 380 Molecular Biophysics
PHYS 480 Radiation Biophysics
CHEM 123 Chemical Reactions, Equilibria and Kinetics
CHEM 124 Organic Chemistry 1

Honours students in another department in the Faculty of Mathematics wishing a "Double Major" or a "Minor" in Applied Mathematics should consult the section "Combination Honours Programs within the Faculty of Mathematics" which begins on page 13:23.

Combinatorics and Optimization

Combinatorics is the study of discrete structures and their properties. It includes coding theory, combinatorial design, enumeration theory, graph theory and polyhedral theory. Many modern scientific advances have employed combinatorial structures to model the physical world, and recent advances in computational technology have made such investigations feasible. In particular, since computers process discrete data, combinatorics has become indispensable to 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 computers, Optimization experienced a dramatic growth as a mathematical theory, enhancing both Combinatorics and classical analysis. In its applications to engineering and management sciences. Optimization forms an important part of the discipline of 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

In conjunction with the common degree requirements in Table I on page 13:8, this program requires at least 26 math half-credits. These overall requirements must include the Faculty core courses outlined in Table II on page 13:10 and the following specific courses:

All of
C&O 230 Introduction to Combinatorics
C&O 350 Linear Programming
One of
C&O 330 Combinatorial Enumeration
C&O 342 Graph Theory 1
Mathematics
Combinatorics and Optimization

One of
C&O 351 Network Flow Theory
C&O 367 Nonlinear Programming

One additional half-credits chosen from:
C&O 330 Combinatorial Enumeration
C&O 331 Coding Theory
C&O 342 Graph Theory 1
C&O 343 Graph Theory 2
C&O 351 Network Flow Theory
C&O 367 Nonlinear Programming
C&O 430 - 466

... of
PMATH 336 Introduction to Group Theory

One of
AM/PMATH 331 Real Analysis
(or one of CS 337, 372, 374)
AM/PMATH 332 Complex Analysis
PMATH 334 Introduction to Rings and Fields

One additional 300 or 400-level math half-credits with a course prefix other than C&O

One additional 300 or 400-level math half-credit

Honours students in another department in the Faculty of Mathematics wishing a "Double Major" or a "Minor" in Combinatorics and Optimization should consult the section "Combination Honours Programs within the Faculty of Mathematics" which begins on page 13:23.

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 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 Division of Mathematics for Industry and Commerce in conjunction with the Department of Combinatorics and Optimization, combines a solid foundation in mathematics with special sequences of 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
In conjunction with the common degree requirements in Table I on page 13:8, this program requires at least 26 math half-credits, of which at least four must be 400-level math half-credits. These overall requirements must include the Faculty core courses outlined in Table II on page 13:10 and the following specific courses:

One of
CS 351 Digital Design and Architecture
CS 354 Software Systems
CS 360 Introduction to the Theory of Computing

Two additional 400-level CS half-credits chosen from
CS 440 - 498

All of
PMATH 336 Introduction to Group Theory

One of
AM/PMATH 331 Real Analysis
AM/PMATH 332 Complex Analysis
PMATH 334 Introduction to Rings and Fields

Joint Honours Combinatorics and Optimization with Computer Science

In conjunction with the common degree requirements Table I on page 13:8, this program requires at least 26 math half-credits. A maximum of ten CS half-credits at the 300 or 400 level may be included in the 40 half-credits presented for a degree. These overall requirements must include the Faculty core courses outlined in Table II on page 13:10 and the following specific courses:

One of
C&O 230 Introduction to Combinatorics
C&O 342 Graph Theory 1
C&O 350 Linear Programming

One of
C&O 330 Combinatorial Enumeration
C&O 331 Coding Theory
C&O 343 Graph Theory 2
C&O 351 Network Flow Theory
C&O 367 Nonlinear Programming
C&O 430 - 466

One of
CS 241 Principles of Computer Science 3
CS 242 Principles of Computer Science 4
CS 340 Data Structures

One of
CS 372 Introduction to Scientific Computation: Numerical Linear Algebra
CS 374 Introduction to Scientific Computation: Numerical Approximation
CS 466 Algorithm Design and Analysis
All of
C&O 350 Linear Programming
C&O 351 Network Flow Theory
C&O 370 Deterministic OR Models
CS 230 Introduction to Computers and Computer Systems
CS 337 Introduction to Numerical Analysis
CS 437 Simulation by Computer
STAT 331 Applied Linear Models
STAT 333 Applied Probability
STAT 371 Stochastic OR Models
STAT 443 Forecasting

Four of
C&O 230 Introduction to Combinatorics
C&O 342 Graph Theory 1
C&O 367 Nonlinear Programming
C&O 450 - 466
CS 334 Data Types and Structures
CS 432 Business Systems Analysis
STAT 332 Sampling
STAT 335 Statistical Process Control
STAT 430 Experimental Design
STAT 433 Stochastic Processes

One of
AM/PMATH 331 Real Analysis
AM/PMATH 332 Complex Analysis
AM 351 Ordinary Differential Equations
PMATH 336 Introduction to Group Theory

One pair chosen from
M SCI 211 Organizational Behaviour 1
M SCI 311 Organizational Behaviour 2
or
M SCI 211 Organizational Behaviour 1
M SCI 441 Management of Information Systems
or
PSYCH 101 Introductory Psychology
PSYCH 333 Industrial/Organizational Psychology
or
SOC 101 Introduction to Sociology
SOC 242 Industrial Sociology

Two of
ACC 121 Understanding and Using Financial Accounting Information
ACC 122 Understanding and Using Managerial Accounting Information
ECON 101 Introduction to Micro Economics
(or ECON 150 An Introduction to Micro and Macroeconomics)
ECON 102 Introduction to Macroeconomics
(or ECON 150 An Introduction to Micro and Macroeconomics)
M SCI 461 Managerial and Engineering Economics II

Two of
ACC 371 Managerial Finance 1
BUS 352W Marketing I
M SCI 432 Introduction to Production Management

Recommended
DRAMA 223 Speech Communication 1
(BUS 352W is offered by Wilfrid Laurier’s School of Business and Economics. It is described by title on page 13:25.)

Students enrolled in a Double Honours program in Computer Science and Operations Research must replace the Computer Science courses listed above with the equivalent courses required by Honours Computer Science Major students.

Mathematics
Combinatorics and Optimization
Computer Science

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 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 facilitated 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 ten half-courses from Year One, with particular emphasis on their performance in MATH 135, 136, 137, 138, and CS 131, 132. In this context, Computer Science Major
Mathematics

Computer Science

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, students normally have the flexibility to change from one Computer Science program to another in the same stream (provided there are no resource limitations in the selected Computer Science Major program), or they may apply to transfer to another program in the faculty of Mathematics.

Notes

* Application Procedure

Students will apply for the Computer Science Major program of their choice when they preregister for their 2A term. Normally, only students whose all-inclusive math and overall averages from Year One 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 a 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.

In recent years, because sufficient places have been available to meet student demand, it has been possible to suspend this formal admission process and allow all students who are eligible to take CS 241 into the Computer Science Major program of their choice. Though this suspension of the admission process will not be guaranteed for future years, it is expected to continue in effect for students commencing their studies in September, 1989. Note, however, that the following policies concerning late admission and required withdrawal have not been suspended.

2. Late Admission

The possibility of admission to Computer Science major programs at a level beyond 2A will not be completely eliminated. However, it is anticipated that such admissions, normally at the 3A level, will be relatively rare, and usually only when unexpectedly attrition allows for new students in the programs.

3. Required Withdrawal

A student in a Computer Science Major program whose all-inclusive cumulative Overall or Math average at the end of any term is below 65% must ensure that both averages are at least 65% at the end of each subsequent academic term. Failure to re-establish and maintain these averages at a level of 65% or above will normally result in the student’s being required to withdraw from Computer Science. (Required withdrawal from Computer Science does not necessarily imply required withdrawal from Honours Mathematics, nor does it disqualify a student from taking Computer Science courses in the non-specialist stream.)

Honours Computer Science

In conjunction with the common degree requirements in Table I on page 13:8, this program requires at least 25 math half-credits. A maximum of ten CS half-credits at the 300 or 400 level may be included in the 40 half-credits presented for a degree. These overall requirements must include the Faculty core courses outlined in Table II on page 13:10 and the following specific courses:

All of

- CS 241 Principles of Computer Science 3
- CS 242 Principles of Computer Science 4
- CS 340 Data Structures
- CS 351 Digital Design and Architecture
- CS 354 Software Systems
- CS 360 Introduction to the Theory of Computing

One of

- CS 372 Introduction to Scientific Computation: Numerical Linear Algebra
- CS 374 Introduction to Scientific Computation: Numerical Approximation

One of

- CS 457 Queueing Models: Analysis, Simulation, and Computer Applications
- CS 462 Formal Languages and Parsing
- CS 464 Computational Complexity Theory
- CS 466 Algorithm Design and Analysis
- CS 472 Numerical Linear Algebra
- CS 473 Numerical Linear Programming
- CS 476 Numerical Solution of Ordinary Differential Equations
- CS 487 Introduction to Symbolic Computation

Two additional 400-level CS half-credits chosen from CS 440 - 498

All of

- C&O 230 Introduction to Combinatorics

Four of

- ACTSC 232 Introduction to Actuarial Mathematics
- AM 231 Calculus 4
- AM 250 Modelling with Ordinary Differential Equations
- AM/PMATH 331 Real Analysis
- AM/PMATH 332 Complex Analysis
- AM 351 Ordinary Differential Equations
- C&O 330 Combinatorial Enumeration
- C&O 342 Graph Theory 1
- C&O 350 Linear Programming
- PMATH 334 Introduction to Rings and Fields
- PMATH 336 Introduction to Group Theory
- PMATH 430A Introduction to Mathematical Logic
- STAT 333 Applied Probability
- STAT 433 Stochastic Processes
Honours Computer Science with Electrical Engineering Electives (Co-operative only)

In conjunction with the common degree requirements in Table I on page 13:8, this program requires at least 25 math half-credits. A maximum of ten CS half-credits at the 300 or 400 level may be included in the 40 half-credits presented for a degree. These overall requirements must include the Faculty core courses outlined in Table II on page 13:10 and the following specific courses:

All of
- CS 241 Principles of Computer Science 3
- CS 242 Principles of Computer Science 4
- CS 340 Data Structures
- CS 354 Software Systems
- CS 360 Introduction to the Theory of Computing

One of
- CS 372 Introduction to Scientific Computation: Numerical Linear Algebra
- CS 374 Introduction to Scientific Computation: Numerical Approximation

Two of
- CS 450 Computer Architecture
- CS 452 Real-time Programming
- CS 454 Distributed Systems
- CS 457 Queueing Models: Analysis, Simulation, and Computer Applications

One additional 400-level CS half-credit chosen from CS 440 - 498

All of
- C&O 230 Introduction to Combinatorics

Four of
- ACTSC 232 Introduction to Actuarial Mathematics
- AM 231 Calculus 4
- AM 250 Modelling with Ordinary Differential Equations
- AM/PMATH 331 Real Analysis
- AM/PMATH 332 Complex Analysis
- AM 351 Ordinary Differential Equations
- C&O 330 Combinatorial Enumeration
- C&O 342 Graph Theory 1
- C&O 350 Linear Programming
- PMATH 334 Introduction to Rings and Fields
- PMATH 336 Introduction to Group Theory
- PMATH 430A Introduction to Mathematical Logic
- STAT 333 Applied Probability
- STAT 433 Stochastic Processes

All of
- EL E 123 Electrical Engineering Circuits
- EL E 208 Electronic Circuit Analysis
- EL E 222 Digital Computers
- EL E 323 Digital Circuits and Systems
- EL E 333 Microelectronic Circuits and Devices
- EL E 427 Digital Systems Engineering

Recommended
- EL E 438 Switching and Digital Circuits

Honours Computer Science - Information Systems Option (Co-operative only)

This program is offered jointly with the Division of Mathematics for Industry and Commerce. In conjunction with the common degree requirements in Table I on page 13:8, this program requires at least 24 math half-credits. A maximum of ten CS half-credits at the 300 or 400 level may be included in the 40 half-credits presented for a degree. These overall requirements must include the Faculty core courses outlined in Table II on page 13:10 and the following specific courses:

All of
- CS 241 Principles of Computer Science 3
- CS 242 Principles of Computer Science 4
- CS 340 Data Structures
- CS 354 Software Systems
- CS 360 Introduction to the Theory of Computing
- CS 448 Introduction to Database Management
- CS 482 Techniques in Systems Analysis

Two additional 400-level CS half-credits chosen from CS 440 - 498

All of
- C&O 230 Introduction to Combinatorics

Two of
- C&O 342 Graph Theory 1
- C&O 350 Linear Programming
- C&O 370 Deterministic OR Models
- STAT 331 Applied Linear Models
- STAT 332 Sampling
- STAT 333 Applied Probability
- STAT 371 Stochastic OR Models

All of
- ACC 121 Understanding and Using Financial Accounting Information
- ACC 122 Understanding and Using Managerial Accounting Information
- BUS 111W Introduction to Business Organization
- BUS 121W Functional Areas of the Organization
- BUS 352W Marketing I
- BUS 481W Business Policy I
- BUS 491W Business Policy II
- ECON 101 Introduction to Microeconomics
- ECON 150 An Introduction to Micro and Macroeconomics
- M SCI 211 Organizational Behaviour 1
- M SCI 311 Organizational Behaviour 2
- M SCI 441 Management of Information Systems
- M SCI 432 Introduction to Production Management
- MTHEL 100 Commercial and Business Law for Mathematics Students

Recommended
- DRAMA 223 Speech Communication 1
Courses labelled BUS are offered by Wilfrid Laurier’s School of Business and Economics. They are described by title on page 13:25.

Joint Honours Mathematics/Business Administration with Computer Science, Chartered Accountancy with Computer Science (Co-operative only) or Management Accounting with Computer Science (Co-operative only)

These programs are described with the Mathematics/Business Administration, Chartered Accountancy and Management Accounting Options on page 13:27.

Joint Honours Applied Math with Computer Science

This program is described with Applied Mathematics programs on page 13:13.

Joint Honours Combinatorics and Optimization with Computer Science

This program is described with Combinatorics and Optimization programs on page 13:15.

Joint Honours Pure Mathematics with Computer Science

This program is described with Pure Mathematics programs on page 13:20.

Joint Honours Statistics with Computer Science

This program is described with Statistics programs on page 13:21.

Honours students in another department in the Faculty of Mathematics wishing a “Double Major” or a “Minor” in Computer Science should consult the section “Combination Honours Programs within the Faculty of Mathematics” which begins on page 13:23.

Honours students in faculties other than Mathematics wishing a “Minor” in Computer Science should consult the section “Combination Honours Programs Leading to a Degree with Another Faculty” described on page 13:30.

Pure Mathematics

Pure Mathematics may be studied for the satisfaction it provides, as well as for its potential to be useful. A mastery of such subjects as algebra, analysis and geometry is essential, not only to prospective algebraists, analysts and geometers, but also to those who have in mind applications to the basic sciences or technology. Thus, the programs of the Department are designed for students who relish mathematics, as well for those who wish to get a solid foundation with a view to applying their knowledge.

Some graduates of Pure Mathematics do go out into industry. Others enter the field of education, from primary to advanced levels. A good number commit themselves to research, either in Pure Mathematics itself, or in some other scientific field. We hope to impart in our students the abilities to think clearly, and to educate themselves, so that they may succeed in their fields of endeavour.

The special interests of the Department include algebra (groups, rings, representation theory, lattices, universal algebra, linear algebra), analysis (integration theory, real and complex functions, functional analysis, operator theory, non-linear problems), geometry (algebraic topology, homotopy, differential geometry, projective geometry), number theory (primes, Diophantine approximation), functional equations (with applications to information theory, probability, engineering, science and social science), logic and foundations (model theory, consistency, recursive functions).

The Department offers three programs: Honours Pure Mathematics, Joint Honours Pure Mathematics with Computer Science and Joint Honours Pure Mathematics with Statistics. A more detailed description of the Department and its programs may be found in the Pure Mathematics Undergraduate Handbook, available upon request.

Honours Pure Mathematics

In conjunction with the common degree requirements in Table I on page 11:8, this program requires at least 24 math half-credits. These overall requirements must include the Faculty core courses outlined in Table II on page 11:10 and the following specific courses:

All of

- PMATH 336 Introduction to Group Theory
- PMATH 344 Introduction to Rings and Fields
- PMATH 351 Real Analysis
- PMATH 352 Complex Analysis
- PMATH 353 Fourier Analysis
- PMATH 367 Set Theory and General Topology

One of

- PMATH 441 Algebraic Number Theory
- PMATH 445 Ring Theory
- PMATH 446 Group Theory
- PMATH 447 Field Theory

One of

- PMATH 451 Measure and Integration
- PMATH 452 Topics in Complex Analysis
- PMATH 463 Functional Analysis

Three additional 400-level PMATH half-credits other than PMATH 430A

All of

- C&O 230 Introduction to Combinatorics

Two additional 400-level math half-credits
Joint Honours Pure Mathematics with Computer Science
In conjunction with the common degree requirements in Table I on page 13:8, this program requires at least 26 math half-credits. A maximum of ten CS half-credits at the 300 or 400 level may be included in the 40 half-credits presented for a degree. These overall requirements must include the Faculty core courses outlined in Table II on page 13:10 and the following specific courses:

All of
PMATH 336 Introduction to Group Theory
PMATH 344 Introduction to Rings and Fields
PMATH 351 Real Analysis
PMATH 352 Complex Analysis

Three additional 400-level PMATH half-credits other than PMATH 430A

All of
CS 241 Principles of Computer Science 3
CS 242 Principles of Computer Science 4
CS 340 Data Structures
CS 360 Introduction to the Theory of Computing

One of
CS 372 Introduction to Scientific Computation: Numerical Linear Algebra
CS 374 Introduction to Scientific Computation: Numerical Approximation

Two additional 400-level CS half-credits chosen from CS 440 - 498

One additional 300 or 400-level PMATH half-credit, or one additional CS half-credit chosen from CS 351, 354, 372, 374, 440 - 498

All of
C&O 230 Introduction to Combinatorics

Joint Honours Pure Mathematics with Statistics
In conjunction with the common degree requirements in Table I on page 13:8, this program requires at least 26 math half-credits. A maximum of ten STAT half-credits at the 300 or 400 level may be included in the 40 half-credits presented for a degree. These overall requirements must include the Faculty core courses outlined in Table II on page 13:10 and the following specific courses:

All of
PMATH 336 Introduction to Group Theory
PMATH 344 Introduction to Rings and Fields
PMATH 351 Real Analysis
PMATH 352 Complex Analysis
PMATH 353 Fourier Analysis
PMATH 451 Measure and Integration

Two additional 400-level PMATH half-credits other than PMATH 430A

One additional PMATH half-credit

Mathematics

Pure Mathematics

Statistics

All of
STAT 330 Statistical Theory and Methods
STAT 331 Applied Linear Models
STAT 332 Sampling
STAT 333 Applied Probability
STAT 430 Experimental Design

One of
STAT 433 Stochastic Processes
STAT 450 Estimation and Hypothesis Testing

All of
C&O 230 Introduction to Combinatorics

Honours students in another department in the Faculty of Mathematics wishing a "Double Major" or a "Minor" in Pure Mathematics should consult the section "Combination Honours Programs within the Faculty of Mathematics" on page 13:23.

Statistics

Statistics is the branch of modern applied mathematics which deals with the collection and analysis of data. Statistical methods are extensively used in Biology, Medicine, Health Sciences, Agriculture, Business, Economics, Engineering, and many other fields. Claims based on statistical arguments appear daily in the press, and it is difficult to assess these intelligently without some knowledge of statistical methods.

The statistician's first job is to determine what data to collect, and how to collect it so that it will be without bias or distortion. These problems are dealt with in the Design of Experiments and Sample Surveys. Statistical Inference is concerned with inferring what the population is like on the basis of a small amount of data (the sample). The link between population and sample is provided by Probability Theory, which forms an important part of the Statistics curriculum. Often the purpose of collecting data is to assist in reaching a decision, so the field of Decision Theory is also a part of Statistics.

Many other areas of pure and applied mathematics find applications in Statistics. Calculus and linear algebra are used extensively in the undergraduate program; abstract algebra, combinatorics, difference and differential equations, analysis, and measure theory are required in more advanced work. Most statistical analyses involve the computer, so a good background in computing is highly desirable.

Honours Statistics

In conjunction with the common degree requirements in Table I on page 13:8, this program requires at least 26 math half-credits. A maximum of ten STAT half-credits at the 300 or 400 level may be included in the 40 half-credits presented for a degree. These overall requirements must include the Faculty core courses outlined in Table II on page 13:10 and the following specific courses:
of
STAT 330 Statistical Theory and Methods
STAT 331 Applied Linear Models
STAT 332 Sampling
STAT 333 Applied Probability
STAT 430 Experimental Design
STAT 450 Estimation and Hypothesis Testing

the additional 400-level STAT half-credit

Four of
ACTSC 431 Risk Theory
ACTSC 432 Loss Distributions and Credibility Theory
AM/PMA 331 Real Analysis
AM/PMA 332 Complex Analysis
AM 351 Ordinary Differential Equations
AM 353 Partial Differential Equations
AM 451 Introduction to Dynamical Systems
C&O 330 Combinatorial Enumeration
C&O 350 Linear Programming
CS 337 Introduction to Numerical Analysis
PMATH 334 Introduction to Rings and Fields
PMATH 353 Fourier Analysis
PMATH 452 Topics in Complex Analysis

three additional 300 or 400-level math half-credits.

Honours Applied Statistics with Engineering
Electives (Co-operative only)

the requirements for this program include those for
Honours Statistics program described above. In
addition, the non-math half-credits must include one of
the groups of Engineering courses listed below. Where
necessary, PHYS 121/122 and CHEM 123/124 should
normally be taken in Year One. The Engineering
courses are taken in Years Two to Four.

Chemical
CHE 201, 202, 203, 301, 302, 303, 304;
CHEM 123/124, PHYS 121/122.

Civil (transportation)
CIV 123, 222, 340, 342, 343, 345;
PHYS 121/122.

groups of courses in Fluid Mechanics and Hydrology,
and Water Quality Control are also available*.

Management Sciences
M SCI 211, 261, 311, 432, 452, 461.

Mechanical
M E 215, 219, 260, 321, 351 and
one of 340, 348;
PHYS 121/122.

Groups of courses in Automation, Production,
materials, Solid Body Mechanics and Thermofluids are
so available*.

Mathematics
Statistics

Systems Design
SY DE 281, 364, 384, 432, 544, 555;
PHYS 121/122.

*Details are available in the Statistics Undergraduate
Studies Handbook.

Note
An Option in Statistics for students in the Faculty of
Engineering is described on page 9:9.

Joint Honours Statistics with Computer Science
In conjunction with the common degree requirements
in Table I on page 13:8, this program requires at least
26 math half-credits. The 300 and 400 level math half-
credits presented for a degree may not include more
than ten CS half-credits nor more than ten STAT half-
credits. These overall requirements must include the
Faculty core courses outlined in Table II on page
13:10 and the following specific courses:

All of
CS 241 Principles of Computer Science 3
CS 242 Principles of Computer Science 4
CS 340 Data Structures
CS 372 Introduction to Scientific Computation:
Numerical Linear Algebra

Two of
CS 351 Digital Design and Architecture
CS 354 Software Systems
CS 360 Introduction to the Theory of Computing
CS 374 Introduction to Scientific Computation:
Numerical Approximation

Two additional 400-level CS half-credits chosen from
CS 440 - 498

All of
C&O 230 Introduction to Combinatorics

One of
AM/PMA 331 Real Analysis
AM/PMA 332 Complex Analysis
AM 351 Ordinary Differential Equations
AM 353 Partial Differential Equations
AM 451 Introduction to Dynamical Systems
C&O 330 Combinatorial Enumeration
C&O 350 Linear Programming
PMATH 334 Introduction to Rings and Fields

Joint Honours Pure Mathematics with Statistics
This program is described with Pure Mathematics
programs on page 13:20.
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 on page 13:23.

Inter-Departmental Program

The purpose of this program is to provide students in the Faculty of Mathematics with breadth of studies at the Honours level rather than the specialization offered by departmental and option Honours programs. Further, it permits a student to defer a decision as to specialization or affiliation with a particular department or option within the Faculty.

Students taking this program will be prepared either for careers in the applications of mathematics or for graduate studies. By choosing appropriate courses, a student should be eligible to proceed from this program to graduate work in any area of mathematics.

Honours Mathematics: Inter-Departmental Program

In conjunction with the common degree requirements in Table I on page 13:8, this program requires at least 26 math half-credits. The 300 and 400-level math half-credits presented for a degree may not include more than six with the same prefix. These overall requirements must include the Faculty core courses outlined in Table II on page 13:10 and the following specific courses:

All of
- AM 250 Modelling with Ordinary Differential Equations
- AM 343 Discrete Models in Applied Mathematics

All of
- C&O 230 Introduction to Combinatorics
- C&O 350 Linear Programming

All of
- CS 230 Introduction to Computers and Computer Systems

One of
- CS 334 Data Types and Structures
- CS 335 Computing Systems
- CS 337 Introduction to Numerical Analysis
- CS 430 Applications Software Engineering
- CS 438 Computer Applications in Business: Data Bases

One of
- PMATH 340 Elementary Number Theory
- PMATH 360 Geometry
- PMATH 430A Introduction to Mathematical Logic

One of
- STAT 331 Applied Linear Models
- STAT 332 Sampling
- STAT 333 Applied Probability

Mathematics

Inter-Departmental Program

Teaching Option

Two of
- AM 231 Calculus 4
- AM/PMATH 331 Real Analysis
- AM/PMATH 332 Complex Analysis

Two of
- AM 444 Applications of Algebra
- C&O 330 Combinatorial Enumeration
- PMATH 334 Introduction to Rings and Fields
- PMATH 336 Introduction to Group Theory
- STAT 430 Experimental Design

Two additional 400-level math half-credits with 300 level prerequisites.

Note

Students in the Faculty Inter-Departmental Honours program may not pursue a Minor designation or Joint/Double Honours program within the Faculty of Mathematics. However, they are encouraged to pursue a Minor or Joint Honours program with an academic area in another faculty.

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 of the Mathematics Faculty's non-teaching Co-operative Programs in Year One, and will be considered for admission to the Teaching Option in Year Two on the basis of two interviews and satisfactory academic and work-term performance.

Work-term arrangements in this Option differ from other Co-operative programs because of the nature of the program. (Consult the Work-Study Sequence Chart on page 5:3.) Details concerning this and the Faculty of Education component are available from the Academic Advisors or the Co-ordinator for this Option.

Honours Mathematics/Teaching Option

(Co-operative only)

In conjunction with the common degree requirements in Table I on page 13:8, this program requires at least 24 math half-credits. The math half-credits submitted for the degree must include at least eight 300 or 400-level math half-credits, and students are encouraged to gain as much mathematical breadth as possible in their section. These overall requirements must include the Faculty core courses outlined in Table II on page 13:10 and the following specific courses:
### Mathematics

**Teaching Option**

Combination Honours Programs

### Notes

1. **Successful completion of the academic requirements for any of the Departmental Honours programs 'X' in the Faculty of Mathematics will be accepted as a replacement for the course requirements listed above. Students who elect this option will be designated by a program label such as "Honours 'X'/Teaching Option" rather than "Honours Math/Teaching Option".** (Since 3B and 4B courses are not normally offered in the Spring term, it will be difficult to satisfy this alternative.)

2. **The Bachelor of Education requirements are completed during a four-month academic term at the Faculty of Education in London. This term occurs after all other components of the program have been completed.**

3. **The selection of courses required for the BMath Teaching Option must include at least four half-credits in one of the following subject disciplines: Biology, Chemistry, Computer Science, Environmental Studies, General Science, or Physics. These four half-credits will fulfill the Ontario Ministry of Education's requirement for a second teaching subject.**

### 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). Note that, with some 'X' and 'Y' combinations, it may be necessary to complete more than 40 half-credits and/or more than eight full-time terms of study to satisfy all of the relevant course requirements.

#### Honours 'X' with 'Y' Minor Programs

All Honours requirements for area 'X' and the specific requirements designated below for area 'Y' must be satisfied. 'X' refers to any one of Actuarial Science, Applied Mathematics, Combinatorics and Optimization, Computer Science, Math/Teaching Option, Operations Research, Pure Mathematics, and Statistics.

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### All of
- **ACTSC 231** Mathematics of Finance

### One of
- **AM 250** Modelling with Ordinary Differential Equations
- **AM 343** Discrete Models in Applied Mathematics

### All of
- **C&O 230** Introduction to Combinatorics

### One of
- **C&O 270** Introduction to Optimization
- **C&O 350** Linear Programming
- **C&O 380** Mathematical Discovery and Invention
- **C&O 480** History of Mathematics 1
- **C&O 481** History of Mathematics 2

### All of
- **CS 230** Introduction to Computers and Computer Systems

### One of
- **CS 330** Introduction to Business Systems
- **CS 334** Data Types and Structures
- **CS 335** Computing Systems
- **CS 337** Introduction to Numerical Analysis
- **CS 430** Applications Software Engineering
- **CS 438** Computer Applications in Business: Data Bases

### One of
- **AM/PMATH 331** Real Analysis
- **AM/PMATH 332** Complex Analysis

### One of
- **PMATH 334** Introduction to Rings and Fields
- **PMATH 336** Introduction to Group Theory

### One of
- **PMATH 340** Elementary Number Theory
- **PMATH 360** Geometry
- **PMATH 430A** Introduction to Mathematical Logic

### One of
- **STAT 331** Applied Linear Models
- **STAT 332** Sampling
- **STAT 333** Applied Probability

### All of
- **MTHEL 206A** Introduction to Mathematics Education
- **SOC 207** Sociology of Education

### Recommended non-math half-credits include:
- **PSYCH 212** Educational Psychology
- **PSYCH 213** Exceptional Children
- **PHIL 311** Philosophy of Education 1
- **PHIL 312** Philosophy of Education 2
- **MTHEL 102** Uses and Abuses of Statistics
'Y' Minor Requirements

Actuarial Science:  
All of  
ACTSC 231 Mathematics of Finance  
ACTSC 232 Introduction to Actuarial Mathematics  
ACTSC 331 Life Contingencies – Single Lives  
ACTSC 332 Life Contingencies – Multiple Lives  
MTHEL305A General Life Insurance 1  

One of  
ACTSC 431 Risk Theory  
ACTSC 432 Loss Distributions and Credibility Theory  

One additional ACTSC half-credit.

Applied Mathematics:  
All of  
AM 251 Modelling with Systems of Ordinary Differential Equations  
AM 343 Discrete Models in Applied Mathematics  
AM 351 Ordinary Differential Equations  
AM 353 Partial Differential Equations 1  
AM 461 Introduction to Dynamical Systems  

Two additional 300 or 400-level AM half-credits.

Combinatorics & Optimization:  
All of  
C&O 230 Introduction to Combinatorics  
C&O 350 Linear Programming  

One of  
C&O 330 Combinatorial Enumeration  
C&O 342 Graph Theory 1  

Two additional half-credits chosen from:  
C&O 330 Combinatorial Enumeration  
C&O 331 Coding Theory  
C&O 342 Graph Theory 1  
C&O 343 Graph Theory 2  
C&O 351 Network Flow Theory  
C&O 367 Nonlinear Programming  
C&O 430 - 466  

Computer Science:  
All of  
CS 131 Principles of Computer Science 1  
CS 132 Principles of Computer Science 2  

One of  
CS 230 Introduction to Computers and Computer Systems  
CS 242 Principles of Computer Science 4  

Five additional CS half-credits.

Note  
Please consult Note 2 on page 13:31 for course-selection advice to students seeking a Computer Science Minor.

Mathematics
Combination Honours Programs

Pure Mathematics:  
All of  
PMATH 344 Introduction to Rings and Fields  
PMATH 351 Real Analysis  
PMATH 352 Complex Analysis  

Three additional 300 or 400-level PMATH half-credits.

Statistics:  
Three of  
STAT 330 Statistical Theory and Methods  
STAT 331 Applied Linear Models  
STAT 332 Sampling  
STAT 333 Applied Probability  

Two additional 300 or 400-level STAT half-credits.

Students do not officially register in an Honours 'X' with 'Y' Minor program. Such students register in the Honours 'X' program and request an official 'Y' Minor designation when they complete an 'Intention to Graduate' form.

Combination Honours Programs With Other Faculties Leading to the BMath Degree

In the descriptions below, 'X' refers to any one of Actuarial Science, Applied Mathematics, Combinatorics and Optimization, Computer Science, Math/Teaching Option, Operations Research, Pure Mathematics, Statistics, or the Faculty Inter-Departmental Honours program. 'Z' refers to any discipline, in a faculty other than Mathematics, that chooses to make a 'Joint Honours' or a 'Minor' designation available to Math Faculty students.

Students interested in a particular discipline 'Z' should consult with the department concerned for specific course requirements.

Joint Honours 'X' and 'Z' Programs  
All Honours requirements for area 'X' and the set of requirements prescribed by discipline 'Z' must be satisfied. In addition to meeting the Graduating Average requirements of the Faculty of Mathematics, students in these programs must also satisfy the Honours average requirements specified by discipline 'Z'. Note that, with some 'X' and 'Z' combinations, it may be necessary to complete more than 40 half-credits and/or more than eight full-time terms of study to satisfy all of the relevant course requirements.

Honours 'X' with 'Z' Minor Programs  
All Honours requirements for area 'X' and a set of ten half-credits prescribed by discipline 'Z' must be satisfied. In addition to meeting the Graduating Average requirements of the Faculty of Mathematics, students in these programs must also satisfy any ...
average requirements in these ten half-credits as specified by discipline "Z".

Students do not officially register in an Honours 'X' with 'Z' Minor program. Such students register in the Honours 'X' program and request an official 'Z' Minor designation when they complete an 'Intention to Graduate' form.

Note
Combination Honours Programs leading to a degree in another faculty (i.e. not BMath) are described on page 13:30.

BMath Transcripts
BMath transcripts include explicit mention of no more than two areas of study in the academic program section.

Division of Mathematics for Industry and Commerce

The Division of Mathematics for Industry and Commerce (DMIC) was formed within the Faculty of Mathematics to deal with activities of the Faculty that relate closely to business and industry. Innovative programs have been developed which combine a University education with substantial amounts of corporate experience.

The DMIC manages five industry and commerce-related programs within the Faculty of Mathematics which lead to a BMath Honours degree:
1. Business Administration
2. Chartered Accountancy
3. Management Accounting
4. Computer Science - Information Systems
5. Operations Research

The Division has two main objectives with respect to these undergraduate programs:

a) To provide a comprehensive education in modern mathematics and related subjects. This will provide the basis for a successful career in a competitive, highly technical world.

b) To provide a set of skills which will enable graduates to rapidly become effective, productive members of the business community.

In addition, the Division serves as a focal point for contact between faculty members and the industrial and commercial sector. Members of the DMIC are drawn from existing departments within the Faculty of Mathematics. There is also representation from the School of Accountancy (Arts), the Department of Co-operative Education and Career Services, and the Department of Management Sciences (Engineering), as well as areas of business and commerce. Advice and guidance is provided by members of the Faculty of Mathematics Strategy Board whose membership includes prominent executives from leading industries, the financial sector, business and government.

BUSINESS ADMINISTRATION, CHARTERED ACCOUNTANCY AND MANAGEMENT ACCOUNTING OPTIONS

The constantly increasing complexity of business organizations has created a demand for persons trained in analyzing business and accounting problems from a mathematical point of view. The Faculty of Mathematics, in co-operation with the Division of Mathematics for Industry and Commerce, the School of Business and Economics at Wilfrid Laurier University, the Departments of Economics and Management Sciences, and the School of Accountancy at Waterloo offers three unique programs combining Mathematics with Business Administration, Chartered Accountancy, and Management Accounting. Each of these is designed so that students gain an appreciation for the applications of mathematics to commerce and gain experience in areas such as banking, marketing, production control, accounting, auditing, etc. All three Options are available, at the Honours level only, in the Co-operative system of study. Only the Business Administration Option, however, is available in the Regular system of study.

The Chartered Accountancy and Management Accounting Options are offered in co-operation with the Institute of Chartered Accountants of Ontario and the Society of Management Accountants of Ontario, respectively. Graduates of the Chartered Accountancy Option will normally have completed all formal university course work required by the Institute. The other principal requirements for the CA designation include two or three years work experience in public accounting and successful completion of the National Institute's Uniform Final Examinations. The Management Accounting Option is structured so that successful completion of the program normally qualifies a student for 16 CMA exemptions and also to write four of the Society's six Uniform National Examinations required for CMA (Certified Management Accountant) certification.

Co-operative work terms are accepted by both the Institute and the Society as part of their respective internship requirements. Thus, Co-op graduates are normally able to complete all Institute or Society requirements in as little as one year after graduation.

Note
In the requirements and recommendations which follow, courses with prefix BUS are offered by Wilfrid Laurier University's School of Business and Economics. These courses are:

BUS 111W - Introduction to Business Organization
BUS 121W - Functional Areas of the Organization
BUS 352W - Marketing I
BUS 362W - Marketing II
BUS 454W - Personnel Management
Complete course descriptions, and the terms in which these courses are normally offered for University of Waterloo students, can be found in the “How To Get Around in MATHEMATICAL CIRCLES” booklet, copies of which are available in the Mathematics Undergraduate Office (MC 5 115).

Honours Mathematics/Busines Administration, Chartered Accountancy (Co-operative only), Management Accounting (Co-operative only)

Options
In conjunction with the common degree requirements in Table I on page 13:8, each of these programs requires at least 20 math half-credits. These overall requirements must include the Faculty core courses outlined in Table II on page 13:10 and one of the math course packages a), b), c) listed below. The non-math component of each of these programs must also include the specific courses listed following package c).

On entering Year Three, students must specify one of packages a), b), c) below:

a) Information Systems Package
All of
- CS 230 Introduction to Computers and Computer Systems
- CS 330 Introduction to Business Systems
- CS 432 Business Systems Analysis
- CS 430 Computer Applications in Business: Data Bases

One additional 300 or 400-level CS half-credit

Two of
- AM 381C Introduction to Information Theory
  (or PMATH 380A Introduction to Information Theory)
- C&O 350 Linear Programming
- C&O 367 Nonlinear Programming
- C&O 370 Deterministic OR Models
- C&O 454 Scheduling

All of
- STAT 331 Applied Linear Models

One of
- STAT 332 Sampling
- STAT 333 Applied Probability
- STAT 335 Statistical Process Control
- STAT 443 Forecasting

One additional 300 or 400-level math half-credit.

b) Optimization Package
All of
- C&O 350 Linear Programming
- C&O 351 Network Flow Theory
- C&O 370 Deterministic OR Models

Two of
- C&O 367 Nonlinear Programming
- C&O 450 Combinatorial Optimization
- C&O 452 Integer Programming
- C&O 454 Scheduling
- C&O 456 Game Theory
- C&O 459 Topics in Optimization
- C&O 464 Quadratic Programming
- C&O 466 Continuous Optimization

All of
- CS 330 Introduction to Business Systems
- CS 438 Computer Applications in Business: Data Bases
- STAT 331 Applied Linear Models

One of
- STAT 332 Sampling
- STAT 333 Applied Probability
- STAT 335 Statistical Process Control
- STAT 443 Forecasting

One additional 300 or 400-level math half-credit.

c) Statistics Package
All of
- STAT 331 Applied Linear Models
- STAT 332 Sampling
- STAT 335 Statistical Process Control
- STAT 443 Forecasting

One of
- STAT 333 Applied Probability
- STAT 430 Experimental Design
- STAT 440 Statistical Computing

Two of
- C&O 350 Linear Programming
- C&O 367 Nonlinear Programming
- C&O 370 Deterministic OR Models
- C&O 454 Scheduling

All of
- CS 330 Introduction to Business Systems
- CS 438 Computer Applications in Business: Data Bases

One additional 300 or 400-level math half-credit.

The following courses are recommended for all three packages a), b), c) above:
- ACTSC 231 Mathematics of Finance
- C&O 270 Introduction to Optimization
- DRAMA 223 Speech Communication

Business Administration Option – Non-Math Component
The non-math half-credits required for the Business Administration Option (together with the terms in which these courses are normally taken) are given below:

1A ACC 121 Understanding and Using Financial Accounting Information
**Mathematics**  
*Industry and Commerce*

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUS 111W</td>
<td>Introduction to Business Organization</td>
<td></td>
</tr>
<tr>
<td>1B ACC 122</td>
<td>Understanding and Using Managerial Accounting Information</td>
<td></td>
</tr>
<tr>
<td>BUS 121W</td>
<td>Functional Areas of the Organization</td>
<td></td>
</tr>
<tr>
<td>2A BUS 352W</td>
<td>Marketing I</td>
<td></td>
</tr>
<tr>
<td>ECON 101</td>
<td>Introduction to Microeconomics</td>
<td></td>
</tr>
<tr>
<td>(or ECON 150)</td>
<td>An Introduction to Micro and Macro Economics</td>
<td></td>
</tr>
<tr>
<td>2B BUS 362W</td>
<td>Marketing II</td>
<td></td>
</tr>
<tr>
<td>ECON 102</td>
<td>Introduction to Macroeconomics</td>
<td></td>
</tr>
<tr>
<td>(or ECON 150)</td>
<td>An Introduction to Micro and Macro Economics</td>
<td></td>
</tr>
<tr>
<td>MTHEL 100</td>
<td>Commercial and Business Law for Mathematics Students</td>
<td></td>
</tr>
<tr>
<td>3A ACC 371</td>
<td>Managerial Finance 1</td>
<td></td>
</tr>
<tr>
<td>M SCI 211</td>
<td>Organizational Behaviour 1</td>
<td></td>
</tr>
<tr>
<td>3B ACC 372</td>
<td>Managerial Finance 2</td>
<td></td>
</tr>
<tr>
<td>M SCI 311</td>
<td>Organizational Behaviour 2</td>
<td></td>
</tr>
<tr>
<td>(or M SCI 441)</td>
<td>Management of Information Systems</td>
<td></td>
</tr>
<tr>
<td>4A BUS 454W</td>
<td>Personnel Management</td>
<td></td>
</tr>
<tr>
<td>BUS 481W</td>
<td>Business Policy I</td>
<td></td>
</tr>
<tr>
<td>4B BUS 491W</td>
<td>Business Policy II</td>
<td></td>
</tr>
<tr>
<td>M SCI 432</td>
<td>Introduction to Production Management</td>
<td></td>
</tr>
</tbody>
</table>

**Accounting Options – Non-Math Component**  
The non-math half-credits required for the Chartered Accountancy and Management Accounting Options (together with the terms in which these courses are normally taken) are given below:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A ACC 101</td>
<td>Introductory Accounting</td>
<td></td>
</tr>
<tr>
<td>BUS 111W</td>
<td>Introduction to Business Organization</td>
<td></td>
</tr>
<tr>
<td>1B BUS 121W</td>
<td>Functional Areas of the Organization</td>
<td></td>
</tr>
<tr>
<td>ECON 101</td>
<td>Introduction to Microeconomics</td>
<td></td>
</tr>
<tr>
<td>(or ECON 150)</td>
<td>An Introduction to Micro and Macro Economics</td>
<td></td>
</tr>
<tr>
<td>2A ACC 281</td>
<td>Cost Management Systems 1</td>
<td></td>
</tr>
<tr>
<td>ECON 102</td>
<td>Introduction to Macroeconomics</td>
<td></td>
</tr>
<tr>
<td>(or ECON 150)</td>
<td>An Introduction to Micro and Macro Economics</td>
<td></td>
</tr>
<tr>
<td>2B ACC 291</td>
<td>Financial Accounting 1</td>
<td></td>
</tr>
<tr>
<td>M SCI 211**</td>
<td>Organizational Behaviour 1</td>
<td></td>
</tr>
<tr>
<td>MTHEL 100</td>
<td>Commercial and Business Law for Mathematics Students</td>
<td></td>
</tr>
<tr>
<td>3A ACC 351</td>
<td>Auditing 1</td>
<td></td>
</tr>
<tr>
<td>ACC 371</td>
<td>Managerial Finance 1</td>
<td></td>
</tr>
<tr>
<td>ACC 392</td>
<td>Financial Accounting 2</td>
<td></td>
</tr>
<tr>
<td>3B ACC 372</td>
<td>Managerial Finance 2</td>
<td></td>
</tr>
<tr>
<td>ACC 381</td>
<td>Cost Management Systems 2</td>
<td></td>
</tr>
<tr>
<td>4A ACC 382</td>
<td>Cost Management Systems 3</td>
<td></td>
</tr>
<tr>
<td>ACC 461</td>
<td>Taxation 1</td>
<td></td>
</tr>
<tr>
<td>ACC 491</td>
<td>Financial Accounting 3</td>
<td></td>
</tr>
<tr>
<td>4B ACC 462</td>
<td>Taxation 2</td>
<td></td>
</tr>
<tr>
<td><strong>M SCI 211</strong> is required only in the Management Accounting Option</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes**

1. ACC 401, 453 are strongly recommended in terms 4A/B of the Accounting Options.

2. In addition to the 60% Math and Overall Graduation Average requirements for an Honours BMath degree, students in the Honours Accounting Options must also achieve an average of at least 70% in all of the courses with the prefix ACC which are explicitly required for their program. (See also Footnote 8(iv) on page 13:9.)

3. The minimum grade required to satisfy a prerequisite for courses with prefix ACC is C–.

**Joint Honours Mathematics/Business Administration with Computer Science, Chartered Accountancy with Computer Science (Co-operative only), or Management Accounting with Computer Science (Co-operative only)**  
In conjunction with the common degree requirements in Table I on page 13:8, each of these programs requires at least 21 math half-credits. These overall requirements must include the Faculty core courses outlined in Table II on page 13:10 and the specific math courses listed below. The non-math component of each of these programs must also include all the specific non-math half-credits required in the corresponding Honours Mathematics Option, i.e., Mathematics/Business Administration, Chartered Accountancy or Management Accounting, as listed earlier.

All of
- CS 241 Principles of Computer Science 3
- CS 242 Principles of Computer Science 4
- CS 340 Data Structures
- CS 354 Software Systems
- CS 360 Introduction to the Theory of Computing
- CS 448 Introduction to Database Management
- CS 482 Techniques in Systems Analysis

One of
- CS 351 Digital Design and Architecture
- CS 372 Introduction to Scientific Computation: Numerical Linear Algebra
- CS 374 Introduction to Scientific Computation: Numerical Approximation
- CS 440 - 498

All of
- C&O 230 Introduction to Combinatorics
- STAT 331 Applied Linear Models
Two of
AM 381C   Introduction to Information Theory
(or PMATH 380A   Introduction to Information Theory)
C&O 342   Graph Theory 1
C&O 350   Linear Programming
C&O 367   Nonlinear Programming
C&O 370   Deterministic OR Models
C&O 454   Scheduling
STAT 332   Sampling
STAT 333   Applied Probability
STAT 335   Statistical Process Control
STAT 443   Forecasting

Honours Computer Science – Information Systems
Option (Co-operative only)
This program is described with Computer Science programs on page 13:18.

Honours Operations Research
This program is described with Combinatorics and Optimization programs on page 13:15.
Three-Year General Program (Regular Only)

In conjunction with the degree requirements in Table I on page 13:8, this program requires a total of 30 half-credits, including at least 15 math half-credits and ten non-math half-credits. These overall requirements must include the specific courses indicated in Table V below.

Table V – Three-Year BMath General Program: Required Year One and Two Faculty Core Courses/Typical Course Loads

<table>
<thead>
<tr>
<th>Term 1A</th>
<th>Term 1B</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 111A Algebra</td>
<td>MATH 111B Linear Algebra and Solid Geometry</td>
</tr>
<tr>
<td>MATH 113A Calculus</td>
<td>MATH 113B Calculus</td>
</tr>
<tr>
<td>CS 100 Introduction to Computer Usage</td>
<td>CS 102 Introduction to Computer Programming</td>
</tr>
<tr>
<td>two non-math half-credits</td>
<td>two additional half-credits</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Term 2A</th>
<th>Term 2B</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 225 Linear Algebra 2</td>
<td>STAT 221 Introduction to Statistical Methods 2</td>
</tr>
<tr>
<td>MATH 227 Calculus 3</td>
<td>STAT 220 Introduction to Statistical Methods 1</td>
</tr>
<tr>
<td>STAT 220 Introduction to Statistical Methods 1</td>
<td>four additional half-credits</td>
</tr>
<tr>
<td>two non-math half-credits</td>
<td>two additional half-credits</td>
</tr>
</tbody>
</table>

Terms 3A, 3B combined

additional math half-credits to bring the total to 15
additional non-math half-credits to bring the total to ten
additional half-credits to bring the total to 30

Recommended additional math courses include:

- ACTSC 231 Mathematics of Finance
- AM 250 Modelling with Ordinary Differential Equations
- AM 343 Discrete Models in Applied Mathematics
- C&O 220 Introductory Combinatorics
- C&O 270 Introduction to Optimization
- CS 290 Introduction to Computers and Computer Systems
- CS 330 Introduction to Business Systems

- PMATH 340 Elementary Number Theory
- PMATH 360 Geometry
- PMATH 430A Introduction to Mathematical Logic
- STAT 321 Applied Regression Analysis
- STAT 322 Application of Sampling Surveys

Footnotes to Table V

1. Table V includes the Year One and Two math courses, in the terms they are normally taken, which are required in the three-year BMath General program. It also includes, for Terms 1A, 1B and 2A, a recommended course-load mix of math vs. non-math courses.

2. The Honours and Advanced courses listed in Tables II and III, on pages 13:10 and 13:11, are not open to students registered in the three-year BMath General program. However, in cases where a student registers in the General program following earlier registrations in an Honours program, any successfully completed Honours or Advanced courses may be substituted, in lieu of the corresponding General required courses in Table V, to satisfy three-year BMath General degree requirements.

3. Depending upon a student’s past background in Computer Science prior to entering the program, the Faculty may approve taking CS 102, 212 in lieu of CS 100, 102.

4. The term ‘math half-credit’ includes courses with prefixes ACTSC (Actuarial Science), AM (Applied Mathematics), C&O (Combinatorics and Optimization), CS (Computer Science), MATH (non-departmental Faculty courses), PMATH (Pure Mathematics), and STAT (Statistics).

The term ‘non-math half-credit’ refers to courses offered by other faculties, as well as those with the course prefix MTHEL offered by the Faculty of Mathematics.

Students admitted to the Faculty of Mathematics prior to the Fall/89 term should consult Table IV on page 13:11 re: further potential course substitutions.
Post-Degree Diploma in Actuarial Science

This pre-professional Diploma program is directed at holders of a Bachelor's degree in an area other than Actuarial Science who wish to obtain the background necessary for entry-level employment in the actuarial profession. Instead of completing the standard Ontario Universities Application Centre application-for-admission form normally used for BMath undergraduate degree studies, applicants interested in this Diploma program should contact the Actuarial Science Graduate Officer directly to apply.

Course Requirements
A Post-Degree Diploma in Actuarial Science requires successful completion of eight half-credits, at least six of which must be labelled ACTSC. If equivalent credits have not been earned in the student's previous baccalaureate program, the following three courses must be included in the six ACTSC half-credits:

- ACTSC 231 Mathematics of Finance
- ACTSC 232 Introduction to Actuarial Mathematics
- ACTSC 331 Life Contingencies - Single Lives

The remaining courses to satisfy the overall Diploma requirements described above must be selected from the following list:

- All ACTSC courses numbered 330 or higher
- STAT 330, 331, 333, 431, 433, 443
- CS 337
- MTHEL 305A, 305B
- Other courses approved by the Actuarial Science Graduate Officer.

Combination Honours Programs Leading to a Degree With Another Faculty

Joint Honours Programs with Mathematics
A ‘Joint Honours with Mathematics’ is available for Honours students in conjunction with any discipline ‘Z’, in a faculty other than Mathematics, that chooses to make a ‘Joint Honours Z with Mathematics’ designation available to its students. Students interested in a particular discipline should consult with the department concerned for specific course requirements.

The Faculty of Mathematics course requirements consist of a total of 14 math half-credits with a minimum average of 60%. These overall requirements must include the following specific courses:

- All of MATH 135 Algebra
- MATH 136 Linear Algebra 1
- MATH 137 Calculus 1
- MATH 138 Calculus 2
- MATH 235 Linear Algebra 2
- MATH 237 Calculus 3

Statistics

- All of STAT 230 Probability
- STAT 231 Statistics

Two of

- CS 100 Introduction to Computer Usage
- CS 102 Introduction to Computer Programming
- CS 212 Programming Principles and Practice
- CS 230 Introduction to Computers and Computer Systems

Four additional math half-credits which qualify for BMath degree credit.

Students wishing to specialize in one particular area of mathematics should consult the Undergraduate Officer of the appropriate department in the Faculty of Mathematics for advice in selecting their “additional” math half-credits.

Minor in Mathematics*
A ‘Minor in Mathematics’ is available for Honours students in other faculties. This Minor requires a total of ten math half-credits with a minimum average of 60%. These overall requirements must include the following specific courses:

- All of MATH 135 Algebra
- MATH 136 Linear Algebra 1
- MATH 137 Calculus 1
- MATH 138 Calculus 2
- All of STAT 220 Probability
- STAT 221 Statistics
- Two of CS 100 Introduction to Statistical Methods 1
- CS 102 Introduction to Statistical Methods 2
- CS 212 Programming Principles and Practice
- CS 230 Introduction to Computers and Computer Systems
- Two additional math half-credits which qualify for BMath degree credit.

*Students do not officially register for a Mathematics Minor. Such students register in the appropriate Honours program and request an official Mathematics Minor designation when they complete an ‘Intention to Graduate’ form.

Minor in Computer Science
A ‘Minor in Computer Science’ is available for Honours students in faculties other than Mathematics. This Minor requires a total of ten half-credits, with a minimum average of 60%, which must consist of:

- MATH 135 Algebra
- MATH 136 Linear Algebra 1
- MATH 137 Calculus 1

Mathematics

- MATH 135 Algebra
- MATH 235 Linear Algebra 2
- MATH 237 Calculus 3

- All of
- STAT 230 Probability
- STAT 231 Statistics

Two of

- CS 100 Introduction to Computer Usage
- CS 102 Introduction to Computer Programming
- CS 212 Programming Principles and Practice
- CS 230 Introduction to Computers and Computer Systems

Four additional math half-credits which qualify for BMath degree credit.

Students wishing to specialize in one particular area of mathematics should consult the Undergraduate Officer of the appropriate department in the Faculty of Mathematics for advice in selecting their “additional” math half-credits.

Minor in Mathematics*
A ‘Minor in Mathematics’ is available for Honours students in other faculties. This Minor requires a total of ten math half-credits with a minimum average of 60%. These overall requirements must include the following specific courses:

- All of MATH 135 Algebra
- MATH 136 Linear Algebra 1
- MATH 137 Calculus 1
- MATH 138 Calculus 2
- All of STAT 220 Probability
- STAT 221 Statistics
- Two of CS 100 Introduction to Statistical Methods 1
- CS 102 Introduction to Statistical Methods 2
- CS 212 Programming Principles and Practice
- CS 230 Introduction to Computers and Computer Systems
- Two additional math half-credits which qualify for BMath degree credit.

*Students do not officially register for a Mathematics Minor. Such students register in the appropriate Honours program and request an official Mathematics Minor designation when they complete an ‘Intention to Graduate’ form.

Minor in Computer Science
A ‘Minor in Computer Science’ is available for Honours students in faculties other than Mathematics. This Minor requires a total of ten half-credits, with a minimum average of 60%, which must consist of:
One half-credit Calculus course
One half-credit Algebra course

\[ \text{all of}\]
- CS 102: Introduction to Computer Programming (or equivalent)
- CS 212: Programming Principles and Practice
- CS 220: Introduction to Computers and Computer Systems

Five of
- CS 330: Introduction to Business Systems
- CS 334: Data Types and Structures
- CS 335: Computing Systems
- CS 337: Introduction to Numerical Analysis
- CS 430: Applications Software Engineering
- CS 432: Business Systems Analysis
- CS 435: Topics in Computing Systems
- CS 437: Simulation by Computer
- CS 438: Computer Applications in Business: Data Bases

Notes
1. Students do not officially register for a Computer Science Minor. Such students register in the appropriate Honours program and request an official Computer Science Minor designation when they complete an 'Intention to Graduate' form.

2. To assist with course-selection planning for students wishing to select courses from the non-specialist stream in Computer Science, the following list summarizes the courses available each term:
   - Fall: CS 330, 334, 430, 432, 438
   - Winter: CS 330, 335, 337, 435, 437, 438
   - Spring: CS 330, 334, 432, 438

The sequences of courses below are recommended for those students who wish to take the maximum two CS courses per term during Years Three and Four. (Other sequences are possible, of course, but they may lead to some terms where there are not two CS courses available for which you are eligible and do not already have credit.)

8-stream Co-op
** 3A (W) - CS 335, 337
  3B (F) - CS 334, 430
  4A (S) - CS 432, 438
  4B (W) - CS 435, 437

4-stream Co-op
  3A (S) - CS 330, 334
** 3B (W) - CS 335, 337
  4A (F) - CS 430, 432
  4B (W) - CS 435, 437

Regular
  3A (F) - CS 330, 334
** 3B (W) - CS 335, 337
  4A (F) - CS 430, 432
  4B (W) - CS 435, 437

Recognition of Excellence

1. Alumni Gold Medal
   An alumni Gold Medal is presented annually, usually at Spring Convocation, to recognize the academic excellence of the Math Faculty's most outstanding undergraduate student.

2. K.D. Fryer Gold Medal
   The K.D. Fryer Gold Medal is presented annually, at Fall Convocation, to a graduating Math student who best exemplifies academic excellence and good student citizenship.

3. J. Alan George Award
   The J. Alan George Award is presented annually, at the Math Graduation Ball, to a graduating Math student who best exemplifies student leadership and dedicated involvement in student affairs on campus for the benefit of Math students.

4. Term Dean's Honours List
   To recognize outstanding academic achievement each term, the designation "Dean's Honours List" is awarded to undergraduate Math students in an Honours program whose term averages, both Math and Overall, are at least 85%, based on all courses taken that term. Only students carrying a standard course load of five half-credits or more in the term will be eligible for the Dean's Honours List. This designation is reflected on end-of-term grade reports and official University transcripts.

5. Graduating "With Distinction"
   In recognition of distinguished academic achievement throughout their undergraduate careers, all students who graduate with a BMath degree, either four-year Honours of three-year General, and have both Math and Overall all-inclusive cumulative averages of at least 80%, based on all courses taken, are eligible to graduate "With Distinction". This notation appears on official University transcripts.

6. Graduating "With Distinction – Dean's Honours List"
   In recognition of outstanding academic records throughout their undergraduate careers, all students who graduate with a BMath Honours degree and have both Math and Overall all-inclusive cumulative averages of at least 85%, based on all courses taken, are eligible to graduate "With Distinction – Dean's Honours List". In addition to having this notation appear on their official University transcripts, such students have
Faculty Policies

1. UNDERGRADUATE STANDINGS AND PROMOTIONS COMMITTEE

Membership, Duties, Operating Procedures
The Committee consists of the Dean, Associate Dean for Undergraduate Studies, Assistant Dean (External Programs), the Assistant Registrar for the Faculty of Mathematics (who serves as the Committee’s Secretary), the Faculty Advisor 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 Cooperative Education and Career Services, and other non-voting persons.

The main purposes of the Committee are to administer the rules and regulations pertaining to undergraduate studies in the Faculty, to make recommendations on student performance before end-of-term grade reports are issued to students by the Registrar, and to consider all requests for special consideration or appeals in matters within its jurisdiction.

Exceptions to normal Faculty policies under the jurisdiction of the Standings and Promotions Committee may be authorized only by that Committee. All such requests must be made in writing to the Assistant Registrar, Faculty of Mathematics, Needles Hall. At its meetings the Committee carefully deliberates all petitions and requests, and when special circumstances justify making an exception to existing rules, the Committee grants the request. It is often useful for students to discuss their circumstances with an Undergraduate Advisor before making a formal request to the Committee. Committee meetings are normally scheduled every other week.

2. PROMOTIONAL POLICIES

2.1 Required Withdrawal from Co-op
Students will be required to withdraw from a Co-operative Mathematics program if they fall into one or more of the following categories:

i) They have been required to withdraw from an Honours Mathematics program.

ii) They have failed to meet minimum requirements for 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 have accumulated more than six half-credit failures in total.

Students who have been required to withdraw as Honours BMath degree candidates will be permitted to register in a three-year BMath General program, provided their records do not meet any of the criteria for ‘Required To Withdraw from Mathematics’ (see Section 2.3 below). Students allowed to continue their studies in the General program will not be permitted to take Honours or Advanced mathematics courses when there are corresponding General courses offered by the Faculty. (See table with Note 2 on page 16:97 for a complete listing of such courses.)

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 eight half-credit failures in total.

ii) They have accumulated six or more half-credit failures during any two consecutive full-time academic terms (including failures obtained in any part-time terms interspersed between the two full-time terms in question).

iii) They have exceeded the maximum number of course attempts allowed for their degree. (See Table I on page 13:8).

iv) They have failed to satisfy all requirements for a three-year BMath General degree by the end of the first term in which they have accumulated 40 or more half-course attempts.

v) In the opinion of the Standings and Promotions Committee, they are unlikely to profit from further study in the Faculty of Mathematics.

Students who have been required to withdraw from the Faculty of Mathematics will not normally be re-admitted to a degree program in Mathematics at any point in the future. However, at the time a Required-To-Withdraw decision is given, the Standings and Promotions Committee will review the student’s academic record to date. If, at the end of any term prior to the term when withdrawal is being required, the student would have qualified for any BMath degree, the student will be granted that degree, even though he/she is not being permitted to pursue his/her studies in the Faculty of Mathematics toward a higher degree.

2.4 Exceeding Maximum Course Attempts/Failures
A student who, at the end of a specific term, has accumulated all the requirements for a particular degree, but has simultaneously exceeded the maximum number of failures or course attempts permitted for the degree in question will not normally be granted the degree. In some cases, depending upon the circumstances, the student might be eligible for a lesser degree. (See the last paragraph in Section 2.3 above.) In other circumstances, however, it is quite possible that the student would be required to withdraw from the Faculty with no degree.
3. GRADING POLICIES

3.1 Grade Designations/Averages
In addition to marks from the numerical scale 0-100, the designations INC (Incomplete course work, no credit granted), AEG (Aegrotat, credit granted due to illness), 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. If a student abandons a course and does not write the final examination, some instructors may elect to submit a numerical grade based upon term work, with a zero mark included for the examination, rather than submitting a DNW grade for the course. Students considering such action are advised to determine their instructor's intentions prior to making any final decision to abandon the course. INC, NMR, DNW count as zeros in the calculation of averages.

A student who receives an INC grade designation has up to eight months (two terms) to complete the appropriate course work. If, after eight months, the course work is not completed, then the INC is automatically converted to a DNW grade designation.

3.2 Grade Appeals
Any math student wishing to appeal a grade may do so by contacting the Assistant Registrar, Faculty of Mathematics, in Needles Hall, and requesting a grade appeal form. The grade appeal form must be completed and returned to the Registrar's Office along with $5.00 per grade appeal (which is refunded if the grade is raised). Such an appeal must normally be submitted within one month of the official release of that term's grades. Please note, however, that a grade may be lowered if a re-examination leads to the discovery of an earlier error not in the student's favour.

3.3 Posting of Final Grades by Instructors
Final course grades are not official until student examination reports have been issued by the Registrar's Office. However, once the official final examination period is over each term, instructors in the Faculty of Mathematics are encouraged to post their lists of unofficial final grades, by I.D. number only, on their office doors. Faculty policy precludes such lists from including student names or being posted prior to the end of the official final examination period. Individual students who do not want their grades included on such posted lists must notify their instructors of this fact prior to the end of the official lecture period.

4. POLICIES RE: COURSES

4.1 Advanced/Honours/General Courses
A number of mathematics courses are offered at three different levels for BMath degree credit to accommodate the wide variety of students interested in such courses. The most challenging level, Advanced, is intended for exceptionally gifted students in an Honours program. The second level, Honours, is intended for all Honours students not taking the Advanced courses. The third level, General, is intended for students registered in the three-year General program. In some instances, there are also other versions of such courses designed for students in faculties other than Mathematics.

Advanced courses may always be substituted in lieu of corresponding Honours courses to satisfy Honours BMath degree requirements. Neither the Advanced nor Honours courses listed in Tables II and III, on pages 13:10 and 13:11, are open to students registered in the three-year BMath General program. However, in cases where a student registers in the General program following earlier registrations in an Honours program, any successfully completed Advanced or Honours courses may be substituted in lieu of the corresponding General required courses to satisfy three-year BMath General degree requirements. See table with Note 2 on page 16:97 for a complete listing of such courses.

4.2 Course Upgrading
A student who takes the General version of a course instead of the Honours version (e.g. MATH 227 instead of 237), but later wishes to pursue an Honours degree, may petition the Standings and Promotions Committee for special consideration. When the academic record of the student in question is of very high calibre, the Committee sometimes permits the student to count the General course toward an Honours degree in lieu of the Honours equivalent. The grade in the General course, however, is not normally included in the Graduating Averages which determine the student's eligibility for an Honours degree.

4.3 Failed Courses
The minimum passing mark in all courses is 50%. If a student fails a course, he/she may either retake the same course (and this will be the case if the course is required for the degree being sought) or replace it by another course. The failed course remains a permanent part of the student's record at the University, regardless of whether he/she passes the same course on a subsequent attempt, and it is included in course-attempt and failure counts. However, the failing grade will not be included in the Graduating Averages required for the degree in question (see Footnote B with Table I on page 13:8).

Note that supplemental examinations are not available for students in the Faculty of Mathematics.
4.4 Repeated Courses
A student may not normally retake a passed course more than once in an attempt to improve the grade. Both attempts will be included in the student’s quota of course attempts, but the course will be included only once in credit counts and may be counted at most once in the Graduating Averages required for the degree in question (see Footnote 8 with Table I on page 13:8).

4.5 No Credit/Overlap Courses
Some courses offered within the University may not normally be taken for credit toward a BMath degree. The content of such courses has usually been designed with the academic needs and background of students in faculties other than Mathematics in mind.

Other courses offered by various departments throughout the University sometimes deal with similar subject matter. In such instances, at most one entry from a group of ‘overlapping’ courses may count for credit toward a BMath degree.

List of such courses are published annually in the “How To Get Around in MATHEMATICAL CIRCLES” booklet, copies of which are available in the Mathematics Undergraduate Office (MC 5115). 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 primarily for 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 is not normally permitted.

For a BMath Honours degree, all explicitly specified course requirements must normally be satisfied by on-campus courses, and there are various on-campus full-time residency requirements to be met. Provided such residency requirements are met, however, any additional courses (math or non-math) may be taken on a part-time basis by Correspondence for Honours degree credit.

For a BMath General degree, students may elect to satisfy any course requirement by part-time Correspondence study, provided suitable courses are available in this mode.

A note of caution is in order for those students who will be studying full-time on campus in the Winter term and wish to take Correspondence courses in the preceding Fall term. Fall Correspondence courses do not begin until late October and normally have their final examinations near the end of January. This presents an overlap in course schedules between on-campus and Correspondence courses. Students are urged to consider carefully the potential extra workload involved in studying for, and writing exams in, Fall Correspondence courses while simultaneously carrying a full-time load of on-campus Winter courses.

Subject to the limitations described above, Correspondence courses may be taken on a part-time basis by Regular and Co-op students during terms off campus. Note that while on a work-term, Co-op students are limited to one half-credit course, unless they have written support from their employer to take two half-credit courses. Interested students are encouraged to discuss Correspondence course selections with their Faculty Advisor, but the actual paperwork to preregister for Correspondence courses involves a completely separate application form available in the Correspondence Program Calendar.

4.7 Courses at Other Universities
(Letters of Permission)
Students in good academic standing (i.e. at least 60% cumulative all-inclusive overall average) are normally permitted to take non-math courses at other universities on a part-time basis during terms off campus, provided the courses are not explicitly required for their particular program. Such courses may be used as credits toward a Bachelor of Mathematics degree at Waterloo. However, only under very special circumstances will math students be permitted to take mathematics courses (i.e. MATH, CS, STAT, etc.) or required non-math courses, or study on a full-time basis, at other institutions to count toward their Waterloo degree requirements. Students wishing to take courses at other universities must apply to the Standings and Promotions Committee for permission by completing a special “Letter of Permission” form available from the Registrar’s Office. Please note that permission must be obtained before taking each course. The Committee will not normally approve courses taken elsewhere for Waterloo degree credit if prior approval has not been obtained.

All courses taken on a Letter of Permission will be recorded on Math Faculty Student Examination Reports with a grade of ‘CR’ (credit) or ‘NCR’ (no credit) as appropriate. As a result, the grades for such courses will be excluded from the calculation of averages used to determine eligibility for graduation with a BMath degree (see Footnote 8 with Table I on page 13:8). Note that, while on a work-term, Co-op students are limited to one half-credit course, unless they have written support from their employer 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 in advance by the Standings and Promotions Committee.

There is a non-refundable fee for processing each request for a Letter of Permission. (Only one host institution may be indicated on each request.) If replacement courses are requested because the host institution has cancelled or closed a course which has already been approved to be taken on a Letter of Permission, there will be no additional charge for this service.

4.8 Dropping/Adding Courses

Normally, the last day to ADD a course is two weeks after the official beginning of lectures.

A 'standard' course load is five half-credits per term in all BMath degree programs. The last day to DROP a course for students not carrying more than a standard course load is four weeks after the beginning of lectures.

Students carrying more than a standard course load may not normally DROP any courses later than two weeks after the beginning of lectures.

These deadline dates apply only to Math Faculty students. All exceptions to these deadlines must be approved by the Standings and Promotions Committee.

Complete withdrawal from a Mathematics program without academic penalty is discussed in Section 5.7 on page 13:37.

Full-time Honours students considering taking less than a standard course load in a given term should first ensure that they are going to be able to satisfy the complete-term and basic-term registration requirements for an Honours degree (see page 13:6).

Since OSAP assistance is partially based upon the course load in which a student is enrolled, course drops during the term can affect a student's initial entitlement. Any students who wish to drop below three half-credit courses per term should first consult With the Student Awards Office staff in Needles Hall. In some cases, such action could have a significant effect on their OSAP entitlement.

A course attempt refers to a course registration not formally cancelled with the Registrar's Office. A course attempt not successfully completed constitutes a course 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 most 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 normally 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 One level, and for students in the Math/Teaching Option, Math/Chartered Accountancy, and Math/Chartered Accountancy/Computer Science Options, four satisfactory work terms may suffice depending upon individual circumstances.) 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 three-year BMath General (Regular) 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 degree. However, if they wish to obtain a Co-op degree, they will 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 normally be eligible only for a Regular Honours 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, Co-operative Education and Career Services, 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.

Before making a formal request to the Standings and Promotions Committee to rearrange an academic/academic term sequence, it is often advantageous for the student to discuss the situation with a Co-ordinator and Faculty Advisor. If the request is approved by the Standings and Promotions Committee, it is the student’s responsibility to deal with any timetabling difficulties which may arise and to make any necessary preregistration arrangements for subsequent terms.

III) Course Load During Academic Terms
While registered for an academic term, Co-op students are normally expected to maintain a full-time course load of three or more half-credits, unless they have already satisfied the complete-term and basic-term registration requirements for an Honours degree and are within one or two half-credits of fulfilling the academic degree requirements for their program. (See the section “Satisfying Basic And Complete-Term Registration Requirements For A BMath Honours Degree” on page 13:6). While on a work term, Co-op students are limited to one half-credit course, unless they have written support from their employer to take two half-credit courses.

5.2 Course Load
Students may not normally preregister for more than a standard course load of five half-credits per term. In exceptional circumstances, Honours students with strong academic records may be permitted to add further courses during the course-change period at the beginning of term, subject to the approval of their Faculty Advisor. General students may not normally add courses beyond a standard course load of five half-credits per term.

When seeking approval to take additional courses beyond a standard course load, students should ensure that they have their most recent mark report for consultation with their Faculty Advisor. Any students carrying more than a standard course load of five half credits at the end of the two-week course-change period may not normally drop any courses subsequent to that date.

5.3 Year Classification
For official registration purposes, a student’s “year” will normally be determined by the number of half-credits (N) achieved to date:

<table>
<thead>
<tr>
<th>Year</th>
<th>0 ≤ N ≤ 10</th>
<th>10 ≤ N ≤ 20</th>
<th>20 ≤ N ≤ 30</th>
<th>≥ 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Year</td>
<td></td>
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</tr>
<tr>
<td>Second Year</td>
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<td>Third Year</td>
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</tr>
<tr>
<td>Fourth Year</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

5.4 Registration of Regular Students in Spring Terms
Students in the Regular program normally take courses during the Fall and Winter terms. They may also register, on a part-time or full-time basis during the Spring (May-August) or Summer (July-August) term. However, there are no Math Faculty course offerings in the Summer term and those in the Spring term are planned primarily for Co-op students. Because of resource limitations, it may not always be possible to allow Regular students universal access to Math Faculty course offerings in the Spring term. First priority for access to particular courses in the Spring term will always be given to Co-op students.

Co-op students normally preregister for Spring courses at the beginning of the preceding November. Regular students may preregister in early February. By that time, the extent of the demand by Co-op students for Spring courses will be known and departments will be in a better position to determine which courses will be available to Regular students. (A list of courses closed to Regular students will be available for February preregistration.) If subsequent preregistration requests from Regular students should exceed the space available in the non-restricted courses, it may not be possible to accommodate all Regular students in the courses in question, and preference will normally be given to students who preregister during the February preregistration period.

5.5 Course Prerequisites
At any time prior to the completion of lectures, if it is discovered that a student is taking a course offered by the Faculty of Mathematics without having previously successfully completed all the course prerequisites stated in the University Undergraduate Calendar, the student is subject to having his/her preregistration/registration in that course purged from university records. Such purging may be done at the request of the course instructor, the department offering the course, and/or the Faculty of Mathematics, but not without the consent of the instructor.

5.6 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, assign a passing mark based solely on term work, or arrange for a deferred examination.

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

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

5.7 Voluntary Withdrawal
The normal deadline date for Math undergraduate students to withdraw from all their courses, without academic penalty, is four weeks after the beginning of lectures in a given term. However, exceptions will normally be made for 1A students who have never previously been registered at a degree-granting post-secondary institution. Such students will normally be permitted to withdraw from all their courses without academic penalty as late as the last official day of lectures for their 1A term. (A special 'Withdrawal Form', available from the Registrar's Office, must be completed.) A student who withdraws late will normally be held responsible for that term's courses in the sense that such courses will be permanently recorded with grades of DNW and will subsequently be counted as course attempts and failures. Students in this category may still be eligible for tuition and residence fee rebates, depending of course, upon the date of withdrawal.

A student who has been admitted as a BMATH degree candidate and subsequently withdraws without academic penalty prior to completing at least one term of study must request re-admission in order to register for a subsequent term. Such requests will be considered by the Faculty Admissions Committee in competition with other new applicants for admission at that time. (Note: the Faculty of Mathematics does not normally offer admission for the Winter or Spring terms.)

5.8 '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, Faculty policies in effect at the time of re-admission will apply, unless stated otherwise by the Faculty when re-admission is approved.

('Inactive' is taken to mean that the student has not been registered as a BMATH degree candidate at the University of Waterloo, or on an approved Letter of Permission.)

6. BMATH WRITING SKILLS REQUIREMENT
BMATH degree candidates must satisfy the following Writing Skills Requirement:

"A grade of 60% or better on the UW English Language Proficiency Exam or a half-credit with a mark of C- or better in a term-course chosen from a list approved by the Undergraduate Affairs Committee and maintained by the Math Undergraduate Office. (The current list includes the following English courses: ENGL 109, 129R, 150, 210A and 210C.)"

The entry ARTS 000 will appear on subsequent Student Examination Reports with a CR grade once the student has successfully completed the Writing Skills Requirement.

7. "AREAS OF STUDY" ON TRANSCRIPTS
BMATH transcripts include explicit mention of no more than two areas of study in the academic program section.
Faculty of Science
Faculty of Science

The Faculty of Science consists of four departments: Biology, Chemistry, Earth Sciences, and Physics, and the School of Optometry.

Since the first students were enrolled in Fall, 1959, the Faculty has grown to 2200 undergraduates and 260 graduate students pursuing full-time studies, and another 1500 undergraduate and graduate students in part-time studies.

Degrees
The degree of Bachelor of Science (BSc) is awarded on the successful completion of the three-year general and four-year honours programs. The degree Doctor of Optometry (OD) is awarded on the successful completion of a four-year professional program.

Programs
Biochemistry, Biology, Chemistry, Earth Sciences and Physics programs are available on both the Regular and Co-operative system of study. In the co-operative system the students alternate four-month study terms on campus with four-month work terms in industry, business or government, in an area related to their studies.

The Faculty of Science also offers Honours Science and Business and Honours Liberal Science (Science for the Generalist) programs, and four year Honours and three year General non-specialized programs. In addition, an Honours BSc in Psychology is offered in co-ordination with the Department of Psychology. A small number of students may be accepted into the BSc Psychology program in Co-operative study.

Graduate programs leading to the degrees of MSc and PhD are discussed in the University of Waterloo Graduate Studies calendar.

Admission

The admission categories, requirements and procedures for all programs are outlined in Chapter 2 of this Calendar.

Normally, admission to the Faculty of Science is to one of the Co-operative programs in Biology, Biochemistry, Chemistry, Earth Sciences or Physics, or to Regular Honours Science. In Regular Honours Science a major field of study or the non-major program (Honours Science – Program One) must be selected on pre-registration.

Transfer Students
Students may be accepted for transfer from other programs in the University or from other universities. Their programs will be evaluated in terms of the number of credits allowed and the number remaining for a degree. Normally transfer students will be required to complete a minimum of 50% of the course work while registered in the Faculty of Science. Credits will be transferred without a cumulative average and only for relevant courses with a 60% or better mark. Students applying to transfer to Co-operative programs in the Faculty of Science will not normally be admitted above the Year Two Term B level.

Admission as a Mature Student
Applicants are normally required to obtain standing in Grade 13 (or O.A.C.) Calculus and one Grade 13 (or O.A.C.) Science (Chemistry or Physics preferred) or their equivalent in order to have the proper background for first-year University courses in these areas. To discuss admissibility, applicants are advised to contact the Assistant Registrar, Faculty of Science.

English Language Proficiency Requirements
All Faculty of Science students entering degree programs in September, 1982 or later 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.

Program and Course Selection

First Year Programs (Regular and Co-operative)
The normal minimum course load for a full-time student in Year One Science is five lecture courses plus required labs per term. At least two of these must be lecture credits from the Year One offerings in two different disciplines from the Faculty of Science.

Students are encouraged to select an Arts elective (preferably English or Psychology). Students whose secondary school Grade 13 average was 70% or better may select six lecture-courses if they wish. It is recommended that students intending to take an Honours Physics program enrol in six lecture-courses.

Courses should be chosen either with a specific Year Two goal in mind or to cover many Year Two programs. The required and recommended Year One selections for Year Two Honours programs and Optometry can be found in the table on page 14.7.

Course and Program Changes
1. Students may "add or drop" courses during the first two weeks of the Fall, Winter and Spring terms upon having the appropriate change form completed.
2. 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 courses. The permission of the instructor and the appropriate undergraduate officer or the Associate Dean must be obtained.
Courses which have not been dropped officially will receive a DNW grade.

3. 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.

4. 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.

Eligibility for Courses
Students must ensure they have the appropriate course prerequisites and where applicable corequisites stated in the course descriptions in the calendar.

Overlap courses
Where substantial overlap exists between two courses credit will be granted for only one even if they are not listed as antirequisites.

Since some Science departments offer both Honours and General equivalent courses it is the student’s responsibility not to duplicate subject matter. Credit will only be given for one of such overlapping courses (e.g. CHEM 266 or 264; PHYS 111, 112 or 121, 122).

This rule also applies to courses offered by various departments throughout the University which sometimes deal with similar subject matter (e.g. STAT 204 or PSYCH 200).

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.

Letters of Permission
Students in good academic standing and whose total number of transfer credits is less than the maximum permitted may be allowed to take an elective course at another university during a term off-campus to count as credit towards their degree.

A student wishing to do so must complete the Letter of Permission form available at the Registrar’s Office (for a fee) and have it authorized by the Associate Dean or an appropriate Undergraduate Officer. The letter of permission must be obtained before taking the course.

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.

Audit
The Faculty of Science does not record nor recognize audits for students in Science or any other Faculty.

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.

Reduced Program
The General Science degree may be taken on a completely part-time or reduced program basis. The Honours Science – Program One degree may be taken on a part-time or reduced program basis if permission is granted by the Examinations and Standings Committee. Normally all other Faculty of Science degrees must be completed (fourth-year) in full-time study, and either the second or third year must also be carried out in full-time study. In order to be considered in full-time study, a student must be taking a minimum of five credits in one academic year.

A student in good standing who “stops out” of an Honours Program for more than a year must have departmental approval before returning to that program.

Only in exceptional circumstances may a first year program for a full-time student be reduced below the five lecture-course minimum.

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.

Teacher Certification in Ontario
The Ontario Teacher’s Certificate may be granted by the Ministry of Education after the successful completion of a program taken at an approved Ontario Faculty of Education. The Faculties of Education require that applicants hold an acceptable University degree (BA or BSc or equivalent, three- or four-year General or Honours).

Those students interested in seeking admission to a Faculty of Education should contact the appropriate university.
Future Regulations
Normally, students will be given advanced warning of changes in regulations but the Faculty reserves the right to make changes without notice where necessary.

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

Students should note that the Faculty of Science normally operates under a "credit-weight system" in which student progress is measured by credits successfully completed rather than by years. (The only exceptions to this are Honours Earth Sciences programs. These programs follow the term course system.) Students who have passed fewer than five credits successfully will be considered Year One students; those with at least five but fewer than ten, Year Two; those with at least ten but fewer than 15, Year Three; and those with 15 or more, Year Four.

Final Examinations
1. The Faculty constitutes the examining body for all examinations. All examination results are considered by the Examinations and Standings Committee and subsequently by the Faculty Council. After the results have been considered by these bodies, they will be issued to individual students by the Registrar. Appeals against faculty decisions made under these regulations should be made in writing to the Registrar's Office within one month of the official announcement of marks.

2. Final examinations are held in December, April, or August. The time normally allowed for each examination is three hours.

3. In all courses each student is required to submit, in such form and at such time as may be determined by the instructor, evidence of satisfactory participation in term work. The marks obtained for work during term are used, in part, in determining standing. The ratio in which marks for term work and written examinations are combined is at the discretion of the individual departments. To pass a course, a student must obtain a minimum of 50% in the combined term and examination marks. Some courses and/or instructors may not require final examinations; in such cases term work only will be used in determining a final grade.

4. 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.

5. In cases where a course (failed or passed) is repeated, both marks will be used in calculating the student's cumulative averages. 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.

6. No course or its equivalent may be repeated more than once.

7. All examinations which receive a failing grade are automatically re-read.

8. Make-up examination privileges may be granted to students in good standing where failure to pass is attributable to extraordinary circumstances, especially medical or health-related problems. The student must have satisfied all term-work requirements in the course and must have the permission of the Examinations and Standings Committee.

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:

1. Evaluation in Year One will be made at the end of term 1B on the entire year's work. Students not meeting requirements of their program will be transferred to another Science program (Regular system) in good standing, if possible.

2. Assessment will be made on a term-by-term basis during Years Two and Three. Terms 4A and 4B will normally be assessed as a unit at the end of the 4B term when both terms are taken consecutively from September to April. Normally a student may take no more than two upper year terms on a part-time or reduced program basis and must have special permission from the Department to do so.

3. 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.

Standing
Grades
Marks in individual courses will be reported as numerical marks on the scale 0 to 100. A mark of 50 or better is necessary to pass and receive credit for a course. For Science students, any grade of less than
32 will be recorded on the marks report and permanent transcript but for averaging purposes a grade of 32 will be used, equivalent to the weighting factor for the F- on the common system.

**Grade Appeals**

Any student wishing to appeal a course grade should submit a formal written appeal either through the Registrar's Office or the Science Undergraduate Affairs Office. Appeal forms are available in both locations.

Normally a formal appeal must be submitted within one month of the official release of the term's grades.

**Conditional Standing**

A student who marginally fails to meet the required standards of any program will be placed on conditional standing for one term only. During this period the student must regain standing in that program or withdraw from it. Conditional standing will be granted only once in any particular program.

**Required to Withdraw**

A student will normally be required to withdraw from the Faculty of Science after failing more than 2.0 credits in any academic year (or equivalent), or after failing to achieve an overall cumulative average of at least 55% and a cumulative average of 55% in all Science courses, or if unlikely to profit from further study, in the opinion of the Examination 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, and a supporting letter from, for example, an employer or minister of religion.

Readmission is not automatic. All such applicants will be assessed in competition with new applicants and on the probability of their future success.

Readmission when granted will be with conditional standing.

**Terminology**

INC (either term work, lab work, examination, etc., are incomplete). A course for which the grade designation INC has been given must be completed within 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.

AEG (aegrotat) - signifies the student's work or examination was incomplete because of illness and the instructor is satisfied that the student should receive credit for the course but a numerical mark could not be set.

CR - Credit granted where performance was satisfactory but no specific mark is given and AEG is not appropriate.

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 cumulative averages.

Unless there are medical or other extenuating circumstances, a DNW will be weighted for averaging purposes as a mark of 32 (equivalent to F- on the common grading system) in determining standing.

"Attempt" is a course completed, whether passed or failed, or recorded as INC or DNW. Courses dropped before the official deadline are not considered as attempts and do not appear on the transcript.

**Course**

A course may refer to a lecture course, a laboratory course, or a lecture-laboratory course which includes both lecture and laboratory.

Most laboratory courses are designated by the letter L following the course number.

Participation courses in Dance, Fine Arts, Drama and Music are considered to be laboratory courses.

**Credit**

Credit values are assigned for lecture and laboratory courses as designated in the course descriptions (also see chapter 16).

**Dean's Honours List**

The Faculty of Science has a Dean's Honours List to recognize outstanding academic achievement.

To be eligible students must have completed a term in Year One or Year Two, Three or Four of an Honours Program with a cumulative average and an overall average for the completed term of at least 80%, have carried a full course load, and not have an INC, DNW or failed course.

The award will be noted on the student's transcript, and the student will receive a congratulatory letter and certificate 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.

YEAR ONE SCIENCE PROGRAM SELECTIONS

<table>
<thead>
<tr>
<th>Major Field of Study</th>
<th>Required Courses in Year One</th>
<th>Recommended Electives in Year One</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology (see Note 3)</td>
<td>Two 200-level term courses in Biology, CHEM 123/124 and 123L/124L, CS 102.</td>
<td>PHYS 111/112, or MATH 113A/B, EARTH 121/122; a third 200-level term course in Biology.</td>
</tr>
<tr>
<td>Biochemistry (see Note 3)</td>
<td>Two 200-level term courses in Biology, MATH 113A/B, CHEM 125/126 and 123L/124L, PHYS 111/111L or 121/121L and 112/112L, CS 102.</td>
<td></td>
</tr>
<tr>
<td>Biology and Environment and Resource Studies (see Note 3)</td>
<td>Two 200-level term courses in Biology, two term courses in Environment and Resource Studies, CHEM 123/124 and 123L/124L, CS 102.</td>
<td></td>
</tr>
<tr>
<td>Biology and Geography (see Note 3)</td>
<td>Two 200-level courses in Biology, two term courses in Geography, CHEM 123/124 and 123L/124L, CS 102.</td>
<td></td>
</tr>
<tr>
<td>Chemistry (see Note 3)</td>
<td>CHEM 125/126 and 123L/124L, MATH 113A/B, PHYS 121/112 and 121L/112L, CS 102.</td>
<td></td>
</tr>
<tr>
<td>Chemistry and Environment and Resource Studies (see Note 3)</td>
<td>CHEM 125/126 and 123L/124L, ERS 100, 101, 150, 151; Biology - two 200-level courses; MATH 115A/B, CS 102; ENV S 195.</td>
<td></td>
</tr>
<tr>
<td>Chemistry with Options</td>
<td>CHEM 125/126 and 123L/124L, MATH 113A/B, PHYS 121/112 and 121L/112L, CS 102.</td>
<td>BIOL 111/112, or two 200-level term courses in Biology, EARTH 121/122, ENV S 195.</td>
</tr>
<tr>
<td>a) Chemistry (Environmental Studies Option) (see Note 3)</td>
<td>CHEM 125/126 and 123L/124L, MATH 113A/B, PHYS 121/112 and 121L/112L, MATH 114 or 134B, CS 102.</td>
<td></td>
</tr>
<tr>
<td>b) Chemistry (Mathematics Option)</td>
<td>CHEM 125/126 and 123L/124L, MATH 115A/B, PHYS 121/112, and 121L/112L, MATH 114 or 134B, CS 102.</td>
<td></td>
</tr>
<tr>
<td>c) Chemistry (Physics Option)</td>
<td>CHEM 125/126 and 123L/124L, MATH 115A/B, PHYS 121/112, and 121L/112L, MATH 111A/134B.</td>
<td></td>
</tr>
<tr>
<td>Earth Sciences (see Note 3)</td>
<td>EARTH 121/122, CHEM 123/124 and 123L/124L, PHYS 121/122 and 121L/122L, CS 102, MATH 113A/B, one unrestricted term course.</td>
<td></td>
</tr>
<tr>
<td>Earth Sciences with Options</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Earth Sciences (Economics Option)</td>
<td>EARTH 121/122, CHEM 123/124 and 123L/124L, PHYS 121/122 and 121L/122L, CS 102; MATH 113A/B, ECON 101 or 102.</td>
<td></td>
</tr>
<tr>
<td>b) Earth Sciences (Geography, Option)</td>
<td>EARTH 121/122, CHEM 123/124 and 123L/124L, GEOG 101/102, CS 102. Either PHYS 111/112 and 111L/112L of BIOL 111/112 or equivalent elective.</td>
<td></td>
</tr>
</tbody>
</table>
# YEAR ONE SCIENCE PROGRAM SELECTIONS

## Regular Programs

<table>
<thead>
<tr>
<th>Major Field of Study</th>
<th>Required Courses in Year One</th>
<th>Recommended Electives in Year One</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optometry (consult page 14:31, for full list of prerequisites for admission to Optometry)</td>
<td>BIOL 230 and 211, CHEM 123/124 and 123L/124L, PHYS 121/122 and 121L/122L, MATH 113A/B, PSYCH 101</td>
<td>PSYCH 102(A-H) or SOC 101.</td>
</tr>
<tr>
<td>Physics (see Note 1)</td>
<td>PHYS 121/122, PHYS 121L/122L; PHYS 123, MATH 115A/B or MATH 113A/B, MATH 134A/B or MATH 111A/B</td>
<td>CHEM 123/124 and 123L/124L.</td>
</tr>
<tr>
<td>Psychology</td>
<td>Two 200-level term courses in Biology, CHEM 123/124 and 123L/124L, PHYS 111/112, 111L/112L or 121/122 and 121L/122L, MATH 113A/B, PSYCH 101; one Psychology elective.</td>
<td></td>
</tr>
<tr>
<td>Honours Science and Business (see Notes 3 and 4)</td>
<td>2.0 Science lecture-credits from the Year One offerings in Chemistry, Earth Sciences, Physics and BIOL 230/273; MATH 113A/B; BUS 111W; BUS 121W, CS 102.</td>
<td>MATH 111B.</td>
</tr>
<tr>
<td>General Science, Honours Science non-major, Liberal Science (see Note 3)</td>
<td>2.0 Science lecture-credits from the courses offered to Year One students in Biology, Chemistry, Earth Sciences &amp; Physics. One Liberal Science Core Course for Liberal Science (Science for the Generalist) program.</td>
<td>MATH 113A/B; CS 102.</td>
</tr>
</tbody>
</table>

## Co-operative Programs

<table>
<thead>
<tr>
<th>Major Field of Study</th>
<th>Required Courses in Year One</th>
<th>Recommended Electives in Year One</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co-operative Biology (see Notes 2 and 3)</td>
<td>Three or four 200-level term courses in Biology, CHEM 123/124 and 123L/124L, CS 102.</td>
<td>PHYS 111/112, EARTH 121/122.</td>
</tr>
<tr>
<td>Co-operative Biochemistry (see Notes 2 and 3)</td>
<td>Three or four 200-level term courses in Biology, CHEM 125/126 and 123L/124L, MATH 115A/B, PHYS 111/111L or 121/121L, and 112/122L, CS 102.</td>
<td></td>
</tr>
<tr>
<td>Applied Chemistry (see Notes 2 and 3)</td>
<td>CHEM 125/126 and 123L/124L, MATH 115A/B, PHYS 121/112 and 121L/112L, CS 102.</td>
<td></td>
</tr>
<tr>
<td>Applied Earth Sciences (Geology Option) (see Note 3)</td>
<td>EARTH 121/122, CHEM 123/124 and 123L/124L, PHYS 121/122 and 121L/122L, CS 102, MATH 113A/B.</td>
<td></td>
</tr>
<tr>
<td>Applied Earth Sciences (Geophysics Option) (see Note 3)</td>
<td>EARTH 121/122, MATH 115A/B; PHYS 121/122, PHYS 111/112, and 121L/122L, CHEM 123/124 and 123L/124L, CS 102, MATH 114 or 111B.</td>
<td></td>
</tr>
<tr>
<td>Applied Physics (see Notes 1 and 2)</td>
<td>PHYS 121/122, PHYS 121L/122L; MATH 115A/B, MATH 134A/B, PHYS 123.</td>
<td>CHEM 123/124 and 123L/124L.</td>
</tr>
<tr>
<td>Applied Physics (Geophysics Option) (see Notes 1, 2 and 3)</td>
<td>PHYS 121/122 and 121L/122L, MATH 114, 115A/B, CHEM 123/124 and 123L/124L, CS 102, EARTH 121/122.</td>
<td></td>
</tr>
</tbody>
</table>

### Notes

**Note 1**
Co-op Physics students and those planning to enrol in Honours Physics in Year Two are advised to select MATH 120A/B instead of MATH 113A/B or 115A/B if they have more than an 80% average, and may select MATH 111 instead of MATH 134 if they have a less than an 80% average in Grade 13 Mathematics and Physics.

Students wishing a Biophysics Option with the Honours Physics program are advised to include BIOL 111/112 in their program.

Students wishing a Geophysics Option with the Honours Physics program are advised to include EARTH 121/122 and CHEM 123/124 in Year One.

Students wishing any of the Business Administration Options with the Honours Physics program are advised to select ECON 101/102.

**Note 2**
Students in the Co-operative Biology, Biochemistry, Chemistry, and Physics programs have two methods of taking Year One: (a) two terms in a row ("8-stream") (September-April) or (b) fall term on campus and spring term on campus (May-August).

**Note 3**
CS 100 must be taken before CS 102 by students with no computing background from high school.

**Note 4**
Students needing CS 100 in the fall must delay CS 102 to the Winter (1B) and reschedule their MATH 111B to Year 2B and MTHEL 100 to 2A.
Academic Programs and Degree Requirements

General Programs

THREE-YEAR GENERAL PROGRAM
The three-year General program allows students to specialize to a limited extent in a particular subject area or to pursue a broad range of Science subjects. However, students graduate with the "General Science" degree with no area of specialization designated.

Students who have completed Year Two or Three of the three-year program with credit in the required courses are qualified to apply for admission to medical school in Ontario. Students who have passed the first year of the program with appropriate choice of courses are qualified to apply for admission to a dental school.

Students must maintain an overall cumulative average of 55% and a cumulative average of 55% in all Science courses to be able to continue in Years Two and Three of the General Science program.

In order to graduate with a three-year General degree, the following requirements must be met:

1. Successful completion of 15.0 credits with a cumulative overall average of 55% and 55% in all Science courses. Of the 15.0 credits:
   a) 14.0 must be lecture credits;
   b) at least 7.5 must be Science credits, and 2.0 of these must be lecture credits from the Year One offerings in 2 different disciplines;
   c) at least 7.5 must be at or above the 200-level;
   d) at least 1.0 credit must be in Math.

2. No more than 3.0 SCI credits may be applied to the three-year General degree.

3. No more than 5.0 failed credits will be allowed.

4. A minimum of 3.0 lecture credits must be obtained per academic year, with no more than 2.0 failed credits allowed.

   In addition, normally no more than 7.0 credits can be from any one department (for example, 7.0 Biology credits, or 7.0 English credits). Students are encouraged to take at least 2.0 credits from non-science areas, such as Arts or Math.

   Normally, 5.0 lecture credits per year are taken.

Year One
5.0 lecture credits, exclusive of laboratory credits. At least two of (a), (b), (c) or (d) must be taken:
   a) BIOL 111/112, or two 200-level term Biology courses;
   b) EARTH 121/122;
   c) CHEM 123/124 + labs;
   d) PHYS 111/112 or PHYS 121/122 + labs.

It is recommended that the required Math credit be taken in Year One.

Science
Academic Programs and Degree Requirements

Years Two and Three
5.0 credits of which two or three should normally be in Science.

The following list indicates some of the courses from which a choice should be made when selecting courses.

Science courses recommended (other than Year One courses):
1. A student required to withdraw from an Honours Program in Chemistry who enrols in the General Program is permitted to take no more than two lecture courses in Chemistry during the first term of study as a general degree student.
2. General Program students may not take Honours Chemistry Core Courses. Nor may they take 400-level courses and certain 300-level courses without the consent of the instructor.

Mathematics courses recommended
MATH 113A, 113B, 111A, 111B, 215 or 216; CS 100, 102: STAT 204, 304 but not MATH 103, 104 or 106.

Honours Programs

The Faculty of Science offers two different types of Honours degrees – the Honours Science programs, and the Honours Major programs.

Minors with Honours Programs
A Minor in each of the four disciplines, Biology, Chemistry, Earth Sciences and Physics is available to Honours students in another department. See individual departmental sections for further information about the requirements.
HONOURS SCIENCE PROGRAMS

The Honours Science program allows students to study sciences in greater depth than permitted in the general Science program, but without as intense a degree of specialization as required in the more specialized programs such as Honours Biology, Honours Chemistry, etc. Students desiring a somewhat broader background in the Sciences might find this program more suitable than the more traditional specialized programs. However, students contemplating graduate study in the traditional disciplines following their undergraduate studies are advised to pursue the more specialized Honours programs.

There are five programs available that will lead to the degree of Bachelor of Science (Honours Science) plus Liberal Science and an Honours Science and Business program. All are conducted through the regular system of study. They are:

1. Program 1: Non-specialized (see below).
2. Program 2: Biology specialization (see page 14:16).
3. Program 3: Chemistry specialization (see page 14:24).
5. Program 5: Physics specialization (see page 14:29).

Liberal Science (see below)
Honours Science and Business (see below).

Honours Science — Program One (Non-Specialized)

Admission to, and continuance in, Honours Science Program 1 requires a cumulative overall average of 60% and a cumulative average of 60% in all Faculty of Science courses.

In order to graduate in the Honours Science (non-specialized) program, the following requirements must be met:

1. Successful completion of 22.0 credits, exclusive of Year One lab credits, with a cumulative overall average of 60%, and a cumulative average of 60% in all Faculty of Science courses. Of the 22.0 credits that are required:
   a) at least 20.0 must be lecture credits;
   b) at least 14.0 credits must be Faculty of Science credits, of which 10.0 must be at or above the 200 level, and at least 5.0 of them other than any SCI credits must be at the 300- or 400-level.
2. At least 1.0 credit must be in Math.
3. No more than 5.0 failed credits are allowed.
4. No more than 3.0 SCI credits may be applied to the program.
5. Unless permission to pursue this degree in part-time status has been granted by the Admissions Committee of the Faculty of Science, a student must have been enrolled full-time in two out of three years, one of which must be either Year Two or Three, and the other must be Year Four. Year Four of the program must be taken at the University of Waterloo.

Year One

5.0 lecture credits, exclusive of laboratory credits. At least two of (a), (b), (c), or (d) must be taken:
   a) BIOL 111/112, or two 200-level Biology courses;
   b) CHEM 123/124 plus labs;
   c) EARTH 121/122;
   d) PHYS 111/112, or PHYS 121/122 plus labs.

Years Two, Three and Four

Normally, 4.0 Science credits plus 2.0 others are taken in Year Two and Three; in Year Four, 4.0 Science credits plus 1.0 other are taken.

Liberal Science (Science for the Generalist)

Director: Prof. G. Atkinson

This program, which has developed from a restructuring of the General Science Program, is intended to present a broader perspective on science. It is a four-year Honours Program, but students may earn a three-year degree with a Liberal Science label by meeting certain conditions as shown below. A Liberal Science Option is also available for students in other programs. The goal of the program is to produce a generalist with the capability of understanding specialist areas in science, and with some selected experiences in doing so in at least two sciences. This program operates under a Board of Studies representing the units in the Faculty of Science and the other faculties which contribute to the teaching of the Core Courses.

Students must apply to be admitted on completion of Year One. A minimum 60% average, both overall, and in all courses taken in the Faculty of Science will be required.

Admission to, and continuance in, the Liberal Science program requires a cumulative overall average of 60%, and 60% in all Science courses. Students required to withdraw from Honours Degree programs may apply for admission, but admission is not automatic and is granted on consideration of individual cases. No student will receive the degree from this program without spending one academic year leading to that degree enrolled in the program. A normal course load is 2.5 lecture credits per term plus any associated lab credits.

In order to graduate with a Liberal Science degree, the following requirements must be met:

1. Successful completion of 22 credits excluding of lab credits with a cumulative average of 60%, including:
   a) 2.5 credits in Core Courses
   b) 1.0 credit in SCI 468A and B
c) 0.5 credit in SCI 469

d) 1.5 credits in mathematics

e) 2.0 credits in Year One offerings of two Science disciplines

f) 2.0 credits in sequences of upper year courses, plus

g) 2.0 credits in other upper year courses in those two Science disciplines

h) 3.0 credits in languages, humanities or social sciences courses.

The remaining 7.5 credits may be freely selected in consultation with an advisor.

2. Apart from the required SCI courses, no more than 1.5 credit in SCI courses may be applied to the degree.

3. Students will be required to withdraw from the program upon failing 2.0 credits in an academic year, or 3.5 credits overall.

4. Students must apply for admission to the program, and spend at least one successful academic year in it, obtaining good standing.

5. Students admitted to this program must choose courses aimed at fulfilling these program requirements, and may not substitute courses aimed at gaining or regaining admission to some other program.

6. A student must take Year Four at the University of Waterloo, and must be enrolled full-time in Year Four and in either Year Two or Year Three.

Students enrolled in Liberal Science who decide to take a three-year degree with a Liberal Science label must:

1. Obtain credit for SCI 369 (and record their intention of doing so early in their penultimate term.)

2. Successfully complete 15 credits exclusive of lab credits with a cumulative average of 60%.

3. Fulfill other requirements for the Honours Degree in part as may be approved by the Board of Studies on a case-by-case basis. (A student enrolled in Liberal Science throughout Years Two and Three will be expected to show credits for at least four Core Courses or acceptable equivalents.)

The following is a list of courses from which students are advised to choose:

**Core Courses**

SCI 260, 261, 263, 265, 267, 369, 469.

**Year One Offerings**

BIOL 230, 273

CHEM 123/123L, 124/124L

EARTH 121/122

PHYS 111/111L, 112/112L or 121/121L, 122/122L

**Upper Year Sequences** (suggested sequences joined by + signs)

BIOL 201 + 202, 210 + 211, 220 + 221, 240 + 241, 470 + 471

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**Science Academic Programs and Degree Requirements**

- CHEM 212 or 218 + 312 or 313, 237 + 332 or 333, 266 + 267, 356 + 357 with the appropriate lab course: CHEM 314L, 237L, 266L, 356L respectively
- EARTH 231 + either 221, 232, or 238, 235 + 238, 236 + 238
- PHYS 226 + 246, 275, 301 + 302, 368 + 369, 390 + 381 with appropriate lab courses

**Students are explicitly excluded from:**

- BIOL 301 and 400-level courses not listed below
- CHEM 400-level courses except by permission of instructor
- EARTH 260 and 400-level courses
- PHYS 400-level courses except by permission of instructor

**Suggested additional Upper Year courses:**

- CHEM any other 200- or 300-level courses subject to prerequisites and antirequisites
- EARTH 331, 332, 333, 336, 342, 345, 370
- PHYS any other 200- or 300-level courses subject to prerequisites and antirequisites
- SCI 250, 255, 355, 453, 454, 462

**Liberal Science Option**

Students in any program may enrol in the Liberal Science Option. This option provides an opportunity to gain some generalist education in science, and to address a number of aspects of the interaction of science and technology with society. If the requirements are fulfilled, the option will be recorded on students' transcripts upon graduation.

Students considering the Liberal Science Option should consult a Liberal Science advisor, and record their proposed option program for approval by the Board of Studies. Subsequent changes to the program must also be recorded and approved.

In order to have a Liberal Science Option recorded, the following requirements must be met:

- Successful completion of six approved term courses with an average of 60%, including:
  - a) three Liberal Science Core Courses or approved alternatives. The third of these courses may by agreement be SCI 369 or 469.
  - b) three other term courses proposed by the student and approved.

Students will submit written statements showing how the three core courses and three other courses form a coherent option related to the student's main program and overall educational plans. Appropriate courses may be found both in regular academic departments and in interdisciplinary programs such as Women's Studies, and Society, Technology and Values.

Specimen option programs will be available as examples to assist students in planning a proposal.
Honours Science and Business
Program Advisor: Prof. H.M. Morrison

As high technology plays an increasingly greater role in society, there will be a growing need for graduates who have a competence in the combined disciplines of science and business. The knowledge and skills which will be required by managers have never been greater. The modern manager must have a knowledge of finance, economics, accounting, marketing, organizational behaviour to name a few areas as well as the quantitative methods so deeply ingrained in the scientific method. A quantitative overview of science and acquired skills in the scientific method will be extremely useful in identifying and solving problems in the increasingly technology-oriented business world. Collection and efficient handling of relevant data are crucial in the decision-making process.

For those students leaning towards administration in industry, the following program is recommended. The business, economics, accounting, finance and mathematics courses required in this program mirror some of the courses taken in graduate MBA programs. Credit for some of these courses may be allowed by some of the admitting universities offering MBA degrees.

Admission to, and continuance in, Honours Science & Business requires a cumulative average of 65% in both Science and non-Science courses.

In order to graduate in the Honours Science and Business program the following requirements must be met:

1. Successful completion of 22.0 credits, exclusive of Year One Lab credits, with cumulative averages of 65% in both Science and non-Science courses. Of the 22.0 credits required:
   (a) at least 20.0 must be lecture credits;
   (b) at least 12.0 credits must be Faculty of Science credits of which 8.0 must be at or above the 200 level, and at least 4.0 of them other than any SCI credits must be at the 300 or 400 level.
2. No more than 5.0 failed credits are allowed.
3. No more than 2.0 SCI credits may be applied to the program.
4. A student must have been enrolled full-time in two out of three years, one of which must be either Year Two or Three, and the other must be Year four. Year Four of the program must be taken at the University of Waterloo.
5. The following courses must be included:
   Year One:
   Two First Year Science courses*, BUS 111W, BUS 121W, MATH 113A, MATH 113B, CS 100 or elective**, CS 102.
   *First Year Science courses are any two 200 level 0.5 credit Biology courses CHEM 123/123L, 124/124L EARTH 121, 122 PHYS 121/121L, 122/122L or 111/111L, 112/112L, or 121/121L, 112/112L
   ** Students with no computer literacy should take CS 100 before CS 102

Year Two:
ECON 101, ECON 102, ACC 121, ACC 122 (or BUS 227 instead of ACC 121, ACC 122), one First Year Science course*.

Year Three:
M SCI 211, M SCI 331, CS 330

Year Four:
M SCI 431 or M SCI 432

Recommended electives are:
MTHEL 100, MATH 111B, one of ECON 221, STAT 202 or 204: M SCI 261, M SCI 461, BUS 352W, BUS 454W

B. HONOURS MAJOR PROGRAMS
Honours major programs are offered through the Regular and/ or Co-operative system of study. The specific programs that are offered are as follows:
Honours Biochemistry – Regular and Co-operative
Honours Biochemistry (Biototechnology Option) – Regular and Co-operative
Honours Biology – Regular and Co-operative
Honours Biology and Environment and Resource Studies – Regular
Honours Biology and Geography – Regular
Honours Chemistry – Regular and Co-operative
Applied (also with Options)
Honours Chemistry and Environment and Resource Studies (Regular)
Honours Earth Science – Regular (Geology, Economics or Geography), and Co-operative Applied (Geology or Geophysics)
Honours Physics – Regular, and Co-operative
Applied (also Geophysics Option)
Honours Psychology – Regular and Co-operative

The Honours Chemistry programs (including Co-op Applied Chemistry and Honours Biochemistry) are normally limited by the available physical facilities to the best qualified students. Those who have failed core courses should not expect to proceed in any Honours Chemistry Program.

Enrolment is limited to approximately 45 students in Year Two of all Earth Sciences programs. Selection is made on the basis of academic standing in Year One, including standing in Earth 121 and 122.

Refer to the specific departmental sections for the degree requirements of the above programs.

Science
Academic Programs and Degree Requirements
Departmental Programs

Biology

The following programs are offered in the Biology department:

- Honours Major Programs
  - Regular:
    - Honours Biology
    - Honours Biochemistry
    - Honours Biochemistry (Biotechnology Option)
    - Honours Biology & Environment and Resource Studies
    - Honours Biology and Geography
  - Co-operative:
    - Honours Co-operative Biology
    - Honours Co-operative Biochemistry
    - Honours Co-operative Biochemistry (Biotechnology Option)

- Honours Science Program Two (with specialization in Biology)
- Honours Science Program Two (Human Sciences-Health Professional Option)
- Minor in Biology

HONOURS MAJOR PROGRAMS - REGULAR

Honours Biology
Program Advisors: Professors M. Globus, W.R. Hawthorn and P.E. Morrison

Admission to, and continuance in, Honours Biology requires a cumulative average of 60% and a cumulative average of 65% in all Biology courses.

In order to graduate in the Honours Biology program, the following requirements must be met:
1. Successful completion of 21.0 credits;
2. At least a 0.75 credit in Biochemistry and a 0.75 credit in Organic Chemistry beyond Year One;
3. By the end of Year Two, students must have completed CS 102;
4. A student must have been enrolled full-time in two out of three years, one of which must be either Year Two or Three, and the other must be Year Four. Year Four of the program must be taken at the University of Waterloo;
5. Mandatory courses as listed below.

Also, any student who fails a Biology course during second or third year will not be permitted to continue in the program unless reinstated by the department.

Year One
1.5 Biology credits from the following: BIOL 210, 211, 220, 221, 230, 239, 240, 241, 250, 273
CHEM 123/123L, and CHEM 124/124L

Science
Departmental Programs
Biology

Five electives (2.5 credits).

Note:
Students who enter Year Two of Regular Honours Biology with 1.0 Biology credit from Year One are advised to complete the remaining 4.0 credits of 200-level Biology courses by the end of Year Two. This will usually mean that these students will have six lecture courses during one term of Year Two.

Year Two
3.5 Biology credits from the following: BIOL 210, 211, 220, 221, 230, 239, 240, 241, 250, 273
CHEM 266/266L, and CHEM 237/237L
STAT 202

Year Three
At least 3.5 credits from the 400-level Biology courses (excluding BIOL 301)
Three electives (1.5 credits). (Chemistry courses and PHYS 301 are recommended)

Year Four
At least 3.0 credits from the 400-level Biology courses
Four electives (2.0 credits)

Honours Biochemistry
Program Advisors: Professors L.J. Brubacher, Chemistry and A.G. Kempton, Biology

This program allows specialization in either biochemistry with a chemical emphasis, or biochemistry with a physiological or microbiological emphasis. The program is also available on the Co-operative system of study.

Professional Standing
The program in Biochemistry fulfills the academic requirements for professional membership in the Chemical Institute of Canada.

Admission to, and continuance in, Honours Biochemistry requires a cumulative average of 60% and a cumulative average of 60% in Chemistry courses and 65% in Biology courses.

In order to graduate in the Honours Biochemistry program, the following requirements must be met:
1. Successful completion of 23.5 credits (including all required labs in Chemistry and Physics).
2. A student must have been enrolled full-time in two out of three years, one of which must be either Year Two or Three, and the other must be Year Four. Year Four of the program must be taken at the University of Waterloo;
3. Mandatory courses as listed below.

Note
Students who plan to take one or more of the Chemical Engineering electives in Year Four of the Biotechnology option, should take the prerequisite MATH 215 or MATH 216 in Year Two or Year Three.
Year One
1.0 Biology credit from: BIOL 210, 211, 220, 221, 230, 239, 240, 241, 250, 273
CHEM 125/123L, and 126/124L
PHYS 121/121L or 111/111L, and 112/112L
MATH 113A/B
CS 102
Elective (0.5 credit)

Year Two
Fall:
0.5 credit from: BIOL 210, 220, 230, 240, 250
CHEM 212, 220, 220L, 264
STAT 202

Winter:
1.0 credit from: BIOL 211, 221, 239, 241, 273
CHEM 221, 221L, 237, 237L*, 265, 265L
*may be taken in Year Three

Year Three
Fall:
1.0 credit from: BIOL 402, 412, 421, 422, 425, 437, 440, 454, 470
CHEM 332, 356, 368, 368L

Winter:
1.0 credit from BIOL 404, 410, 411, 423, 436, 445, 453, 471
CHEM 333, 334L, 355L, 357, 357L
One elective (0.5)

Year Four
Fall:
1.5 credits from: 400-level Biology courses, CHEM 432, 435, 452 or 492A*
CHEM 312, 464

Winter:
2.0 credits from: 400-level Biology courses, CHEM 419, 433, 434, 492B*
One elective (0.5)
* Students electing CHEM 492A/B must earn 5.5 credits in Year Four.

Honours Biology and Environment and Resource Studies

Honours Biology and Geography
Program Advisor: Professor A.G. Kempton, Biology

Admission to, and continuance in, either program requires an overall cumulative average of 60% with a cumulative average of 70% in the Faculty of Environmental Studies courses, and a cumulative average of 65% in Biology courses.
In order to graduate in either program, the following requirements must be met:
1. Successful completion of 21.0 credits;
2. Of the 21.0 credits required, 7.0 credits must be approved by the Dept. of Biology, and 6.5 credits beyond Year One must be in the appropriate department of the Faculty of Environmental Studies, or equivalent;
3. STAT 202, and CS 102;
4. CHEM 123/123L, CHEM 124/124L, CHEM 266/266L and CHEM 237/237L;
5. Students must have been enrolled full-time in two out of three years, one of which must be either Year Two or Three, and the other must be Year Four. Year Four of the program must be taken at the University of Waterloo.

Since proper course selection in either program is critical, contact Professor A.G. Kempton, Biology, for further details.

HONOURS MAJOR PROGRAMS - CO-OPERATIVE

Honours Co-operative Biology
Program Advisors: Professors M. Globus, W.R. Hawthorn and P.E. Morrison

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.

Admission to, and continuance in, Honours Co-operative Biology requires a cumulative average of 60% and a cumulative average of 65% in all Biology courses.

In order to graduate in the Honours Co-operative Biology program, the following requirements must be met:
1. Successful completion of 21.0 credits;
2. By the end of Year 2B, students must have completed the ten introductory Biology courses at the 200 level, and CS 102;
3. 13 400-level Biology courses;
4. Four satisfactory work-term reports;
5. Mandatory courses as listed below.

Note to All 1A Students
BIOL 230 is recommended for first year. BIOL 240 should be taken before BIOL 241.

Note to All 1B Students
Students should be aware that BIOL 239 and 273 must be taken during 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.
Science
Biology

Stream 8
(Students who take Year 1B during Winter Term)

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<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
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<tbody>
<tr>
<td>Year 1A</td>
<td>Year 1B</td>
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<tr>
<td>BIOL 230</td>
<td>BIOL - 1.0 or 1.5 200-level credits.</td>
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<td>BIOL 240</td>
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<td>CHEM 123/123L</td>
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<td>Electives -</td>
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<td>1.0 credit.</td>
<td>1.0 or 0.5 credit.</td>
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| Year 2A    | Work Term     |               |
| BIOL - 1.5 200-level credits. |               |
| CHEM 256/260L |               |               |
| STAT 202   |               |               |

| Work Term | Year 3A       |               |
| BIOL - 1.5 or 2 400-level credits. |               |
| CHEM 228   | Electives - 0.5 credit. (CHEM 267 is recommended.) |               |

| Year 3B    | Work Term     |               |
| BIOL - 1.5 or 2 400-level credits. |               |
| Electives - 0.5 credit. (Biochemistry courses are recommended) |               |

Stream 4 and Stream 8
(Students who take Year 1B during Spring Term)

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<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
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<tbody>
<tr>
<td>Year 1A</td>
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<tr>
<td>BIOL 230</td>
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<td>BIOL 240</td>
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<td>CHEM 123/123L</td>
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<td>Electives -</td>
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<td>1.0 credit.</td>
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</table>

| Work Term | Year 2A       |               |
| BIOL - 1.0 or 1.5 200-level credits. |               |
| CHEM 256/256L | CHEM 228 |               |
| Electivo - 0.6 credit. |               |

| Year 2B    | Work Term     |               |
| BIOL - 1.5 200-level credits. |               |
| CHEM 237/237L | STAT 202 |               |

| Work Term | Year 3A       |               |
| BIOL - 1.5 or 2 400-level credits. |               |
| Electives - 0.5 credit. (CHEM 267 or CHEM 333 are recommended) |               |

Stream 4 and Stream 8
(Students who take Year 1B during Spring Term)

<table>
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<tr>
<th>Fall</th>
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<tbody>
<tr>
<td>Year 4A</td>
<td>Year 4B</td>
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<tr>
<td>BIOL - 1.5 400-level credits.</td>
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<tr>
<td>Electives - 1.0</td>
<td>Electives - 1.0</td>
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<td>credit. (Biochemistry courses are recommended)</td>
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Honours Co-operative Biochemistry
Program Advisors: Professors L.J. Brubacher, Chemistry and A.G. Kempton, Biology.

This program allows specialization in either biochemistry with a chemical emphasis, or biochemistry with a physiological or microbiological emphasis. The program is also available on the Regular system of study.

Professional Standing
The program in Biochemistry fulfills the academic requirements for professional membership in the Chemical Institute of Canada.

Admission to, and continuance in, Honours Co-operative Biochemistry requires a cumulative average of 60%, a cumulative average of 60% in Chemistry courses, and a cumulative average of 65% in Biology courses.

In order to graduate in the Honours Co-operative Biochemistry program, the following requirements must be met:

1. Successful completion of 23.5 credits (including all required labs in Chemistry and Physics);
2. By the end of Year 2B, students should have completed BIOL 230, 239, 240, 241 and 273;
3. Four satisfactory work-term reports.

Notes
1. Students should be aware that BIOL 239 and 273 must be taken during either the Winter or Spring Terms in even-numbered years and BIOL 241 must be taken during either the Winter or Spring Terms in odd-numbered years. Students entering in the Fall of odd-numbered years will take the same courses as listed below but in a slightly different sequence.

2. Students who plan to take one or more of the Chemical Engineering electives in Year Four of the Biotechnology option, should take the prerequisite MATH 215 or MATH 216 in Year Two or Year Three.
### Stream 8

(Students who take Year 1B in Winter Term)

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<th>Fall</th>
<th>Winter</th>
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<tbody>
<tr>
<td>Year 1A</td>
<td>BIOL 230</td>
<td>BIOL 239</td>
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<tr>
<td>BIOL 230</td>
<td>CHEM 125/123L</td>
<td>BIOL 273</td>
</tr>
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<td>MATH 115A</td>
<td>CHEM 126/124L</td>
<td>MATH 115B</td>
</tr>
<tr>
<td>CS102</td>
<td>PHYS 111/111L or 121/121L</td>
<td>PHYS 112/112L</td>
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<td>Work Term</td>
<td>Year 2A</td>
<td>Year 2B</td>
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<td></td>
<td>BIOL 436</td>
<td>BIOL 421</td>
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<td>BIOL - 0.5 400-level credit.</td>
<td>CHEM 221/221L</td>
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<td>CHEM 333</td>
<td>CHEM 237/237L</td>
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<td>CHEM 357</td>
<td>CHEM 265/265L</td>
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<td></td>
<td>CHEM 368/368L</td>
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<td>Work Term</td>
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<td>Year 2B</td>
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<td></td>
<td>BIOL 436</td>
<td>BIOL 421</td>
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<td>CHEM 333</td>
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<td>CHEM 357</td>
<td>CHEM 265/265L</td>
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<td>CHEM 368/368L</td>
<td>Elective (0.5)</td>
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<td>Year 3B</td>
<td>Work Term</td>
<td>Work Term</td>
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<td>BIOL 437</td>
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<td>BIOL 454</td>
<td>CHEM 366</td>
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### Stream 4

(Students who take Year 1B in Spring Term)

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<td>BIOL 230</td>
<td>BIOL 239</td>
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<td>BIOL 230</td>
<td>CHEM 125/123L</td>
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<tr>
<td>CS102</td>
<td>PHYS 111/111L or 121/121L</td>
<td>PHYS 112/112L</td>
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<td>Work Term</td>
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<td>BIOL 241</td>
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<td>CS102</td>
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<td>CHEM 212</td>
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<td>CHEM 220/220L</td>
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<td>CHEM 264</td>
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<td>Work Term</td>
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<td>BIOL 436</td>
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<td>BIOL - 0.5 400-level credit.</td>
<td>CHEM 333/334L</td>
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<td>CHEM 357</td>
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<td>Elective (0.5)</td>
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<td>BIOL 436</td>
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<td>BIOL - 0.5 400-level credit.</td>
<td>CHEM 333/334L</td>
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<td>CHEM 368/368L</td>
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### Streams 4 and 8

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<td>CHEM 464</td>
<td>BIOL 427X</td>
<td>BIOL 433X</td>
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<td>Plus:</td>
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<td>CHEM 435</td>
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<td>CHEM 452</td>
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<td>CHEM 492A*</td>
<td>or BIOL 499B</td>
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<td>BIOL 499A Plus</td>
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<td></td>
<td>Students electing CHEM 492 must earn 5.5 credits in Year Four.</td>
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### Honours Co-operative Biochemistry (Biotechnology Option)

**Program advisors** – Professors L.J. Brubacher, Chemistry and A.G. Kempton, Biology

The first two years of this program coincide with the Honours Co-operative Biochemistry programs for streams 4 and 8. The Biotechnology option comes into effect in Year Three. Although this option is set up in Co-operative format, it is also available for students in the Regular system of study.

**Note**

Students who plan to take one or more of the Chemical Engineering electives in Year Four, should take the prerequisite MATH 215 or MATH 216 in Year Two or Year Three.

### Stream 8

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<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
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<tbody>
<tr>
<td>Work Term</td>
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<td>Year 3B</td>
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<td>BIOL 437</td>
<td>BIOL 437</td>
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<td>BIOL 440</td>
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<td>BIOL 454</td>
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<td>CHEM 332/334L</td>
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<td>CHEM 356</td>
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(continued on next page)
### Year 4A
- **BIOL 432X**
- **BIOL 443**
- **CHEM 312**
- **CHEM 356L**
- **CHEM 464**
- One recommended elective (0.5)

### Year 4B
- **BIOL 439**
- Two electives (1.0)
- Two recommended electives (1.0)

### Stream 4

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<th>Spring</th>
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<td>Work term</td>
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<td><strong>BIOL 436</strong></td>
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<td><strong>CHEM 333/334L</strong></td>
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### Work Term

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<td><strong>CHEM 312</strong></td>
<td>Two electives (1.0)</td>
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<td><strong>CHEM 356L</strong></td>
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</tr>
<tr>
<td><strong>CHEM 464</strong></td>
<td>One recommended elective (0.5)</td>
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### Notes

1. Recommended electives:
   - **BIOL 428, 433X, 434**
   - **CHEM 562, 564** (one of **MATH 215** or **216** must be taken as a prerequisite).
   - **CHEM 419, 432, 433, 434, 435**
2. Students may prepare in writing some variation in this program for approval by the Biology and Chemistry undergraduate advisors to accommodate their special interest.

### HONOURS SCIENCE PROGRAM TWO (With Specialization in Biology)

**Program Advisors:** Professors M. Globus, W.R. Hawthorn, P.E. Morrison.

Admission to, and continuation in, Honours Science - Program Two requires an overall cumulative average of 60% and a cumulative average of 65% in Biology courses.

In order to graduate in the Honours Science program, with specialization in Biology, the following requirements must be met:

1. Successful completion of 21.0 credits.
   - Of the 21.0 credits that are required:
     a) at least 19.0 must be lecture credits;
     b) at least 13.5 must be Faculty of Science credits;
2. At least 0.75 credit of biochemistry and 0.75 of organic chemistry beyond Year One;
3. 1.0 credit in Math is required, of which 0.5 must be CS 102.
4. No more than 3.0 SCI credits may be applied to the program.
5. A student must have been enrolled full-time in two out of three years, one of which must be either Year Two or Three, and the other must be Year Four. Year Four of the program must be taken at the University of Waterloo.
6. Mandatory courses as listed below.

### Year One
- 1.0 credit from the following: BIOL 210, 211, 220, 221, 230, 239, 240, 241, 250, 273
- CHEM 123/123L and CHEM 124/124L
- CS 102
- Electives (2.5)

### Year Two
- 3.0 credits from BIOL 210, 211, 220, 221, 230, 239, 240, 241, 250, 273
- CHEM 266/266L and 237/237L
- Electives (1.0)

### Year Three
- 0.5 credit in Science Electives (1.5)

### Year Four
- 4.0 Science credits at least 2.0 of which are Biology credits from the 400-level
- Electives (1.0)

### HONOURS SCIENCE PROGRAM TWO (Pre Health - Professions Option)

**Program Advisors:** M. Globus, W.R. Hawthorn and P.E. Morrison.

This program combines the Honours Science Program Two core with specific courses in biology, chemistry, physics and statistics. Electives are recommended from health, kinesiology, physics, psychology, science, and sociology. It is suitable preparation for work in medicine, dentistry, physiotherapy, radiotherapy, and chiropractic, or for the student whose interests develop into graduate study in the health disciplines. Students are strongly urged to consult the admission requirements of the professional schools of interest to aid their choice of electives.

Admission to, and continuation in, Honours Science Program Two (Pre Health-Professions Option) requires an overall cumulative average of 60% and a cumulative average of 65% in Biology courses.

In order to graduate with this option, the following requirements must be met:

1. Successful completion of 21.0 credits; of the 21 credits that are required:
   a) at least 19.0 must be lecture credits;
   b) at least 13.5 must be Faculty of Science credits;
2. No more than 3.0 SCI credits may be applied to the program;
3. A student must have been enrolled full-time in two out of three years, one of which must be either Year Two or Three, and the other must be Year Four. Year Four of the program must be taken at the University of Waterloo.

4. Mandatory courses as listed below.
5. A minimum of 4.0 lecture credits from the recommended electives.
6. For students interested in Optometry at the University of Waterloo, consult page 14.31 for requirements.

Honours Science Program Two (Pre Health-Professions Option)

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<tr>
<th>Year 1 (Fall)</th>
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<td>BIOL 230</td>
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<td>CHEM 124/124L</td>
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<td>Recommended electives: HLTH 101, PSYCH 101, PHYS 111/111L</td>
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<td>CHEM 237/237L</td>
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<tr>
<td>STAT 202</td>
<td>CS 102</td>
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<td>0.5 credit elective</td>
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<tr>
<td>Recommended electives: HLTH 220, SOC 248, SOC 249</td>
<td>Recommended electives: PSYCH 261, SCI 255</td>
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<td>CHEM 257</td>
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<td>PHYS 480</td>
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<td>Recommended electives: HLTH 442</td>
<td>Recommended electives: KIN 410, HLTH 407, KIN 416, BIOL 439, PHYS 481</td>
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Note: Pre Health-Professions Options are also offered by the Departments of Health Studies and Kinesiology.

MINOR IN BIOLOGY
In order to graduate with a Minor in Biology, the following requirements must be met:
Successful completion of 5.0 Biology credits, at least 2.5 of which must be at the fourth year level.
A minimum average of 65% is required in Biology courses.
Students are advised to see an Undergraduate Advisor in the Department of Biology.
Chemistry

The following programs are offered in the Chemistry department:

- **Honours Major Programs**
  
  **Regular:**
  - Honours Biochemistry - (see page 14:12)
  - Honours Biochemistry, Biotechnology Option – (see page 14:15)
  - Honours Chemistry
  - Honours Chemistry and Environment and Resource Studies
  - Honours Chemistry (with Options)
    a) Environmental Studies Option
    b) Mathematics Option
    c) Physics Option
    d) Thesis Option
  
  **Co-operative:**
  - Honours Co-operative Biochemistry - (see page 14:14)
  - Honours Co-operative Biochemistry, Biotechnology Option – (see page 14:15)
  - Honours Co-operative Applied Chemistry
  - Thesis Option

- **Honours Science – Program Three (with specialization in Chemistry)**

- **Minor in Chemistry**

**Program Flexibility for Excellent Students**

An excellent student in second or third year in any Honours Chemistry program, co-operative or regular, may propose a variation in the schedule of courses required for the degree. Proposals are entertained at the end of each term from students who have a cumulative Chemistry average of 80% and a cumulative average over all courses of 80%. Academic performance is reviewed each term by an advisory committee.

**Professional Standing**

The Honours Major programs fulfill the academic requirements for professional membership in the Chemical Institute of Canada.

**Note to all Honours Chemistry Students:**

Honours Chemistry students (all programs) may not elect to take these General program courses for degree credit:

CHEM 218, 219, 266, 267, 366

**Electives**

The following chart outlines proposed offerings of technical electives with Chemistry content from which Honours students should choose their required electives.
## Technical Electives with Chemistry Content

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## Electives Relevant to Industrial Employment

Students contemplating careers in industry should consider some of these courses:

| Statistics | STAT 204, 304 | Writing | SCI 209, ENGL 210A or C |
| Environment | ERS 320 | Law | PSCI 291, 292, ENV S 201, ACC 231 |
| Management Science | M SCI 211 | Business (WLU) | BUS 352, 362, 382, 383 |
| Economics | ECON 101, 102, 201, 202 | Accounting | ACC 121, 122 |
| Computing | CS 212, 230, GEN E 121 | Microprocessors | EL E 222, 323, 427, PHYS 353 |
|            |            | Critical Thinking | PHIL 145 |

**Notes**

* indicates recommendation for Applied Chemistry students.
† indicates special permission required from the Associate Chairman for Undergraduate Studies in the Chemical Engineering Department.
‡ indicates strong recommendation for all Chemistry major students.
HONOURS MAJOR PROGRAMS - REGULAR

Honours Biochemistry
(see page 14:12)

Honours Biochemistry (Biotechnology Option)
(see page 14:15)

Honours Chemistry
Program Advisor: Professor G.E. Toogood
Admission to, and continuance in, Honours Chemistry requires a cumulative average of 60% and a cumulative average of 60% in all Chemistry lecture courses each term.

In order to graduate with an Honours Chemistry degree, the following requirements must be met:

1. Successful completion of 24.75 credits including 5.75 lab credits;
2. In Years Three and Four, students must choose four 400-level term courses (other than CHEM 407) and two term lecture courses at any level from the list of Technical electives with Chemistry content (see page 14:19);
3. In Year Three or Four, students must take one of CHEM 350, 354, 358, 458;
4. Failure of more than one course in the field of specialization will result in the requirement to withdraw from the program. Students may petition for re-admission; such re-admission to be at the discretion of the Chemistry Undergraduate Committee and in exceptional circumstances only;
5. Students must have been enrolled full-time in Year Four, and in either Year Two or Three. Year Four of the program must be taken at the University of Waterloo;
6. Mandatory courses as listed below;
7. Students are encouraged to include an ethics course in their program such as STV 100, PHIL 225, SCI 263, SCI 265.

Year One
Fall:
CHEM 125/123L
PHYS 121/121L
MATH 113A
CS 102 (Fall or Winter)
Electives (0.5 or 1.0)

Winter:
CHEM 126/124L
PHYS 112/112L
MATH 113B
Electives (1.0 or 0.5)

Year Two
Fall:
CHEM 220, 220L, 254, 264
MATH 215
PHYS 249, 249L

Science
Chemistry

Winter:
CHEM 10, 212, 221/221L, 256, 265/265L
Elective (0.5)

Year Three
Fall:
CHEM 312, 314L, 359/355L, 368/368L
Two electives (1.0)

Winter:
CHEM 10, 313, 315L, 358L
Four electives (2.0) (see note 3 above)

Year Four
CHEM 10, 492A/B (1.5)
Eight electives (4.0)

Honours Chemistry and Environment and Resource Studies
Program Advisors: Professors G.E. Toogood (Chemistry) and S.C. Lerner (Environment and Resource Studies)
Admission to, and continuance in, Honours Chemistry and Environment and Resource Studies requires an overall cumulative average of 60% and a cumulative average of 60% in all Chemistry lecture courses each term. A 70% average is required in all Faculty of Environmental Studies courses.

In order to graduate with an Honours Chemistry and Environment and Resource Studies degree, the following requirements must be met:

1. Successful completion of 23.75 approved credits including 4.25 lab credits;
2. The student must have been enrolled full-time in Year Four and in either Year Two or Three. Year Four must be taken at the University of Waterloo;
3. Mandatory courses as listed below.

Year One
CHEM 125/126, 123L/124L
ERS 100, 101, 150, 151
Biology - two 200-level courses
MATH 115A/B
CS 102
ENV S 195 (0.5)

Upper Years
CHEM - 7.5 lecture credits including CHEM 212, 220, 221, 237, 264, 265, 356, 357, 368, and 3.0 lecture credits from appropriate 300- and 400-level courses in the Chemistry Department.
2.25 laboratory credits: CHEM 220L, 221L, 237L, 265L, 356L, 357L, 368L
ERS - 12 courses (to be selected in consultation with the Department of Environment and Resource Studies)
MATH 215
STAT 202
CHEM 492A/B or ERS 490A/B
Honours Chemistry (with Options)
a) Honours Chemistry (Environmental Studies Option)
Program Advisor: Professor G.E. Toogood
His program supplements the Honours Chemistry core with courses to familiarize the student with legal, economic and social aspects of environmental control and resource management.
Admission to, and continuance in, Honours Chemistry (Environmental Studies Option) requires an overall cumulative average of 60%. In addition, a 60% average must be obtained in all Chemistry lecture courses each term. A 70% average is required in all Environmental Studies courses.
In order to graduate with an Honours Chemistry (Environmental Studies Option) degree, the following requirements must be met:
1. Successful completion of 24.0 credits including 5.0 lab credits;
2. 4.0 credits from the Environmental Studies Option course list (or courses approved by the Undergraduate Dean of Environmental Studies);
3. Failure of more than one course in the field of specialization will result in the requirement to withdraw from the program. Students may petition for re-admission; such re-admission to be at the discretion of the Chemistry Undergraduate Committee and in exceptional circumstances only;
4. Students must have been enrolled full-time in Year Four, and in either Year Two or Three. Year Four of the program must be taken at the University of Waterloo;
5. Mandatory courses as listed below;
6. Students are encouraged to include an ethics course in their program, such as STV 100, PHIL 215, PHIL 226, SCI 263, SCI 265.
ENVIRONMENTAL STUDIES OPTION COURSE LIST
Students must take ENV S 195.
In addition, 3.5 credits must be selected from both portions of the list below:
Legal, Economic and Social Aspects
ENV S 201, 401
RS 220, 320
Resource Management
ENV S 200
ERS 218, 241, 305, 318, 337, 338
EOG 356
EOG/PLAN 367, 368
Year One
Students must take the same courses as stated in the Honours Chemistry program.
Year Two
Students must take the same courses as stated in the Honours Chemistry program (page 14:20)

Year Three
Fall:
CHEM 312, 314L, 356L, 368/368L
STAT 204
Two Electives (1.0)
Winter:
CHEM 10, 313, 357/357L
STAT 304
Two electives (1.0)

Year Four
CHEM 10, 419, 492A/B
ENV S 201
2.0 Chemistry credits. (CHEM 237/237L, 311, 320, 321L, 420, 452 and 455 are recommended)
Four electives (2.0).
b) Honours Chemistry (Mathematics Option)
Program Advisor: Professor F.R. McCourt
This program combines the Honours Chemistry core with an enriched background in mathematics. It is suitable preparation for work in Theoretical Chemistry or Chemical Physics, or for the student whose interests and abilities lie in a mathematical direction.
Students wishing to follow this program on the Co-operative system of study should first speak to Professor McCourt and to Mr. R.A. Pullin of the Department of Co-operative Education and Career Services.
Admission to, and continuance in, Honours Chemistry (Mathematics Option) requires an overall cumulative average of 60%. In addition, a 60% average must be obtained each term in all Chemistry lecture courses. A 60% average is required in all Mathematics courses.
In order to graduate with an Honours Chemistry (Mathematics Option) degree, the following requirements must be met:
1. Successful completion of 23.75 credits including 4.75 lab credits;
2. Failure of more than one course in the field of specialization will result in the student being required to withdraw from the program. Students may petition for re-admission; such re-admission to be at the discretion of the Chemistry Undergraduate Committee and in exceptional circumstances only;
3. The student must have been enrolled full-time in Year Four, and in either Year Two or Year Three. Year Four must be taken at the University of Waterloo;
4. Mandatory courses as listed below;
5. Students are encouraged to include an ethics course in their program, such as STV 100, PHIL 215, PHIL 226, SCI 263, SCI 265.
Year One
Fall:
CHEM 125/123L
PHYS 121/121L
MATH 115A, 114
(or 134B, Winter)
CS 102
Winter:
CHEM 126/124L
PHYS 112/112L
MATH 115B
Electives (1.0)

Year Two
Fall:
CHEM 220/220L, 254, 264
One Elective (0.5)
PHYS 249/249L
Winter:
CHEM 10, 212, 221/221L, 256, 265/265L
MATH 210 or 213B or 230B

Year Three
Fall:
CHEM 312, 314L, 359/355L
MATH 216
CS 212
One Elective (0.5)
Winter:
CHEM 10, 358/358L
MATH 322B
PHYS 365
Two Electives (1.0)

Year Four
CHEM 10, 492A/B (1.5)
Three Chemistry Electives (1.5) mainly from 400-level courses
Three Mathematics Electives (1.5) from 300- or 400-level courses
Two other Electives (1.0)

c) Honours Chemistry (Physics Option)
Program Advisor: Professor J.W. Hepburn

This program combines the Honours Chemistry core with courses in physics. It is suitable preparation for work in Physical Chemistry or Chemical Physics, or for students whose interests divide between the two disciplines.

Students wishing to follow this program on the Co-operative system of study should first speak to Professor Hepburn and to Mr. R.A. Pullin of the Department of Co-operative Education and Career Services.

Admission to, and continuance in, Honours Chemistry (Physics Option) requires an overall cumulative average of 60%. In addition, a 60% average must be obtained in all Chemistry lecture courses each term. A 60% average is required in all Physics courses.

In order to graduate with an Honours Chemistry (Physics Option) degree, the following requirements must be met:

1. Successful completion of 24.0 credits including 5.0 lab credits;
2. Failure of more than one course in the field of specialization will result in the requirement to withdraw from the program. Students may petition for re-admission; such re-admission to be at the discretion of the Chemistry Undergraduate Committee and in exceptional circumstances only;
3. Students must have been enrolled full-time in Year Four, and in either Year Two or Three. Year Four of the program must be taken at the University of Waterloo;
4. Mandatory courses as listed below;
5. Students are encouraged to include an ethics course in their program, such as STV 100, PHIL 215, PHIL 225, SCI 263, SCI 265.

Year One
Fall:
CHEM 125/123L
PHYS 121/121L
MATH 115A, 111A
CS 102
Winter:
CHEM 126/124L
PHYS 112/112L
MATH 115B, 134B
Elective (0.5)

Year Two
Fall:
CHEM 220/220L, 254, 264
One Elective (0.5)
PHYS 249/249L
Winter:
CHEM 10, 212, 221/221L, 256, 265/265L
MATH 210 or 213B or 230B

Year Three
Fall:
CHEM 312, 314L, 359/355L
MATH 216
CS 212
One Elective (0.5)
Winter:
CHEM 10, 358/358L
MATH 322B
PHYS 365
Two Electives (1.0)

Year Four
CHEM 10, 492A/B (1.5)
Three Chemistry Electives (1.5) mainly from 400-level courses
Three Mathematics Electives (1.5) from 300- or 400-level courses
Two other Electives (1.0)

(continued on next page)
Three chemistry electives (1.5), and two physics electives (1.0) (courses other than Chemistry and Physics, such as Chemical Engineering, Mathematics, or Applied Mathematics, may be acceptable, but permission must be given by the Undergraduate Officer).

The other elective (0.5) (suggested electives include PHYS 353/353L, 363, 432, 441 and 445)

1) Honours Chemistry (Thesis Option)

Program Advisor: Professor G.E. Toogood

Students who have achieved an average of 80% in all Chemistry courses, and 80% over all courses taken, may request to complete their degrees with a reduced course load and an increased research load. Admission is by interview after completion of Year Two in any Honours Chemistry program, regular or co-operative.

Years One and Two: as at present in any Honours Chemistry program.

Years Three and Four: CHEM 359, 368, one of 312/313, and three of 496A-E, plus research courses, CHEM 392A/B and 495A/B.

Student performance is assessed by an advisory committee at the end of each academic term. Assessment is based on research-related activities (70%) and general knowledge of chemistry (30%), and a satisfactory performance in each category will be required.

HONOURS MAJOR PROGRAMS – CO-OPERATIVE

Honours Co-operative Biochemistry
see page 14:14)

Honours Co-operative Biochemistry (Biotechnology Option)
see page 14:15)

Honours Co-operative Applied Chemistry
Program Advisor: Professor G.E. Toogood

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 Department of Co-operative Education and Career Services 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 Four together and graduate together in the spring.

Admission to, and continuance in, Honours Co-operative Applied Chemistry requires an overall cumulative average of 60%. In addition, students must achieve a 60% average in all Chemistry lecture courses each term.

In order to graduate with an Honours Co-operative Applied Chemistry degree, the following requirements must be met:

1. Successful completion of 24.75 credits including 5.75 lab credits;

2. In Years Three and Four, students must choose four 400-level term courses (other than CHEM 407) and two term lecture courses at any level from the list of Technical Electives with Chemistry Content (see page 14:19);

3. In Year Three or Four, students must take one of CHEM 350, 354, 358, 458;

4. Failure of more than one course in the field of specialization will result in the requirement to withdraw from the program. Students may petition for re-admission; such re-admission to be at the discretion of the Chemistry Undergraduate Committee and in exceptional circumstances only;

5. Successful completion of a minimum of four work terms, and submission of a minimum of four satisfactory work reports;

6. Mandatory courses as listed below;

7. Students are encouraged to include an ethics course in their program, such as STV 100, PHIL 215, PHIL 226, SCI 263, SCI 265.

Stream 8

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<thead>
<tr>
<th>Fall</th>
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<tr>
<td>Year 1A</td>
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<td>CS 102</td>
<td>Electives (0.5)</td>
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<td>Work Term</td>
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<td>Year 3B</td>
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<tr>
<td>MATH 215</td>
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<td>(continues on next page)</td>
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HONOURS SCIENCE PROGRAM THREE (With Specialization in Chemistry)
Admission to, and continuation in, Honours Science Program Three requires an overall cumulative average of 60%, and a cumulative average of 60% in all Chemistry courses.

In order to graduate with an Honours Science Program 3 degree, the following requirements must be met:
1. Successful completion of 23.0 credits, including at least 20.0 lecture credits and 14.0 credits in the Faculty of Science;
2. At least 0.5 lab credit and 1.0 lecture credit in each of the following areas of Chemistry: Analytical, Inorganic, Organic, Physical. Wherever possible, the laboratory chosen should accompany the appropriate lecture-course;
3. No more than 5.0 failed credits are allowed;
4. No more than 3.0 SCI credits may be applied to the program;
5. Students must have been enrolled full-time in Year Four, and in either Year Two or Three. Year Four of the program must be taken at the University of Waterloo;
6. Mandatory courses as listed below.

Year One
PHYS 111/112 & 111L/112L or PHYS 121/112 & 121L/112L; CHEM 123/124 or 125/126, 123L/124L; MATH 113A/B, CS 102; Three Electives (1.5)

Year Two
3.0 Chemistry lecture credits, at least 2.0 of which must be chosen from: CHEM 212, 220, 221, 254, 256, 264, 265
1.0 lecture credit chosen from Physics, Biology or Earth Sciences courses
Two Electives (1.0)
CHEM 10

Year Three
3.0 Chemistry lecture credits at the 300-level or higher
1.0 lecture credit chosen from Physics, Biology or Earth Sciences courses
Two Electives (1.0)
CHEM 10

Year Four
2.0 Chemistry credits at 300-level or higher (at least 1.0 at 400-level)
2.0 lecture credits from Biology, Chemistry, Earth Sciences or Physics
Two Electives (1.0)
CHEM 10

MINOR IN CHEMISTRY
In order to graduate with a Minor in Chemistry the following requirements must be met:
The following courses must be taken, with a minimum cumulative average of 60% in these courses:

a) CHEM 123/124 or 125/126, and CHEM 123L/124L;
b) a minimum of 3.5 lecture credits from 200-level or higher Honours-level Chemistry courses, of which a minimum of 1.0 lecture credit must be from 300-or 400-level Chemistry courses;
c) 0.5 lab credits beyond Year One appropriate to the lecture credits chosen.

Students are urged to check their plans with the Undergraduate Officer in Chemistry.

Earth Sciences
The following programs are offered in the Earth Sciences Department:

- Honours Major Programs
  Regular:
  Honours Earth Sciences (Geology Option)
  Honours Earth Sciences (with Options)
    a) Geography Option
    b) Economics Option
  Co-operative:
  Co-op Applied Earth Sciences (Geology Option)
  Co-op Applied Earth Sciences (Geophysics Option)

- Honours Science Program Four (with a specialization in Earth Sciences)
- Minor in Earth Sciences

The first four programs provide academic preparation for students intending to pursue careers as professional geologists. Honours Science, with a specialization in Earth Sciences, provides a less intense specialization in Earth Sciences and is intended primarily for those wanting a geological background for careers in other areas, e.g. teaching, business management, civic administration, finance, specialized sales, agriculture, etc.
Admission to, and continuance in, all Earth Sciences Honours Major Programs requires an overall cumulative average of 60%, and a cumulative major average of 65%.

In order to graduate in any of the four Honours Major Programs, the following requirements must be met:
1. Successful completion of 42 one-term courses (plus additional Year One and Two labs);
2. In Year One and Two, science courses must be taken with the lab if an optional lab is available;
3. Failure of more than one course in the field of specialization will result in the requirement to withdraw from the program;
4. Mandatory courses as listed under the specific programs.

A breakdown of course-type groupings for each program is provided below:

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<thead>
<tr>
<th>Year</th>
<th>Co-op Applied Earth Sciences/Geology Option</th>
<th>Co-op Applied Earth Sciences/Geophysics Option</th>
<th>Regular Honours Earth Sciences/Geology Option</th>
<th>Regular Honours Earth Sciences/Geography Option</th>
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Excluding SCI courses; optional Labs must be taken. Students who plan to do graduate work in hydrogeology are advised to take MATH 213A/B or CIV E 221 during their fourth year.

Honours Earth Sciences (Geology Option)

Year One
EARTH 121/122, CHEM 123/124 and 123L/124L, PHYS 121/122 and 121L/122L, CS 102, MATH 113A/B, one elective.

Year Two
EARTH 211, 231, 232, 235, 236, 238, 260
ENGL 210C
Two electives

Year Three
EARTH 331, 332, 333, 336, 342, 345, 355, 370, 390
Four electives

Year Four
EARTH 427, 436A/B, 490
Five* term courses from: EARTH 421, 432, 433, 434, 435, 437, 439, 440, 456, 458, 459, 460, 470
Two electives, not from Earth Sciences

* Upon approval from the Undergraduate Officer, a student may take four term courses from (2) above, to allow freedom to take courses in the Faculties of Mathematics, Engineering, or Science.

Honours Earth Sciences (Geography Option)

In addition to the requirements for all Honours Major programs listed on page 14:24, Honours Earth Sciences/Geography Option students must meet the following requirements:

1. In addition to the 42 term courses required for credit, two field courses must be taken;
2. Students must maintain a 70% average in all Geography courses.

Geography Electives:
In selecting 200-, 300-, and 400-level Geography courses, five term courses from one or more of the following sequences should be chosen:

Cartography Sequence
GEOG 160, 360, 403, 404

Air Photo-Remote Sensing Sequence
GEOG 275, 375, 470, 471

Resource Management Sequence
GEOG 303, 356, 357, 358, 359, 414, 461

Year One
EARTH 121/122, CHEM 123/124 and 123L/124L, GEOG 101/102, CS 102, either PHYS 111/112 and 111L/112L or BIOL 111/112 or equivalent elective.

Year Two
EARTH 221, 231, 232, 235, 236, 238
ENV S 200
GEOG 202 and one of GEOG 208, 275 or 309
One elective

Year Three
EARTH 331, 332, 333, 336, 342, 345, 370, 390
ENGL 210C
Two Geography electives
Two unrestricted electives
Year Four
EARTH 427, 436A/B, 440, 490, plus two term courses from 400-level Earth Sciences courses.
Three Geography electives from 300- or 400-level courses.
One unrestricted elective.

Honours Earth Sciences (Economics Option)
This program is intended for Earth Sciences students who wish to take additional courses in Economics and Business. It will be of particular interest for those who intend to pursue an M.B.A. or who anticipate careers in management or entrepreneurial areas. Students must maintain a 65% average in both Earth Sciences and Economics courses.

Economics courses:
Required courses are ECON 101, 102, 201 and 355.
Two additional courses are required, with no more than one from each of the following groups:
ECON 241 or 341, BUS 111W or 121W (offered at WLU), M SCI 211
A course in entrepreneurship.

Year One:
EARTH 121/122, CHEM 123/124 and 123L/124L, PHYS 121/122 and 121L/122L, CS 102, MATH 113A/B, ECON 101.

Year Two:
EARTH 221, 231, 232, 235, 236, 260
ECON 102, 201
elective

Year Three:
EARTH 331, 332, 333, 345, 370, 390
One other 300-level Earth Sciences course
ECON 355
ENGL 210C
One Economics elective
Three other electives.

Year Four:
EARTH 427, 436A/B, 490
Three other 400-level Earth Sciences courses
One Economics elective
Three electives

CO-OPERATIVE APPLIED EARTH SCIENCES
For both of the Co-operative Applied Earth Sciences programs offered, a good academic training, as well as considerable practical experience is gained.

Work term reports must be submitted within 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. See Chapter 5 for further information regarding the Co-operative system of study, and page 5.3 for the Co-op chart outlining the normal progression for Co-operative Earth Sciences students.

Transfer to a regular Honours program will be permitted if all requirements of the Co-op program have been met up to the time of the transfer.

Co-operative Applied Earth Sciences (Geology Option)

Year One
EARTH 121/122, CHEM 123/124 and 123L/124L, PHYS 121/122 and 121L/122L, CS 102, MATH 113A/B, one elective.

Year Two
2A
EARTH 231, 235, 236, 260
One elective
2B
EARTH 221, 232, 238
ENGL 210C
One elective

Year Three
3A
EARTH 332, 333, 345, 370, 390
Two electives
3B
EARTH 331, 336, 342, 355
Two electives

Year Four
Identical to the regular program in Honours Earth Sciences (see page 14.25).

Co-operative Applied Earth Sciences (Geophysics Option)

This Co-op program supplements the core Geology courses with courses from Physics, Math, Computer Science and Engineering. It aims to graduate earth scientists with a strong background in the techniques of quantitative analysis particularly appropriate for geophysical exploration, hydrogeology, mathematical geology, and geotechnical careers.

Required courses in Mathematics and Physics are: MATH 114 (or MATH 111B), MATH 115A/B; MATH 213A/B; PHYS 121/122 and 121L/122L.

Year One
EARTH 121/122, PHYS 121/122 and 121L/122L, CHEM 123/124 and 123L/124L, CS 102, MATH 115A/B, 114 or 111B.

Year Two
2A
EARTH 231, 235, 260
MATH 213A
ENGL 210C
One elective from Physics, Mathematics, Computer Science or Engineering.
Page 3

EARTH 221, 232, 238
MATH 213B
IATH 216

Year Three
3A
ARTH 333, 358, 370, 390
One elective from Physics, Mathematics, Computer Science, or Engineering
One unrestricted elective

B
EARTH 236, 355, 368, 458
One elective from Physics, Mathematics, Computer Science or Engineering
One Arts elective

Year Four
ARTH 427, 436A/B, 460, 461, 490
Two electives from Physics, Mathematics, Computer Science, or Engineering
An additional four Earth Sciences courses from 300- or 400-level courses

Recommended Electives:
STAT: 204, 220
PHYS: 246, 252, 253, 256, 259, 352, 353, 364, 365, 369
CS: 212, 230, 316
JIV E: 375, 381, 472, 473, 480, 486
CHEM: 212, 219, 254, 264, 311, 312, 313, 354
IEOG: 275, 375, 376

HONOURS SCIENCE PROGRAM FOUR (With Specialization in Earth Sciences)
In order to graduate in the Honours Science Program Four, a student must have an overall cumulative average of 60%, and a cumulative average of 65% in all Earth Sciences courses.

Year One
Students entering Year One must take a total of ten term courses, which must include:
ARTH 121/122
CHEM 123/124 and 123L/124L
PHYS 111/112 and 111L/112L, or BIOL 111/112 or Two 200-level Biology term courses
MATH 113A/B
CS 102

Year Two
Students entering Year Two must take a total of ten term courses, which must include:
ARTH 221, 231, 232, 235, 236, 238
ENGL 210C
Two other Science term courses

Year Three
Students entering Year Three must take a total of 12 term courses, which must include:
Six or eight term courses from: EARTH 260, 331, 332, 333, 336, 342, 345, 355, or 460, 370
Two other Science term courses
Two or one Arts term courses

Year Four
Students entering Year Four must take a total of ten term courses, which must include:
ARTH 427, plus three to five term courses from EARTH 300- or 400-level courses

MINOR IN EARTH SCIENCES
In order to graduate with a Minor in Earth Sciences, the following requirements must be met:
1. Successful completion of 5.0 credits in Earth Sciences, with a cumulative average of 65% in all Earth Sciences courses.
2. The required credits must include:
a) EARTH 121/122 in Year One;
b) 2.0 credits from: EARTH 221, 231, 232, 235, 236, 238 in Year Two;
c) 1.5 or 1.0 credits from: EARTH 331, 332, 333, 336, 342, 345, 355, 358, 368, 369, 370 in Year Three;
d) 0.5 or 1.0 credits from: EARTH 421, 432, 433, 434, 435, 438, 440, 458, 459, 470 in Year Four.

Physics
The following programs are offered in the Physics department:
- Honours Major Programs
  Regular:
  Honours Physics
  Honours Physics (Geophysics Option)
  Co-operative:
  Honours Co-op Applied Physics
  Honours Co-op Applied Physics (Geophysics Option)
Honours Science Program Five (with specialization in Physics)

Honours Physics

The Honours Physics program is 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.

Admission to, and continuance in, Honours Physics requires an overall cumulative average of 60% and a 60% Physics average each year.

In order to graduate with an Honours Physics degree, the following requirements must be met:

1. Successful completion of 19.0 lecture credits plus 2.0 physics lab credits.
2. Mandatory courses as listed below.

Year One
Fall:
PHYS 121/121L, 123
MATH 115A or 113A, 111B or 134A
One elective (0.5)

Winter:
PHYS 122/122L
MATH 115B or 113B, 111B or 134B
Two electives (1.0)

Year Two
Fall:
PHYS 10, 252, 256/256L
MATH 213A, 216
One elective (0.5)

Winter:
PHYS 10, 234, 253/253L, 263
MATH 213B
One elective (0.5)

Year Three
Fall:
PHYS 10, 334, 358, 360A, 364
One elective (0.5)
One elective 300-level Physics lab (0.25)

Winter:
PHYS 10, 359, 360B, 363, 365
One elective (0.5)
One elective 300-level Physics lab (0.25)

Year Four
Students entering Year Four must take a total of 5.0 credits, which must include the following:
PHYS 10, 434, 441, 455, plus an additional 1.0 credit of Physics electives. PHYS 437A and PHYS 454 are strongly recommended for students intending to do graduate work. PHYS 443 is recommended for students intending to do graduate work or intending to work as industrial physicists.

Honours Physics (Geophysics Option)

In order to graduate with an Honours Physics (Geophysics Option) degree, the academic requirements listed on page 14:29 under Honours Co-op Applied Physics (Geophysics Option) must be met.

Elective Programs

The "core plus electives" structure of the Honours Physics program allows a great variety of combinations of courses to be taken. By judicious selection of elective courses, students can deepen their knowledge of theoretical or experimental physics, or emphasize particular aspects of the subject, for example solid state physics, astrophysics or biophysics. It is also possible (subject to timetable restrictions) for physics students to use their elective courses to gain expertise in other subjects, for example business administration, computing, electrical engineering or philosophy. The departmental undergraduate advisors are available to assist any student who wished to build such a coherent elective program.

Honours Major Programs — Co-operative

Applied Physics is an Honours program in the form of a core of required courses, plus appropriate electives. The electives available in the second, third, and fourth years allow students to strengthen complementary areas of interest whether in some specific field in physics or in some other subject area.

Through the Co-operative part of the program Applied Physics students have the opportunity of exposure to practical research and development situations in Government and industry. Work opportunities, which are available on a competitive basis, are co-ordinated to complement the student's course work and interest where possible. Many work-term experiences, especially in the upper years, provide the student with a deeper insight into the meaning and methods of research as well as an incentive to develop course work. Such experience provides a contribution to the development of a scientist which cannot be learned in lecture courses, and helps prepare an individual to apply a fundamental physics background to the solution of practical problems.

Further information about the Co-operative work terms and the Department of Co-operative Education and Career Services 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, for which the "core plus electives" structure allows a great variety of combinations of courses to be taken. Some examples of the possibilities are given above under the heading "Elective Programs". The
Second option is in Geophysics. It is offered as a combination of Physics and Earth Science courses with work terms following the scheme of the Co-op Earth Science program, and is detailed separately below.

Honours Co-op Applied Physics
Admission to, and continuance in, Honours Co-op Applied Physics requires an overall cumulative average of 60% and a 60% Physics average in Year One and in each subsequent term.

In order to graduate with an Honours Co-op Applied Physics degree, the following requirements must be met:

1. Successful completion of 19.0 lecture credits plus 2.0 physics lab credits.
2. Mandatory courses as listed below.

Year One

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<th>Course</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>PHYS 121/121L, 123</td>
<td></td>
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<tr>
<td>MATH 115A, 111A or 134A</td>
<td></td>
</tr>
<tr>
<td>One elective (0.5)</td>
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<tr>
<td>Winter or Spring:</td>
<td></td>
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<tr>
<td>PHYS 122/122L</td>
<td></td>
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<tr>
<td>MATH 115B, 111B or 134B</td>
<td></td>
</tr>
<tr>
<td>Two electives (1.0)</td>
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</tbody>
</table>

Year Two

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>PHYS 10, 252, 256/256L</td>
<td></td>
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<tr>
<td>ATH 213A or 230A, 216 or AM 260</td>
<td></td>
</tr>
<tr>
<td>One elective (0.5)</td>
<td></td>
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<tr>
<td>2A (Fall):</td>
<td></td>
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<tr>
<td>HYS 10, 234, 253/253L, 263</td>
<td></td>
</tr>
<tr>
<td>ATH 213B or 230B</td>
<td></td>
</tr>
<tr>
<td>One elective (0.5)</td>
<td></td>
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<tr>
<td>2B (Spring):</td>
<td></td>
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<tr>
<td>PHYS 10, 334, 358, 360A, 364</td>
<td></td>
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<tr>
<td>One elective (0.5)</td>
<td></td>
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<tr>
<td>2B (Fall):</td>
<td></td>
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<tr>
<td>PHYS 10, 334, 358, 360A, 364</td>
<td></td>
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<tr>
<td>One elective (0.5)</td>
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<tr>
<td>3 (Winter):</td>
<td></td>
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<tr>
<td>PHYS 359, 363, 365</td>
<td></td>
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<tr>
<td>One elective (0.5)</td>
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<tr>
<td>3 (Winter):</td>
<td></td>
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<tr>
<td>PHYS 359, 363, 365</td>
<td></td>
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<tr>
<td>One elective (0.5)</td>
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</table>

Year Four

Students entering Year Four must take a total of 5.0 credits, which must include the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 10, 434, 441, 455, plus an additional 1.0 credit of Physics electives. PHYS 437A and PHYS 454 are strongly recommended for students intending to do graduate work. PHYS 443 is recommended for students intending to do graduate work or intending to work as industrial physicists.</td>
<td></td>
</tr>
</tbody>
</table>
In order to graduate in the Honours Science program, with a specialization in Physics, the following requirements must be met:

1. Successful completion of 22.0 credits. Of the 22.0 credits that are required, 14.0 must be Faculty of Science credits;
2. No more than 5.0 failed credits will be allowed;
3. No more than 3.0 SCI credits may be applied to the program;
4. Students must have been enrolled full-time in two out of three years, one of which must be either Year Two or Three, and the other must be Year Four. Year Four of the program must be taken at the University of Waterloo;
5. Mandatory courses as listed below.

Year One
Fall:
PHYS 121/121L
MATH 115A or 113A, 111A or 134A
Two electives (1.0)

Winter:
PHYS 122/122L
MATH 115B or 113B, 111B or 134B
Two electives (1.0)

Year Two
PHYS 234, 252, 253/253L, 256/256L, 263
MATH 213A/B, 216, or equivalent

Years Three and Four
At least 6.0 lecture credits of Physics courses at the 300- or 400-level, which must include PHYS 334 and 455 and at least 1.5 lecture credits of other Honours Physics core courses at the 300- or 400-level.

MINOR IN PHYSICS
In order to obtain a Minor in Physics, the following requirements must be met:

Successful completion of 4.5 Physics lecture credits and 1.0 Physics lab credit, with a minimum average of 60% in all Physics courses attempted;
Lecture credits must include: PHYS 121/122 and at least 2.5 other credits from the Physics core;
Lecture credits must include at least 1.5 credits from 300- or 400-level Physics courses.

Honours Psychology
The Honours B.Sc program in Psychology is intended for students who want to apply knowledge gained in biology, chemistry and physics to problems in neuropsychology, neuroscience, cognitive science, developmental and clinical psychology, and related disciplines, or who will seek professional training in medicine perhaps with specialization in neurology, psychiatry or pediatrics. A strong background in the natural sciences provides excellent preparation for research or graduate work in these fields of study.

Students interested in Honours Psychology (BSc) will normally be admitted at the beginning of their second year based on their academic performance in Year One, as specified below. Application for admission to Honours Psychology is made at the time of preregistration for Year Two. Normally, only students whose Year One Science average is at least 60% and whose Psychology average is at least 75% will be admitted. Owing to resource limitations, however, fulfillment of the minimum entrance average requirements will not guarantee students admission to Honours Psychology, and a higher Psychology average may be required for admission. In order to remain in good standing in Honours Psychology, students must maintain a cumulative average of at least 60% in the Faculty of Science courses and a cumulative average of at least 75% in the Psychology courses.

Students in Honours Psychology may select either the Thesis Option or the Coursework Option. However, students selecting the Coursework Option are advised that a thesis in Psychology is typically required for admission to graduate studies in Psychology.

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. Owing to resource limitations, some students who meet the minimum requirements for continuing in the Honours program may not be admitted to the Co-op program. However, interested students are advised to consult with the Co-op Faculty Advisor when planning their second year programs.

In order to graduate with an Honours Psychology degree, the following requirements must be met:

Successful completion of 23.0 credits including:
1. Honours Psychology requirements a-i on p. 8:33
2. A total of 5.0 Science credits over Years Two, Three, and Four, including no more than 2.0 SCI credits
3. Of the above 5.0 Science credits, at least 2.0 must be at the 300- or 400-level, exclusive of SCI credits.
**Recommended Program For the Thesis Option**

**Year One**
Two 200-level term courses in Biology; CHEM 231/2/241L, 242L, 243, 244L; PHYS 111/112, 111L/112L or PHYS 121/122, 121L/122L; MATH 113A/B; PSYCH 101, one PSYCH elective

**Year Two**
3YCH 291/292 (see overlapping courses p. 8:7)
one Natural Science Course from PSYCH 203, 206, 207, 261, 271
one Social Science Course from PSYCH 211, 253, 355, 357
wo PSYCH Electives (1.0)
Four Science Electives (2.0)
wo Unspecified Electives (1.0)

**Year Three**
PSYCH 391 (see overlapping courses, p. 8:7)
one Natural Science Research Course from PSYCH 392*, 394, 396, 398
one Social Science Research Course from PSYCH 392*, 393, 395, 397
one Natural Science Course from PSYCH 203, 206, 207, 261, 271
one Social Science Course from PSYCH 211, 253, 355, 357
Honours Seminar in Psychology
wo Science Electives (2.0)
wo Unspecified Electives (1.0)
*Students may not use PSYCH 392 to satisfy both 2 and 3.

**Year Four**
SYCH 499A/B/C*
One Honours Seminar in Psychology
wo Science Electives (1.0)
wo Unspecified Electives (2.0)
Students may choose to begin PSYCH 499 in their 3B term.

**Recommended Program For the Coursework Option**
Students will replace PSYCH 499A/B/C in fourth year with two advanced courses in Psychology and one Psychology elective.

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**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 individuals for the practice of optometry. Graduates are eligible to apply for registration as optometrists in the province of their choice. The program provides students with a background in general science and specialized knowledge in visual science so that they may follow a career in optometric research and teaching if they so desire. A two year Diploma of Residency program, designed for persons with the O.D. degree who wish to improve and extend their clinical skills, is available. Graduate programs in Physiological Optics leading to the Master of Science degree and the Doctor of Philosophy degree are also available.

†As with other health care professions, graduates in optometry must hold the certificate of the licensing body of the province in which they choose to practise.

**REQUIREMENTS FOR ADMISSION**

**Citizenship**
Applications are accepted from candidates who are Canadian citizens or from legal residents of Canada who have held Permanent Resident status for at least 12 months prior to the registration day of the Fall term. Proof of Permanent Resident status must accompany the application. In special circumstances a limited number of foreign students (one or two) may be admitted, i.e. those on student authorization.

**Prerequisites**
Applicants should satisfy the Admissions Committee that they are well-prepared academically for entry to the School of Optometry. A good background in Science and Mathematics is required and the disciplines of Biology/Zoology, Calculus, Chemistry, Physics and Psychology should be represented. At the University of Waterloo a program is offered to allow prospective applicants to the first professional year the opportunity to fulfill all the required and recommended prerequisite courses. The following courses represent the minimum requirements for admission to the School of Optometry: BIOL 230, Cell Biology; BIOL 211, Vertebrate Zoology; CHEM 123/123L, Chemical Reactions, Equilibria and Kinetics; CHEM 124/124L, Introductory Organic Chemistry; PHYS 121/122, 121L/122L, General Physics; (students without Grade 13 Physics must take PHYS 111/112 and PHYS 111L/112L); MATH 113A/B, Calculus; PSYCH 101, Introductory Psychology. The following courses represent a second year program of strongly recommended courses: BIOL 201, Human Anatomy; BIOL 202, Histology, Embryology; BIOL 240, Fundamentals of Microbiology; CHEM 266/266L, Organic Chemistry; CHEM 237/237L, Biochemistry; PHYS 246/246L, Physical Optics; PSYCH 200 or 292, or STAT 202, Statistics. Additional suggestions: One (per term) of any of the following courses: Computer Science, Introductory Accounting, Economics, Languages. Laboratory courses must be completed where given. To complete the pre-professional program, additional courses in the behavioural sciences, social sciences and the humanities are recommended.
Admission Test
It is recommended but not required, that applicants take the Optometry Admission Test (OAT). Details of this test can be obtained from the Psychological Corporation, 211 East Chicago Avenue, Chicago, Illinois, 60611, USA. (312) 440-2693.

The Admissions Committee will also consider applications from superior students who have completed other academic programs. In the event that applications from such students are successful, they may be expected to remedy specific deficiencies either during the summer preceding admission or during the regular professional program.

Selection Factors
All applicants should note that enrolment in the first professional year is limited to 60 and that in 1988 there were approximately 500 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 scholarships, interest, motivation, general qualifications for the profession and recommendations.

While offers of admission are made to well qualified applicants from all the provinces, prospective candidates are advised that some preferential consideration is given to Ontario residents. Applicants to Honours Science, Regular 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 Honours Science, Regular as given at the University of Waterloo.

The provinces of British Columbia, Alberta, Manitoba, New Brunswick, Prince Edward Island and Saskatchewan have entered into a contract with the province of Ontario and the University of Waterloo regarding admission of applicants to the School of Optometry from those provinces. Under the terms of the agreement, the University of Waterloo, School of Optometry offers an allotted number of places in the first professional year who have taken courses equivalent to those from other provinces. The breakdown of allotted places for contract province residents is as follows:

British Columbia 5; Alberta 7; Saskatchewan 3; Manitoba 3; New Brunswick 1; Prince Edward Island 1 (every 3 years). In each year arrangements will be made to provide an opportunity for applicants from British Columbia, Alberta, Manitoba and Saskatchewan to be interviewed in their home provinces. Applicants from the six contract provinces must meet the same admission criteria as other applicants. Additional information may be obtained from the Admissions Office of the School of Optometry.

Science
Optometry

Application Procedures
Candidates who are currently or have previously been enrolled in any University of Waterloo course are considered internal applicants. These candidates initiate their application to the Optometry program by completing an application for internal transfer obtained from the Admissions Office at the School of Optometry. The Application for Admission to the School of Optometry, due during pre-registration week in March, can be obtained from the Optometry Admissions Office after October 15. In the winter term an interview with the Admissions Committee will be arranged for these students. Prospective candidates who have never taken a course at the University of Waterloo are considered external applicants and must apply through the Ontario Universities Application Centre (OUAC). Such applicants should obtain the appropriate OUAC applications form from the Registrar of either the University of Waterloo or any Ontario University. These forms will not ordinarily be available from the Registrar prior to October 15. The Application for Admission to the School of Optometry, due March 31, will be sent by the University of Waterloo Office of the Registrar upon receipt of its copy of the OUAC Form #105 from Guelph, provided that this form is received by February 28. The Application for Admission to the School of Optometry contains seven sections:

Section A: Personal ID
Section B: General Information
Section C: Academic Record
Section D: Autobiographic Sketch
Section E: Personal Health Statement
Section F: 3 Confidential Assessment Forms (CAFs)
Section G: Essay

Specific instructions, including deadlines, will be outlined in the application procedures accompanying the Application.

The deadline for receipt of academic transcripts is June 15. Upon acceptance to the Optometry program students will be requested to submit documentation of up-to-date immunization for measles, rubella, mumps, polio, diphtheria and tetanus (refer to application package for further details). Students are not allowed to participate in the optometry clinics without this documentation.

Students granted admission to the first professional year who have taken courses equivalent to those required in the professional program may apply for exemptions from these courses immediately after acceptance into the program. Details on the policy of exemptions may be obtained by writing to the Admissions Office of the School of Optometry.

Admission to Advanced Standing
Applications are not ordinarily accepted to a year more advanced than the first professional year. However, graduates from certain Commonwealth Universities who are licensed to practice optometry in their country of origin may in certain instances be admitted to a
more advanced level in a program leading to the O.D. degree. For more information write: The Admissions Office, School of Optometry.

**Note**

Interviews arranged by the Admissions Office of the School are recommended in the following situations before any application will be processed:

1. Applicants with undergraduate or graduate training who have not completed prerequisites for the pre-professional program and who are considering a "make-up" year.
2. Applicants considering a "make-up" year to repeat courses for the purpose of raising grades.
3. Applicants who are engaged at present in another vocation such as teaching, engineering, research, etc., and who may find it necessary to terminate employment before the admission decision has been made.

Appointments for interviews can be made by phone or letter to the Admissions Office of the School of Optometry.

**ACADEMIC COURSE REQUIREMENTS**

In the Optometry program an overall 60% average as well as a mark of at least 60% in each course of the major subject must be obtained each term. In Optometry 346A/346B, 416 and 448A/448B a mark of at least 70% will be considered a passing grade. In the Optometry program a student who fails to demonstrate clinical competence as evidenced by a failing grade in a clinical course will not be allowed to continue in the program.

**Year One**

**Fall term:**
OPTOM 100, 104, 105, 106, 109
BIOL 301A

**Winter term:**
OPTOM 111, 114, 115, 116
BIOL 301B

**Year Two**

**Fall term:**
OPTOM 241, 242, 244, 245, 246, 261

**Winter term:**
OPTOM 251, 252, 254, 255, 274

**Year Three**

**Fall term:**
OPTOM 342, 344, 346A, 347, 348A, 364

**Winter term:**
OPTOM 346B, 348B, 350, 351, 352, 353, 357, 372

**Year Four**

**Spring term:**
OPTOM 418

**Fall term:**
OPTOM 440, 442, 448A, 449, 468, 480
OPTOM 441 or PSYCH 357*

**Winter term:**
OPTOM 448B, 452, 459, 490, 499 (A-E)
OPTOM 451 or one elective (0.5)*

*Students with a particular interest in and an aptitude for research in physiological optics may substitute OPTOM 441/451 for PSYCH 357 and the winter term elective. A student is required to complete one or the other of these alternatives. STAT 202 or equivalent is recommended for OPTOM 441/451.
Interdisciplinary Options
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 One. The Interdisciplinary Options now available are described below:

Canadian Studies, S.E. McMullin, Director, St. Paul's College
Gerontology, W.F. Forbes, Director, PAS 3010
Latin American Studies, T. Korovkin, Director, HH 313
International Studies1, R. Bullock, Director, ESI 119
Legal Studies, M. McDonald, Director, ML 119
Management Studies, E.S. Lucy, Director, NH 3042B
Middle East Studies, D. Sahas, Director, HH 289G
Peace and Conflict Studies, R.J.R. Mathies, Director, Conrad Grebel College
Personnel and Administrative Studies, E.S. Lucy, Director, NH 3042B
Society, Technology and Values, R.D. Legge, Director, St. Paul's College
Studies in the French Language2, C. Bryant, Director, ESI 232
Studies in Personality and Religion, R.D. Legge, Director, St. Paul's College
Studies in Sexuality, Marriage and the Family, P.J. Naus, Director, St. Jerome's College
Women's Studies, L. Dorney, Director, PAS 3022

1Program information not available at time of printing. Consult Professor R. Bullock, ext. 3073 for details.

2Program information not available at time of printing. Consult Professor C. Bryant, ext. 3610 for details.
Canadian Studies

Participating faculty members are listed in Chapter 16.

THE CANADIAN STUDIES OPTION
The Canadian Studies Option provides an opportunity to gain insight into Canada in three ways: through courses about Canada in the student's home discipline, courses about Canada in departments outside that discipline, and core interdisciplinary courses offered by the Canadian Studies Program Centre. The Centre is located at St. Paul's United College on the UW campus.

GENERAL AND HONOURS OPTIONS
Students in Anthropology, Economics, English, Environment and Resource Studies, French, Geography, History, Political Science, Sociology, and Urban and Regional Planning are invited to consider the General or Honours Option in Canadian Studies.

Year One
Because most UW students declare their main field of study in their second year, there are no strict Canadian Studies requirements for Year One. However, students intending to take the Option should take a French language course and CDN ST 101, and they should otherwise proceed with their Faculty's usual Year One program.

Having chosen a main field of study (a "home discipline") from among the ten departments listed above, students can then select the Canadian Studies Option. Those in a three-year General degree program choose the General Option, while those in a four-year Honours program select the Honours Option. The difference in the two Options is that Honours students complete the fourth year (see below).

Year Two
- CDN ST 201, 202 Core courses
- two term courses in the home discipline dealing specifically with Canada
- two term courses from outside the home discipline, dealing with Canada and chosen from the approved course list (see p. 15:4)
- the equivalent of four term courses chosen to meet the Honours requirement in the home discipline

Year Three
- two of CDN ST 301, 302, 313, 365 Core courses
- two term courses in the home discipline dealing specifically with Canada
- two term courses from outside the home discipline, dealing specifically with Canada and chosen from the approved course list (see p. 15:4)

General degree students will graduate at the end of Year Three with a degree in their home discipline and with "Canadian Studies Option" shown on the diploma.

Year Four
- CDN ST 400A, 400B Core Courses
- two term courses from outside the home discipline, dealing specifically with Canada and selected from the approved course list on p. 15:4
- the equivalent of four term courses chosen to meet the Honours requirement in the home discipline

Double Honours and Canadian Studies
Students may take a Joint Honours program and the Canadian Studies Option by taking two term courses in each Honours discipline and the core CDN ST courses. They are not required to take the courses listed outside of their Honours areas in other departments.

MINOR IN CANADIAN STUDIES
Honours students may minor in Canadian Studies regardless of faculty or department. This requires assembling a package equivalent to ten term courses. The package includes four of CDN ST 101, 201, 202, 301, 302, 313 and 365 plus six term courses from the approved course list on p. 15:4.

GENERAL NON-MAJOR DEGREE (CANADIAN STUDIES)
This degree enables students to take a general approach to the study of Canada without having to declare a major or honours area of concentration. Students can assemble a package of courses for a degree that is "non-major" yet emphasizes Canadian Studies. The program must be arranged through theFaculty of Arts Undergraduate Office.

PRINCIPAL CANADIAN CONTENT COURSES OFFERED BY PARTICIPATING DEPARTMENTS
The list below indicates courses tentatively scheduled for 1989-90. Refer to previous and forthcoming Undergraduate Calendars for other Canadian content courses.

Anthropology (ANTH)
102A Introduction to Social and Cultural Anthropology
222 Prehistoric Cultures in the Great Lakes Area
230 Indians of Canada
233 Inuit & Eskimo Cultures
241 The Contemporary Canadian Indian Scene
322 Prehistoric Cultures in the Great Lakes Area
499 Honours Essay

Economics (ECON)
101 Introduction to Micro-economics
102 Introduction to Macro-economics
150 An Introduction to Macro and Micro Economics
310 History of Canadian Economic Development
333 Interregional Economics
341 Public Finance
Interdisciplinary Options

Canadian Studies

343 Urban Economics
345 Industrial Organization
351 Labour Economics
353 Population Economics
355 Economics of Energy and Natural Resources
361 Cost-Benefit Analysis and Project Evaluation
363 Contemporary Canadian Problems

English (ENGL)
205R The Canadian Short Story
214 Themes in Canadian Literature
313 Canadian Literature to 1920
314 Canadian Poetry Since 1920
315 Canadian Prose Since 1920
316 Canadian Drama
490A-Z Special Topic Seminars in Canadian and Commonwealth Literature
495A/B Senior Honours Essay Canadian Literature Option

Environment and Resource Studies (ERS)
241 Introduction to Environmental and Social Impact Studies
338 Social Impact Assessment
352 Current Issues in the Canadian North
385 Technology/Lifestyles for a Conserver Society

Environmental Studies (ENV S)
195 Introduction to Environmental Studies
201 Introduction to Environmental and Planning Law
401 Environmental Law
402 Planning Law
433 People in Natural Areas

French (FR)
151 Basic French
152 Basic French
155 Intensive Review of French
192 French Language
193 French for Bilingual Students I
250 Advanced French Language
250A Advanced French Language
273 Aspects du Québec
275 Contemporary French-Canadian Novel
293 French for Bilingual Students II
300 Advanced French Language
300A Advanced French Language
371 French-Canadian Poetry
372 Contemporary French-Canadian Theatre
400 Advanced French Language
400A Advanced French Language
471 French-Canadian Poetry

Geography (GEOG)
251 Cities in Canada
300 Geomorphology and the Southern Ontario Environment
309 Physical Climatology
322 Geographical Study of Canada

341 Historical Geography of Canada 1
342 Historical Geography of Canada 2
352 The Rural-Urban Fringe
422 Canada
461 Land Dereliction and Rehabilitation 1

History (HIST)
102C Origins of War in the 20th Century
102E Canadian History
204 Life on the Ontario Frontier
206 History of Canadian Minorities
207 Canadian Labour History
215 The Proper Sphere: Canadian Women in Historical Perspective
234 The Catholic Church in Canada since Confederation
248 History of Canadian-American Relations to 1914
253 Canadian History: 1760-1900
254 Canadian History: 1900-1979
273 Canadian Social History I
274 Canadian Social History 2
320 Modern Quebec History
325 History of Canadian Indians to 1870's
326 History of Canadian Indians since 1870's
385 Canada From MacDonald to Laurier
389 Canada in World Affairs: From Laurier to Trudeau
403 Senior Seminar: Canadian History

Political Science (PSCI)
101M Introduction to Public Policy
102M Contemporary Issues in Canadian Public Policy
231 Government and Business in Canada
260A/B Canadian Government and Politics 1/2
291 The Canadian Legal Process
292 Issues in Canadian Criminal Law
331 Public Administration 1
332 Public Administration 2
333 Administrative Law
342 Politics in Quebec
343 Canadian Municipal Government
344 The Politics of Local Government
351 Federal and Consociational Political Systems
363 Canadian Constitutional Law
372 Political Parties and Interest Groups
422 Conflict of Political Ideas in Canada
428 The State and Economic Life
431 Canadian Public Policy
435 The Politics of Canadian Resource Development
442 Politics in Ontario
443 Politics in Western Canada
461 Problems in Canadian Politics 1
462 Problems in Canadian Politics 2

Sociology (SOC)
101 Introduction to Sociology
102 Social 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 Diploma 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 Diploma represent multidisciplinary programs, combining courses from a variety of departments such as Biology, Optometry, 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 Diploma 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 Diploma consists of a selection of five required and five optional courses.

**Academic Requirements for the Minor**

1. Students must be in an Honours Program at the University of Waterloo.

2. Successful completion of five core courses, including the Multidisciplinary Seminar and, in addition, successful completion of five courses selected with the approval of the program committee from the list of optional or core courses. Students will have to take at least one of Gerontology 402 and Gerontology 255 as part of the core requirements.

3. An overall minimum average of 65% in the ten academic courses.

**Core Courses (five to be completed)**
- GERON 255/SCI 255: The Biology of Aging
- GERON 400: Multidisciplinary Seminar on Aging
- GERON 402/MTHEL 402B: Epidemiology of Aging
- KIN 352/SOC 344: Sociology of Aging
- PSYCH 217/218/SOC 247: Aging, Dying and Death

**Optional Courses**
- GERON 208/ENGL 208F: The Literature of Aging
- GERON 401A/B/GERON 403/MTHEL 402A: Directed Studies in Special Topics
- ANTH 404: Human Development in a Cross-Cultural Perspective: Human Development, Aging and Death
- BIOL 433: Stress Physiology and Aging in Plants
- CS 316: Introduction to Statistical Problem Solving by Computer

**Academic Requirements for the Diploma**

- ECON 353: Population Economics
- HLTH 245: Community Health
- HLTH 210: Growth, Development and Aging
- HLTH 472: Special Topics: Aging, Immunity and Health
- ISS 350D: Adult Life Crises and Events
- OPTOM 449: Community Health Optometry
- OPTOM 452: Special Populations
- PHIL 226: Ethics and the Life Sciences
- PHYS 480: Radiation Biophysics
- PLAN 414/416: Issues in Housing
- PLAN 420: Health, Environment and Planning
- REC 361: Aging and Leisure
- RS 271: Personality and Religion
- RS 400A: Aging as Spiritual Journey
- SOC 248: Health, Illness and Society
- SOC 343: Sociology of Health Care
- SOC 415: Social Networks
- SOC WK 367H: Social Work with the Elderly

**An approved course in Statistics**

**Further Information**

Enquiries are encouraged and additional information can be obtained by writing or calling:

- The Director (W.F. Forbes)
- The University of Waterloo Program in Gerontology
- PAS Building: Room 3010
- Ext. 3468

or any members of the Committee

**Science:**
- J.C. Carlson, Biology: B2-252A (ext. 2664)
- N.H. Charness, Psychology: PAS 4055 (ext. 3313)
- H.S. Coblenz: ES1-331 (ext. 3909)
- B.D. McPherson, Adjunct Professor: Faculty of Social Work, W.L.U.

**Church Colleges:**
- P. Naus: St. Jerome's College STJ 114 (ext. 6593)

**Optometry:**
- M.E. Woodruff: School of Optometry OPT 339 (ext. 3175)

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**Latin American Studies**

**Assistant Professor, Director**
- T. Korovkin, BA, MA (Moscow), MA, PhD (York)

**Professor**
- M.J. Craton, BA (London), MA, PhD (McMaster)
- FRHistS
The Latin American Studies Option is an Interdisciplinary program designed for students in any faculty of the University who have an interest in Latin America and the Caribbean. 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 Latin American 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 ten term courses from those listed below, of which at least six term courses must be selected from disciplines other than the student’s Honours program. To graduate with the Latin American Studies Option indicated on the diploma, students must have an overall average of 65% in the Latin American Studies Option courses.

Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIST 102K</td>
<td>Conflict in the Caribbean and Central America</td>
</tr>
<tr>
<td>HIST 230</td>
<td>Church and Revolution in Latin America</td>
</tr>
<tr>
<td>HIST 232</td>
<td>Revolutions in Latin America</td>
</tr>
<tr>
<td>HIST 350</td>
<td>British West-Indian History</td>
</tr>
<tr>
<td>PACS 301A</td>
<td>Liberation and Nonviolence in Latin America</td>
</tr>
<tr>
<td>PSCI 102F</td>
<td>Politics in the Third World</td>
</tr>
<tr>
<td>PSCI 350A</td>
<td>Politics of the Developing Areas 1</td>
</tr>
<tr>
<td>PSCI 350B</td>
<td>Politics of the Developing Areas 2</td>
</tr>
<tr>
<td>P SCI 453</td>
<td>Comparative Politics of Latin America</td>
</tr>
<tr>
<td>/651</td>
<td></td>
</tr>
<tr>
<td>P SCI 454</td>
<td>Comparative Politics II</td>
</tr>
<tr>
<td>/652</td>
<td></td>
</tr>
<tr>
<td>SPAN 217</td>
<td>Spanish American Civilization 1 (in English)</td>
</tr>
<tr>
<td>SPAN 218</td>
<td>Spanish American Civilization 2 (in English)</td>
</tr>
<tr>
<td>SPAN 227</td>
<td>Survey of Spanish American Literature 1 (in Spanish)</td>
</tr>
<tr>
<td>SPAN 228</td>
<td>Survey of Spanish American Literature 2 (in Spanish)</td>
</tr>
<tr>
<td>SPAN 101</td>
<td>Language</td>
</tr>
<tr>
<td>SPAN 102</td>
<td>Language</td>
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<td>SPAN 201A</td>
<td>Language</td>
</tr>
<tr>
<td>SPAN 201B</td>
<td>Language</td>
</tr>
<tr>
<td>SPAN 251A</td>
<td>Language</td>
</tr>
</tbody>
</table>

Legal Studies

The Legal Studies Committee

Associate Professor, Director
M.F. McDonald, BA (Toronto), MA, PhD (Pittsburgh)

Associate Professors
C.G. Brunk, BA (Wheaton), MA, PhD (Northwestern) G
F.G. Reynolds, BSc, MSc, (Manitoba), FSA, FCIA, MAAA
J.A. Wahl, CR, BA (Western Ontario), MA, PhD (St. Louis) J

Assistant Professors
P.J. Carrington, AB (Harvard), MA, PhD (Toronto)
S.F. Gunz, BA, LLB (Sydney), MBA (Manchester)
R.P. Woolstencroft, BA, PhD (Alberta)

Adjunct Faculty
S.R. Garrod, BA (McMaster), LLB (York), MES (York)

Legal Studies is an Interdisciplinary Option that focuses on law primarily from a multidisciplinary perspective. Given the centrality of law to most human institutions and values, a great deal of attention has been paid to law by scholars working in a wide variety of disciplines including Accounting, Actuarial Sciences, Economics, Environmental Studies, History, Philosophy, Political Science, and Sociology. Students are invited to join these scholarly investigations. The liberal arts orientation of this program emphasizes the student’s development of broadly based critical and creative intellectual skills, clarity and facility in the communication of ideas, and humane values in this examination of law as a major feature of social life. In this regard it should be noted that Legal Studies is not intended as either a necessary or a sufficient preparation for law school.

Requirements
The courses in this option are divided into three sections. The first consists of broadly based courses that are concerned with the nature and character of legal systems, reasoning and concepts; these include courses in the history of law, philosophy of law, sociology of law, and Canadian law. Students are required to take all the courses (four term courses) in this section. In the second section the courses are in general more advanced and concerned with particular aspects of the law. Students must select four term courses from this section. In the third section the courses are less central to the area of legal studies, but serve to bridge the gap between legal studies and...
particular disciplines. Students will choose two term
courses from courses in this section that fit their
General or Honours program. Students are strongly
urged to consult the Legal Studies Director in making
their course selections from Sections Two and Three.

The Legal Studies Option is open to students in
General or Honours programs. Students must
complete five year-course equivalents of designated
Legal Studies courses from the appropriate sections.
An overall average of 65% in these courses is
necessary to graduate with the Legal Studies Option.

COURSES

Section 1

Students are required to complete successfully all of
the following courses:

- HIST 210X History of Law
- PHIL 327A Philosophy of Law - Part 1
- PSCI 292 Aspects of Canadian Law
- SOC 370 Sociology of Law

Total credits in Section 1: 2.0.

Section 2

Students are required to complete successfully two
year-course equivalents from the following courses.
Students in the Faculty of Environmental Studies must
take ENV S 201, 401, and PLAN 402 plus one other
course in Section 2.

- ACC 231 Business Law
- ACTSC 458 Insurance Law
- ENV S 201 Introduction to Environmental & Planning Law
- ENV S 401 Environmental Law (not offered in 1989/90)
- HIST 102M Law and Society in the Middle Ages:
  - 500-1000
- HIST 329 History of the Common Law
- ISS 350E Family Law and Social Work
- PHIL 327R Philosophy of Law - Part 2
- PLAN 402 Planning Law
- PSCI 291 The Canadian Legal Process
- PSCI 333 Administrative Law
- PSCI 363 Canadian Constitutional Law
- SOC 224 Law and Order: Regulating Deviance
- SOC 227 Criminology
- SOC 228 Corrections

Total credits in Section 2: 2.0.

Section 3

Students are required to complete successfully one
year-course equivalent from the following courses:

- ACC 461 Taxation 1
- ACC 462 Taxation 2
- HIST 211 British History to 1603
- HIST 212 British History Since 1603
- PACS 202 Conflict Resolution
- PHIL 215 Professional and Business Ethics
- PHIL 226 Ethics & the Life Sciences
- PHIL 329 War, Peace and Justice

Interdisciplinary Options

Legal Studies
- PSCI 225 History of Political Theory 1
- PSCI 260A Canadian Government & Politics
- SOC 222 Juvenile Delinquency
- SOC 223 Deviance: Perspectives & Processes
- SOC 329 Crime as Business
Total credits in Section 3: 1.0.

Management Studies

Management Studies is a Minor program that can be
taken in conjunction with many existing Honours
Majors. The course is designed to provide a vehicle
which allows a student who has pursued an Honours
Major in a theoretical or specialized academic
discipline, to focus such a background by completing
a series of courses in those academic disciplines
which provide the theoretical background for much of
current management practice.

Management and management decision making
have become much more complex in the past two
decades with decisions needing to be based more on
research and knowledge rather than intuition and
experience. In order to gain maximum advantage of
courses in the Management Studies program, it is
necessary for students to have skills in algebra and
calculus.

Management Studies provides a background which
would be useful in many entry level management jobs,
and offers a basis for further education in
management.

Management studies should be of particular interest
to students who see their future in tasks involving
problem solving, the design of systems, or operations
analysis.

Required Courses

1. All of the courses listed below:
   - ECON 101
   - M SCI 211 or PSYCH 333
   - ACC 121 and 131
   - CS course compatible with Major program
   - BUS 352 (WLU)
   - ENGL 210 or SCI 209

   Statistics course compatible with Major program

2. Three of the courses listed below, but only one in
   each category:

<table>
<thead>
<tr>
<th>Categories</th>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounting</td>
<td>ACC 122</td>
</tr>
<tr>
<td>Economics</td>
<td>ECON 102</td>
</tr>
<tr>
<td>Management</td>
<td>ACC 132</td>
</tr>
<tr>
<td>Computers</td>
<td>An additional CS course</td>
</tr>
<tr>
<td>Organizational Behaviour</td>
<td>M SCI 311 or PSYCH 339</td>
</tr>
<tr>
<td>Decision Making</td>
<td>PHIL 216 or M SCI 452</td>
</tr>
<tr>
<td>Personnel</td>
<td>PAS 200</td>
</tr>
<tr>
<td>Psychology</td>
<td>PSYCH 253, 254</td>
</tr>
<tr>
<td>Sociology</td>
<td>SOC 242, 243, 310, 336, 340, 342</td>
</tr>
</tbody>
</table>
Only two courses in the Major field may be counted for the Minor. This does not include Statistics.

An overall average of 70% in these courses is necessary to graduate with the Management Studies Minor.

More information on this program is available from the Course Director, E.S. Lucy, ext. 4551.

Middle East Studies

Director of Middle East Studies
Daniel J. Sahas, BA (Athens), STM (Indianapolis), PhD (Hartford)

Acting Director 1989-90
Leonard A. Curchin, BA (Western Ontario), MA (Toronto), MA (Carleton), PhD (Ottawa)

(Participating Faculty members are listed in Chapter 16).

The Middle East has played a vital role in the history of the world for millennia. Its past and present civilizations, languages, religions, cultures and scientific accomplishments have penetrated and become integral parts of Western civilization and culture. The Middle East continues to be a significant factor in world events today. For these reasons, the study of the Middle East remains an important and valuable academic activity.

This Middle East Studies Option provides, in an organized way, a listing of courses with Middle East content.

Students will normally enter the program in their second year, although appropriate courses taken during Year One can be applied to the Middle East Studies Option. Before preregistration each Spring, students should consult with the Director of the Middle East Studies Option and with the department involved to determine which courses will be available during the coming year.

Requirements

1. This option may be taken in combination with any general or honours program.

2. A minimum of eight term courses are required for this Option. These courses are to be distributed as follows:
   a) MES 200 Introduction to the Middle East.
   b) One or more term courses from the series MES 302A-D Directed Studies on the Middle East.
   c) The remainder of the courses from the list described below. If there are more than five courses in this category they must be taken from at least three different disciplines.

3. To meet the graduation requirements a student must maintain a minimum of 65% average overall in the Option.

Required Middle East Studies Courses
MES 200 Introduction to the Middle East
MES 302A-D Directed Studies on the Middle East

Middle East Content Courses
ANTH 224 Archaeology and Growth of Cultural Complexity
ANTH 321 Studies in Archaeology of Complex Cultures
CLAS 101 Colossus – the Major Figures of Ancient Greece
CLAS 102 Colossus – the Major Figures of Ancient Rome
CLAS 201 Ancient Greek Society
CLAS 202 Ancient Roman Society
CLAS 251 Greek History
CLAS 252 Roman History
CLAS 292 Modern Issues in the Ancient World
CLAS 301 Ancient Myth and Religion 1
CLAS 302 Ancient Myth and Religion 2
CLAS 371 Christianity and the Roman Empire
CLAS 373 The Fall of the Roman Empire
ECON 335 Economic Development
ECON 353 Population Economics
ENGL 202A The Bible and Literature 1
ENGL 202B The Bible and Literature 2
ERS 218 Introduction to Sustainable Environmental & Resource Systems
ERS 231 Environmental Issues in a Global Perspective
ERS 360 Man and Nature
ERS 361 International Communications System and Development
FINE 110 Introduction to World Art I
FINE 111 Introduction to World Art 2
GEOG 125R Introduction to the Third World
GEOG 220A The World Region
GEOG 220B The World Region and World Issues
HIST 210 History of Law
HIST 214X Empires and Missionaries
HIST 235 History of Christianity
HIST 237 Ancient Civilization 1
HIST 259 Modern African History
HIST 303 Medieval Church History from 1096 to 1449
PACS 201 Roots of Conflict and Violence
PACS 202 Conflict Resolution
PACS 230 The Politics of Nonviolence
PHIL 329 War, Peace and Justice
PSCI 281 International Politics
PSCI 282 Foreign Policy
PSCI 437 The Politics of International Resources
PSYCH 102 Culture’s Influence on Behaviour
RS 100B Religions of the West
RS 100E Biblical Studies 1
RS 100F Biblical Studies 2
RS 205 The Hebrew Prophets
RS 209 The Apostle Paul: Life and Letters
RS 216 Islam
RS 217 Judaism
Interdisciplinary Options
Peace and Conflict Studies

RS 225 The History and Culture of the Orthodox Church
RS 304 Modern Study of Jesus
RS 306 Intermediate Biblical Hebrew
RS 308 Parables of Jesus
RS 310 The Sacred Book of Islam
RS 318 Islam and Christianity
RS 334 Islamic Theology, Philosophy and Mysticism
SOC 256 Race and Ethnic Relations
SOC 333 Canadian Multiculturalism
SOC 354 World Population Problems
W S 200 Introduction to Women’s Studies

Note:
Other courses not included in this list may be relevant to the Middle East Studies Option. However, before registration to such courses, students should consult with the Director as to the suitability of these courses to fulfill the requirements of the MES Option.

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 or in a General "non-major program. 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. PACS is especially appropriate for those considering careers in conflict resolution occupations (e.g. social work, community development, public administration, law and corrections, education, or politics). The program is administered by Conrad Grebel College in co-operation with participating departments in the University of Waterloo. The participating departments presently include Environment and Resource Studies, History, Philosophy, Political Science, Psychology, Religious Studies, Social Development Studies, and Sociology.

PROGRAMS
There are three different programs open to students participating in PACS: 1) General Program Option, 2) Honours Option, and 3) Honours 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 in Chapter 16) as well as a specified number of "PACS Content Courses" (listed below). If students are in a major program they must fulfill all the requirements for the major in their own department.

1. The General Degree Option (Peace and Conflict Studies)
The General Degree Option in Peace and Conflict Studies is available to all students in the Faculties of Arts and Environmental Studies. In addition to fulfilling the major (normally including at least ten term courses in the major field) or non-major requirements, the general degree student must meet the following PACS requirements:
a) PACS 201, 202, 301, and 302.
b) any six PACS Content Courses (see below).

2. Honours Option (Peace and Conflict Studies)
Students may choose straight or joint honours in any of the participating departments. Students are granted, upon completion of the program, 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 four-year period of study.
a) PACS Core Courses 201, 202, 301, 302, 499 A/B. (The PACS 499 A/B requirement may be met by the successful completion of any Honours Research Course or its equivalent which fulfills the requirement for an Honours degree in a participating department, if the research is in an approved PACS-related field of inquiry.)
b) six term courses chosen from among the PACS Content Courses offered by the student’s department (eight term courses if joint honours in two participating departments). Those courses may also be used to meet the department’s honours requirements if approved as such by the department.
c) three term courses chosen from among any of the PACS Content Courses. (Students should use their first year to take lower-level prerequisites for PACS Content Courses in those departments where they have special interests.)

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

PEACE AND CONFLICT STUDIES CONTENT COURSES OFFERED BY PARTICIPATING DEPARTMENTS

The following PACS-related courses are offered by the participating departments and the PACS program under their own designations. Many of the 300- and 400-level courses have specific prerequisites. Students planning to pursue study in these upper level courses
should use their electives wisely to ensure that the prerequisites for these courses are met. Additions or deletions may occur from time to time. Full course descriptions are found in Chapter 16.

Where a participating department has not designated a large enough number of courses to meet the requirements for the Honours Option in PACS, or where students find the list inadequate for their needs, students are encouraged to take the listed PACS Content Courses, and/or to petition the PACS Administration to have specific courses accepted as PACS Content Courses. This should happen before registration in the course in question is finalized. Please consult the undergraduate officer for more information.

**Environment and Resource Studies**

ERS 231 Environmental Issues in Global Perspective  
ERS 241 Introduction to Environmental and Social Impact Assessment  
ERS 337 Environmental Impact Assessment  
ERS 338 Social Impact Assessment  
ERS 351 Current Issues in the Canadian North  
ERS 400 Senior Honours Seminar  
ENV S 401 Environmental Law

**History**

HIST 102C The Origins of Wars in the 20th Century  
HIST 102D From Nationalism to Totalitarianism  
HIST 102K Conflict in the Caribbean and Central America  
HIST 208 The Cold War: American-Russian Relations Since November, 1917  
HIST 217 Irish History: The Nineteenth and Twentieth Century  
HIST 222 History of Modern Revolutions  
HIST 230 Church and Revolution in Modern Latin America  
HIST 232 Revolutions in Latin America  
HIST 348 Radical Reformation

**Interdisciplinary PACS**

PACS 230 The Politics of Nonviolence  
PACS 250 The Nuclear Crisis  
PACS 271 Introduction to Peace Research 1  
PACS 272 Introduction to Peace Research 2  
PACS 350 Canada and the Nuclear Crisis  
PACS 390 A/B Field Studies in Peace and Conflict  
PACS 398/399 Directed Readings in Peace and Conflict Studies

**Philosophy**

PHIL 216 Rational Behaviour and Decision-Making  
PHIL 243 Conflict, Contract and Choice  
PHIL 327A Philosophy of Law 1

**Interdisciplinary Options**

**Peace and Conflict Studies**

PHIL 327B Philosophy of Law 2  
PHIL 329 War, Peace, and Justice  
PHIL 422 Political Philosophy 1  
PHIL 423 Political Philosophy 2

**Political Science**

PSCI 101A Introduction to Politics  
PSCI 102F Politics in the Third World  
PSCI 102K Mass Political Violence  
PSCI 102N The Politics of Nationalism and Ethnicity  
PSCI 225 Political Theory 1  
PSCI 226 Political Theory 2  
PSCI 281 International Politics 1  
PSCI 282 Foreign Policy  
PSCI 321 Marxist Theory  
PSCI 322 Marxism after Marx  
PSCI 350A The Politics of Developing Areas 1  
PSCI 360B The Politics of Developing Areas 2  
PSCI 380A World Politics 1  
PSCI 381 Foreign Policies of South Asian States  
PSCI 479 Violence in the Political Process  
PSCI 481 Research Seminar on World Politics  
PSCI 483 Power Politics and World Order Studies  
PSCI 484 Contemporary Strategies: Theories and Policies

**Psychology**

PSYCH 254 Interpersonal Relations  
PSYCH 333 Industrial/Organizational Psychology  
PSYCH 354 Interpersonal Processes in Critical Situations

**Religious Studies**

RS 257 The Thought and Practise of Christian Peacemaking  
RS 263 Justice, Peace and Development  
RS 274 Religious Approaches to Personal Crises  
RS 322 Radical Reformation  
RS 353 The Bible and Peace  
RS 354 War and Peace in Christian Theology

**Social Development Studies**

PSYCH 221R Interpersonal Interaction  
SOC 221R Master Trends in Modern Society  
SOC 327R Minority Status in Canadian Society  
SOC 328R Canadian Ethnic and Cultural Minorities  
SOCWK 355R Child Maltreatment: Identification and Treatment  
SOCWK 357R Family Violence  
SOCWK 390 A/B Family Violence: Advanced Seminar

**Sociology**

SOC 214 Class, Status and Power  
SOC 222 Juvenile Delinquency  
SOC 236 Social Movements  
SOC 255 Third World Development  
SOC 256 Ethnic and Racial Relations  
SOC 265 Political Sociology
Personnel and Administrative Studies

Personnel and Administrative Studies (PAS) is a Minor program that can be taken in conjunction with many existing Honours Majors. The program is designed to provide a broad interdisciplinary exposure to those academic disciplines which provide the theoretical background for current management practice. The program should be of interest to those students who wish to pursue further education in management, or to those who plan to begin a management or administrative career at the entry level immediately after university.

This Minor program assumes that students will develop, in depth, an interest in a major academic field or course of study and then focus this interest toward their personal career development through pursuing a Personnel and Administrative Studies course. The PAS Minor may be combined with a co-operative program in order to obtain work experience in this field.

The program of study consists of 12 half-course credits that may be completed at any point in the four-year term, plus a course in statistics. Many honours programs require a statistics course, and these are acceptable.

An overall average of 70% in these courses is necessary to graduate with the Personnel and Administrative Minor.

The courses required for the PAS Minor encompass several central themes. First, analytical techniques are stressed. These "functional" tools have become increasingly important in administrative and business settings. Second, there is a strong emphasis on human resources. This focus is provided by courses in Political Science, Psychology, Management Science and Sociology. The third content area is concerned with the application of economic theory to the administrative role. Finally, there are two "core" courses in Personnel Administration. Students are encouraged to enrol in these courses in their second and third years of study. The two courses have a practical orientation and provide an integrative perspective on the topic area.

Society, Technology and Values

Rapid development of new technologies in communications, biotechnology, robotics and other fields is paralleled by growing public concern and discussion as well as increasing academic research on the human context of science and technology. How can people guide technology so that it will contribute to human betterment? What values shape, or should shape, the direction and pace of technological change? These and other questions are explored in the STV Option and in its component courses.

The Option comprises six courses. Three of these are core courses required of all students enrolled in the Option. The other three are chosen from a list of course offerings grouped in Theme Packages. Normally, students choose these offerings from one Package, but they may, with consent of the STV Option Co-ordinator, select from more than one. Theme Package courses are usually taken after STV 100.

Requirements
Three core courses:
STV 100 Society, Technology and Values: Introduction
STV 200 Society, Technology and Values: Projects
STV 400  Society, Technology and Values: Senior Project
Three Theme Package courses

Theme Package Areas
Currently identified Theme Areas are listed below. Others may be possible.
Values and Ethics
Issues in War and Peace
History and Future of Technology
Impact Assessment Studies
Economic and Management Issues
Technology and Artistic Expression

The STV Program Board approves the Theme Package courses on the recommendation of the Option Co-ordinator. The courses are selected in consultation with the course instructors and with students registered for the Option. This ensures that the selected courses are offered when required, and that the program remains responsive to students' personal needs and interests.

Sample Theme Package
If a Values and Ethics Package is chosen, three courses would be selected from the following:

- GEN E 351 Information Technology and Society
- GEN E 412 Ethics and the Engineering Profession
- ERS 385 Technology/Lifestyles for a Conserver Society
- PHIL 207 Science, Technology and Society
- PHIL 215 Professional and Business Ethics
- PHIL 224 Humankind and Nature
- RS 260 Issues in Science, Technology and Religion
- W S 380 Women, Science and Society
- SCI 263 Science and Society
- SOC 232 Technology and Social Change

For More Information
Russell Lege, Interim Option Co-ordinator
Centre for Society, Technology and Values
MC 4049, ext. 6215

Program Board
R.D. Lege, Director
H.K. Banks, Dean of Arts
J.H. Bater, Dean of Environmental Studies
J.G. Kalbfleisch, Dean of Mathematics
W.C. Lennox, Dean of Engineering
R.G. Marteniuk, Dean of Human Kinetics and Leisure Studies
G.F. Atkinson, Science (Chemistry)
R. Cohen, Mathematics (Computer Science)
R.B. Gibson, Environmental Studies (Environment and Resource Studies)
J.W. Hepburn, Science (Chemistry)
S.C. Lerner, Environmental Studies (Environment and Resource Studies)

Interdisciplinary Options
Society, Technology and Values
Studies in Personality and Religion (SIPAR)

J.A. Thomson, Human Kinetics and Leisure Studies (Kinesiology)
G.K. Warriner, Arts (Sociology)

Studies in Personality and Religion (SIPAR)

Chairman & Director of the Program
R.D. Lege, BA (Transylvania), STB (Harvard), PhD (McMaster)

Members of the SIPAR Advisory Committee

Professors
H.J. Fallding, BA, BSc, MA (Sydney), PhD (Australian National), FRCS
J.R. Horne, BA, MA (Western Ontario), RTh (Huron), PhD (Columbia)

Associate Professors
D.M. Amoroso, BA, MA (Toronto), PhD (Waterloo)
A.L. Evans, BA (Toronto), BD (Emmanuel), STM (McGill), DMin (Andover-Newton)
F.C. Gérard, MA (College St. Dominique, France), BD, STM (McGill), PhD (Hartford Seminar Foundation)

Studies in Personality and Religion (SIPAR) is an interdisciplinary program which may be chosen by students in conjunction with a major in any department. It provides a course of study for those who have a special interest in the relationship between religious growth and human development. The SIPAR Option is also appropriate for those considering careers in the ministry or other social service oriented vocations. The program is administered by St. Paul’s College in co-operation with an advisory committee representing four departments in the University of Waterloo – Philosophy, Psychology, Religious Studies and Sociology.

The Core Course Curriculum
The core courses provide an introduction to the field of Studies in Personality and Religion. These courses give the student a base of knowledge, a familiarity with the subject and an understanding of the concepts involved.

There are four term courses in the core program; Psychology of Religion in Historical Perspective (ARTS 202P) provides an historical survey of theories on the relationship between personality and religion; Psychology of Religion (RS 270) examines the variety of religious experience from a psychological point of view; Personality and Religion (RS 271) examines personality theory and its relationship to religious development and growth; Seminar on Selected Topics in Personality and Religion (ARTS 302P) involves the study of how the disciplines of philosophy, sociology, and religious studies have come to know and understand human behaviour.
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.

General Program
A SIPAR Option may be earned by students in a General program majoring in one of the sponsoring disciplines. Courses are to include ARTS 202P, RS 270 and RS 271 plus three other SIPAR designated courses outside of the major field. The subtitle "Studies in Personality and Religion" would be designated on the degree. In every case, students must fulfill all the requirements for the Major in their own departments.

Honours Minor in Personality and Religion
A Minor in SIPAR is available to students pursuing an Honours degree in any faculty. This Minor consists of ten term courses chosen from among the courses approved for SIPAR credit in any participating department, and must include the SIPAR Core Courses, ARTS 202P, RS 270, RS 271, ARTS 302P.

Note:
Each of the participating departments has designated certain course offerings as Studies in Personality and Religion content courses. Many of the 300- and 400-level courses have specific prerequisites. Students planning to pursue studies in these upper-level courses should use their elective courses wisely to ensure that the prerequisites for these courses are met.

CORE COURSES
ARTS 202P 0.5
Psychology of Religion in Historical Perspective
RS 270 0.5
Psychology of Religion
RS 271 0.5
Personality and Religion
ARTS 302P 0.5
Seminar on Selected Topics in Personality and Religion

COURSES SELECTED FROM PARTICIPATING DEPARTMENTS
A further understanding of this subject may be developed through the study of selected courses offered by participating departments, which will either broaden the student's comprehension of the field or permit a deeper understanding of some particular aspect of Studies in Personality and Religion.

The actual combination of courses selected by a student is subject to the approval of the SIPAR advisor.
The SMF program should have broad appeal. It might be of interest to anyone with questions about sexuality, marriage, and the family, but is especially valuable for those whose anticipated career or current work situation requires a sound understanding of these important aspects of the human condition. Specifically, the program would be an appropriate choice for persons who aim for a broad general education as well as for those who intend to pursue, or are currently involved in, a career in the areas of health, social service, counselling or teaching.

The SMF program is an interdisciplinary program offered within the Faculty of Arts at the University of Waterloo, but administered by the University of St. Jerome's College which is federated with the University of Waterloo.

The program may be chosen as an Honours Option, as a Minor, or as a General Option, in conjunction with a Major in an undergraduate discipline. A Diploma program in Sexuality, Marriage, and the Family is available for those who wish to do some focused study in this field, but who are either not seeking a university degree or already holding such a degree.

The Honours Option in Sexuality, Marriage and the Family

This option is intended for students, pursuing any type of Honours degree at UW, who would like to gain specialization in the area of sexuality, marriage and the family.

In addition to fulfilling the requirements for the Honours degree in the home discipline, the Honours Option in SMF requires the successful completion of at least 14 term courses chosen from the Approved List of Sexuality, Marriage, and the Family courses. These 14 term courses must include:

a) SMF 201A Introduction to Sexuality and Sex Education 1

and

SMF 202A Introduction to Marriage and the Family 1

b) SMF 201B Introduction to Sexuality and Sex Education 2

or

SMF 202B Introduction to Marriage and the Family 2

c) SMF 301A/B Advanced Study of Sexuality and Sex Education 1 and 2

or

SMF 302A/B Advanced Study of Marriage and the Family 1 and 2

d) SMF 303A Introduction to Marriage and Family Therapy 1

e) SMF 402 Independent Study: Special Topics in Sexuality

or

SMF 403 Independent Study: Special Topics in Marriage and the Family

A cumulative average of at least 75% must be maintained in these seven SMF courses.

Upon completion of the requirements of the Honours degree in their home discipline, and of those of the Honours Option in SMF, students are granted a Bachelor's degree in their subject area with the subtitle: Studies in Sexuality, Marriage, and the Family.

The Minor in Sexuality, Marriage, and the Family

A Minor in Sexuality, Marriage, and the Family is available to students, pursuing any type of Honours degree at UW, who would like some specialization in this field of study. The requirements for the Minor consist of the successful completion of at least ten term courses chosen from the Approved List of Sexuality, Marriage, and the Family Courses. The ten term courses must include:

a) SMF 201A Introduction to Sexuality and Sex Education 1

and

SMF 202A Introduction to Marriage and the Family 1

b) SMF 201B Introduction to Sexuality and Sex Education 2

or

SMF 202B Introduction to Marriage and the Family 2

c) SMF 301A Advanced Study of Sexuality and Sex Education 1

or

SMF 302A Advanced Study of Marriage and the Family 1

d) SMF 303A Introduction to Marriage and Family Therapy 1

A cumulative average of at least 70% must be obtained in these five SMF courses.

Upon completion of the requirements of the Honours degree in their home discipline, and of those of the Minor in SMF, students are granted a Bachelor's degree in their subject area with the subtitle: Studies in Sexuality, Marriage, and Family.

The General Option

The General Option in SMF is available to students pursuing a General degree in any undergraduate discipline or a Non-major Arts degree at UW. The requirements for the General Option are the same as those for the Minor program in Sexuality, Marriage, and the Family, except that the cumulative average in the five SMF courses must be at least 65%.

Upon completion of the requirements of the General degree in their home discipline (or of a Non-major Arts degree), and of those of the General Option in SMF, students are granted a Bachelor's degree in their subject area with the subtitle: Studies in Sexuality, Marriage, and the Family.
The UW Diploma in Sexuality, Marriage, and the Family

This program is intended for part-time students who seek education in this field but who do not wish to obtain an undergraduate degree or already hold such a degree. Requirements are the same as those for the General Option in SMF; that is, successful completion of ten courses from the Approved List of Sexuality, Marriage, and the Family courses. Five of these ten courses must be the SMF courses specified for the Minor in SMF, and the cumulative average in these courses must be at least 65%.

The SMF courses required for the Diploma will be offered regularly during the evening; a number of the other courses on the Approved List of Courses may be offered during the evening as well.

Approved List of Sexuality, Marriage, and the Family Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANTH 350</td>
<td>Sex Roles in Anthropology</td>
</tr>
<tr>
<td>ENGL 108E</td>
<td>Images of Women in Literature</td>
</tr>
<tr>
<td>ENGL 208E</td>
<td>Women Writers of the 20th Century</td>
</tr>
<tr>
<td>HIST 202X</td>
<td>The Individual and the Family in History</td>
</tr>
<tr>
<td>HIST 241</td>
<td>Society and the Sexes in Early Modern Europe</td>
</tr>
<tr>
<td>HLTH 220</td>
<td>Health and the Family</td>
</tr>
<tr>
<td>ISS 350H</td>
<td>Values and the Contemporary Family</td>
</tr>
<tr>
<td>PHIL 201</td>
<td>Love</td>
</tr>
<tr>
<td>PHIL 202</td>
<td>Philosophy of Women</td>
</tr>
<tr>
<td>PHIL 316J</td>
<td>Philosophy of the Family</td>
</tr>
<tr>
<td>PSYCH 235</td>
<td>Psychological Perspectives on Gender and Sex</td>
</tr>
<tr>
<td>PSYCH 236</td>
<td>A Psychological Analysis of Human Sexuality</td>
</tr>
<tr>
<td>PSYCH 254</td>
<td>Interpersonal Relations</td>
</tr>
<tr>
<td>RS 236</td>
<td>Human Sexuality and Christian Morality</td>
</tr>
<tr>
<td>RS 382</td>
<td>Theology of Marriage</td>
</tr>
<tr>
<td>SOC 200</td>
<td>Sociology of the Family</td>
</tr>
<tr>
<td>SOC 206</td>
<td>Gender Roles</td>
</tr>
<tr>
<td>SOC 209</td>
<td>Family Origin and Personal Identity</td>
</tr>
<tr>
<td>SOCWK 321R</td>
<td>Social Work with Families</td>
</tr>
<tr>
<td>W S 200</td>
<td>Introduction to Women's Studies</td>
</tr>
<tr>
<td>W S 300</td>
<td>Seminar in Women's Studies</td>
</tr>
<tr>
<td>SMF 201A/B</td>
<td>Introduction to Sexuality and Sex Education 1 and 2</td>
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<tr>
<td>SMF 202A/B</td>
<td>Introduction to Marriage and the Family 1 and 2</td>
</tr>
<tr>
<td>SMF 301A/B</td>
<td>Advanced Study of Sexuality and Sex Education 1 and 2</td>
</tr>
<tr>
<td>SMF 302A/B</td>
<td>Advanced Study of Marriage and the Family 1 and 2</td>
</tr>
<tr>
<td>SMF 303A/B</td>
<td>Introduction to Marriage and Family Therapy 1 and 2</td>
</tr>
<tr>
<td>SMF 402</td>
<td>Independent Study: Special Topics in Sexuality</td>
</tr>
<tr>
<td>SMF 403</td>
<td>Independent Study: Special Topics in Marriage and the Family</td>
</tr>
</tbody>
</table>

Interdisciplinary Options

Studies in Sexuality, Marriage, and the Family
Women's Studies

Women's Studies

Director of Women's Studies
Lindsay Dorney, B.A. (Louisville), M.A. (Louisville)

In the last 15 years women have been the focus of major research projects, particularly in the humanities and social sciences. Questions on topics such as social expectations for women, medical, philosophical and religious assumptions of female capacities, women's self-perception, women's biological role and vocational place have been raised, and the many answers have been intensely debated.

Because this relatively recent focus in research has become such an important component of contemporary scholarship, the University of Waterloo and Wilfrid Laurier University co-operate in the staffing and teaching of courses in this field of study. Students may take courses at either university to fulfill requirements for the Option. However, if a course at one institution is substantially the same as that at the other, credit will be allowed for only 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. To register in the Option, simply indicate "Women's Studies Option" on the registration form. Before preregistration each spring, students should consult with the Women's Studies Director and with the Department involved to determine which courses will be available in the coming academic year.

Requirements

1. This Option may be taken in combination with any General or Honours program.
2. Ten term courses are required for this Option. They are to be distributed as follows:
   a) W S 200
   b) W S 300 (prerequisite: W S 200 or permission of the Director or Co-ordinator)
   c) At least three courses from the Core List of courses.
   d) At least five courses from the Approved List of Women's Studies courses. When a department offers a special topics course which is relevant to the Women's Studies program, it may be counted toward the Option. Students should consult the Director of Women's Studies before preregistering to ascertain what special topics courses will be offered and to ensure that they are meeting the requirements for the Option.
   e) In exceptional cases a course from the Approved List may be substituted for a Core Course with the permission of the University of Waterloo-Wilfrid Laurier University Committee on Women's Studies.
3. To meet the graduation requirements a student must have a minimum average of 65% in the ten courses in the Option.

Students should declare an Option on their registration form as early as possible to ensure proper completion of course requirements.

**Women's Studies Core Courses**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 108E (UW) or English 225 (WLU)</td>
<td>Women in Literature</td>
</tr>
<tr>
<td>History 248 (WLU)</td>
<td>History of the Sexes</td>
</tr>
<tr>
<td>PHIL 202 (UW)</td>
<td>Philosophy of Women and Men</td>
</tr>
<tr>
<td>PSYCH 235 (UW)</td>
<td>Scientific Perspectives on Gender &amp; Sex</td>
</tr>
<tr>
<td>Sociology 233 (WLU)</td>
<td>Sociology of Women</td>
</tr>
</tbody>
</table>

**Women's Studies Approved Courses**

**University of Waterloo**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>ANTH 350</td>
<td>Sex Roles in Anthropology</td>
</tr>
<tr>
<td>ANTH 404</td>
<td>Human Development in a Cross-Cultural Perspective</td>
</tr>
<tr>
<td>CLAS 292*</td>
<td>Modern Issues in the Ancient World (=WLU Classics 218)</td>
</tr>
<tr>
<td>ECON 353</td>
<td>Population Economics</td>
</tr>
<tr>
<td>ENGL 108E*</td>
<td>(=WLU English 225) Women in Literature</td>
</tr>
<tr>
<td>ENGL 208E</td>
<td>Women Writers of the 20th Century</td>
</tr>
<tr>
<td>FR 391</td>
<td>French Women Writers</td>
</tr>
<tr>
<td>HLTH 220**</td>
<td>Health and the Family</td>
</tr>
<tr>
<td>HIST 202X</td>
<td>The Individual and the Family in History</td>
</tr>
<tr>
<td>HIST 215</td>
<td>The Proper Sphere: Canadian Women in Historical Perspective</td>
</tr>
<tr>
<td>HIST 241**</td>
<td>Society and the Sexes in Early Modern Europe</td>
</tr>
<tr>
<td>HIST 242**</td>
<td>Democracy for All: American Women in Historical Perspective</td>
</tr>
<tr>
<td>ISS/</td>
<td>Values and the Contemporary Family</td>
</tr>
<tr>
<td>SOCWK 350H**</td>
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<tr>
<td>MUSIC 221**</td>
<td></td>
</tr>
<tr>
<td>PHIL 201</td>
<td>Love</td>
</tr>
<tr>
<td>PHIL 202</td>
<td>Philosophy of Women and Men</td>
</tr>
<tr>
<td>PHIL 220</td>
<td>Moral Issues</td>
</tr>
<tr>
<td>PHIL 302</td>
<td>Modern Feminism</td>
</tr>
<tr>
<td>PSCI 476</td>
<td>Research Seminar in Political Behaviour</td>
</tr>
<tr>
<td>PSYCH 235</td>
<td>Scientific Perspectives on Gender and Sex</td>
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<td>PSYCH 236</td>
<td>A Psychological Analysis of Human Sexuality</td>
</tr>
<tr>
<td>RS 236</td>
<td>Human Sexuality and Christian Morality</td>
</tr>
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<td>RS 261</td>
<td>Women and the Great Religions</td>
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**Wilfrid Laurier University**

<table>
<thead>
<tr>
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<th>Title</th>
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<tbody>
<tr>
<td>RS 292A/D</td>
<td>Women and the Church</td>
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<tr>
<td>SMF 202 A/B</td>
<td>Introduction to Marriage and the Family 1 and 2</td>
</tr>
<tr>
<td>SMF 302A/B</td>
<td>Advanced Study of Marriage and the Family 1 and 2</td>
</tr>
<tr>
<td>SOC 206*</td>
<td>Gender Roles (=WLU SOC 234)</td>
</tr>
<tr>
<td>SOC 378**</td>
<td>Sociology of Women</td>
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<tr>
<td>W S 365</td>
<td>Special Topics Course</td>
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</table>

**Special Topics Courses**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>ANTH 404</td>
<td>Human Development in a Cross-Cultural Perspective</td>
</tr>
<tr>
<td>W S 365</td>
<td>Special Topics</td>
</tr>
</tbody>
</table>

(The above courses are described fully in Chapter 16.)

Courses with an * have an equivalent course at the other university and are not available for credit to students who already have credit for that course.
Women's Studies Diploma
The new Women's Studies Diploma Program is specially designed for students who want to explore women's issues but who are not necessarily seeking a university degree, or for those who already have a degree and wish to upgrade their understanding of the dynamics of gender in social institutions, the workplace, government policy, and cultural and normative values.

The Diploma offers an opportunity to study women's history, biology and psychology, education, socio-economic status, and political activity from a wide-ranging interdisciplinary perspective. Students may choose university-credit courses from sixteen subject areas.

The Women's Studies Diploma is especially relevant for those students interested in the health care, teaching, or counselling professions as well as in social work, or in the personnel and management fields.

Requirements
Ten term courses with a minimum average of 65%, arranged as follows:

WS 200 Introduction to Women's Studies
WS 300 Seminar in Women's Studies
At least three Core WS courses
At least five Approved WS courses

Notes
1. Students without a university degree must achieve an average of 65% in WS 200 and 300 to continue in the Program.
2. Students with a university degree may be admitted and registered as post-degree students. See Chapter 2 for details.

Special Topics Courses
Currently over 20 courses in ten subject areas comprise this list. Titles include Human Development in Cross-Cultural Perspective, Women in Greece and Rome, Women Artists, History of the Sexes from the Industrial Revolution to the Present, Love and its Myths, Canadian Social Welfare Programs, and Sociology of Women. Consult the Director before pre-registering.

Other Women's Studies Content Courses
(These courses are not available for credit toward the Women's Studies Option.)

CS 492 The Social Implications of Computing
DANCE 110 Introduction to the World of Dance
DANCE 233 A History of Modern Dance
ECON 351 Labour Economics
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.

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

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

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

Sample Course Description

<table>
<thead>
<tr>
<th>Course</th>
<th>Term(s) Offered</th>
<th>Type of instruction and Number of hours/wk</th>
<th>Credit weight (See Note 1, below)</th>
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<tr>
<td>STAT 333</td>
<td>F,W,S</td>
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Course Name — Applied Probability

Course Description


Additional Information — Prereg: STAT 230

Terminology

<table>
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<th>Terms Offered</th>
<th>Type of Instruction</th>
<th>Additional Information</th>
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<tbody>
<tr>
<td>F</td>
<td>Fall term</td>
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</tr>
<tr>
<td>S</td>
<td>Spring term (See Note 2, below)</td>
<td>prerequisite*</td>
</tr>
<tr>
<td>W</td>
<td>winter term</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>summer, first half, July</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>summer, second half, August</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>summer, both terms, July, August</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>lecture</td>
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</tr>
<tr>
<td>L</td>
<td>laboratory</td>
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<td>S</td>
<td>seminar</td>
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<td></td>
</tr>
<tr>
<td>P</td>
<td>practicum</td>
<td></td>
</tr>
</tbody>
</table>

Note 1
For term courses with credit weights other than 0.5, students should consult their faculty advisor regarding how such courses are counted for degree credits in their particular program.

Note 2
For purposes of course selection, courses designated "S" (Spring) in the Course Description listings are normally those offered in the spring term of the year following the fall and winter terms of the particular academic year.
## Course Abbreviations

<table>
<thead>
<tr>
<th>Course Name</th>
<th>Course Abbreviation</th>
<th>Course Name</th>
<th>Course Abbreviation</th>
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</thead>
<tbody>
<tr>
<td>Accounting</td>
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<td>Interdisciplinary Social Science</td>
<td>ISS</td>
</tr>
<tr>
<td>Actuarial Science</td>
<td>ACTSC</td>
<td>Italian</td>
<td>ITAL</td>
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<tr>
<td>Anthropology</td>
<td>ANTH</td>
<td>Kinesiology</td>
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<td>Applied Math</td>
<td>AM</td>
<td>Latin</td>
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</tr>
<tr>
<td>Architecture</td>
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<td>Management Sciences</td>
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<td>MATH</td>
</tr>
<tr>
<td>Biology</td>
<td>BIOL</td>
<td>Mechanical Engineering</td>
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</tr>
<tr>
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<td>BUS</td>
<td>Middle East Studies</td>
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<td>Canadian Studies</td>
<td>CDN ST</td>
<td>Music</td>
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</tr>
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<td>Chemical Engineering</td>
<td>CHE</td>
<td>Peace and Conflict Studies</td>
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<td>Chemistry</td>
<td>CHEM</td>
<td>Personnel and Administrative Studies</td>
<td>PAS</td>
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<td>Civil Engineering</td>
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<td>Planning, Urban and Regional</td>
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<td>Classical Studies</td>
<td>CLAS</td>
<td>Pure Math</td>
<td>PMATH</td>
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<td>Combinatorics &amp; Optimization</td>
<td>C&amp;O</td>
<td>Polish</td>
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<td>Computer Science</td>
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<td>Psychology</td>
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<td>Dance</td>
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<td>Recreation and Leisure Studies</td>
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<td>Russian</td>
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<td>DUTCH</td>
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<td>SCI</td>
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<td>EARTH</td>
<td>Sexuality, Marriage and the Family</td>
<td>SMF</td>
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<td>ECON</td>
<td>Social Work</td>
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<td>Society, Technology and Values</td>
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<td>Systems Design Engineering</td>
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<td>FR</td>
<td>Ukrainian</td>
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<td>General Engineering</td>
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<td>Women's Studies</td>
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<td>Gerontology</td>
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<td>Greek</td>
<td>GRK</td>
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<tr>
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<td>History</td>
<td>HIST</td>
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</tr>
<tr>
<td>Independent Studies</td>
<td>IS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
School of Accountancy

Professor, Director
J.R. Hanna, BComm (McMaster), MBA, PhD, (Michigan), CA, FCA

Associate Professors
B.G. Gaber, BA (Wilfrid Laurier), MS, PhD (Wisconsin), CA
S.P. Gunz, BA, LLB, MA (Sydney), MBA (Manchester)
D.B. Kennedy, BMath (Waterloo), MBA (McMaster), MS, PhD (Cornell), CMA
E.F. Kirzner, BA, MBA (Toronto)
A. Maunaughty, BA (Wilfrid Laurier), PhD (British Columbia)
F.C. Shen, BA, MA, PhD (Simon Fraser)
R.T. Vachon, BComm (Ottawa), MBA, MAcct (Laval), CA

Adjunct Faculty
R.P. Bish, CA
A.H. Headlam, MBA (Wilfrid Laurier), FCA
P.A. Lubka, BBA (Wilfrid Laurier), CMA
L.M. Stillabower, BA, MS (Kent State), PhD (Case Western), CPA

Faculty Members of Accounting holding cross appointments to:
1. Economics

Faculty Members holding cross appointments to Accounting from:
2. Statistics
3. Management Sciences
4. Economics

Accounting Advisory Council Members
The Accounting Advisory Council was established in 1963 to provide liaison between the School of Accountancy and senior representatives from business, government and public accounting practice. Council meetings are normally held three times a year.

Mr. J.W. Adams, Consultant, Emco Limited
Mr. M. Baronian, Vice-President, Johnson & Johnson Baby Products
Mr. J.C. Barrett, Retired
Mr. J.T. Black, Chairman, The Molson Companies Limited
Mr. W.E. Bradford, President and Chief Executive Officer, North American Life Insurance Co.
Mr. D.A. Brown, Executive Partner, Cooper & Lybrand
Mr. Terry Clarke
Mr. G.E. Cronkright, Executive Partner, Calgary Office, Clarkson Gordon
Mr. K.M. Dye, Auditor General of Canada, Government of Canada
Mr. G.C. Fowler, Partner, Peat, Marwick, Mitchell & Co.
Mr. S.J. Gaston, Partner, Price Waterhouse
Mr. J.L. Goodfellow, Executive Partner, Touche Ross & Co.
Mr. R.G. Harris, Executive Partner, Deloitte Haskins & Sells
Mr. J. Healey, Partner, Thorne Ernst & Whinney
Mr. T.G. Hierlithy, Partner, Thorne Ernst & Whinney
Mr. D.C. Higginbotham, Partner, Price Waterhouse
Mr. D.H. Houston, President and Chief Executive Officer, Swimming Canada Natation
Mr. K. Hurdle, Sole practitioner
Mr. G.S. Knights, Vice-President, CP Trucks
Mr. E.J. Lang, Executive Vice-President, A. Reynolds Tobacco International Inc.
Mr. J.A. Milburn, Partner, Clarkson Gordon
Mr. R.T. Neville, Partner, Dunwoody & Company
Mr. J.F. Otterman, Assistant Provincial Auditor, Province of Ontario
Mr. H.J. Pankraz, Executive Partner, Vancouver Office, Clarkson Gordon
Mr. M. Rayner, Comptroller General of Canada
Mr. L. Rosen, Partner, Rosen, Ezrin, Ogus & Company
Ms. N.B. Shroff, Partner, Arthur Andersen & Company
Mr. J.W. Sinclair, President and Chief Executive Officer, Moore Corporation Limited
Mr. J.A. Stacey, Partner, Deloitte, Haskins & Sells
Mr. T.R. Turnbull, Chairman, Thorne Ernst & Whinney
Mr. W.R. Walker, Senior Partner, Peat, Marwick, Mitchell & Co.
Mr. C.D. Wayman, Partner, Peat Marwick Mitchell & Co.

Course Descriptions

Introductory Notes

1. Honours Accountancy Studies courses are restricted to students who require those courses as part of their undergraduate program. If space permits, students in good standing in other Honours programs may be admitted, subject to prerequisite requirements.

2. Students who fail to preregister during normal preregistration periods may be unable to take a particular course in their term of preference.

3. The minimum grade required to satisfy a prerequsite for Honours Accountancy Studies courses is C-.

4. Students may only repeat courses labelled ACC in which they have a
ACC 231 F,S 3C 0.5  **Business Law**  
Particular attention is given to the law relating to contracts and business organizations. Other areas of study include sources of law, the judicial process, real and personal property, torts, agency, credit, and negotiable instruments.

ACC 281 F,S 3C 0.5  **Cost Management Systems 1**  
An introduction to the principles and practices of managerial accounting.  
**Prereq:** ACC 101 and second-year standing

ACC 291 F,S 3C,1T 0.5  **Financial Accounting 1**  
A first course in intermediate financial accounting dealing with the theory and practice of financial statement preparation and reporting. The emphasis will be on asset valuation and the related impact on income measurement.  
**Prereq:** ACC 281

ACC 351 F,W 3C 0.5  **Auditing 1**  
An examination of the auditing process, including elements of effective control structures, concepts of evidence, ethical conduct, legal and statutory requirements and elements of audit strategy.  
**Prereq:** ACC 291

ACC 371 F,W,S 3C 0.5  **Managerial Finance 1**  
Analytic techniques for financial decision-making will be considered within a conceptual framework. Emphasis is placed upon the long-term investment, capital structure and distribution decisions. Developments in capital asset pricing, and efficient markets will be examined.  
**Prereq:** ECON 221 and ACC 291 or permission of School of Accountancy

ACC 372 F,W,S 3C 0.5  **Managerial Finance 2**  
The theoretical concepts examined in Accounting 371 will be applied within the context of the Canadian economy. Topics examined will include interest rate determination, capital markets, and risk/return characteristics of financing alternatives.  
**Prereq:** ACC 371

ACC 381 F,W,S 3C 0.5  **Cost Management Systems 2**  
The development of accounting information in performing the managerial functions of planning, controlling, and decision making. Emphasis is on analysis of costs and analytical tools such as regression analysis, electronic worksheets and linear programming.  
**Prereq:** ACC 291 and a course in Statistics

ACC 382 W,S 3C 0.5  **Cost Management Systems 3**  
Consideration of more complex topics in management planning and control. Emphasis is on cost accumulation systems, performance evaluation, control models and case analysis of situations involving complex management accounting systems.  
**Prereq:** ACC 381

ACC 401 F 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 392 and 371

ACC 415-419 0.5  **Special Topics**  
Admission by consent of instructor.

ACC 432 W 0.5  **Communicating Accounting Information for Decision Making**  
The first half stresses interpersonal communications and covers such topics as communications in the workplace and negotiating skills. The second half concerns formal presentation skills with emphasis on those skills that are necessary for the professional accountant.  
This course is part of an integrated, professionally accredited sequence of courses open only to students by permission of the School of Accountancy.
ACC 441 S 3C 0.5

**Accounting Information Systems**
Investigates the concepts and principles of management information systems. Concentration is on the role of accounting information in the planning/decision-making process and the design and implementation of accounting information systems.
Prereq: CS 100 or equivalent, and ACC 391

ACC 443 W 3C 0.5

**Creative Thinking, Problem Solving and Decision Making for Accountants**
This course comprises three modules: problem solving techniques, including intuitive and formal methods for considering risk, uncertainty and value, individual and group processes for generating and evaluating alternatives; data organization, analysis and presentation; and decision support and expert systems.
Prereq: CS 100 or equivalent
This course is part of an integrated, professionally accredited sequence of courses open only to students by permission of the School of Accountancy.

ACC 451 S 3C 0.5

**Auditing 2: Audit Strategy**
An examination of elements of audit strategy and their interrelationships, including financial assertions, types and sources of audit assurance, and evidence gathering procedures, including statistical auditing methods, such as sampling and regression analysis.
This course is part of an integrated, professionally accredited sequence of courses open only to students by permission of the School of Accountancy.

ACC 453 W 3C 0.5

**Control and Audit of Computer-Based Systems**
An examination of the weaknesses in computer-based systems and compensating controls and their effect on the auditor's study and evaluation of internal control, and the utilization of computer-assisted audit techniques.
Prereq: ACC 441

ACC 454 F 3C 0.5

**Comprehensive/Operational Auditing**
Examination of the value for money audit concept in the private and public sectors. This approach goes beyond the scope of the traditional financial audit and looks at all facets of the organization, including human resource management.
Prereq: ACC 351 and fourth-year students in an Honours accounting program

ACC 461 W 3C 0.5

**Taxation 1**
A course in the interpretation in application of the major provisions of the Income Tax Act through an analysis of court decisions, Revenue Canada's publications, and practical problem situations.
Prereq: ACC 392

ACC 462 F 3C 0.5

**Taxation 2**
A continuation of ACC 461.
Prereq: ACC 461

ACC 463 F 3C 0.5

**Taxation 3**
A course which integrates the topics covered in ACC 461 and 462 for individual and corporate tax planning through a study of trusts, partnerships, corporate reorganizations and estate planning.
Prereq: ACC 462
This course is part of an integrated, professionally accredited sequence of courses open only to students by permission of School of Accountancy.

ACC 471 W 3C 0.5

**Investments**
The objective of this course is to introduce the student to concepts of investment selection, purchase and management. The student should obtain a knowledge of security markets and the risk/return characteristics of forms of investment.
Prereq: ACC 371

ACC 491 W 3C 0.5

**Financial Accounting 3**
An advanced accounting course considering specific problems of accounting for the corporate entity, such as business combinations, intercorporate investments, consolidated financial statements, accounting for foreign operations and foreign currency transactions, segment reporting.
Prereq: ACC 392

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**Department of Anthropology**

**Professor, Chairman of the Department**
D.A. Counts, BS (S.W. Texas State University), MA (Kentucky), PhD (Southern Illinois)

**Professor**
S.M. Weaver, BA, MA, PhD (Toronto)

**Associate Professors**
T.S. Abler, BA (Northwestern), MS (Wisconsin-Milwaukee), PhD (Toronto)
M.H. Hill, BA (Washington), MA (Washington State), PhD (Southern Illinois)

**Assistant Professors**
C. Ellis, BA (Waterloo), MA (McMaster), PhD (Simon Fraser)
A.C. Zeller, BSc (Trent), MA, PhD (Toronto)

**Research Assistant Professor**
M.C. Rodman, BA (Goucher), MA, PhD (McMaster)

**Adjunct Faculty**
D.G. Willms, BA (Waterloo), MA (McMaster), PhD (British Columbia)

**Faculty Members of Anthropology holding cross and/or joint appointments to:**
'Urban and Regional Planning

**Course Descriptions**

Courses not offered in the current academic year are listed at the end of this section.

**ANTH 101 F,W 3C 0.5**
**Human and Cultural Evolution**
An overview of Physical Anthropology and Archaeology. Lectures on living and fossil primates, the fossil evidence for the origins and development of man, modern races, and archaeological evidence for the origins and development of culture.
ANTH 102A F,W 3C 0.5
Introduction to Social and Cultural Anthropology
The dynamic nature of socio-cultural systems is examined. Topics include language, technology, social organization, economics, politics, and religion. Data are drawn from a broad ethnographic base, including both “primitive” cultures and modern, developed societies.
A student may not take both ANTH 102A and ANTH 102B for credit.

ANTH 103 W 3C 0.5
The Nature of Language
A general introduction to the scientific study of language. Lectures on the nature of human language as compared with animal communication, some of the basic methods of historical and descriptive linguistics, and the importance of language in culture and society.

ANTH 201 W 3C,1L 0.5
Principles of Archaeology
An introduction to the working assumptions, analytic approaches, and integrative and descriptive methods of archaeological anthropology.

ANTH 202 F 3C 0.5
Principles of Social Organization
An introduction to basic concepts used by social anthropologists for the analysis of social, economic, political and ideological systems.
Prereq: ANTH 102A or ANTH 102B or permission of the instructor

ANTH 222 F 3C 0.5
Prehistoric Cultures of the Great Lakes Area - A Survey
A general survey of the archaeological evidence of prehistoric man in the Great Lakes area from his arrival ca. 11,000 years ago to the coming of the Europeans. Cultural ecology and cultural evolution will be stressed.
Honours Anthropology students should take ANTH 322.

ANTH 230 W 3C 0.5
Indians of Canada
The cultures of Canadian Indians are described as they existed when initially contacted by Europeans. Consideration is given to economic adaptation, social organization, political structure, material culture, ritual, and mythology.
Prereq: Second-year standing

ANTH 233 F 3C 0.5
Inuit and Eskimo Cultures
An examination of Inuit and Eskimo cultures of Alaska, Canada, and Greenland from their prehistoric origins to the present. Administrative systems imposed upon the Inuit and Eskimo will be analysed and compared, as will the contemporary problems these communities face.
Prereq: Second-year standing

ANTH 241 F 3C 0.5
The Contemporary Canadian Indian Scene
An analysis of present-day Canadian Indian politics, economics, social organization, and education. The emergence of pan-Indianism and large-scale Indian organizations will be examined as responses to the Federal Government's policy of withdrawing and decentralizing administrative services for native people.

ANTH 260 F 3C,1L 0.5
Human Evolution
Data, methods, and theory in the study of the origin and evolution of humans are surveyed. Topics will include osteology, growth and development, the fossil record, and genetics.
Prereq: ANTH 101 or permission of the instructor

ANTH 261 W 3C 0.5
Primate Behaviour
An introduction to the behaviour of non-human primates and its relevance to human development. Topics will include social organization, role behaviour, and communications patterns, as well as the history of primate studies.

ANTH 300 W 3C 0.5
Design of Anthropological Inquiry
This course systematically examines research design and methodology in anthropology.
Prereq: ANTH 202

ANTH 311 F 3C 0.5
Magic, Witchcraft and Religion
An introduction to the way in which anthropologists study the system of behaviour and belief known as religion.

ANTH 322 F 3C 0.5
Prehistoric Cultures of the Great Lakes Area
An in-depth study of the archaeological evidence of prehistoric man in the Great Lakes area from his arrival ca. 11,000 years ago to the coming of the Europeans. Cultural ecology and cultural evolution will be stressed.
Prereq: ANTH 203 or consent of the instructor

ANTH 330 W 3C 0.5
Cultural Ecology
An examination of the relationships among environment, technology, society, and culture. The increasing levels of complexity will be considered in the context of hunting and foraging bands, horticultural tribes and chiefdoms, pastoral tribes and agricultural peasantry.
Prereq: Full credit in Anthropology or consent of the instructor

ANTH 333 W 3C 0.5
Applied Anthropology
Examines the practical application of anthropological knowledge to programs for change in Canada as well as in Third and Fourth World societies.
Prereq: ANTH 202

ANTH 352 F 3C 0.5
History of Anthropological Thought
An examination of the historical origins and development of culture theory. The major emphasis is on the period from the appearance of anthropology as a distinct discipline in the nineteenth century until the emergence of modern perspectives in the 1950s.
Prereq: ANTH 102A or 102B or permission of the instructor

ANTH 365 W 2C,1L 0.5
Fossil Hominids
A detailed examination of the fossil evidence for human evolution with particular emphasis on interpretation and reconstruction.
Prereq: ANTH 260 or permission of the instructor

ANTH 390A/B F,W 0.5/0.5
Reading in Anthropology
Guided reading in a selected portion of the anthropological literature.
Prereq: Anthropology Major or Honours student and permission of the instructor
ANTH 391/393 F,W,S 0.5/0.5
Reading in Anthropology
Guided reading in a selected portion of the anthropological literature.
Prereq: Anthropology Major or Honours student and permission of the instructor

ANTH 400 W 3C 0.5
Special Topics in Anthropological Theory
Seminar on current topics in method and theory in Anthropology. Focus will vary from year to year.
Prereq: ANTH 201 or 202

ANTH 420 W 3C 0.5
Social and Cultural Change
An analysis of contemporary thought on culture contact and cultural evolution. The concepts to be explored might include integration, assimilation, conflict, nativistic reactions, and general and specific evolution.
Prereq: One credit in socio-cultural anthropology

ANTH 492A/B F,W 0.5/0.5
Reading in Anthropology
Guided reading in a selected portion of the anthropological literature.
Prereq: Anthropology Major or Honours student and permission of the instructor

ANTH 495/497 F,W,S 0.5/0.5
Reading in Anthropology
Guided reading in a selected portion of the anthropological literature.
Prereq: Anthropology Major or Honours student and permission of the instructor

ANTH 499A/B F,W 0.5/0.5
Honours Essay
Directed reading and research in a selected area of anthropology inquiry. A letter grade for ANTH 499A will be submitted only after the completion of ANTH 499B.

COURSES NOT OFFERED 1989-90
ANTH 1028 Anthropology Through Science Fiction
ANTH 203 North American Prehistory
ANTH 223 Archaeology and Cultural Adaptation: Gatherers and Hunters
ANTH 224 Archaeology and Growth of Cultural Complexity
ANTH 270 Archaeological Method and Technique
ANTH 271 Archaeological Field Methods
ANTH 304 Aging and Dying
ANTH 320 Studies in Hunter-Gatherer Archaeology

ANTH 321 Studies in Archaeology of Complex Cultures
ANTH 345 Special Topics in Anthropology
ANTH 350 Culture and Sexuality
ANTH 351 Comparative Policies on Native Minorities
ANTH 370 Ethnographic Field Methods
ANTH 377 Early Cultures in the New World
ANTH 460 Human Adaptation and Evolution

School of Architecture
Assistant Professor, Director
E.R. Halldenby, BES, BArch (Waterloo), Recipient of the Distinguished Teacher Award

Associate Professor, Associate Director
T. Seebohm, BEng, MEng, PhD (McGill), MArch (Berkeley), OAA, PEng
Assistant Professor, Associate Director
I. Pignatti, BArch (Rome), MArch (Toronto)
Assistant Professor, Undergraduate Officer
T.M. Boake, BES, BArch (Waterloo), MArch (Toronto)

Professors
A. Banerji, BArch (Calcutta), MArch (North Dakota State)
L.A. Cummings, AB (Washington), AM (Missoum), PhD (Washington), Recipient of the OCUIFA (Ontario) Teaching Award
F.H. Watts, AA Dip (London), MLA (Harvard), MRAIC

Associate Professors
M. Elmitt, National Diploma in Design (High Wycombe)
W.K. Huang, BArch, MArch (Nanjing), Visiting Professor
B.R. Hunt, AA Dip (London), RIBA, MRAIC
D.B. McIntyre, BArch (Toronto), MRAIC
D. McKay, BArch (Toronto)
L.W. Richards, BArch (Miami, O.), MArch (Yale), OAA, MRAIC
R.M. Schuster, BS, MS (North Dakota State), PhD (Iowa State), PEng
F. Thompson, BArch, MArch (Toronto), MRAIC

R. Willer, BA (Waterloo), MA (Ottawa)
Assistant Professors
O. Dutt, BA (Punjab), BSc (London), MEng (Wisconsin), PhD (Waterloo), PEng
R.J. van Pelt, Cand.Lit., Drs.Lit., D.Lit. (Leiden)

Adjunct Faculty
R. Andrichetti, BES, BArch (Waterloo)
P. Brook, BArch (Montreal), OAA, MRAIC
J. Brown, BArch (Toronto)
P. Ferguson, BES (Waterloo), BArch (Carleton)
P. Hanson, BFA, MArch (Manitoba)
R. Keenberg, BFAED (Pratt), RCA
W. Lam, BArch (McGill), FAAIC
V. Rynnimeri, BES, BArch (Waterloo)
J. Souls, BES, BArch (Waterloo)
P. Syme, BArch (Toronto)
F. Urban, AB (Merrimack), MA (Boston), BFA (Nova Scotia)

Guest Critics and Lecturers in the School of Architecture January 1 - November 30, 1988
Cheryl Atkinson
Ron Awde
Joost Bakker
Marc Baraness
Marie Black
Brian Boigon
Martin Bressani
Carl Briestensky
Brian Brisbin
Chris Brown
Andrew Clarke
David Clusiau
Peter Cook
Catherine Czock
Donald Cruickshank
Gary Michael Dault
David Dennis
Jeremy Dixon
Wallace Eley
Kathryn Firth
Steven Fong
Gerald Forsyth
Sandra Franke
William Gastmeier
Michael Gold
Victoria Gregory
Peter Heywood
Dan Hoffman
David Jansen
Victor Jaunkalns
Edward Jonno
George Kapelos
Michael Kirkland
Bruce Kuwabara
Barney Lawrence
Andrew Levitt
Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

COURSES FOR BACHELOR OF ENVIRONMENTAL STUDIES (PRE-PROFESSIONAL ARCHITECTURE)

ARCH 112 F 3C,2L 0.5
Mathematics in Architecture
The application of mathematics to architecture through such studies as analytical and constructive geometry, trigonometry, algebra, differential and integral calculus, functions and matrices.

ARCH 124 F 2C,2std 0.5
Introduction to Landscape Design
An introduction to the design of landscape with emphasis upon the architectural attributes of plants and landforms. Replaces ARCH 195

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 problem of what the artist is, the quality of the human existence, culture, environment, as well as the working of the icon from raw state of perceived image to its function as an expressive symbol in poetry, music, dance, architecture and other works of art; a study of modern work in comparison to an ancient achievement.
Prereq: ARCH 142

ARCH 143 W 4C,2L 1.0
Statics and Structural Analysis
Fundamental concepts of mechanics and structures, as related to architectural design, study of loading conditions, forces, moments, systems of forces, conditions of equilibrium for two and three dimensional structures, center of gravity of loads and areas, bar forces in trusses, simple frame analysis, friction, moment of inertia.
Prereq: ARCH 112

ARCH 171 F 3C 0.5
Theories and Technologies of Building
Introduction to applications of technology in the design and construction of buildings. Organized as a series of case studies concentrating on the last three centuries, it addresses, among other themes, the emergence of new structural methods and materials, the evolution of environmental control, the rationalization of building assembly, and the invention of the modern urban infrastructure.
Prereq: Consent of instructor

ARCH 172 W 2C,2L 0.5
Building Construction I
An introduction of the fundamentals of building construction, in terms of materials, technical aspects of the making and design of buildings, basic building science and environmental concerns. Emphasis will be placed on soils, foundations, masonry construction and wood frame construction.

ARCH 174/175 0.5 each
Experimental Courses
These courses offer a vehicle for introducing additional electives to the program on a short-term basis, and for developing future permanent courses.
Prereq: Consent of instructor

ARCH 192 F 1T,1S,14std 1.5
Design Fundamentals and Workshop Design Studio
Development of the means to appreciate art and science of building; introduction to a history of architecture; introduction to the study of theories of architecture; development of skills in graphic communication; introduction to a study of building structure, construction, and materials; promotion and encouragement of the theory and practice of design. Field trip (1 week).
Prereq: Architecture students only

ARCH 193 W 1T,1S,14std. 1.5
Design Fundamentals and Studio
Reinforcement and development of the ARCH 192 program, but with emphasis upon the application of design method and practice to specific architectural problems.
Prereq: ARCH 192

ARCH 213 F,W 3C,3std 0.5
Introduction to Architectural Computer Graphics
The focus of the course is on threedimensional modelling using computers. There are two studio projects: the first involves the design and modelling of sculptures; the second deals with interpretations, through modelling, of distinctive buildings from the recent and distant past. Lectures support the hands-on work by providing a general theoretical background.
Prereq: CS 100, ARCH 192, 193 or consent of instructor

Faculty Members of Architecture holding cross and/or joint appointments to:
1 English
2 Civil Engineering
ARCH 225 S 3C 0.5
Patterns of Perception: Landscape and Settlement
In this course, students will be confronted with the ways different professionals with whom the architect has to deal (developer, planner, ecologist, archaeologist, public health official, etc.) look at landscape and settlement. The course will explore the interface of these latter concerns with those of architecture.
Prereq: Consent of instructor: for Architecture 2B students

ARCH 244 F 2C,2D 0.5
History of Gardens of Europe and Western Asia
The study of gardens as works of art reconciling man with his world. Gardens of Europe and Western Asia are studied as responses to specific human needs, the stress and aspirations of an age, and to the climate and landscape of the land in which they were created.
Prereq: Consent of instructor

ARCH 245 W,S 1C,2L 0.5
Survey of Contemporary Architecture
Beginning with the formative years of modern architecture, the course will analyze buildings and theories of representative architects and designers, documenting the development of architectural ideas in Europe and elsewhere.
Prereq: Consent of instructor

ARCH 246 F 4C,2L 1.0
Foundations of Europe: Sense of Periods and Styles
Recognition of patterns of life and concepts of order and conduct, models of the universe and other, moving metaphors and myths by means of study of the thoughts, acts, art, architecture, technology, literature, music and town design of the West from the break-up of the Roman Empire until the Renaissance. Field trips to museums, concerts in Toronto, Detroit or Buffalo.
Prereq: ARCH 143 or consent of instructor

ARCH 247 S 4C,2L 1.0
Renaissance to Revolution: Sense of Periods and Styles
Analysis of the various styles emerging out of provincial and international Gothic, especially Italian use of classical models, the spread of this "renaissance" mode, leading to consideration of the Mannerist, the Baroque, the Rococo, the Neoclassical; investigation of the course of men's attitudes from humanism, nationalism, and Reformation through the Enlightenment until the French Revolution and Hume's dethronement of Reason. Field trips to museums, concerts in Toronto, Quebec, Detroit or Buffalo; Stratford Festival.
Prereq: ARCH 246 or consent of instructor

ARCH 252 F,W,S 0.5
Creative Problem Solving
Development of creative skills through group behaviour in problem solving sessions by: developing a clear understanding of each participant's own creative thought processes; increasing his/her ability to consciously and deliberately make use of his/her own creative potential; engendering an awareness of the capacity to use himself/herself and the people he/she works with to produce better solutions to the problems identified by the group.
Prereq: Consent of instructor

ARCH 256 F 2C,2L 0.5
Building Construction II
The study of more advanced aspects of building construction dealing with the design and technological aspects of building structure: reinforced concrete, precast concrete, and steel framing; building envelope: cladding principles, window walls, roofing and glazing; and interior finish selection and interface with mechanical and electrical systems.
Prereq: ARCH 172 or consent of instructor

ARCH 274/275 0.5 each
Experimental Courses
These courses offer a vehicle for introducing additional electives to the program on a short-term basis, and for developing future permanent courses.
Prereq: Consent of instructor

ARCH 276 S 2C,2L 0.5
Timber: Design, Structure and Construction
Architectural case studies are used to examine conceptual development, structural design, building process and the selection of structural timber systems. Topics such as flexural, compression and truss members; connections; and plywood construction are studied using calculations, design aids, rules of thumb and the latest CSA design standards.
Prereq: ARCH 262

ARCH 284/285 F,W 3C 0.5 each
Architectural Research
This offers a student an opportunity for independent research into architectural problems not offered in the regular curriculum, guided exploration of specific architectural problem areas, of appropriate complexity to the particular term.
Prereq: Approval of (in house) UGAC

ARCH 292 F 3C,11std 1.5
Design Concepts and Studio
To develop in each student the ability to design on a small, personal scale and explore design as a thinking process. Small space design exercises where the student is required to define and analyze a problem and generate an architectural solution. Solutions are refined through a series of evaluations.
Prereq: ARCH 192, 193

ARCH 293 S 3C,11std 1.5
Design Concepts and Studio
Design involving problems of human perception and dimension in complex or large spaces, and to develop in each student the ability to generate solutions to architectural problems on a scale which involves "privacy and community". Emphasis is placed on programming, analysis and solution evaluation. Problems of construction, servicing, and siting will be further explored. Field trip to a major Urban Area (1 week).
Prereq: ARCH 292
ARCH 313 W 3C,3std 0.5
Computer Aided Design
The emphasis of the course is on Computer Aided Design (CAD). Software running on personal computers (AUTOCAD) and on minicomputers (McDonnell Douglas, GDS) will be used. These systems will be used to develop a systematic approach to the creation of line drawings such as a floor plan of a distinctive apartment building and elevations of Baroque or Renaissance buildings. The drawing projects will be supplemented by seminars on CAD system usage and related theory.
Prereq: ARCH 1213

ARCH 345 W 2C,1S 0.5
Architectural Theory 1850-1940
Beginning with the introduction of important theories of architecture in vogue prior to 1850, the course will examine texts, movements, buildings, projects, and urban proposals of the period in order to understand the structure of contemporary architectural theory.
Prereq: Consent of instructor

ARCH 346 W 2C,2L 0.5
Romanticism and 20th Century: Sense of Periods and Styles
Depiction of "modern" culture as one in which the notion of environmental order as the fulfilling of natural law is replaced by a notion of order as the creation of autonomous human wills. Selected works in philosophy, literature, art and architecture will be studied.
Prereq: ARCH 247 or consent of instructor

ARCH 348 F (Rome) 2C,2S 0.5
Italian Renaissance Architecture
Architecture and urban design from the early 15th to the early 17th century in central and northern Italy. Special attention is paid to the development of theory and its relation to architectural practice. In addition to the works of the major figures of the period, typical relationships between buildings and their urban and natural contexts are considered.
Prereq: Registration in ARCH 492 or consent of instructor

ARCH 349A/B/C S 4C,T 0.5
Topics in Cultural History
Research into various topics including architectural history, theory, practice, and pedagogy but exploring the means of study (the human mind, the preceptors, the tools of searching, ordering of findings, ways of presentation of the results of reflection). Guest lecturers, field trips, and private consultants will diversify the common studies. Because the topics will shift, it is possible to enrol in the course more than once.
Prereq: Consent of Instructor
The letter designation allows this course to be taken more than once for credit.

ARCH 362 W 2C,2L 0.5
Steel: Design, Structure and Construction
Architectural case studies are used to examine conceptual development, structural design, building process and the selection of structural steel systems. Topics such as tension, flexural and compression members; and connections are studied using calculations, design aids, rules of thumb and the latest CSA design standards.
Prereq: ARCH 262

ARCH 363 F 2C,2L 0.5
Concrete: Design, Structure and Construction
Architectural case studies are used to examine conceptual development, structural design, building process and the selection of structural concrete systems. Topics such as flexural (rectangular, T-Beams, and one-way slabs) and unreinforced members; footing and retaining walls; non-reinforced and reinforced masonry walls are studied using calculations, design aids, rules of thumb and the latest CSA design standards.
Prereq: ARCH 262

ARCH 372 W 2C,2L 0.5
Building Services I
The course focuses on the air and water systems of buildings and is aimed at developing knowledge and skills appropriate to architectural practice. Subjects covered include environmental parameters, heating and cooling loads, energy conservative design, the selection of heating, ventilating and air conditioning systems, plumbing systems, and fire protection criteria and systems, with reference to building codes and standards.
Coreq: ARCH 392 or consent of instructor

ARCH 373 F 2C,2L 0.5
Building Services II
A study of services in buildings, covering electrical distribution, vertical transportation, lighting and acoustics. The course also addresses exterior applications, site planning and district services, and a survey of urban infrastructures.
Coreq: ARCH 393 or consent of instructor

ARCH 374/375 0.5 each
Experimental Courses
These courses allow for 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 each
Architectural Research
This offers a student an opportunity for independent research into architectural problems not offered in the regular curriculum. It allows guided exploration of a specific architectural problem area, of appropriate complexity to the particular term.
Prereq: Approval of (in house) UGAC

ARCH 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: ARCH 293

ARCH 393 F 3C,18std 2.0
Design Concepts and Studio
The analysis and exploration of relationships between physical, social, political and economic systems that influence the physical environment; techniques for defining the patterns of interaction and predicting the influence on physical form involving other disciplines; projects to explore the techniques and design with others at the city or community scale.
Prereq: ARCH 392
COURSES FOR BACHELOR OF ARCHITECTURE

ARCH 445 F,W 2C,2D 0.5
The Practice of Criticism in Creative Design
The application of critical thought will be exercised regularly through oral and written assignments on a wide range of designed human experience; secondarily, there will be reading assignments to facilitate the practice of criticism through a broadening knowledge of critical theory and its relationship to culture.

Prereq: Consent of instructor

ARCH 446 F (Rome) 2C,2S 0.5
Italian Urban History
The course provides a survey of the history of settlement and urban form on the Italian peninsula from antiquity to the present day. It is the influences upon the structure of public and private space are outlined for each historical period. These include the constants such as geography and climate, but more especially the factors that induce and manifest change: politics, warfare, economics, social structure, the arts and theory.

Prereq: Registration in ARCH 492 or consent of instructor

ARCH 448 F (Rome) 2C,2S 0.5
Rome and the Campagna
History of settlement and building in Rome and the surrounding area from antiquity to the present. Acts of design in architecture, urban form and landscape related to political, cultural and spiritual authority of Rome. Comparison drawn between the image of the city, represented in literature and art, and the material facts of the place. Field trips, lecture.

Prereq: Registration in ARCH 492 or consent of instructor

ARCH 452 W,S 2C 0.5
Specifications
Architectural working drawings and specifications; bidding requirements; general conditions; general requirements trade divisions; reference and source material; assembly and reproduction; structural, mechanical and electrical consultants.

Prereq: BES standing or consent of instructor

ARCH 474/475 0.5 each
Experimental Courses
These courses allow for additional electives to the program on a short-term basis, and for developing future permanent courses.

Prereq: Consent of instructor

ARCH 484/485 F,W 3R 0.5 each
Architectural Research
This offers a student an opportunity for independent research into architectural problems not offered in the regular curriculum. It allows guided exploration of a specific architectural problem area, of appropriate complexity to the particular term.

Prereq: Approval of (in house) UGAC

ARCH 492/493 F,W,S 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. Fall term held in Rome or Waterloo.

Prereq: ARCH 393 for 492 and 492 for 493

ARCH 499 W,S 0.0
Fifth Year Thesis Proposal
Architecture students are responsible for developing a satisfactory thesis proposal prior to and as a pre-requisite of the 5A Design Studio. The completion of this requirement will be indicated as a mark of 'CR' for the course on the student's academic record. The thesis proposal will be developed independently by the student between the 4B and 5A terms and will be reviewed and assessed by the 5A studio instructor.

Prereq: ARCH 493

ARCH 555 S 2C 0.5
Architectural Practice: The Profession
Discussion of the legal and ethical aspects of architectural practice in Canada and in Ontario in particular, contracts, bonds and insurance, mechanics' liens, by-laws and regulations, architectural partnership. The legal background, client-architect relations, partial services, professional problems.

Prereq: BES standing

ARCH 574/575 0.5 each
Experimental Courses
These courses allow for additional electives to the program on a short-term basis, and for developing future permanent courses.

Prereq: Consent of instructor

ARCH 584/585 W,S 3R 0.5 each
Architectural Research
This offers a student an opportunity for independent research into architectural problems not offered in the regular curriculum. It allows guided exploration of a specific architectural problem area, of appropriate complexity to the particular term.

Prereq: Approval of (in house) UGAC

ARCH 592/593 W,S 3C 3.0 each
Design Studio
These courses provide an opportunity for the student to select an area of concentration for study and design in depth. A thesis topic is to be submitted and approved during term eight (4B) and all research work completed by the end of the eight-month Co-op work term five. Terms nine and ten (5A and 5B) will be spent developing the thesis for presentation during term ten. The thesis is to be a vehicle for thinking and design at an innovative level. Thus considerable emphasis is placed on both theory and development of design solutions.

Prereq: ARCH 499 and consent of instructor

A letter grade for ARCH 592 will be submitted only after the completion of ARCH 593.

COURSES NOT OFFERED 1989-90

ARCH 212 Computer Science Simulation
ARCH 223 Human Ecology: Social Behaviour as the Human/Physical Interface
ARCH 282 Preservation Practice-Background
ARCH 283 Preservation Practice-Technology and Technique
ARCH 347 The Roots of Civilization
ARCH 371 Designing and Building with Solar Energy
ARCH 455 Management and Evaluating
Arts

Professor
P.H. Smith, Jr., BA (Harvard), PhD (Pennsylvania)

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes

1. Courses designated "Arts", those listed below, usually cover some topics and themes of general interest to several disciplines and their presentation is often made with this interdisciplinary perspective in view.

2. Arts courses are elective courses in General and Honours programs and, except for ARTS 100, do not satisfy either the Group A or Group B requirements.

ARTS 100 F,W 3C 0.5 Introduction to the Humanities
A one-term multidisciplinary introduction to the humanities, including art and music as well as literature, history, and religious studies. In addition to the principal professor, visiting lecturers from the different disciplines enable the student to see each through expert eyes. The sampling of fields can be helpful to the first-year student in choosing further work in the humanities, and to more senior students in relating familiar areas to new ones.
Prereq: None
Counts toward the AI requirement.

ARTS 122 F 2C,1D 0.5 Quest for Meaning in the 20th Century
This course invites students to a quest for personal and corporate meaning in the context of a century in which traditional meaning definitions have been challenged by world wars, nuclear threat and rapidly shifting sexual, social, economic and religious values.
Offered by Conrad Grebel College.

ARTS 198 F,W 0.5 Introduction to Computer Technology
A general introduction to the fundamental ideas of computers. Topics treated will include the use of an interactive computing system, word processing, and the beginnings of program writing. The course will examine the history of computing, and will consider the social and economic impact of 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/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 225 W 3C 0.5 Mennonite Authors and Artists
An examination of Mennonite cultural expression in literature (fiction, poetry, drama, children's literature) and the visual arts (especially painting and film) during the past century.
Offered by Conrad Grebel College.

ARTS 300 Integrating Seminar
An interdisciplinary examination of the contributions the humanities and social sciences have made to our understanding of a basic intellectual problem: the relationship between society and the individual. Specifically, the course will provide an opportunity to discover how different disciplinary approaches can be combined to increase our insight into that relationship.
Prereq: Students in third year or above, or consent of instructor Offered at St. Jerome's College.

COURSES NOT OFFERED 1989-90
ARTS 215 A/B Man in Crisis (Literary Views)
ARTS 300 Integrating Seminar

Department of Biology

Professor, Chairman of the Department
R.G.H. Downer, BSc, MSc (Queen's, Belfast), PhD (Western Ontario), DSc (Belfast), Recipient of the Distinguished Teacher Award

Associate Professor, Associate Chairman of the Department
D.G. Dixon, BSc (Sir George Williams), MSc (Concordia), PhD (Guelph)

Professor, Associate Dean of Graduate Studies, Faculty of Science
W.B. Kendrick, BSc, PhD, DSc (Liverpool), FRSC

Professor, Associate Dean for Computing, Faculty of Science
C.I. Mayfield, BSc, PhD (Liverpool)

Associate Professors, Graduate Officers
N.C. Bolsover, BSc (Simon Fraser), MSc (British Columbia), PhD (Toronto)
B.R. Glick, BSc (City College of New York), MSc, PhD (Waterloo)

Associate Professors, Undergraduate Officers
M. Globus, BSc, MSc (McGill), PhD (Toronto)
W.R. Hawthorn, BSc, MSc (McMaster), PhD (Western Ontario)
A.G. Kempton, BSA, MSA (Toronto), PhD (Michigan State)
Course Descriptions

Biology

P.E. Morrison, BSc, MSc (Western Ontario), PhD (McMaster)

Professor Emeritus
H.B.N. Hynes, BSc, PhD, DSc (London), DSc (Waterloo), ARCS, FRSC

NSERC/Allelix Industry-University Professorship in Microbial Biotechnology
O.P. Ward, BSc, PhD (Dublin)

Professors
E.B. Dumbroff, BSc, MForesstry, PhD (Georgia)
H.C. Duthie, BSc, PhD (Wales)
C.H. Fernandez, BSc (Caylon), DPhil (Oxford)
W.E. Inniss, BSA, MSA (Toronto), PhD (Michigan State)
J.Kruuv, BSc, MSc (Waterloo), PhD (Western Ontario)
J.R. Lapock, BS, MS (West Virginia), PhD (Pennsylvania State)
J.K. Morton, BSc, PhD (Durham), DSc (Newcastle-upon-Tyne), FLS
J.J. Pasternak, BA, MA (Toronto), PhD (Indiana)
C.A. Peterson, BSc, MSc (Alberta), PhD (California, Davis)
G. Power, BSc (Durham), PhD (McGill)
J.C. Semple, BSc (Tufts), MA, PhD (Washington U, St. Louis)
J. Sivak, I.LScO (Montreal), MS (Indiana), PhD (Cornell), OD (Pennsylvania College of Optometry)
J.B. Theberge, BScA (Guelph), MSc (Toronto), PhD (British Columbia)
T. Viswanatha, MSc, PhD (Mysore), Recipient of the Distinguished Teacher Award

Associate Professors
J.C. Carlson, BSc, MSc, PhD (Massachusetts)
A.M. Charles, BSc, MSc, PhD (Manitoba)
S.M. Smith, BSc, MSc (McMaster), PhD (Manitoba) Recipient of the Distinguished Teacher Award
W.D. Taylor, BSc, PhD (Toronto)
K. Zachanah, BSc (Madras), BA Hons (Oxford), MA, PhD (Princeton)

Assistant Professors
D.R. Barton, BA (Ohio Wesleyan), MSc (Akron), PhD (Waterloo)
B.M. Greenberg, BSc (California, Berkeley), PhD (Colorado)
M. Griffith, BA (Mount Holyoke), MFS (Yale), PhD (Minnesota)
J.J. Heikkiia, BSc, MSc, PhD (Toronto)
K.M. Kovacs, BSc (York), MSc (Lakehead), PhD (Guelph)
R.L. Legge, BSc (Calgary), PhD (Waterloo), NSERC Research Fellow
B.A. Moffatt, BSc (Guelph), PhD (Toronto)
R.E.H. Smith, BSc (Guelph), PhD (McGill)
S. Vethamanay-Globus, BSc, MA, MSc (Madras), PhD (Toronto)

Research Associate Professor
N.R. Tumkur, BSc (Mysore), MSc (Banaras), PhD (Waterloo)

Research Assistant Professor
T.J. Singh, BSc, PhD (Manitoba), NSERC University Research Fellow

Adjunct Faculty
H.R.N. Eydt, BSc, MSc, PhD (McMaster)
A.D. Harrison BSc, MSc, BEd, PhD (Capetown)
P.V. Hodson, BSc (McGill), MSc (New Brunswick), PhD (Guelph), Canada Centre for Inland Waters
V.C. Nealis, BSc, MSc (Carleton), PhD (British Columbia), Great Lakes Forestry Centre
G.G. Stewart, BSc (Wales), PhD (Bath) The Labatt Brewing Company, London
J.E. Thompson, BSA (Toronto), PhD (Alberta), University of Guelph

Instructors
J.F. Brookfield, BA, BEd, BSc, MSc (Dahousie)
L. Pasternak, BA, MA (Toronto)
N.J. Scott, BSc, MBA (McMaster), MSc (Waterloo)
K.E. Trevors, BSc (Acadia), MSc (Waterloo)

Faculty Members of biology holding cross appointments to:
1Chemistry
Faculty Members holding cross appointments to Biology from:
2Physics
3Urban and Regional Planning
4Optometry
5Chemistry
6Chemical Engineering

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 111 cannot be counted for credit toward a joint degree in Biology and the Faculty of Environmental Studies.

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 112 cannot be counted for credit toward a joint degree in Biology and the Faculty of Environmental Studies.

BIOL 201 F 2C,3L 0.5
Human Anatomy
Basic anatomical features of the skeletal, muscular, nervous, cardiovascular, endocrine and reproductive systems of the human.
Open to students other than those intending to major in Biology.
BIOL 201 cannot be counted for credit toward a BSc (Kinesiology) degree.

BIOL 202 W 2C,3L 0.5
Embryology and Histology
Fundamental developmental processes in vertebrates, including man; the development of the early embryo; morphogenesis of tissues and the major organ systems. Structure of human cells and tissues at the light-microscope level; epithelia, connective, muscular and nervous tissues and the major organ systems.
Open to students other than those intending to major in Biology.

BIOL 210 F 2C,3L 0.5
Introductory Invertebrate Zoology
A study of the functional morphology of selected invertebrate types with special emphasis on the various grades of organization and development in the different phyla.
BIOL 211 W,S 2C,3L 0.5
Introductory Vertebrate Zoology
An introduction to the structure, evolution and development of vertebrate organ systems.
Offered during the Spring term in odd-numbered years.

BIOL 220 F 2C,3L 0.5
Plant Biology 1 - The Living Plant
An introduction to the structure, function and physiology of plants with emphasis on flowering plants.

BIOL 221 W,S 2C,3L 0.5
Plant Biology 2 - The Diversity of Plants
A comparative survey of the morphology and life histories of the different kinds of plants and fungi important to man and an introduction to their evolution.
Offered during the Spring term in odd-numbered years.

BIOL 222 F 0.5
Non-Vascular Plants
An introductory course which will survey the evolution, morphology, ecology and importance to man of the fungi, algae, and Bryophytes.
By correspondence only for 1989-90.

BIOL 230 F 2C,3L 0.5
Introductory Cell Biology
An introduction to the concepts of cell biology with emphasis on (1) the structural organization of the cell and its constituent organelles and (2) the function of critical molecular processes that are characteristic of living organisms.

BIOL 239 W,S 2C,3L 0.5
Genetics
Offered during the Spring term in even-numbered years.

BIOL 240 F 2C,3L 0.5
Fundamentals of Microbiology
Introduction to fundamental theories, principles and methods of microbiology. Structure, methods of cultivation, growth, effects of physical factors, and inhibition and killing of microorganisms will be studied.

BIOL 241 W,S 2C,3L 0.5
Introduction to the Microbial World
Biological characterization of major bacterial groups, microorganisms as geochemical agents, utilization of microorganisms by man, and mechanisms of microbial pathogenicity.
Offered during the Spring term in odd-numbered years.

BIOL 250 F 3C 0.5
Ecology
An introduction to the study of the relationships of plants and animals to their environment. The nature of ecosystems, ecological energetics, biogeochemical cycling, community ecology, introduction to population biology. BIOL 298 is recommended for students specializing in ecology.

BIOL 273 W,S 2C,3L 0.5
Introductory Human Physiology
The physiology of the major organ systems including the nervous, muscular, circulatory, respiratory, urinary, digestive, endocrine and reproductive systems.
Antireq. Sci 351-352
Offered during the Spring term in even-numbered years.
(Formerly BIOL 233)

BIOL 298 F fld lab 0.25
Field Course 1
A series of one-day field trips from campus held on Saturdays during the first half of term (omitting Thanksgiving weekend), designed to introduce students to the flora, fauna and major ecosystems of Southern Ontario. Written reports will be required for each trip.
Coreq: BIOL 250 or equivalent
Field trip fee of $75 is required towards the cost of transportation. Minimum enrolment of 24 students is required.

BIOL 301A/B F,W 2C,3L 0.5/0.5
Human Physiology
The physiology of the major organ systems of the body. The topics discussed include circulation, respiration, digestion and nutrition, metabolism, muscle, nervous systems, special senses, and the endocrine system.
No credit or grade will be given for the first term course unless the two term sequence is completed.
For Optometry students only.

BIOL 402 F 2C,3L 0.5
Embryology
Fundamental processes and concepts in embryonic development including the acquisition of multicellularity, organization of the early embryo, morphogenesis of tissues, major organ systems, fetal membranes, growth, differentiation and analysis of common developmental defects.
(Formerly BIOL 336)

BIOL 403 F 2C,3L 0.5
Developmental Toxicology
Analysis of embryonic development of selected organisms with emphasis on growth and the processes of subcellular, cellular and organ differentiation stressing recent experimental methodology.
(Formerly BIOL 435)

BIOL 404 W 2C,3L 0.5
Histology and Cytology
The structure of mammalian cells, tissues and organs interpreted in functional terms. Cell reproduction and differentiation, with some discussion of the embryological origin of tissues and the regulation of tissue growth. Light and electron microscopy techniques.
Prereq: BIOL 211 or 230 or 273
(Formerly BIOL 333)

BIOL 410 W 2C,3L 0.5
Invertebrate Zoology
The biology of invertebrate animals, excluding arthropods. Topics covered will include reproduction, development, life history, feeding, locomotion, and behaviour. Laboratories will introduce the major invertebrate phyla.
Prereq: BIOL 210
(Formerly BIOL 315)

BIOL 411 W 2C,3L 0.5
Vertebrate Zoology
Major topics in vertebrate zoology as exemplified by both living and fossil members of the phylum Craniata.
Prereq: BIOL 211
(Formerly BIOL 311)

BIOL 412 F,S 2C,3L 0.5
Arthropod Zoology
A survey of the phylum Arthropoda, including the insects, with emphasis on their classification, interrelationships and ways of life.
Prereq: BIOL 210
Offered during the Spring term in even-numbered years.
(Formerly BIOL 316)
BIOL 416 F 2C,3L 0.5
Entomology
Introduction to morphology, systematics and biology of insects.
Brief field trips will be made to collect insects from different local habitats.

BIOL 420 W 2C,3L 0.5
The Flora of Canada
The composition and history of the Canadian flora. Major plant commu-
nities in Canada; their floristic composition and ecology. Endangered species and the conservation of our flora.

BIOL 421 F.S 2C,3L 0.5
Plant Anatomy and Morphogenesis
Plant structure in relation to function and development with particular refer-
ence to the vascular plants. Cell, tissue and organ differentiation.
Prereq: BIOL 220 and 230
Offered during the Spring term in odd-numbered years.
(Formerly BIOL 323)

BIOL 422 F 2S,3L 0.5
Mycology
Fungal taxonomy and ecology; medical mycology; plant pathology; industrial
applications; food and food processing; toxins and hallucinogens; biological
control; fungi as coprophiles, predators and symbionts with plants and animals.
Prereq: BIOL 221
(Formerly BIOL 327)

BIOL 423 W 2C,3L 0.5
Plant Physiology
A study of physiological principles that govern the water economy, mineral
nutrition, transport processes and metabolism of plants with an emphasis on
biophysical and biochemical mechanisms.
(Formerly BIOL 335)

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 permis-
sion of the instructor
Offered in even-numbered years.

BIOL 425 F 2C,3L 0.5
The Flowering Plants
A study of floral morphology in relation to classification and evolution. An intro-
duction to taxonomy and nomenclature. History of taxonomy. Systems of classi-
fication. Mechanisms of pollination and dispersal.
Students entering this course are required to make a flowering plant
collection. Instructions should be obtained from the Herbarium prior to
the summer break.
(Formerly BIOL 324)

BIOL 426 W 2C,3L 0.5
Applied Physiology
Algae in human affairs and the environment. Topics examined include algal
ecology; algae and organic, thermal, metal and acid pollution; cultural eutro-
phication; toxic algae; uses of algae for food; algal products; mass culture of
microalgae and macroalgae.
Prereq: BIOL 220 or 221

BIOL 427X F 2C,3L 0.5
Environmental Physiology
A study of the physiological processes used by plants and animals to respond
to changes in the physical environment. The adaptation processes will be exam-
ined from the molecular to the organismal level.
Prereq: BIOL 250 and one of the
following: BIOL 273, 423, 436 or 470
(Formerly BIOL 433)

BIOL 428 F 2C,3L 0.5
Plant Growth Regulation: Biochemical and Molecular Perspectives
A study of the molecular and biochemical processes that control development in
plants with emphasis on the growth-regulating compounds and their interactions.
(Formerly BIOL 432)

BIOL 432X F 3C 0.5
Biotechnology 1
Genetic engineering entails the directed alteration of the hereditary apparatus of
cells. The applications of recombinant DNA technology will be examined
including the use of restriction endonu-
ucleases, cloning vehicles, transformation
procedures, screening methods and expression of cloned genes.
Prereq: BIOL 437 and 440 or permis-
sion of instructor
(Formerly BIOL 480)

BIOL 433X W 3C 0.5
Biotechnology 2
Biotechnology involves the harnessing of biological processes for large-scale
industrial applications. Topics examined will include industrial enzymology, and
animal and plant cell culture.
Prereq: BIOL 437 and 440 or permis-
sion of instructor
(Formerly BIOL 481)

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 euka-
ryotes. Current research literature will be reviewed.

BIOL 436 W 2C,3L 0.5
Cell Physiology
The functional organization of cells with particular reference to cell-cell interac-
tion, the structure, function and develop-
ment of organelles and the biological roles of cellular membranes.
Prereq: BIOL 230
(Formerly BIOL 331)

BIOL 437 F.S 2C,3L 0.5
Molecular Biology
Structure, expression and regulation of prokaryote and eukaryote genes,
including DNA replication, transcription and protein synthesis. Introduction to recombinant DNA technology.
Prereq: BIOL 230 and 239 or permis-
sion of instructor
(Formerly BIOL 330)

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 concep-
tual advances. Current research litera-
ture will be reviewed.
Prereq: BIOL 437

BIOL 439 W 3C 0.5
Biochemistry of Natural Products
The chemistry, functions and distribution of natural products including alka-
loids, isoprenoids, amines, phenolics,
cyanogenic glycosides and other impor-
tant 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 440 W 2C,3L 0.5
Advanced Microbial Physiology
The physiology of microorganisms in the environment. The role of bacteria as
important agents in natural processes.
Prereq: BIOL 230 and 239 or permis-
sion of instructor
(Formerly BIOL 330)
BIOL 440 F, S 2C, 3L 0.5
Microbial Biotechnology
The role of genetically manipulated microorganisms in biotechnology.
Topics examined include the principles of recombinant DNA technology and the development of microorganisms important in biotechnology.
Prereq: BIOL 240/241 or permission of instructor
It is recommended that this course be taken after completion of second year.
(Formerly BIOL 342)

BIOL 441 F 2C, 3L 0.5
Immunology
Physical and biological properties of immunological agents that protect against disease, the procedures for their identification and their practical applications.
Prereq: BIOL 240/241

BIOL 442 W 2C, 3L 0.5
Virology
The nature of viruses and their interaction with their plant, microbial and animal hosts.
Prereq: BIOL 240/241

BIOL 443 F 2C, 3L 0.5
Microorganisms of Industrial Importance
A study of the role of microorganisms in industrial processes of biosynthesis and degradation.
Prereq: BIOL 445

BIOL 444 W 2C, 3L 0.5
Microorganisms and Disease
A study of the microorganisms involved in pathogenesis, their mode of infection, symptoms and prevention.
Prereq: BIOL 240/241, 441

BIOL 445 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
(Formerly BIOL 344)

BIOL 446 F 2C, 3L 0.5
Microbial Ecology
A study of the ecological roles of microorganisms. Examples from freshwater, terrestrial, marine and other ecosystems will be used to illustrate the activities and importance of microorganisms in these habitats.
Prereq: BIOL 240/241, or permission of instructor

BIOL 447 W 2C, 3L 0.5
Environmental Microbiology
A study of the environmental impact of microorganisms. Aspects of pollution, waste treatment, biodegradation of environmental contaminants, and nutrient cycling will be examined.
Prereq: BIOL 240/241, 446, or permission of instructor

BIOL 448 F 2C, 3L 0.5
Microbial Physiology 1
A study of the physiology of microorganisms including multiphasic and synchronous growth, cell permeation, nutrition, physical and chemical environmental factors and metabolic mechanisms as elucidated by radioactively labelled tracers.
Prereq: BIOL 240/241, or permission of instructor

BIOL 449 W 2C, 3L 0.5
Microbial Physiology 2
A study of the physiology of microorganisms with emphasis on synthetic and assembly processes. Mechanisms underlying the biosynthesis of DNA, protein, stable RNA, peptidoglycan, phospholipids, lipopolysaccharides and polysaccharides as well as assembly of the cell envelope, the nucleoid and polysomes will be discussed.
Prereq: BIOL 240/241 or permission of instructor

BIOL 450 F 2C, 3S 0.5
Marine Biology
An examination of coastal and offshore marine environments. Physical and chemical oceanography, plankton, benthos, fish and marine tetrapods are discussed.
Prereq: BIOL 250; a marine field course
Antireq: SCI 453

BIOL 451 W 2C, 3S 0.5
Limnology
A study of the biology, chemistry and physics of lakes and streams. Emphasis is placed on biological processes and their interaction with the environment.
Prereq: BIOL 210 and 250
Antireq: SCI 454

BIOL 452 F 2C, 3S/fldlab 0.5
Fisheries Biology
The practices of fisheries biology; life history; age and growth, fecundity, production, harvest and management of fisheries resources.

BIOL 453 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
(Formerly BIOL 356)

BIOL 454 F, S 2C, 3L 0.5
Environmental Toxicology 1
An introduction to the basic theories, principles and techniques of environmental toxicology. A comparative study of the effects of specific groups of toxicants on ecosystems; biodegradation and cycling.
(Formerly BIOL 350)

BIOL 455 F 2C, 3L 0.5
Environmental Toxicology 2
Cellular, development and physiological effects of toxicants on multicellular organisms.
Prereq: BIOL 454

BIOL 456 W 2C, 3dlab/T 0.5
Population Ecology 2
The analysis of the structure and dynamics of plant and animal populations. Theoretical, mathematical and experimental approaches to the study of population ecology. Evolutionary processes in population biology.
Prereq: BIOL 453

BIOL 457 F 2C, 3dlab/T 0.5
Analysis of Communities
A study of the organization, structure and development of communities with emphasis on vegetation change. Topics include: sampling procedures; diversity; stability; succession; niche; multivariate analysis.
Prereq: BIOL 250 and STAT 202

BIOL 458 F 2C, 3L 0.5
Ethology
The scientific study of the behavior patterns of animals. The course will examine concepts, processes and methodologies developed (or studied) in the fields of animal behaviour, within an evolutionary framework.
Prereq: BIOL 250 and 273 or permission of instructor
BIOL 459 W 3C/S 0.5
Evolution
A study of the processes of evolution; the differentiation of populations and the origin of new forms of life.
Prereq: BIOL 239
(Formerly BIOL 473)

BIOL 461 W 3C 0.5
Statistics and Experimental Design
Design and analysis of experiments: analysis of variance; experimental designs; factorial experiments; models; missing data; transformations; a-priori and a-posteriori comparisons among means; regression and correlation analysis; analysis of covariance; circular data.
Prereq: STAT 202 or equivalent

BIOL 470 F.S 2C,3L 0.5
Comparative Animal Physiology 1
The comparative physiology of animals with particular emphasis on homoeostatic principles as demonstrated by water balance, excretion, nutrition, digestion and the endocrine system.
Prereq: BIOL 210 and 211
(Formerly BIOL 337)

BIOL 471 W 2C,3L 0.5
Comparative Animal Physiology 2
A comparative study of the cardiovascular, nervous, muscular, respiratory and reproductive systems.
Prereq: BIOL 273
(Formerly BIOL 338)

BIOL 473X W 2C,3L 0.5
Mammalian Reproductive Physiology
A study of the endocrine and reproductive systems of mammals. Major topics include methods of hormone assay, chemistry of the hormones, regulation of secretion, mechanisms of hormone action, neurosecretion, reproductive cycles, gametogenesis and fertilization.
Prereq: BIOL 273 recommended
(Formerly BIOL 431)

BIOL 490A/B F,W,S 2C,3L 0.5/0.5
Field Course in Marine Biology
A two-week study of marine environments and biota. Emphasis on the flora and fauna of the intertidal and subtidal benthos. Grade based on a field notebook and a research project. This course will normally be held at Huntsman Marine Lab, New Brunswick each September. Courses sponsored by Ontario Universities at other times of the year may also qualify.
Prereq: BIOL 210, 250 or equivalent Field trip fee: $400-$600

BIOL 491A/B F,W,S 2C,3L 0.5/0.5
Field Course in Terrestrial and Aquatic Biology
A two-week study of the flora and fauna of terrestrial environments, lakes and streams. Emphasis on bio-systematics, distribution and dynamics of organisms. Both population and community approaches are stressed. This course will normally be held in Algonquin Park, Ontario each September. Courses sponsored by Ontario Universities at other times of the year may also qualify.
Prereq: BIOL 250 or equivalent Field trip fee: $300-$400

BIOL 492 F,W,S 2C,3L 0.5
Introduction to Marine Mammals
A two-week field course at the Huntsman Marine Laboratory, St. Andrews, NB. The course has a strong emphasis on field research and each student must complete a research project. Lectures will introduce the evolution, zoogeography, ecology and behaviour of whales, seals and sirens. Additionally, marine-mammal fisheries will be dealt with in both lecture and laboratory work.

BIOL 498 F,W,S 2C,3L 0.25
Field Course 2
A general interest field course usually of one week duration. Requirement is met by attending the first week only of a two-week trip arranged or approved by the Department (e.g. BIOL 490 or 491). Courses sponsored by Ontario Universities at other times of the year may also qualify.
Coreq: BIOL 250 or equivalent Field trip fee: $100-$300

BIOL 499A/B S,F,W 6L 0.5/0.5
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.
A final grade for BIOL 499A will be submitted only after completion of 499B.

COURSES NOT OFFERED 1989-90
BIOL 472 Comparative Animal Physiology 3 (Formerly BIOL 430)
Ontario culture. to the emergence of a distinctive cultural identity in Canada. Particular attention is paid to defining distinctive regional identities by literature, film, drama, and fine arts.

Cultural Regionalism

CDN ST 201 F 3S 0.5
Regionalism: West
This course continues the exploration of Canadian regionalism by applying knowledge gained in CDN ST 201/202 to distinctive problems of the Canadian west and northwest. The focus of the seminar will vary according to the interests of the faculty and students.
Prereq: CDN ST 101, 201 or 202 or permission of the instructor

CDN ST 302 W 3S 0.5
Regionalism: East
This course continues the exploration of Canadian regionalism by applying knowledge gained in CDN ST 201/202 to distinctive problems of Atlantic Canada. The focus of the seminar will vary according to the interests of the faculty and students.
Prereq: CDN ST 101, 201 or 202 or permission of the instructor

CDN ST 313 F,W 3S 0.5
Canadian Traditional and Popular Culture
Studies traditional and popular bases for Canadian culture through interdisciplinary examination of verbal, musical, ritual, material, and belief heritage, reflected in a variety of social groupings: occupational, family, gender, age, community, ethnic, religious, linguistic, and regional.

Special Topics
A course offered from time to time on a significant Canadian issue or theme using expertise available by special arrangement.

CDN ST 365C W 3S 0.5
Les francophones hors Québec
Ce cours est offert à tous ceux qui veulent en savoir davantage sur la culture traditionnelle et populaire des Francophones vivant hors du Québec. Autour de ce thème central seront étudiés une variété de sujets présentés par des conférenciers invités: historiens, sociologues, éducateurs, artistes... que viendront de diverses régions du Canada français, du sud et du nord de l'Ontario, de l'Acadie, du Manitoba, ainsi que de l'Université de Waterloo.

CDN ST 365D 0.5
Reading Course

Course Descriptions

Introductory Note
The core courses provide an interdisciplinary study of Canadian issues and are offered either in lecture/tutorial or seminar formats (depending on the size of the class). These courses are given by members of the participating UW departments and by other scholars who may be visiting the University for brief or extended periods during the year.

CDN ST 101 F 2C,1S 0.6
Landforms and Mindscapes
An introduction to the Canadian landscape and its early impact upon the creative imagination of Canadians. The course provides a basis for dealing with contemporary Canadian culture.

CDN ST 201 F 2C,1S 0.5
Social Regionalism
Lecturers from various social scientific disciplines examine Canada region by region, looking at how economic disparities, federal-provincial-and-territorial relations, social elites, political parties, etc. influence Canadian regionalism. Focuses on current issues.

CDN ST 202 W 2C,1S 0.5
Cultural Regionalism
Lecturers discuss the contribution made by literature, film, drama, and fine arts in defining distinctive regional identities in Canada. Particular attention is paid to the emergence of a distinctive Ontario culture.

CDN ST 301 F 3S 0.5
Regionalism: West
This course continues the exploration of Canadian regionalism by applying knowledge gained in CDN ST 201/202 to distinctive problems of the Canadian west and northwest. The focus of the seminar will vary according to the interests of the faculty and students.
Prereq: CDN ST 101, 201 or 202 or permission of the instructor

CDN ST 302 W 3S 0.5
Regionalism: East
This course continues the exploration of Canadian regionalism by applying knowledge gained in CDN ST 201/202 to distinctive problems of Atlantic Canada. The focus of the seminar will vary according to the interests of the faculty and students.
Prereq: CDN ST 101, 201 or 202 or permission of the instructor

CDN ST 313 F,W 3S 0.5
Canadian Traditional and Popular Culture
Studies traditional and popular bases for Canadian culture through interdisciplinary examination of verbal, musical, ritual, material, and belief heritage, reflected in a variety of social groupings: occupational, family, gender, age, community, ethnic, religious, linguistic, and regional.

Special Topics
A course offered from time to time on a significant Canadian issue or theme using expertise available by special arrangement.

CDN ST 365C W 3S 0.5
Les francophones hors Québec
Ce cours est offert à tous ceux qui veulent en savoir davantage sur la culture traditionnelle et populaire des Francophones vivant hors du Québec. Autour de ce thème central seront étudiés une variété de sujets présentés par des conférenciers invités: historiens, sociologues, éducateurs, artistes... que viendront de diverses régions du Canada français, du sud et du nord de l'Ontario, de l'Acadie, du Manitoba, ainsi que de l'Université de Waterloo.

CDN ST 365D 0.5
Reading Course

Department of Chemical Engineering

Professor, Chairman of the Department
O.L. Remmel, BSc, PhD (British Columbia), FCIC

Professor, Associate Chairman (Graduate Studies)
R.R. Hudgins, BASc, MASc (Toronto), PhD (Princeton), PEng

Associate Professor, Associate Chairman (Undergraduate Studies)
C.E. Gall, BASc (Toronto), MSc (Queen's), PhD (Minnesota), PEng

Professors
C.M. Burns, BASc, MASc (Toronto), PhD (Polytechnic Institute, Brooklyn), PEng
J.J. Byerley, BASc, MASc, PhD (Toronto), MEng (British Columbia)
K.S. Chang, BS (Hayang Institute Technology, Seoul), MSc, PhD (Northwestern)
F.A.L. Dullien, Dipl Ing (Budapest Technical University) MASc, PhD (British Columbia), PEng
T.Z. Fahidy, BSc, MSC (Queen's), PhD (Illinois), PEng
G.J. Farquhar, BASc (Waterloo), PhD (Wisconsin), PEng, Recipient of the Distinguished Teacher Award
R.Y.-M. Huang, BASc (National Taiwan University), MASc, PhD (Toronto), PEng
I.F. Macdonald, BEng (NSTC), PhD (Wisconsin)
M. Moo-Young, BSc (London), MASc (Toronto), PhD (London), PEng
K.F. O'Driscoll, BChE (Pratt Institute), MA, PhD (Princeton)
D.C.T. Pei, BEng (McGill), MSC (Queen's), PhD (McGill)

Research Essay
An extensive senior research essay, supervised by a committee composed of faculty members from two or more of the participating departments, which deals with a specific aspect of Canada utilizing material and methods from several different disciplines.
A grade for CDN ST 400A is submitted only after the completion of CDN ST 400B
Course Descriptions

Chemical Engineering

C.W. Robinson, BASc (British Columbia), PhD (Northwestern), PEng

A. Rudin, BSc (Alberta), PhD (Northwestern), PEng

D.S. Scott, BSc, MSc (Alberta), PhD (Illinois), PEng

P.L. Silveston, BS, MS (MIT), Dr Ing (Munich), PEng

J.R. Wynnypoy, BEng (McGill), MASC, PhD (Toronto), PEng

Associate Professors

L.E. Bodnar, BA, MA (Saskatchewan), PhD (McMaster)

I. Chatzis, BASc, MASC, PhD (Waterloo) (DuPont-NSERC Assistant Professor)

P.L. Douglas, BASc, MASC, PhD (Waterloo), PEng

K. Enns, BASc, LLB, MASC, PhD (Toronto)

J.D. Ford, BEng (McGill), MASC, PhD (Toronto), PEng

D.A. Holden, BSc, LMus (McGill), MSc, PhD (Toronto), NSERC University Research Fellow

F.T.T. Ng, BSc (Hong Kong), MSc, PhD (British Columbia)

J.M. Scharer, BSc, PhD (Pennsylvania)

G.R. Sullivan, BASc (Waterloo), DIC, PhD (London), PEng (DuPont-NSERC Associate Professor)

Assistant Professors

R.L. Legge, BSc, (Calgary), PhD (Waterloo), NSERC University Research Fellow

A. Penlidis, Dipl. Eng. (Thessaloniki), PhD (McMaster), PEng

Adjunct Faculty

T.A. Duever, BASc, MASC, PhD (Waterloo)

M.R. Mohammadi, BE (Karachi), MASC, PhD (Waterloo)

G.S. Mueller, BASc (Waterloo), MASC, PhD (Manchester), PEng

P.M. Reilly, BSc (Toronto), DIC, PhD (London), FSS, PEng, Recipient of the Distinguished Teacher Award

E. Rhodes, BSc Tech, MSc Tech, PhD (Manchester), PEng

Faculty Members of Chemical Engineering holding cross appointments to:

1Chemistry

2Management Sciences

3Biotechnology

Faculty Members holding cross appointments to Chemical Engineering from:

4Chemistry

5Civil Engineering

Course Descriptions

Introductory Note

Prerequisite: For all courses in the Department of Chemical Engineering, registration in the Department or permission of the Associate Chairman (Undergraduate Studies) is a requirement.

CH E 007 F, W, S 1C 0

General Awareness Seminar

Informal discussions on the Chemical Engineering program.

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; chemical equilibrium. Laboratory on visual communication is included.

CH E 101 W, S 3C, 1T, 2L 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 021 F, W 3C, 1T, 3L' 0.5

Transport Processes 1 (Equilibrium Stage Operations)

Equilibrium between phases; the equilibrium stage concept. Cascade of stages with and without reflux; group methods and stage-by-stage approaches; graphical solutions. Applications in the separation of components by distillation, adsorption, stripping, extraction and leaching.

Prereq: CH E 100 and CH E 101

Formerly CH E 210

CH E 022 F, W 3C, 1T 0.5

Applied Mathematics 1 (Statistics)

Introduction to statistical ideas, probability theory, distribution theory, sampling theory, confidence intervals and significance tests. Introduction to regression analysis. Introduction to design of experiments.

Formerly CH E 220

CH E 023 F, W 3C, 1T, 3L 0.5

Physical Chemistry 1


Prereq: CH E 101 and CH E 102

Alternate weeks

Formerly CH E 230

CH E 025 S, F 3C, 2L 0.5

Transport Processes 2 (Fluid Mechanics)


Formerly CH E 213

CH E 026 S, F 3C, 1T, 3L 0.5

Physical Chemistry 2

Thermodynamics: ideal dilute solutions; equilibria in condensed phases and in non-ideal systems; activities and fugacities in solutions. Surface phenomena: surface tension; capillarity; adsorption; electrical double layers; colloids. Transport properties: thermal conductivity, viscosity and diffusion coefficients. Chemical kinetics: rate laws; mechanisms; catalysis; reaction rates; heterogeneous reactions; photochemistry. Polymers: types; thermodynamics of solutions.

Prereq: CH E 023

Alternate weeks

Formerly CH E 231

CH E 030 W, S 3C, 1T, 0.5

Transport Processes 3 (Heat Transfer)


Prereq: CH E 021 and CH E 025

Formerly CH E 314
CH E 031 W,S 3C,1T 0.5
Process Flowsheeting
Process simulation and mathematical modelling of chemical engineering flowsheets involving process units. Design variables; process simulation architectures; flowsheet decomposition theories. Use of modern computer-aided process design packages such as CHEMSHARE, ASPEN and SPEEDUP.

CH E 032 W,S 3C,2L 1.0
Introductory Biotechnology
Biological systems for the production of commercial goods and services: foods, drugs, chemicals, fuels, equipment, diagnostics, waste treatment. Properties of microbial, plant and animal cells, and of enzymes used in bioprocess applications. Classification and characterization of biological agents and materials; quantification of metabolism, bioinformatics, bioenergetics. Elementary aspects of molecular biology, genetic engineering, biochemistry, microbiology.

\*Alternate weeks

CH E 033 W,S 3C,1T 0.5
Chemical Engineering Thermodynamics
Thermodynamics applied to practical situations. Examples to be chosen from such topics as: fluid flow; simultaneous generation of heat and power; refrigeration; air conditioning and water cooling; liquefaction of gases; equilibria in complex chemical reactions; separation processes; surface phenomena; electrochemical reactions; plasma; global thermodynamics; biological processes; explosives; dust explosions.

Prereq: CH E 023 and CH E 026
Formerly CH E 330

CH E 034 W,S 3C,1T,3L 1.0
Inorganic Process Principles 1
Inorganic chemical processes of industrial importance: sulphuric acid; nitric acid; ammonia; chlorine; phosphate; caustic; uranium. Principles and applications of atomic and molecular structure to inorganic processes; atomic theory; bonding; stereochemistry; catalysis; transition metal chemistry. Some thermodynamic aspects of inorganic chemistry: thermodynamics; stability of elements and compounds; graphical representation of thermodynamic data; aqueous solution thermodynamics. Inorganic materials: structure and properties of metals and alloys; ceramics; composites; semiconductors. Selected topics in biology, polymers, metallurgy.

\*Alternate weeks
Formerly CH E 222

CH E 035 F,W 3C,1T 0.5
Transport Processes 4 (Mass Transfer)
Steady state and unsteady state mass transfer by molecular and turbulent motion. Heat-mass transfer analogies. Mass transfer models and applications: absorption; extraction; adsorption. Simultaneous heat and mass transfer in gas-liquid contacting and solids drying.

Prereq: CH E 030
Formerly CH E 317

CH E 036 F,W 3C 0.5
Chemical Reaction Engineering

Prereq: CH E 023 and CH E 026
Formerly CH E 331

CH E 037 F,W 3C 0.5
Applied Mathematics 2 (Advanced Mathematics in Chemical Engineering)

Prereq: MATH 216
Formerly CH E 320

CH E 038 F,W 3C,3L 1.0
Inorganic Process Principles 2

Prereq: CH E 034
\*Alternate weeks
Formerly CH E 332

CH E 040 S,F 1C,6L 0.5
Chemical Engineering Unit Operations 1 Laboratory
Experimental applications of physical and chemical principles using pilot scale equipment. Experiments illustrating major unit operations: distillation; absorption; reactors; extraction; drying; humidification; heat exchange.

Prereq: CH E 030
Formerly CH E 410

CH E 041 S,F 2C,1T,2L 0.5
Introduction to Process Control

Formerly CH E 321

CH E 043 S,F 3L 0.25
Research-Design Project 1
Individual research or design on any chemical engineering subject chosen by the student in consultation with the supervising professor. A written interim preliminary report is required.

Formerly CH E 580

Students enrolled in this course must take CH E 044 in 4R.

CH E 044 S,F 3C 0.5
Economics for Chemical Engineering

Formerly CH E 382

CH E 045 S,F 2C,4T 0.5
Process Equipment Sizing and Selection
Introduction to practical methods of equipment specification critical in process design, to engineering methods and computations (including standard computer packages) for the selection and sizing of process equipment to proper choice of materials and to equipment cost estimation. The topics include process piping systems, control valves, pressure vessels, heat exchangers and condensers including regenerators, tower contactors for one- and two-phase flow, agitated vessels, reactors, mixers etc. for two- and three-phase contacting, and special topics, as appropriate.

Prereq: CH E 035, CH E 036

CH E 047 W 12L 1.0
Group Design Project
Student design teams of two to four members work on design projects of industrial scope and importance under the supervision of a faculty member.

Antireq: CH E 048
CH E 048 W 9L 0.75

Research-Design Project 2

A continuation of CH E 043. The individual research or design project started and presented in proposal form in 4A is carried out. An oral presentation of results and a written report are required.

Prereq: CH E 043

Antireq: CH E 047

Formerly CH E 581

CH E 512 W 3C 0.5

Separation Processes

Computational approaches in the design of multiple component separation processes. Energy requirements. Capacity and efficiency of contacting devices: distillation; absorption; liquid-liquid extraction; filtration; molecular sieves; membranes; ion exchange. Prereq: CH E 021, CH E 033 and CH E 035

Formerly CH E 517

CH E 514 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 oil production performance, water flooding and enhanced oil recovery techniques. Formerly CH E 502

CH E 522 W 3C 0.5

Advanced Process Dynamics and Control


Formerly CH E 521

CH E 524 W 1C,3L 0.5

Process Control Laboratory

Experiments on process dynamics, control and simulation of processes. Time constant; step and frequency response; controller tuning; multivariable control strategies. Implementation using simulation systems, mainframe computers control, microcomputers. Prereq: CH E 037 and CH E 041

Coreq: CH E 522

Formerly CH E 523

CH E 542 W 6C 1.0

Polymerization and Polymer Properties


CH E 552 W 3C 0.5

Extracive Metallurgy 1

(Hydrometallurgy)

Introduction to extractive metallurgy: ores, minerals, metals, metalloids, geology. Ore and mineral dressing. Thermodynamic and kinetic considerations. The extraction-refining-winning of industrially important metals: zinc, uranium, copper, nickel, gold, silver, aluminum and magnesium. Biomedical metallurgy. Prereq: CH E 033, CH E 034 and CH E 038

Formerly CH E 551

CH E 554 W 3C 0.5

Extracive Metallurgy 2

(Pyrometallurgy)

In-depth discussion of several processes of importance in Canada: blast-furnace smelting (iron, lead, zinc); steelmaking and other specialized refining processes. Pyrometallurgical treatment of sulphide ores. Fused salt electrolysis. The emphasis is to be placed on the interplay between the underlying thermodynamics, kinetics and transport processes in these heterogeneous reactions, and on the associated process engineering considerations. Formerly CH E 553

CH E 562 W 3C 0.5

Fermentation Engineering

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 reaction with biochemical and biological constraints. Prereq: CH E 032

Formerly CH E 561

CH E 564 W 3C 0.5

Food Process Engineering

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 and separation and purification processes. Effects of formulation, additives and processing on organoleptic and nutritional quality. Formerly CH E 032

CH E 572 W 3C 0.5

Air Pollution Control

Treatment of gaseous waste products from representative Canadian industries. Characterization and toxicity of filtration, scrubbing, cycloning, electrostatic precipitation and other chemical treatments. Legal, sociopolitical, economic and engineering aspects. Formerly CH E 570

CH E 574 W 3C 0.5

Treatment of Aqueous Inorganic Wastes

A case-study-based introduction to treatment of inorganic wastes from metallurgical processes and metals working/finishing operations. Chemical treatment; ion exchange; reverse osmosis; adsorption, electromembrane treatment; electrochemical treatment. Legal jurisdiction: economic and social implications. Formerly CH E 571
Department of Chemistry

Professor, Chairman of the Department
A. J. Cary, BSc, PhD (Nottingham), FCIC

Professor, Associate Chairman of the Department
R. G. Woolford, MSc (Western Ontario), PhD (Illinois), FCIC

Associate Professor, Advisor on Academic Human Resources to the Office of the Vice-President, Academic and Provost
D. A. Brittin, BSc (Alberta), PhD (Toronto)

Associate Professor, Assistant Dean, Special Projects, Faculty of Science
R. J. Friesen, BSc, MSc (Manitoba)

Associate Professor, Graduate Officer
D. A. Holden, MSc, LMus (McGill), MS, PhD (Toronto)

Associate Professor, Undergraduate Officer
A. H. Maynes, MA, PhD (Toronto)

Professor, (University of Waterloo) Director of the Guelph-Waterloo Centre for Graduate Work in Chemistry
T. B. McMahon, BSc (Alberta), PhD (California Institute of Technology)

Professors Emeritus
F. W. Karasek, BS (Elmhurst), PhD (Oregon State), FCIC
W. A. E. McBryde, MA (Toronto), PhD (Virginia), FCIC
W. B. Pearson, DFC, MA, DSc (Oxford), DSc (Waterloo), FRSC, FCIC

Professors
J. Cizek, RNDr (Charles University, Prague), CSc (Czechoslovak Academy of Sciences, Prague)
R. G. H. Downer, BSc, MSc (Queen’s, Belfast), PhD (Western Ontario), DSc (Belfast), Recipient of the Distinguished Teacher Award
T. E. Gough, BSc, PhD (Leicester)
D. E. Inrah, BSc (Western Ontario), MSc (McMaster), PhD (Chicago), FCIC, Recipient of the Distinguished Teacher Award, OCUFA Teaching Award 1988
N. R. Isenor, BSc (Acadia), MSc, PhD (McMaster)
R. J. LeRoy, BSc, MSc (Toronto), PhD (Wisconsin)

F. R. McCourt, BSc, PhD (British Columbia)
H. G. McLeod, MA, PhD (Toronto), (Retired)*
J. B. Moffat, BA, PhD (Toronto), FCIC
K. F. O’Driscoll, BChE (Pratt Institute), MA, PhD (Princeton) FCIC
J. Paldus, RNDr (Charles University, Prague), CSc (Czechoslovak Academy of Sciences, Prague)
L. W. Reeves, BSc, PhD, DSc (Bristol) FRSC, FCIC
G. L. Rempel, BSc, PhD (British Columbia) FCIC
A. Rudin, BSc (Alberta), PhD (Northwestern)
H. D. Sharma, MSc (Delhi), PhD (California), FCIC
J. J. Sloan, BSc, PhD (Queen’s)
V. A. Snieckus, BSc (Alberta), MS (California), PhD (Oregon), FCIC
T. Viswanath, MSc, PhD (Mysore), Recipient of the Distinguished Teacher Award

Associate Professors
G. F. Atkinson, MA, PhD (Toronto), CChem, FRSC (UK), FCIC
L. J. Brubacher, BA (Goshen College, Indiana), PhD (Northwestern)
J. B. Capindale, MA, DPhil (Oxford)
P. C. Chieh, BSc (Nat. Taiwan), MSc (Nat. Tsing Hua), PhD (British Columbia)
G. L. Dmitrienko, BSc, PhD (Toronto)
W. L. Elsdon, MSc (Western Ontario), PhD (McGill), (Retired)*
J. W. Hepburn, BSc (Waterloo), PhD (Toronto)
J. L. Koppel, BA, PhD (Toronto), FCIC, (Retired)*
D. Mackay, BSc, PhD (Aberdeen)
M. F. Tchir, BSc (Alberta), PhD (Western Ontario), Recipient of the Distinguished Teacher Award
G. E. Toongood, BSc, PhD (Nottingham), CChem, FRSC (UK), FCIC

Assistant Professors
S. Collins, BSc, PhD (Calgary)
J. F. Honek, BSc, PhD (McGill)
G. A. Lajoie, BSc (Sherbrooke), PhD (McGill)
K. T. Leung, BSc, PhD (British Columbia)
T. B. Marder, BSc (Massachusetts Institute of Technology), PhD (UCLA)
L. F. Nazar, BSc (British Columbia), PhD (Toronto)
J. Pawliszyn, BSc, MS (Technical University of Gdańsk, Poland), PhD (Southern Illinois University, Carbondale)

Research Assistant Professor
M. J. Chong, BSc, PhD (British Columbia), NSERC University Research Fellow

Adjunct Faculty
E. Jelium, BSc (Herriot-Watt University, Edinburgh), PhD (Oslo)
R. G. A. Rodrigo, BA (Ceylon), PhD (Nottingham)
G. Scates, Dottore in Chimica (Genova), LibDoc, FCIC
N. J. Taylor, BSc, PhD (Surrey)

Senior Demonstrators
S. O. de Silva, BSc (Ceylon), PhD (Waterloo)
C. Folzer, BSc (Purdue), MSc, PhD (Rutgers)
S. Forsy, BSc, MSc (Waterloo)
T. Rudensky, BSc, PhD (Waterloo)

Faculty Members of Chemistry holding cross appointments to:
1. Physics
2. Applied Mathematics
3. Chemical Engineering
4. Biology

Faculty Members holding cross appointments to Chemistry from:
5. Applied Mathematics
6. Chemical Engineering
7. Biology
8. Physics

8. Faculty Member holding joint appointment with Physics.

*Also has Adjunct appointment

Course Descriptions

Some courses are regularly given every other year, and are listed in their regular places.

Introductory Note
In all cases, it is the student’s responsibility to determine eligibility to enter a course. It is advisable to obtain special consents in writing before registration period to avoid delays and complications.

Most 300- and 400-level courses are listed as two lecture hours. An additional hour may be scheduled at the discretion of the lecturer, usually for tutorials.

COURSES CARRYING NO UNIVERSITY CREDIT

Course Descriptions

Chemistry

16:23
CHEM 001
Pre-University Chemistry
The course covers the material considered essential preparation for first year chemistry courses. Included are formulae, nomenclature, stoichiometry, an introduction to thermochemistry, solvation 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 010 W 1C 0.0
General Chemistry Seminar
Required for all Chemistry students beyond Year One, this seminar brings together students from all years to receive information concerning the activities of the Chemistry Department and the Chemical Institute of Canada, and to hear invited speakers.

YEAR 1 CHEMISTRY COURSES

CHEM 123 F 3C,1T 0.5
Chemical Reactions, Equilibria and Kinetics
The stoichiometry of compounds and chemical reactions; principles of equilibria, solubility and acid-base equilibria; electrochemistry; chemical kinetics. Prereq: Grade 13 Chemistry, Mathematics (Calculus)
Coreq: (for Science students) CHEM 123L
Antireq: CHEM 125
CHEM 123L F 3L 0.25
Chemical Reaction Laboratory 1
Selected experiments for students taking CHEM 123 or 125.
CHEM 124 W,S 3C,1T 0.5
Organic Chemistry 1
Bonding in carbon compounds. Structures, properties and nomenclature of several important classes of organic compounds. Interconversions of functional groups. Mechanisms of organic reactions. Prereq: Grade 13 Chemistry, Mathematics (Calculus)
CHEM 124 strongly recommended Coreq: (for Science students) CHEM 124L
Antireq: CHEM 126, 026
CHEM 124L W,S 3L 0.25
Chemical Reaction Laboratory 2
Selected experiments for students taking CHEM 124 or 126.
CHEM 125 F 3C,1T 0.5
Chemical Reactions, Equilibria and Kinetics
An enriched version of CHEM 123 for all students in, or planning to enter, Chemistry or Biochemistry programs. Prereq: Same as for CHEM 123 Coreq: Same as for CHEM 123 Antireq: CHEM 123
CHEM 126 W,S 3C,1T 0.5
Organic Chemistry 1
An enriched version of CHEM 124 for all students in, or planning to enter, Chemistry or Biochemistry programs. Prereq: Same as for CHEM 124 Coreq: Same as for CHEM 124 Antireq: CHEM 124, 026

UPPER YEAR CHEMISTRY COURSES

CHEM 026 F,W 3C,3L 0.5
Organic Chemistry 1
Basic chemistry of aliphatic compounds; shapes of molecules. A laboratory course on preparative organic chemistry accompanies the lectures. Prereq: Grade 13 Chemistry Antireq: CHEM 124, 124L, 126 For students in Year Two Engineering
CHEM 036 F,S 3C 0.5
Organic Chemistry 2
Survey of aliphatic and aromatic chemistry with examples from industrial processes; carbohydrates and other natural products. Prereq: CHEM 026 Antireq: CHEM 264, 266, 267 For students in Year Two Engineering
CHEM 212 F,W 3C 0.5
Structure and Bonding
Classical and wave theories of the electronic structure of atoms. The periodic table. Formation and characteristics of ionic and covalent bonds. Molecular orbital and valence bond theories. Bonding in molecular, ionic, and metallic solids. Structure and stereochemistry of simple inorganic compounds. Prereq: Grade 13 Chemistry, Physics, completion of Year One in good standing or permission of instructor Antireq: CHEM 218 For Honours students only
CHEM 218 F 2C,1T 0.5
Development of Chemical Bonding and Structure
Current models of bonding in inorganic Chemistry. Prediction of stereochemistry and electronic structure. Inorganic nomenclature. Prereq: Grade 13 Chemistry, Physics, completion of Year One in good standing or permission of instructor Antireq: CHEM 212
CHEM 219 W 0.5
Chemistry of Non-Transition Elements
Group trends in main group chemistry. Emphasis will be placed on correlation of structure with physical properties in various groups of compounds. Prereq: CHEM 212 or 218 Antireq: CHEM 313
By correspondence only
CHEM 220 F,W 2C,1T 0.5
Introductory Analytical Chemistry
The principles underlying quantitative measurements. Prereq: CHEM 123 or 125, 123L Coreq: (for Science students) CHEM 220L Antireq: CHEM 228 For Honours students only
CHEM 220L F,W 3L 0.25
Analytical Chemistry Laboratory 1
Selected experiments for students taking CHEM 220. For Honours students only
CHEM 221 F,W,S 2C 0.5
Multi-component Analysis
Electrochemical, spectroscopic and separation methods for the quantitative description of multi-component systems. Prereq: CHEM 220 Coreq: (for Science students) CHEM 221L Antireq: CHEM 228 For Honours students only
CHEM 221L F,W,S 6L 0.5
Analytical Chemistry Laboratory 2
Selected experiments for students taking CHEM 221. For Honours students only
CHEM 228 W 2G,3L 0.5
Analytical Chemistry for Life Sciences
Selected topics of importance to Biology students, with related experiments. Prereq: CHEM 123 or 125, 124 or 126 Antireq: CHEM 220, 221 For students in Honours Biology only
CHEM 237 F,W,S 3C 0.5
Introductory Biochemistry
An introduction to the chemistry of amino acids, carbohydrates, lipids and nucleic acids. Structure and properties of proteins and enzymes.
Prereq: CHEM 264 or 266

CHEM 237L F,W,S 3L 0.25
Introductory Biochemistry Laboratory
Selected experiments for students taking CHEM 237.

CHEM 254 F,W 2C,1T 0.5
Chemical Thermodynamics 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 or 125, MATH 113A/B or equivalent
Antireq: CHEM 356
For Honours students only

CHEM 256 W,S 2C,1T 0.5
Introductory Quantum Mechanics
Introduction to the microscopic description of physical processes, laws governing electrons and atoms and the properties of atomic and molecular states, application to electromagnetic radiation interacting with atoms and molecules producing transitions between states.
Prereq: CHEM 123 or 125
Coreq: MATH 215 or equivalent
Antireq: PHYS 234
For Honours students only
(Formerly CHEM 355)

CHEM 264 F,W 3C 0.5
Organic Chemistry 2
Preparation and reactions of typical organic functional groups examined on the basis of reaction mechanisms. Stereochemistry of organic molecules.
Prereq: CHEM 124 or 126
Antireq: CHEM 036, 266
For Honours students only

CHEM 265 F,W,S 2C,1T 0.5
Organic Chemistry 3
The detailed treatment of organic chemistry begun in CHEM 124 and 264 is continued, with further emphasis on stereochemistry, reaction mechanisms and aromaticity. Introduction to spectroscopy.
Prereq: CHEM 264
Antireq: CHEM 267
For Honours students only

CHEM 265L F,W,S 3L 0.25
Organic Chemistry Laboratory 1
Selected experiments for students taking CHEM 265.
For Honours students only

CHEM 266 F,W 3C 0.5
Basic Organic Chemistry 2
More detailed discussions of the important classes of aliphatic and aromatic compounds. An extended look at stereochemistry and its importance in reaction mechanisms.
Prereq: CHEM 124 or 126
Antireq: CHEM 036, 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 036, 265
For students needing a full year of Organic Chemistry as a prerequisite to medicine, either the sequence 266/267 and 266L, or the sequence 264/265 and 265L should be selected.

CHEM 311 W 2C 0.5
Radiochemistry
Prereq: Grade 13 Chemistry, completion of Year 1 in good standing or permission of instructor

CHEM 312 F,S 2C,1T 0.5
Transition Metal Chemistry
The transition elements and their compounds. Stereochemistry of complex ions; ligand field and molecular orbital theories of metal-ligand bonding; electronic spectra and magneto-chemistry of complexes; reaction mechanisms (if time permits).
Prereq: CHEM 212
Antireq: CHEM 316
For Honours students only

CHEM 313 W 2C,1T 0.5
Chemistry of Main Group Elements
A systematic approach to the syntheses, properties, reactions and structures of compounds of the main group elements. Trends in chemical behaviour, bonding and stereochemistry. Electron-deficient compounds, the rare gases, chemistry of phosphorus, nitrogen and sulfur will be dealt with in detail.
Prereq: CHEM 212
Antireq: CHEM 219
For Honours students only

CHEM 314L F,W,S 3L 0.25
Inorganic Chemistry Laboratory 1
An introduction to practical inorganic chemistry.
Coreq: CHEM 312 or 313
For Honours students only

CHEM 315L F,W 6L 0.5
Inorganic Chemistry Laboratory 2
Advanced experiments in inorganic chemistry.
Prereq: CHEM 314L
For Honours students only

CHEM 316 F 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
By correspondence only

CHEM 320 W 2C 0.5
Analytical Separations and Surface Analysis
Basic principles, instrumentation and methods of analytical separations and surface analysis.
Prereq: CHEM 221 or permission of instructor

CHEM 321 L W 3L 0.25
Advanced Analytical Laboratory
Selected experiments for students of analytical chemistry.
Prereq: CHEM 221, 221L

CHEM 332 F,S 2C 0.5
Structural Biochemistry
Prereq: CHEM 237
Coreq: CHEM 265 or 267
CHEM 333 F,W 2C 0.5
Metabolism 1
Metabolism of carbohydrates, lipids and amino acids.
Prereq: CHEM 237
Coreq: CHEM 265 or 267

CHEM 334L F,W 3L 0.25
Advanced Biochemistry Laboratory
Selected experiments for students taking CHEM 332 and CHEM 333.
Prereq: One term course in biochemistry beyond CHEM 237

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 256

CHEM 353 F,S 3C 0.5
Introduction to Polymer Science
Basic definitions and polymer nomenclature, molecular weight averages and distributions, constitutional and configurational isomerism, rubber elasticity, step-growth and free radical chain growth polymerizations, emulsion polymerization.
Prereq: CHEM 254, 264 or equivalent
Antireq: CH E 542

CHEM 354 W 2C,1T 0.5
Chemical Thermodynamics 2
This course extends the introduction provided by CHEM 254 to the thermodynamics of non-ideal systems. Topics covered include: the phase rule and phase diagrams, the Clausius-Clapeyron equation, fugacity and its application to nonideality in gases, partial molar properties, ideal and non-ideal solutions, colligative properties, electrolyte solutions, electrochemical thermodynamics.
Prereq: CHEM 254
Antireq: CHEM 255

CHEM 355L F,W,S 3L 0.25
Physical Chemistry Laboratory 1
Selected experiments for students in the 3A term.
For Honours students only

CHEM 356 F,S 2C,1T 0.5
General Physical Chemistry
An introductory survey of the thermodynamics of ideal systems; the application of thermodynamic principles to the study of solutions, phase equilibria, chemical equilibrium and the properties of electrolytes.
Prereq: CHEM 129 or 125, MATH 113A/B or equivalent
Antireq: CHEM 254

CHEM 356L F,W 3L 0.25
General Physical Chemical Laboratory 1
Selected experiments for students who have taken CHEM 356.
Prereq: CHEM 356
A special section in Winter term will be available for Honours Biochemistry students only.

CHEM 357 W 2C,1T 0.5
Physical Chemistry for the Life Sciences
An introductory survey of kinetic molecular theory and transport phenomena with applications to biological systems. Chemical kinetics. Some spectroscopies important to life sciences.
Prereq: CHEM 123 or 125, 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
Statistical Thermodynamics
The statistical nature of large assemblies of atoms and molecules, kinetic theory of gases, transport processes, the collision theory and transition state theory of chemical kinetics.
Prereq: CHEM 254,256
For Honours students only

CHEM 359 F 2C,1T 0.5
Kinetics and Dynamics
A course in chemical kinetics, which includes recent developments in reaction dynamics. Topics covered: rates and mechanisms of chemical reactions (rate laws, treatment of kinetic data, reaction mechanisms, complex and fast reactions); theory of reaction rates (collision theory, activated complex theory); selected recent topics, such as laser chemistry, atmospheric chemistry, heterogeneous catalysts.
Prereq: CHEM 254,256
For Honours students only

CHEM 362 W (even years) 2C 0.5
Mechanistic Organic Chemistry
Simple molecular orbital theories and their use in organic chemistry. Effects of substituents and reaction conditions on the mechanism of organic reactions.
Prereq: CHEM 265
Coreq: CHEM 368

CHEM 363 W 2C 0.5
Applied Organic Chemistry
The organic chemistry involved in selected industrial processes will be discussed. Petroleum chemistry, synthesis of dyestuffs, pharmaceuticals, pesticides, organic polymers, etc.
Prereq: CHEM 265 or 267

CHEM 366 F 2C 0.5
Structural and Synthetic Organic Chemistry
Stereochemistry in organic reactions; synthesis of selected organic compounds examined in detail with emphasis on cyclo-addition reactions and condensation reactions.
Prereq: CHM 265 or 267
Antireq: CHEM 388

CHEM 366L F 3L 0.25
Organic Chemistry Laboratory
Selected experiments for students taking CHEM 366.

CHEM 368 F,W,S 2C 0.5
Organic Chemistry 4
The design of organic syntheses, and especially the formation of enolate ions and their use in the formation of new carbon-carbon bonds. Acidity and basicity of organic molecules. Stereochemical concepts applied to organic molecules as well as conformational analysis.
Prereq: CHEM 265
Antireq: CHEM 366
For Honours students only
CHEM 368L F.W,S 6L 0.5  
Organic Chemistry Laboratory 2  
Selected experiments for students  
taking CHEM 368.  
For Honours students only

CHEM 380 F,W 1C,3T 0.5  
Chemical Problem Solving by Computer  
Analysis of chemical problems, development of mathematical and numerical models and algorithms, implementation of programs using procedure-oriented languages (BASIC, FORTRAN, PASCAL), simulations and calculations on chemical processes, data reduction and treatment.  
Prereq: CS 102 or equivalent, good standing in Year Two or higher of a chemistry program.  
Formerly CHEM 280

CHEM 392A F,W,S 9L 0.75  
Research Project 1  
For students in the Honours Chemistry (Thesis Option) program.

CHEM 392B F,W,S 18L 1.5  
Research Project 2  
For students in the Honours Chemistry (Thesis Option) program.

CHEM 395 W (odd years only) 3C 0.5  
History of Chemistry  
The development of chemistry will be traced from alchemy to the 20th century. The contributions of famous scientists to the concepts and models of modern chemistry will be emphasized.  
Prereq: Completion of two years of a Chemistry Honours program

CHEM 407 F 2C 0.5  
Industrial Chemistry  
Given entirely by invited lecturers from a broad spectrum of chemistry-related industries. The range of topics will include current industrial laboratory practice, the laboratory/plant interface, and the handling of large quantities of materials.  
Strongly recommended for all chemistry majors.

CHEM 409 W (odd years only) 2C 0.5  
Solid State Chemistry  
Packing in solids; metals, alloys and molecular crystals; ionic and covalent solids; chemical factors affecting crystal structures; properties of metals, semiconductors and molecular crystals.  
Prereq: CHEM 312 or 313

CHEM 411 F 2C 0.5  
Organometallic Chemistry  
Prereq: CHEM 312

CHEM 417 W (odd years only) 2C 0.5  
Inorganic Cage Compounds  
The synthesis, structure and reactions of selected groups of important cage compounds such as metal clusters, metalloboranes, boranes, and carbonanes will be considered. The emphasis is on current literature. The course is available on a special self-study basis or by regular lectures.  
Prereq: CHEM 312 or 313

CHEM 419 W 2C 0.5  
Biological Aspects of Inorganic Chemistry  
Metalloproteins and other metal-containing biological molecules in hydrolytic enzymes; redox reactions; nitrogen fixation and oxygen transport; the role of alkalai and alkaline earth metal cations.  
Prereq: CHEM 312 or 316

CHEM 420 W 2C 0.5  
Analytical Chemistry  
Selected topics in modern analysis of inorganic materials such as rocks, ores, ceramics, metals and alloys; atomic flame spectroscopic methods, analytical X-ray techniques, methods for ultrapure materials, trace and micro determinations.  
Prereq: CHEM 221 or permission of instructor

CHEM 421 W 2C 0.5  
Mass Spectrometry  
Principles involved in the use of electric and magnetic fields for mass analysis. Ionization methods. Applications of mass spectrometric analysis to the identification and quantitation of chemical compounds.  
Prereq: CHEM 264, or permission of instructor

CHEM 422 F 2C 0.5  
Thermal and Electrical Analytical Methods  
Techniques and fundamental principles of thermal and electroanalytical methods.  
Prereq: CHEM 221 or permission of instructor

CHEM 425A-Z F.W,S 2C 0.5  
Special Topics in Analytical Chemistry

CHEM 432 F 2C 0.5  
Metabolism 2  
Prereq: CHEM 333  
Coreq: CHEM 332

CHEM 433 W 2C 0.5  
Advanced Biochemistry  
Prereq: CHEM 333

CHEM 434 W 2C 0.5  
Special Topics in Biochemistry  
Special topics in biochemistry with applications. Areas covered in recent years include biochemistry of methane-producing bacteria; mechanism of action of antibiotics, antiviral agents and vitamins.  
Prereq: CHEM 333

CHEM 435 F 2C 0.5  
Bioorganic Mechanisms  
Modern techniques of biosynthetic studies. Enzyme reaction mechanisms.  
Prereq: CHEM 237 and one of 368, 366

CHEM 452 F 2C 0.5  
Colloids, Liquid Crystals and Bilayer Chemistry  
The colloidal size range, the importance of the interface, classical studies on Brownian motion, light scattering, the micelle formation of detergents in water and solubilisation. Phase diagrams of soaps and lipids and their study by X-ray diffraction and NMR. The biological membrane as an entity of colloidal size. The related spectroscopy, microscopy, etc. of lyotropic liquid crystals and bilayers.  
Prereq: CHEM 354

CHEM 453 W 2C 0.5  
Polymer Properties and Polymerization  
Copolymerization, ionic and coordinate polymerizations, introduction to polymer reaction engineering, mechanical properties of polymers, polymer mixtures.  
Prereq: CHEM 353 or equivalent  
Antireq: CH E 542
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<tr>
<th>Course Code</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CHEM 454</td>
<td>2 C</td>
<td>Surface Chemistry</td>
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<td>CHEM 455</td>
<td>3 C</td>
<td>Electrochemistry</td>
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<tr>
<td>CHEM 456</td>
<td>2 C</td>
<td>Catalysis</td>
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<tr>
<td>CHEM 457</td>
<td>1 C, 6 L</td>
<td>Experimental Aspects of Polymer Science</td>
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<tr>
<td>CHEM 458</td>
<td>2 C</td>
<td>Advanced Quantum Mechanics</td>
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<tr>
<td>CHEM 464</td>
<td>2 C</td>
<td>Spectroscopy in Organic Chemistry</td>
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<tr>
<td>CHEM 465</td>
<td>2 C</td>
<td>Special Topics in Organic Chemistry</td>
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**CHEM 492A** F 9L 0.75
**Advanced Laboratory**
Laboratory work on a senior year research project. See CHEM 492 co-ordinator for descriptive booklet and details.

For Honours students only

**CHEM 492R** W 9L 0.75
A continuation of CHEM 492.

No credit or grade is given for the first term course unless the two term sequence, CHEM 492A/B, is completed.

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<th>Course Code</th>
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<td>CHEM 456A-E</td>
<td>0.5</td>
<td>Independent Study in the Defined Field of Study</td>
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A - Analytical Chemistry
B - Biochemistry
C - Inorganic Chemistry
D - Organic Chemistry
E - Physical Chemistry

Open to students in the Honours Chemistry (Thesis Option) program only.

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**Department of Civil Engineering**

**Professor, Chairman of the Department**
R.C. Haas, BSc, MSc (Alberta), PhD (Waterloo), PEng

**Professor, Dean of the Faculty of Engineering**
W.C. Lennox, BASc, MSc (Waterloo), PhD (Lehigh), PEng

**Professor, Associate Chairman Graduate Studies**
J.F. Sykes, BASc, MSc, PhD (Waterloo), PEng

**Associate Professor, Associate Chairman, Undergraduate Studies**
B. LeLievre, BEng (West Australia), MSc, PhD (Waterloo), PEng

**Professor Emeritus**
J.T. Pindera, MSc (Warsaw and Lodz), PhD (Polish Acad. Sc. Warsaw), DSc (Cracow), PEng

**Professors**
S.T. Ariaratnam, BSc (Eng) (Ceylon), MSc (London), PhD (Cambridge)
E.F.P. Burnett, BSc (Cape Town), DIC, MS, PhD (London), PEng
M.Z. Cohn, Csc (Bucharest), PEng
M.B. Dusseault,5 BSc, MSc, PhD (Alberta), PEng
G.J. Farquhar,6 BASc (Waterloo), PhD (Wisconsin), PEng, Recipient of the Distinguished Teacher Award
G.M.L. Gladwell,7 BSc, PhD, DSc (London)
R. Green, BSc (Eng) (London), MSc (Queen’s), MSc (Waterloo), PhD (Texas), PEng
D.E. Grierson, BASc, MSc, PhD (Waterloo), PEng
V K Handa, BSc (Calcutta), BSc (Eng) (London), MSc (Queen’s), MSc, PhD (Waterloo), PEng
B.G. Hutchinson, BE (Sydney), MSc (Queen’s), PhD (Waterloo), PEng
N.C. Lind, MSc (Technical University of Denmark), PhD (Illinois), PEng, FRSC
E.L. Matyas, BASc (Toronto), DIC, PhD (London), PEng
E.A. McBean, BASc (British Columbia), SM, PhD (MIT), PEng
W.A. McLaughlin, BSc (Saskatchewan), MSc, PhD (Purdue) PEng
G.M. McNeil, BASc (Waterloo), PhD (London), PEng
T. Prasad, BSc, MSc (Banaras Hindu), PhD (Cambridge)

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**Chemistry**

**Civil Engineering**
Course Descriptions

Civil Engineering

CIV E 126 W,S 2C,4L/T 0.5
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.

CIV E 203 F,W 2C,2T 0.5
Statics
Equilibrium of rigid and deformable bodies. Analysis of internal forces in structures: beams, cables, arches, trusses.

CIV E 204 F,W 3C,1T 0.5
Mechanics of Solids 1

CIV E 205 F,S 3C,1T 0.5
Mechanics of Solids 2
Flexure, Strain Energy, Yielding and Buckling, Impact, Virtual Work, Influence Lines.

CIV E 221 F,W 3C,1T 0.5
Calculus 2

CIV E 222 F,S 3C,1T 0.5
Differential Equations

CIV E 223A F,W 1C,3T 0.25
Computer Workshop A
An introduction to Microcomputers, Spreadsheets, Word Processors and the BASIC language. Workshop includes applications selected from Year Two Civil Engineering courses. Five weeks only.

CIV E 223B S,F 1C,3T 0.25
Computer Workshop B
An introduction to the use of Microcomputers, Spreadsheets, Word Processors; Application to problems in Civil Engineering. Five weeks only.

CIV E 224 F,W 2C,2T 0.5
Probability and Statistics

CIV E 253 F,S 2C,2T 0.5
Geology for Engineers
A study of earth processes and earth materials from an engineering point of view. Topics include: mineral and rock identification, the rock cycle, structural geology, geology of Canada, effects of water, ice and wind. Description of aggregates used in engineering works.

CIV E 265 F,W 3C,1T,3L 0.5
Structure and Properties of Materials

CIV E 280 S,F 4C,2T,2L 0.75
Fluid Mechanics and Thermal Sciences
An introduction to fluid mechanics and thermal sciences. Fluid properties, fluid statics; thermodynamic principles; Bernoulli equation; the momentum equation and applications: laminar and turbulent flow; closed conduit flow; pipe network analysis; dimensional analyses and similitude; steady flow in pipes; heat transfer. 4 lab sessions.
CIV E 291 F 1 wk fld lab 0.5
Survey Camp
A one-week course in surveying. Introduction to surveying, length measurements, levelling, transit surveys.
Approximate cost to each student: $175 (if paid by June 30th, 1989 - $150).

CIV E 292 F,W 2C,2T 0.5
Engineering Economics
An introductory course on the principles of engineering economy. Basic concepts; capital; interest formulas and derivations; annual worth comparisons; present worth; return on investment; benefit-cost ratio depreciation effect of taxes.

CIV E 298 F,W 2S 0.0
CIV E 299 S,F 2S 0.0
Seminar
The engineer in society. Principles, methods and practice of Civil Engineering. Informal lectures.

CIV E 300 W,S 2C,2T 0.5
Civil Engineering Project 1
The development of problem-solving skills utilizing the systems approach to the solution of civil engineering problems. Knowledge from previous courses and the practical application of the digital computer are integrated in a team/project-oriented environment. A written report and a verbal presentation are requirements.

CIV E 303 W,S 3C,1T 0.5
Structural Analysis 1

CIV E 306 F,W 3C,1T 0.5
Mechanics of Solids 3

CIV E 313 F,W 3C,1T 0.5
Structural Concrete Design 1
Reinforced Concrete Members. Concrete and reinforcing steel materials. Safety, loads, design criteria. Flexure, shear, combined bending and axial force. Serviceability. One-way slabs, beams, columns, foundations and retaining walls.
Prereq: CIV E 303

CIV E 342 W,S 3C,1T 0.5
Transport Principles and Applications
Introduction to basic principles and procedures of transport planning and engineering, as applied to Canadian intercity transport problems.

CIV E 343 F 3C,1T 0.5
Traffic Engineering
Theories of road capacity; Capacity and quality of service on rural and urban roads. Traffic signals: capacity, delay, allocation and optimization of phase times. Control of combinations and networks of signals. Application of assignment in traffic models.

CIV E 344 F 3C,1T 0.5
Urban Transport Planning
The course develops a number of standard methods for predicting travel in urban areas. General characteristics of urban travel and urban transport systems are presented along with a dicussion of typical issues pertaining to urban areas. Methods used to evaluate alternatives and resolve issues are presented. These include trip generation, trip distribution and mode split.

CIV E 353 W,S 3C,1T,2L 0.5
Geotechnical Engineering 1
An introduction to geologic processes; subsurface exploration; classification systems; weight-volume relationships; soil mechanics principles including state of stress, ground water flow, consolidation and shear strength.
Six lab sessions.

CIV E 354 F,W 3C,1T 0.5
Geotechnical Engineering 2
Foundation engineering; earth pressure theories; retaining walls; anchors; shallow and deep foundations; braced trenches and excavations; slope stability.
Prereq: CIV E 353

CIV E 375 W,S 3C,1T,2L 0.5
Water Quality Engineering
Six lab sessions.

CIV E 381 F,W 3C,1T 0.5
Hydraulics
Open channel flow; flood routing; dams; spillways; gates and culverts; pumps and turbines; flood mapping; urban drainage.

CIV E 398 W,S 2S 0.0
CIV E 399 F,W 2S 0.0
Seminar
The engineer in society. Principles, methods and practice of Civil Engineering. Informal lectures.

CIV E 400 F,S 1C,3T 0.5
Civil Engineering Project 2
The purpose is to provide the students with an opportunity to demonstrate their capacity to engage in the practice of civil engineering as a profession. The students are encouraged to independently identify and resolve a problem within the scope of their chosen area of specialization utilizing knowledge gained from their academic and employment experiences. A written report and a verbal presentation are requirements.

CIV E 401 W 4T 0.5
Civil Engineering Project 3
An independent or team project dealing with engineering design or research, under the direction and with the consent of a faculty member.

CIV E 403 F,S 3C,1T 0.5
Structural Analysis 2
Advanced structural analysis of planar and space frameworks, linear and nonlinear behaviour. Computer Applications.
Prereq: CIV E 303

CIV E 404 W 2C,2T 0.5
Structural Analysis 3
Approximate methods of analysis for a variety of structural forms. Application of approximate techniques to beams, building frames, shear wall structures, plates, buckling and vibration problems. Approximate structural design.
Prereq: CIV E 313, 413

CIV E 405 W 3C,1T 0.5
Structural Dynamics

CIV E 407 W 2C,2T 0.5
Building Science and Technology
The building process; loadings: gravity, wind, thermal, moisture, fire; enclosure design: walls, windows, roof; subgrade construction; energy related considerations.
Prereq: CIV E 313, 413, 414 or consent of instructor
CIV E 413  F,S  3C,1T  0.5
Structural Steel Design
Prereq: CIV E 303

CIV E 414  S,F  3C,1T  0.5
Structural Concrete Design 2
Prereq: CIV E 313

CIV E 415  W  2C,2T  0.5
Structural Systems.
Geometries, loads, safety and serviceability, structural idealizations. Building design and bridge design. Proportioning of components and structures in concrete, steel, masonry and wood.
Prereq: CIV E 313, 413, 414

CIV E 422  W  2C,2T  0.5
Finite Element Analysis
Introduction to the Finite Element Methods in field problems. Applications to the theory using available computer programs.

CIV E 430  W  2C,2L  0.5
Experimental Mechanics

CIV E 440  W  3C,1T  0.5
Transport Systems Analysis
Introduction to basic concepts of transport systems analysis: systems analysis framework, accounting methods, experimental design techniques, decision theory, basic approaches to simulation modelling. The emphasis is on development of methods of analysis, for application to selected case studies in the transport sector.
Prereq: CIV E 342

CIV E 442  W  3C,1L  0.5
Pavement Structural Design
Pavement design, soil identification, subgrade design, base courses, flexible pavement design, design and testing of asphaltic concrete mixes, surface treatments.
Prereq: CIV E 353

CIV E 454  W  2C,2T  0.5
Geotechnical Engineering 3
Simulation of geotechnical consulting practice. Students are required to complete several projects, based on actual case studies, which require problem identification, evaluation of geotechnical data, analysis, design and report preparations.
Prereq: CIV E 353, 354

CIV E 460  F  3C,2T  0.5
Orthopaedic Bioengineering
Introduction of engineering technology to the field of orthopaedics. Specific topics deal with the repair and reconstruction of portions of the musculoskeletal system affected by trauma or pathological response. Primary study is directed toward the skeletal joints and major load carrying structures. Students must have had background study in properties and mechanics of materials equivalent to CIV E 204 and CIV E 265. Registration in this course will be assessed on an individual basis through scheduled interviews.
Cross-listed as GEN E 460

CIV E 472  F,S  3C,1T  0.5
Wastewater Treatment
Introduction to Wastewater treatment. Wastewater quantity; Wastewater characteristics; Primary treatment; Secondary treatment; Sludge treatment and disposal; Industrial wastewater management. Design project.
Prereq: CIV E 375

CIV E 473  W  2C,2T  0.5
Contaminant Transport
Prereq: CIV E 375

CIV E 480  W  2C,2T  0.5
Water Resources Management
A course on water resource management problems in Canada. Description of basic areas of water resource management. Application of systems analysis and operations research techniques management. Benefit-cost analysis. Social, political, legal and ecological considerations.
Coreq: CIV E 381

CIV E 483  W  2C,2T  0.5
Design of Urban Water Systems
Design of water supply and distribution systems. Design of sanitary sewer and storm water management systems. Concepts of urban infrastructure renewal. The course consists of 24 hours of lectures and a design project. The emphasis is on computer aided design, using commonly used water resources engineering software packages and computer graphics.
Prereq: CIV E 375, 381 and 486

CIV E 486  S,F  3C,1T  0.5
Hydrology
Basic hydraulic principles; elementary hydrologic design; principles of reservoir design; mathematical modelling of hydrologic budget; data networks; design events; urban hydrology.

CIV E 491  W  3C  0.5
Engineering Law
Restricted to 4B Civil and Geological Engineering students

CIV E 493  W  2C,2T  0.5
Engineering in the Canadian North
Terrain features and permafrost; thermal deformation characteristics of frozen and unfrozen soils; thaw of permafrost and settlement; ice and snow construction; buildings and foundation design; water wastewater and waste disposal; ice motion; policy issues; transportation in the North.

CIV E 496  W  2C,2T  0.5
Construction Engineering
Introduction to project/construction management - network methods, critical path, crashing, resource allocation and levelling. Earth moving and heavy construction; Building construction methods; Contract construction.

CIV E 498  S,F  2S  0.0
CIV E 499  W  2S  0.0
Seminar
The engineer in society. Principles, methods and practice of Civil Engineering. Informal lectures.
Department of Classical Studies

Associate Professor, Chairman of the Department
R.L. Fowler,2 BA, MA (Toronto), DPhil (Oxford)

Assistant Professor and Undergraduate Officer
L.L. Neuru,2 BA (San Francisco), MA (Oregon), PhD (McMaster)

Assistant Professors
L.A. Curchin,2 BA (Western Ontario), MA (Toronto), MA (Carleton), PhD (Ottawa)
S.B.P. Haag, BA, MA (Queen's), MA (Waterloo), MPhil (Toronto)
R.L. Porter, BA (McMaster), MA, PhD (Princeton)

Lecturer
S.L. Ager, BA, MA (Queen's)

Participating Faculty in Classics at Wilfrid Laurier University
D. Emanuele, BA, MA (British Columbia), PhD (Texas, Austin)
H.A. MacLean, BA (McMaster), MA, PhD (Wisconsin)
G.P. Schaus, BA, MA (Dalhousie), PhD (Pennsylvania)
C.J. Simpson, BA, MPhil (Nottingham), PhD (Alberta)
J. Zeyl, BA, MA (Toronto), PhD (McMaster)

Faculty Member of Classical Studies holding cross appointment to:
1) Fine Arts
2) History

Course Descriptions

CLASSICAL STUDIES

(Courses in Translation)

Introductory Notes
1. Students should consult with the departmental Undergraduate Advisor for the latest information on course offerings. Some courses are offered in rotation.

2. CLAS courses were formerly designated C CIV.

CLAS 100 F,W 3C 0.5
An Introduction to Classical Studies

An introduction to Greek and Roman civilization, focusing on six key aspects of the discipline of classical studies: history, literature, philosophy, myth and religion, art and architecture, and classical archaeology.

CLAS 101 F 3C 0.5
Ancient Greek Society

A survey of the civilization of ancient Greece through some of its most prominent figures. Each year two of the following will be featured: Homer and Horatio Greeke; Ptolemy and the Rise of Democracy; Socrates, Man and Martyr; Alexander the Great and The Age of Expansion.

CLAS 102 W 3C 0.5
Ancient Rome

An introductory study of the civilization 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 Corruptio of Power; Hadrian and the Imperial Machine.

CLAS 103 F,W 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.

CLAS 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.

Students are advised to preregister early for this course as enrolment is limited.

CLAS 202 S,F,W 3C 0.5
Ancient Roman Society

A survey of the civilization of the Roman Republic and Empire, featuring such topics as the individual (male and female), political institutions, art, religion, philosophy, literature, social life and leisure activities.

Students are advised to preregister early for this course as enrolment is limited.

CLAS 251 S,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.

CLAS 252 W 3C 0.5
Roman History

A military, political, social and economic survey of Rome from earliest times to the Empire's fall.

This course is acceptable for credit by the History Department.

CLAS 255 3C 0.5
Medieval Civilization 1

A study of medieval literature, art, architecture, music and other expressive forms. The period from late antiquity to A.D. 1200 will be studied.

CLAS 256 3C 0.5
Medieval Civilization 2

A study of medieval literature, art, architecture, music and other expressive forms. The period from A.D. 1200 to the Renaissance will be studied.

CLAS 265 F 2S 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 Vergil. The evolution of the epic genre is traced in lectures and discussions. No knowledge of Greek or Latin is needed.

CLAS 266 3C 0.5
Ancient Tragedy in Translation

This course focuses upon the dramatic literature of the classical age in Athens. It features the Orestea of Aeschylus, the "Oedipus" plays of Sophocles, and the Medea, Hippolytus and Bacchae of Euripides. Roman tragedy is also studied for comparative purposes through the plays of Seneca. No knowledge of Greek or Latin is needed.

Cross-listed as DRAMA 251
CLAS 292 3C 0.5  
**Modern issues in the Ancient World**
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, minority groups and racial prejudice, war and conflict.  
Prereq: CLAS 201 or 202 or instructor's permission

CLAS 301 F,W 3C 0.5  
**Ancient Myth and Religion 1**
A study of Greek and Roman myth, including the birth of the gods, creation, the Olympians, Prometheus and the fall, the flood, the ages of man, and the Greek mystery religions.

CLAS 302 W 3C 0.5  
**Ancient Myth and Religion 2**
A study of Greek and Roman legend, including the cycles of Troy, Mycenae, Thebes; the Argonauts, the heroes, Odysseus; and the oriental mystery religions (with their relation to Christianity).

CLAS 351 W 3C 0.5  
**Greek Art and Architecture**
A survey of the art and architecture of the ancient Greek world from the Minoan to the Hellenistic periods.  
*Cross-listed as FINE 310*

CLAS 352 3C 0.5  
**Roman Art and Architecture**
A survey of the art and architecture of the Roman world from Etruscan to Imperial Times.  
*Cross-listed as FINE 311*

CLAS 361 F 3C 0.5  
**History of Ancient Philosophy 1**
From the beginnings to Plato.  
*Cross-listed as PHIL 380*

CLAS 362 W 3C 0.5  
**History of Ancient Philosophy 2**
From Aristotle to the close of classical antiquity.  
*Cross-listed as PHIL 381*

CLAS 365 W 3C 0.5  
**Ancient Comedy in Translation**
The comedy of the ancient Greeks and Romans will be examined through selected plays of Aristophanes, Menander, Plautus and Terence. The different types of comedy, and their evolution, will be studied in lectures and discussions. No knowledge of Greek or Latin is needed.  
Prereq: CLAS 266 or instructor's permission  
*Cross-listed as DRAMA 358*

CLAS 366 2S 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: CLAS 265 or 266 or an appropriate course in literature, or instructor's permission

CLAS 371 3C 0.5  
**Christianity and the Roman Empire**
This course examines the relationship between Christianity and the Roman Empire, dealing in particular with the Christians in the social context of the Roman Empire generally and its various regions.

CLAS 373 3C 0.5  
**The Fall of the Roman Empire**
This course deals with the transition of the Roman Empire into the beginnings of the European states in the West and the Byzantine Empire in the East. Popular theories for the "decline and fall" of the old Roman Empire are examined.  
Prereq: CLAS 202, 252 or instructor's permission

CLAS 384 F 3C 0.5  
**Science and Technology of Ancient Greece and Rome**
A study of scientific thought and achievements in such areas as astronomy, biology, anatomy and medicine, and of the technological skills which produced and distributed raw materials, manufactured goods and agricultural products.  
Prereq: First year science or engineering course, or CLAS 201 or 202 or 251 or 252 or instructor's permission

CLAS 402 3C 0.5  
**The Aegean in the Bronze Age**
A senior course concentrating on the Cycladic, Minoan and Mycenaean civilizations of the Bronze Age.  
Prereq: CLAS 201, 251, 351 or instructor's permission

CLAS 485 F 2C 0.5  
**Greco-Roman Civilization and History 1**
Senior seminar; intensive study of various problems.  
Prereq: Previous work in ancient history or instructor's permission  
This course is acceptable for credit by the History Department (but not as a senior seminar).

CLAS 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).

490A/B F,W 0.5/0.5  
**Senior Honours Thesis**
All senior honors students should consult with the Undergraduate Advisor about writing a thesis or doing Directed Study. For further details see Classical Studies programs (Chapter 8).

A letter grade for CLAS 490A will be submitted only after the completion of CLAS 490B.

CLAS 492-498  
**Senior Seminars**
By arrangement with the Department, an individual student or a small group of students will follow a course of study under the supervision of a faculty member.

**GREEK**

**Introductory Note**
Students should consult with the departmental Undergraduate Advisor for the latest information on course offerings. Some course are offered in rotation.

GRK 100A F 4C 0.5  
**Introductory Ancient Greek 1**
A course designed for students beginning the study of ancient Greek or who have not yet reached the level expected in GRK 231/232. The teaching approach emphasizes exposure to simple texts as soon as possible, but students desiring minimal competence in reading should go on to do GRK 100B.  
GRK 100A and RS 106A may not both be taken for credit.

GRK 100B W 4C 0.5  
**Introductory Ancient Greek 2**
Continuation of GRK 100A. Most of the rules of Greek grammar will be covered by the end of the year, and students should have a minimal competence in reading prose texts; but for the remaining grammar and further practice students should go on to do GRK 231.  
Prereq: GRK 100A or RS 106A
Course Descriptions
Classical Studies

GRK 231 F 3C 0.5
Intermediate Greek
The course will complete the study of Greek grammar and begin more extensive reading in Greek authors (normally Homer and Herodotus).
Prereq: GRK 100B, OAC or Grade 13 Greek or instructor's permission

GRK 232 W 3C 0.5
Selections from Greek Authors
A literature course designed to follow GRK 231. Authors normally read are Euripides, Thucydides and Plato.
Prereq: GRK 100B, OAC or Grade 13 Greek or instructor's permission

GRK 262 3C 0.5
Introduction to Plato
Selections from Plato.
Prereq: GRK 100B, OAC or Grade 13 Greek or instructor's permission

GRK 271 3C 0.5
Hellenistic and Later Greek Literature
Selections from Christian and pagan writers.
Prereq: GRK 100, Grade 13 or OAC Greek or instructor's permission

GRK 301 3C 0.5
Advanced Greek Reading
A reading course designed to follow GRK 232 or GRK 262. By the end of the course students should be competent to read moderately difficult prose and poetic texts. Authors and teaching techniques will be chosen to fit the needs of the students.
Prereq: One full 200-level course in GRK or instructor's permission

GRK 351 2C 0.5
Advanced Composition and Grammar
Intensive study of Greek language and style through composition and translation.
Prereq: GRK 251, or consent of instructor

GRK 361 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 3C 0.5
Introduction to the Greek Historians
Selections from Xenophon and others.
Prereq: One full 200-level Greek course or instructor's permission

GRK 372 3C 0.5
Herodotus
Selections from the Persian Wars.
Prereq: One full 200-level Greek course or instructor's permission

GRK 452 3C 0.5
Homer
Extended reading of Homer.

LAT 100A F 4C 0.5
Introductory Latin 1
A course designed for students beginning the study of Latin or who have not yet reached the level expected in LAT 203/204. Although the teaching approach emphasizes exposure to simple texts as soon as possible, students desiring basic competence in reading should go on to do LAT 100B.
Students are advised to preregister early for this course as enrollment is limited.

LAT 100B W 4C 0.5
Introductory Latin 2
Continuation of LAT 100A. The aim is to attain basic reading competence in prose.
Prereq: LAT 100A

LAT 203 F 3C 0.5
A Survey of Latin Literature 1
A general survey of Latin prose and poetry from its origins to the beginning of the Roman Empire. The literary achievement of Rome will be examined mainly through selections in Latin with occasional readings in translation.
Prereq: OAC or Grade 13 Latin, LAT 100B or instructor's permission

LAT 204 W 3C 0.5
A Survey of Latin Literature 2
A general survey of Latin prose and poetry from the beginning to the fall of the Roman Empire; a continuation of LAT 203.
Prereq: LAT 203 or instructor's permission

LAT 261 3C 0.5
Latin Prose 1
Selections from the Letters of Cicero and Pliny.

LAT 262 3C 0.5
Latin Prose 2
Selections from Livy and Suetonius.

LAT 272 3C 0.5
An Introduction to Vergil
Selections from the Works of Vergil.
Prereq: OAC or Grade 13 Latin, LAT 100B or instructor's permission.
LAT 281 3C 0.5  
Latin Poetry 1  
Selections from the lyric poems of Catullus and Horace.

LAT 282 3C 0.5  
Latin Poetry 2  
Selections from Ovid and Martial.

LAT 301 3C 0.5  
Advanced Latin Reading  
A reading course designed to follow the second year of Latin. By the end of the course students should be competent to read moderately difficult prose and poetic texts. Authors and teaching techniques will be chosen to fit the needs of the students.  
Prereq: One full 200-level course in LAT or instructor's permission

LAT 351 3C 0.5  
Latin Composition and Grammar  
Composition, translation and grammar with intensive analysis of selected passages.

LAT 352 3C 0.5  
The History of the Latin Language  
A study of the history and development of the Latin language from its origins to its evolution into the Romance languages.

LAT 361 3C 0.5  
Cicero  
The life and works of Cicero, his historical importance and his contribution to Latin literature. Selections from various works.  
Prereq: One full 200-level course in LAT or instructor's permission

LAT 362 3C 0.5  
Lucretius  
Selections from the De Rerum Natura.  
Prereq: Grade 13 or OAC Latin, LAT 100B, or instructor's permission

LAT 363 3C 0.5  
Roman Comedy  
The study in Latin of at least one play by Plautus or Terence, with supplementary readings in translation.  
Prereq: One full 200-level course in LAT or instructor's permission

LAT 371 F 3C 0.5  
Introduction to the Roman Historians  
Selections from Sallust and Livy; a study of the development of Roman historiography.  
Prereq: One full 200-level course in LAT or instructor's permission

LAT 372 3C 0.5  
Tacitus  
Selections from the works of Tacitus.  
Prereq: One full 200-level Latin course or instructor's permission

LAT 381 3C 0.5  
Medieval Latin 1  
Selections from the works of the fourth to the 12th centuries A.D.  
Prereq: One full 200-level Latin course or instructor's permission

LAT 382 3C 0.5  
Medieval Latin 2  
Selections from works of the 12th century A.D. to the Renaissance.  
Prereq: One full 200-level Latin course or instructor's permission

LAT 421 W 2S 0.5  
Latin Epigraphy  
The course introduces and investigates Latin inscriptions as evidence for the Latin language and Roman political, religious, legal, social and economic history.  
Prereq: Senior standing in Latin

LAT 461 2S 0.5  
Vergil 1  
Selections from Aeneid 1-6.

LAT 462 2S 0.5  
Vergil 2  
Aeneid VII-XII (selections); readings from the Eclogues and Georgics.  
Prereq: LAT 461 or instructor's permission

LAT 471 3C 0.5  
Roman Elegy  
Selections from Catullus, Ovid, Propertius and Tibullus.

LAT 481 3C 0.5  
Roman Satire 1  
Selections from Horace and Persius.

LAT 482 3C 0.5  
Roman Satire 2  
Selections from Petronius, Martial and Juvenal.

LAT 491-494  
Senior Seminars  
By arrangement with the department, an individual student or a small group of students will follow a course of study under the supervision of a faculty member.  
Senior standing or instructor's permission is a prerequisite for any 400-level Latin course.

LAT 491 W 2S 0.5  
Augustan History  
The Res Gestae will be read, as well as selections from Suetonius and Tacitus.  
Offered 1989-90 at Wilfrid Laurier University

Dance Group

Assistant Professor, Chairman of Dance Group  
J. Officer, ARAD (Adv. and ATC), (London), Recipient of the Distinguished Teacher Award

Associate Professor, Undergraduate Officer  
R. Ryman, BA, MA (York), Al Chor (London)

Associate Professor  
R. Priddle, BPHE (Toronto), MSc (Springfield), MA (Waterloo), PhD (Waterloo)

Assistant Professor  
J.V. Chapman, BA, MA (York), PhD (CNAA, England)

Lecturer  
L. Prada, BSc (Waterloo), ARAD (Adv. and ATC), (London)

Guest Artist  
S. Cash BFA (York)

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 Dance  
An examination of theatre dance and the various professional activities which contribute to its growth. Extensive viewing of films as well as lectures and workshop sessions. No dance background necessary.

DANCE 111 W 2C,2std 0.5  
The Elements of Dance  
An in-depth examination, practical and theoretical, of the formal and thematic components of dance. Studio sessions deal with problem solving in space, dynamics and rhythm. No dance background necessary.
DANCE 230 F 2C,1std. 0.5
Roots of Western Theatre Dance
History and cultural significance of dance up to and including Fokine and Duncan.

DANCE 232 S,F 3C 0.5
Survey of Ballet History
An examination of the development of ballet from the Renaissance to contemporary times, focusing on the nature of dance of the past and its changes within a cultural context. Major personalities, events and forms, as well as social influences are assessed for their impact on the art.

Not for Dance Majors
By correspondence only

DANCE 235 W 3C 0.5
History of 20th-Century Dance
The two major Western theatre dance forms are examined in their radically different but complementary evolutions as perceived through the work of significant choreographers.

Prereq: DANCE 230 or permission of instructor.

DANCE 241 F 3C,1 1/2 std 0.5
Benesh Notation 1
A theoretical and practical introduction to Benesh Movement Notation at the elementary level focusing on the reading of ballet syllabus work.

Coreq: Elementary ballet or permission of instructor

Offered alternate years

DANCE 264A F 2C IT
Developmental Aspects of Movement
A study integrating the theoretical and applied aspects of motor and perceptual motor development in children and adolescents. Tutorials will emphasize children in sport.

Antireq: DANCE 264A and 264B
Cross-listed as KIN 264C

DANCE 334 F,Shrswk 0.5
Women in Western Theatre Dance
The achievements of women in dance will be viewed in the context of the woman's place in artistic and social hierarchies, as well as in the light of the disadvantages and advantages experienced due to being female. Autobiographies, biographies, films, videos and historical accounts will be consulted.

Offered alternate years

DANCE 336 W 3C 0.5
Dance Criticism
This course offers students a chance to enhance their abilities to write and talk about the dance experience. Examples of dance criticism from the past two centuries are used in tandem with films, videos and slides to sharpen perceptions.

DANCE 341 W 3C 0.5
Benesh Notation 2
A theoretical and practical study of Benesh Movement Notation focusing on the reading and recording of ballet variations.

Prereq: DANCE 241
Coreq: Elementary Ballet or permission of instructor

Offered alternate years

DANCE 353 W 2C,2std 0.5
Modern Dance Composition
This course explores major forms and theories of modern dance choreography through studio practice and seminars.

Coreq: Intermediate Modern Dance or permission of instructor

Offered alternate years

DANCE 410/411 F/W 0.5/0.5
Honours Dance Major Paper
Students will examine dance research from different approaches including experimental, descriptive, historical and philosophical.

Prereq: Honours Dance students only

Students must consult with a faculty advisor before registering in one of the following:

DANCE 410B and DANCE 411B Skill Learning
Prereq: DANCE 264, 366, 367, KIN 255, 330

DANCE 410D and DANCE 411D Dance Notation
Prereq: DANCE 241, 341 and 482 or 474 (Benesh) or DANCE 242, 342 and 482 or 474 (Labanotation)

DANCE 410E and DANCE 411E Dance History
Prereq: DANCE 220, 225 or equivalent, 333, 334 or 343

DANCE 410F and DANCE 411F Developmental Studies with Children in Dance
Prereq: DANCE 264, 366, 367, 484
Recommend auditing KIN 330 and PSYCH 211

DANCE 412 W 3C 0.5
Seminar in Dance
An examination of current and major issues in dance.

Prereq: Honours Dance students only

DANCE 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: Permission of instructor

DANCE 480 F,W wkshp 0.5
Workshop Series
The following courses are designed to give the student an opportunity to take theoretical knowledge to the applied setting. Offerings each year are determined by student interests. Topics available include:
DANCE 480 Historical Dance
Prereq: DANCE 235 or equivalent
DANCE 481 Ballet Choreography
Prereq: DANCE 351 and Elementary Ballet
Coreq: Intermediate Ballet
DANCE 482 Dance Notation Reconstruction
Prereq: DANCE 341 or 342
DANCE 483 Modern Dance Composition
Prereq: DANCE 353 and Intermediate Modern Dance
Coreq: Advanced Modern Dance
DANCE 484 Developmental Perspectives of Creative Movement with Children
Prereq: DANCE 264 and 242 or permission of instructor
DANCE 486 Dance Criticism
Prereq: DANCE 336, 235 or equivalent, 333
DANCE 488 Dance Production
Prereq: DANCE 351 or 353

The Workshop series is open only to third- and fourth-year Dance students. Two workshops in the 480 series may be taken toward the Honours degree. Workshops are offered pending sufficient enrolment.

Technique Courses
Entrance to Technique Courses is by audition only. Students are placed according to their year of enrolment, and their level of technique. Sections are as follows:
- A Advanced
- B Intermediate
- C Elementary
- D Pre-Elementary

For example, DANCE 301A is Year Three Advanced Ballet I. Auditions are held in May and September. Consult the Dance Department for time and location. Remedial non-credit classes are available for students who do not pass the audition for admission to credit courses.

Students are advised to check with their home department regarding the acceptability of Technique Courses for credit. Each of the following courses consists of two 1 1/2 hour classes per week.

**Credit 0.00**
DANCE 001 Introductory Ballet I F
DANCE 002 Introductory Ballet II W

DANCE 003 Introductory Modern Dance I F
DANCE 004 Introductory Modern Dance II W

**Credit 0.25**
DANCE 101A,B,C,D Year One Ballet I F
DANCE 102A,B,C,D Year One Ballet II W
DANCE 103A,B,C,D Year One Modern Dance I F
DANCE 104A,B,C,D Year One Modern Dance II W
DANCE 201A,B,C,D Year Two Ballet I F
DANCE 202A,B,C,D, Year Two Ballet II W
DANCE 203A,B,C,D Year Two Modern Dance I F
DANCE 204A,B,C,D Year Two Modern Dance II W
DANCE 301A,B,C Year Three Ballet I F
DANCE 302A,B,C Year Three Ballet II W
DANCE 303A,B,C Year Three Modern Dance I F
DANCE 304A,B,C Year Three Modern Dance II W
DANCE 401A,B Year Four Ballet I F
DANCE 402A,B Year Four Ballet II W
DANCE 403A,B Year Four Modern Dance I F
DANCE 404A,B Year Four Modern Dance II W

**COURSES NOT OFFERED 1989-90**
DANCE 200 Special Studies in Dance I
DANCE 220 Socio-Cultural Study of Western Dance
DANCE 221 Socio-Cultural Study of Non-Western Dance
DANCE 225 Dance Ethnology
DANCE 242 Labanotation I
DANCE 300 Special Studies in Dance II
DANCE 325 Festivals: Mediators in Multiculturalism

**Course Descriptions**

Courses not offered in the current academic year are listed at the end of this section.

**Introductory Note**
Laboratory sessions and rehearsal periods may be added to any course at the discretion of the instructor.

DRAMA 101A F 3C 0.5
**Introduction to the Theatre 1**
Introductory study of the theatre as a major art form. Selected plays as produced in their historical contexts. Contributions of the actor, designer and technician to theatre production.

DRAMA 101B W 3C 0.5
**Introduction to the Theatre 2**
An extension of the studies described in 101A.
An introduction to acting. The class will be structured as a rehearsal, where the students will explore improvisation and text work, concentrating on the practical problems of an actor's experiences in creating a role.

**Coreq:** DRAMA 101A or B

**Limited Enrollment. Permission required.**

**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 101A or 101B, 102 and permission of the instructor

**Limited enrollment.**

**DRAMA 222 W 6L 0.5**

**Intermediate Acting 2**

An extension of Drama 221.

**Prereq:** DRAMA 221 and permission of the instructor

**DRAMA 223 F,W,S 4L 0.5**

**Speech Communication 1**

Theory and practice of public speaking. Course involves design and delivery of various kinds of speeches, and the development of organizational, vocal, listening and critical skills.

**Prereq:** None

**Open to students in all faculties but limited enrollment. Permission required.**

**DRAMA 224 F,W,S 4L 0.5**

**Speech Communication 2**

Complex Speech Situations. Principles and practice of formal and informal meetings, communication for group decision-making, interviewing and media relations.

**Prereq:** DRAMA 223

**DRAMA 243 F 2C,2L 0.5**

**Introduction to Technical Production 1**

Theory and practice of building, painting, rigging and shifting scenery; construction of properties; familiarity with lighting instruments, sound equipment and their control systems. Students must spend a certain number of hours working on department productions.

**Prereq:** Permission of the instructor

**DRAMA 244 W 2C,2L 0.5**

**Introduction to Technical Production 2**

An extension of the studies described in DRAMA 243.

**Prereq:** DRAMA 243

**DRAMA 251 F 3C 0.5**

**Survey of Dramatic Literature and Dramatic Theory 1**

The Greek and Roman periods. Cross-listed as CLAS 266

**DRAMA 252 3C 0.5**

**Survey of Dramatic Literature and Theory 2**

The Middle Ages, Elizabethans and Jacobines (excluding Shakespeare) and the Spanish Golden Age.

**DRAMA 253 3C 0.5**

**Survey of Dramatic Literature and Theory 3**

French neo-classicism, the Restoration period and sentimental drama.

**DRAMA 254 3C 0.5**

**Survey of Dramatic Literature and Theory 4**

The late 18th, 19th and early 20th centuries, romanticism and naturalism.

**DRAMA 255 3C 0.5**

**Survey of Dramatic Literature and Theory 5**

Dramatic literature of the 20th century.

**DRAMA 256 3C 0.5**

**Advanced Acting 1**

A workshop course consisting of the preparation of one or more detailed production books. Interpretation and analysis will be emphasized.

**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.

**DRAMA 302 W 3C 0.5**

**Script Interpretation 2**

An extension of the studies described above in 301.

**DRAMA 306 A/B/C F std 0.5**

**Special Studies in Theatre Production 1**

Production participation and the study of selected problems of theatrical production.

**Prereq:** Permission of the play director

**DRAMA 307 A/B/C W std 0.5**

**Special Studies in Theatre Production 2**

See Drama 306.

**Prereq:** Permission of the play director

**DRAMA 321 F 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, DRAMA 222, and permission of the instructor.

**Usually restricted to Drama majors.**

**DRAMA 322 W 6L 0.5**

**Advanced Acting 2**

An extension of the studies described in DRAMA 321.

**Prereq:** DRAMA 321 and permission of the instructor

**DRAMA 323 F,W,S 4L 0.5**

**Speech Writing**

The analysis, writing and performance of speeches. Analysis will focus on the theory of communication and speech models for imitation; writing, on in-class workshops; and performance, on videotaping and student evaluation of speeches.

**Prereq:** DRAMA 223 and 224

**Cross-listed as ENGL 309E**
DRAMA 326 F 4L 0.5
Voice and Non-verbal Communications 1
A workshop course in voice, designed to increase vocal power, range, flexibility and variety in presenting the spoken word, and to channel and expand the range of gestures, facial expression, and eye contact.

Prereq: DRAMA 326

DRAMA 327 W 4L 0.5
Voice and Non-Verbal Communication 2
An extension of the studies described in DRAMA 326.

Prereq: DRAMA 326

DRAMA 331 F 3LD 0.5
Design for the Theatre 1
An introduction to the problems of designing for the theatre. Work for the course will include the preparation of drawings and models as well as practical experience in the theatre.

Prereq: DRAMA 244 and permission of the instructor

DRAMA 332 W 3LD 0.5
Design for the Theatre 2
An extension of the studies described in DRAMA 331, concentrating on the practicalities of set design.

Prereq: DRAMA 331

DRAMA 341 F 4L 0.5
Lighting Design for the Theatre 1
An introduction to the theory and practice of theatre lighting design through studio experience.

Prereq: DRAMA 244 and permission of the instructor

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 and permission of the instructor

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 and permission of the instructor

DRAMA 344 W 2L,2C 0.5
Theatre Technology 2
A continuation of the studies described in DRAMA 343.

Prereq: DRAMA 343 and permission of the instructor

DRAMA 348 3C 0.5
Arts Administration 1
An introduction to the problems and techniques of arts administration. Topics include: budgeting, program selection, fund raising, publicity and audience analysis.

Prereq: Permission of the instructor

DRAMA 349 3C 0.5
Arts Administration 2
An extension of the studies in DRAMA 348.

Prereq: Permission of the instructor

DRAMA 351 3C 0.5
Canadian Drama
See ENGLISH 316.

Cross-listed as ENGL 316

DRAMA 352 3C 0.5
Russian Drama
Cross-listed as RUSS 341

DRAMA 353 3C 0.5
Russian Drama
Cross-listed as RUSS 342

DRAMA 355 3C 0.5
The Stage as Forum: German Drama in Translation
Cross-listed as GER 355

DRAMA 356 3C 0.5
The Stage as Forum: Russian Drama in Translation
Cross-listed as RUSS 356

DRAMA 358 3C 0.5
Ancient Comedy in Translation
Cross-listed as CLAS 365

DRAMA 361 F std 0.5
Advanced Directing 1
Work as an assistant director on a major production involving the writing of a production casebook.

Prereq: DRAMA 261 or 262, at least three dramatic literature classes and permission

DRAMA 362 W std 0.5
Advanced Directing 2
Students will be expected to form their own production company, mount a short play, and submit a detailed promptbook.

Prereq: DRAMA 361 and at least four dramatic literature classes

DRAMA 371 3C 0.5
Theatre History 1
Theatre History from Classical Greece to the Renaissance.

Prereq: Permission of the instructor

DRAMA 372 3C 0.5
Theatre History 2
Theatre history from the Classical French and English Restoration periods to the present era.

Prereq: Permission of the instructor

DRAMA 406 A/B/C F std 0.5
Theatre Workshop 1
Participation in stage production for advanced students.

Prereq: Permission of the play director and DRAMA 101A and B

DRAMA 407 A/B/C W std 0.5
Theatre Workshop 2
Participation in stage production for advanced students.

Prereq: Permission of play director and DRAMA 101A and B

DRAMA 409 W 3C 0.5
Theatre Criticism
Study and practice of the criticism of theatre production and performance.

This course will not normally be taken until the student's final year.

DRAMA 421 F 6L 0.5
Advanced Acting Workshop 1
An intensive workshop designed to develop performance skills. Special attention given to individual acting problems.

Prereq: DRAMA 321, 322, and permission of the instructor

DRAMA 422 W 6L 0.5
Advanced Acting Workshop 2
An extension of DRAMA 421.

Prereq: DRAMA 421 and permission of the instructor

DRAMA 490 A-E F wkshp 0.5
Selected Seminars In Drama and Theatre Arts
Seminars in special areas of drama and theatre.

Prereq: Permission of the Department

DRAMA 491 A-E W wkshp 0.5
Selected Seminars in Drama and Theatre Arts
Seminars in special areas of drama and theatre.

Prereq: Permission of the Department

DRAMA 499 A/B C 6F W T 0.5
Senior Seminar
Open only to drama honours students in their fourth year. It is designed to give the student an opportunity to complete a comprehensive presentation in his or her major area of concentration.

A letter grade for DRAMA 499A will be submitted only after the completion of DRAMA 499B.
COURSES NOT OFFERED 1989-90
Consult with Drama Undergraduate Officer to determine offerings for 1989-90.

Department of Earth Sciences

Associate Professor, Chairman of the Department
J.P. Greenhouse, BSc, MSc (British Columbia), PhD (Calgary, San Diego) Recipient of the Distinguished Teacher Award

Associate Professor, Associate Chairman of the Department
J.F. Barker, BSc, MSc (McMaster), PhD (Waterloo)

Associate Professor, Graduate Officer
D.E. Lawson, BSc, MSc (New Brunswick), PhD (Reading)

Associate Professor, Undergraduate Officer
E.C. Appleyard, BSc (Western Ontario), MSc (Queen’s), PhD (Cambridge)

Professors
J.A. Cherry, BE (Saskatchewan), MS (California, Berkeley), PhD (Illinois), PEng, FRSC
M.B. Dusseault, BSc, MSc, PhD (Alberta), PEng
R.N. Farvolden, MSc (Alberta), PhD (Illinois); Chair in Regional Hydrogeology, Waterloo Centre for Groundwater Research
E.O. Friind, BASc, MSc, PhD (Toronto), PEng
I.L. Gibson, BSc, PhD (Imperial College, London)
R.W. Gillham, BSA (Toronto), MSc (Guelph), PhD (Illinois)
M. Dusseault, BSc (Queen’s), PhD (Illinois)
J.F. Karrow, BSc (Queen’s), PhD (Illinois)
A.V. Morgan, BSc (Leicester), MSc (Calgary), PhD (Birmingham)
E.J. Reardon, BA (St. Francis Xavier), PhD (Pennsylvania State)

Associate Professors
S.K. Frape, BSc, MSc, PhD (Queen’s)
J.-M. Konrad, BSc, Dipl.Ing. (Strasbourg), MSc (Laval), PhD (Alberta), PEng
J.A. Legault, BSc, MSc (Ottawa), PhD (Alberta), MSc, PhD (McGill)
R.G. Roberts, BA (Cambridge), MSc, PhD (McGill)

Assistant Professors
M. Coniglio, BSc (McGill), MSc (Manitoba), PhD (Memorial)
T.W.D. Edwards, BSc, MSc (Queen’s), PhD (Waterloo)
R.V. Nicholson, BSc (Concordia), MSc, PhD (Waterloo)
D.C. Nobs, BSc, MSc, PhD (Toronto)
S. Schiff, BSc (McMaster), MA, MPhil, PhD (Columbia)

Research Professors
A.P. Annah, BASc, MSc (Toronto), PhD (Memorial)
J.A. Franklin, BSc (Eng) (London), MSc, D.I.C., PhD (Imperial College, London), PEng

Research Assistant Professors
D. Elseworth, BSc (Portsmouth Polytechnical College), MSc, D.I.C. (Imperial College, London)
E.C. Jowett, BSc, MSc, PhD (Toronto)
C.W. Mase, BSc (California, San Diego), MSc (Utah), PhD (British Columbia)
E.A. Sudicky, BSc, MSc, PhD (Waterloo), PEng
B.G. Warner, BSc, MSc (Waterloo), PhD (Simon Fraser)

Adjunct Faculty
I.D. Delorme, BSc (Saskatchewan), MSc (Alberta), PhD (Saskatchewan)
P. Fritz, DiplGeol, Dr. rer. nat. (Stuttgart)
J.E. Gale, BA, BSc (Memorial), MSc (Western Ontario), MEng Sc, PhD (California, Berkley), PEng
M. Gascoyne, BA, BSc (Lancaster), PhD (McMaster)
F. Goodarzi, BSc (Tehran), MSc, PhD (Newcastle-upon-Tyne)
I. Herrera, PhD (Brown)
D.R. Lee, BSc, MSc (North Dakota), PhD (Virginia Polytechnic Institute)
R.W. Macqueen, BA, MA (Toronto), PhD (Princeton)
D.E. McWhorter, BSc (Colorado School of Mines), MSc (Colorado State)
J.O. Nriagu, BSc (Ibadan), MSc (Wisconsin), PhD (Toronto)
J.F. Pankow, BA (New York, Suny), MS, PhD (California Institute of Technology)
H.C. Saunders, BA (Queen’s Belfast), MA, PhD (Toronto)
L.R. Snowden, BSc (Calgary), PhD (Houston)
G. van der Kamp, BSc, MSc (British Columbia), PhD (Amsterdam)
O. White, BSc, MSc (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:

1.Civil Engineering

2.Physics

3.Faculty Member holding joint appointment with Physics

Course Descriptions

Introductory Notes

1. EARTH 121/122 is normally regarded as a prerequisite for any Major program in Earth Sciences.

2. Second, third and fourth year courses may involve field trips in the fall. All those enrolled in Honours Earth Sciences programs are required to take a two-week field camp at the end of the third year (EARTH 390). The cost will range from $120-$150 per student.

3. 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.

Antireq: GEO E 126

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.

Antireq: EARTH 121

Antireq: GEO E 126

EARTH 221 W, S 3C,1T 0.5
Geochemistry 1

Preq: EARTH 231 or permission of instructor
ENTRANSATION: DISTRIBUTION AND OCCURRENCE OF IGNEOUS ROCKS.

The principles and theories of igneous magma types.

EARTH 332 W 2C,3L 0.5
Metamorphic Petrology
Principles and theories of metamorphic rock genesis. Static, dynamic and poly- 
phased crystalloblastic growth. Processes of solid-state crystallization in 
metamorphic environments. Zonal and facies classifications; facies series 
and the place of metamorphism in 
global tectonics. Introduction to metasomatism.
Prereq: EARTH 232

EARTH 333 W 2C,3L 0.5
Introductory Sedimentology
The origin, transport and deposition of sediments. Size analysis and sedimen- 
tary structures. Recent sedimentary environments as a key to the interpreta- 
tion of ancient sediments. Sedimentary petrology.
Prereq: EARTH 232

EARTH 336 F 2C,3L 0.5
Paleontology
Advanced paleontology emphasizing morphology, classification, evolution, 
paleoecology and stratigraphic value of fossil invertebrates. Laboratory study 
of fossil collections.

EARTH 342 F 2C,3L 0.5
Geomorphology
The process of landscape evolution and the classification of landforms. 
Geomorphic effects of glacial, fluvial, marine and slope processes. Physical 
and chemical weathering, soil formation. Laboratory study of topographic 
and air photo interpretation. Field trips.

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 maps and cross sections.
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 113A/B and an introductory course in computer program- 
ming

EARTH 358 W 3C,1T 0.5
Environmental Geology for Earth Scientists
The influence of geology on the natural environment with special emphasis on 
hazards and the role of groundwater; 
hydrogeology in the runoff cycle; 
groundwater resources development and subsurface waste disposal; environ- 
mental geology as a factor in health 
and disease.
Prereq: EARTH 121/122 or GEO E 126

Antireq: SCI 250

EARTH 368 F 2C 0.5
Geophysics 1
Introductory topics on the physics of the earth. Seismology and the earth's 
continents and continental drift.
Prereq: MATH 113A/B, PHYS 121/122 or equivalent. Math 216 is recommended

Cross-listed as PHYS 360

EARTH 369 W 3C 0.5
Geophysics 2
The geology of the ocean basins. Topics in physical oceanography. 
Physical properties of ocean water, heat budget of the world oceans. 
Oceanic circulation, Coriolis effects. Some idealized current regimes.
Prereq: MATH 113A/B, PHYS 121/122 or equivalent. Math 216 is recommended

Cross-listed as PHYS 369

EARTH 370 W 3C,2L 0.5
Economic Geology
The occurrence and geological setting 
of metallic, non-metallic minerals and 
construction materials. Energy 
resources. Special emphasis on Cana- 
dia's resource industries. The laboratory 
will involve sampling methods, ore 
calculation and property evaluation.
Prereq: EARTH 231, 232

EARTH 390 W field lab
Methods in Geologicai Mapping
Ten day field camp at Whitefish Falls, 
held at beginning of spring term.
EARTH 421 F 2C,3L 0.5
Geochemistry 2
The application of chemical thermodynamics to geochemical problems.
Development of the three laws of Thermodynamics; Gibbs free energy and equilibrium constants. Introduction to various topics in aqueous geochemistry such as mineral equilibria, ion exchange and redox equilibria. Various aspects of organic geochemistry and geochemical exploration will also be covered.
Prereq: First year chemistry, EARTH 221
Restricted to fourth year and graduate students.

EARTH 427 W 2C,3S 0.5
Crustal Evolution
The application of geological knowledge and reasoning to significant contemporary earth science problems including that of global tectonics and global change.
Normally restricted to fourth year Earth Sciences students.

EARTH 432 F 3C,2S 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 W 2C,3S 0.5
Biostatigraphy
Methods of using paleontological data to solve stratigraphic problems. Faunal provinces in space and time. Effects of continental drift and climatic change on biogeography through the Phanerozoic.
Prereq: EARTH 336

EARTH 435 W 3C,2L 0.5
Advanced Structural Geology
The geometry, kinematics and dynamics of structural geology. The relationships of structures from the microscopic to the megascopic scale; statistical studies of structural elements.
Prereq: EARTH 260

EARTH 436 A/B F/W 6L 0.5/0.5
Honours Thesis
(A course for Honours Earth Sciences students only.) Each student will work under the direction of a member of the Department on a short research project. The results of this will be presented in thesis form and will be critically examined by members of this and, where pertinent, other departments.

EARTH 437 F 2C,3L 0.5
Rock Mechanics
Review of stress and strain. Mohr's circle, strength theories, laboratory tests, classification of rocks. Rock mechanics considerations in the construction of shafts, drifts, tunnels, foundations and rock slopes. Laboratory exercises will deal with uniaxial, triaxial, flexure, hardness and tensile testing of rock. Problem sets will be assigned.
Prereq: A course in Statics and Mechanics of deformable materials, or consent of instructor

EARTH 438 W 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 440 F 2C,3L 0.5
Quaternary Geology
Stratigraphy and history of the Quaternary Period with emphasis on glacia tion. Laboratory studies on glacial deposits. Field trip. A previous course in geomorphology is recommended. Not to be taken by third year students.

EARTH 441 W 2C,3L 0.5
Introductory Quaternary Ecology
An introduction to Quaternary ecology. The morphology, biostratigraphy, distribution and palaeoecological significance of major plant and animal groups in the Quaternary sciences. Relationships of fossil assemblages to modern ecosystems. Students will be expected to arrange with the instructors a field trip in the preceding term.
Prereq: EARTH 440 or consent of instructors

EARTH 446 F 3C 0.5
Numerical Methods in Geocognition
Prereq: MATH 113A/B and an introductory course in computer programming

EARTH 458 F, S 3C,1T 0.5
Physical Hydrogeology
An introduction to physical hydrogeology, including Mohr's law, the groundwater flow equations for steady-state and transient conditions, applications to flow nets, aquifer testing, groundwater resources evaluation, and construction-project dewatering. The role of groundwater in the hydrologic cycle is explored with emphasis on natural groundwater flow systems and their influence on stream flow, slope stability and soil drainage. Physical processes controlling groundwater contamination are introduced.
Prereq: EARTH 121/122 or GEO E 126 or CIV E 253, and MATH 213A/B or equivalents.

EARTH 459 W 3C,1T 0.5
Chemical Hydrogeology
An introduction to the chemical side of hydrogeology with emphasis on groundwater quality and contaminants in the groundwater zone, the geochemical origin of major ions in natural groundwater, causes of hardness, groundwater age determination using isotopes, common causes of groundwater contamination; processes governing contaminant behaviour including dispersion, diffusion and adsorption, hydrogeologic aspects of site selection for waste disposal.
Prereq: EARTH 221 or CIV E 375 or equivalent, and EARTH 458
(Formerly EARTH 439)

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, time series analysis and computer modelling of geophysical responses.
Prereq: EARTH 260
Recommended: MATH 213A and an introductory course in computer programming.
Applied Geophysics 3
Geophysical field methods for Engineering and Hydrogeology.
Prereq: Students must be enrolled in the Geophysics Option

Altered Mineral Deposits
The petrology and genesis of metalliferous ore deposits. The description of classic deposits, the stability of ore minerals, ore minerals in aquiferous systems. The laboratory will include instruction and practice in ore microscopy.
Prereq: EARTH 370

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

One or more geology field trips normally conducted at the beginning of the Fall term. These trips will emphasize field observations of a wide-ranging nature; some trips will augment field observations with study of specimens, core laboratory data, etc. Field exercises and reports may be part of the requirements. Enrolment limits will apply to all trips.
Honours Earth Sciences students are required to attend at least one of these trips. Open to other students only if places are available.
Field trip fees will apply; listing of current trips and respective costs available from department office.

Department of Economics

Professor, Chairman (Acting)
R.R. Korton, BComm (Toronto), MA (Carleton), PhD (Duke)

Professor, Chairman (On leave 1988-89)
D. Wilton, BComm (McMaster), PhD (MIT)

Professor, Associate Chairman, Graduate Affairs
W.R. Thirk, BA (British Columbia), MA, PhD (Yale)

Professor, Associate Chairman, Undergraduate Affairs
M.C. Howard, BA, MA (Lancaster), PhD (Leicester)

Lecturer, Undergraduate Officer
E. Lau, BA (Toronto), MA (Manchester)

Professors
S.K. Ghoos, BSc, MSc (Calcutta), MS, PhD (Wisconsin)
J.H. Hotson, BA (Colorado College), MA, PhD (Glasgow)

Associate Professors
A.A. Andrikopoulos, BA (Athens), MA (Wayne State), PhD (Southern California)
K.M. Bennett, BA, MA (Queen's), PhD (McGill)
J.A. Brox, BA (Toronto), MA, PhD (McMaster)
J.E. Cuenca, LIC (Madrid), MA (Western Michigan), PhD (Toronto)
L.P. Fletcher, BComm (Mount Allison), MA, PhD (Brown)
S.W. Kardasz, BA (Loyola), PhD (Queen's)

R.C. Kumar, BStat, MStat (Indian Statistical Institute), MA, PhD (Toronto)
F.M. Naqib, BSc (Washington), MSc (Oregon), PhD (Queen's)
W.R. Needham, BComm (Carleton), MA, PhD (Queen's)
K.R. Stollery, BA (Southern California), MA, PhD (Queen's)

Assistant Professors
R.A. Androkovich, BSc (Lethbridge), MA, PhD (Western Ontario)
R.W. Bodei, BSc (Sydney, Australia), MA, PhD (York)
E. Carvalho, BA, MA, PhD (Waterloo)
T.T. Nguyen, BSc, ChE (Barkeloy), MA (Simon Fraser), PhD (Western Ontario)

ECON 101 F,W,S 3C 0.5
Introduction to Microeconomics
An introduction to the central economic problems of society, the functioning of a mixed enterprise system, the economic role of government, the composition and pricing of national output, pricing of productive factors, and income distribution.
Prereq: "M" sections only: Grade 13 or OAC in algebra or calculus. When appropriate, calculus and algebra will be used in "M" sections
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.
Prereq: M sections only: Grade 13 or OAC in algebra or calculus. When appropriate, calculus and algebra will be used in “M” sections.

ECON 150 F,W,S 3C 0.5
An Introduction to Micro and Macro Economics
Selected topics in both Micro and Macro economics, with emphasis on theory, practical applications and public policy. This is a one term course for students holding a credit in economics.
Prereq: OAC in Economics
Anima: Student may not take both ECON 150 and ECON 101 and/or ECON 102 for credit.

ECON 201 F,W,S 3C 0.5
Microeconomic Theory
Theory of consumer choice; the economics of production; pricing and output under perfect and imperfect competition; pricing of inputs.
Prereq: ECON 101 or 150

ECON 202 F,W,S 3C 0.5
Macroeconomic Theory
Theory of the determination of the level of national income (GNP), the unemployment rate, interest rates, prices and inflation; analysis of macroeconomic policies to stabilize the economy and alleviate the problems of inflation and unemployment.
Prereq: ECON 101 and 102; or 150

ECON 211 F,W 3C 0.5
Introduction to Mathematical Economics
Application of mathematics to problems in economic theory. Topics include an introduction to matrix algebra, differentiation, partial derivatives, optimization techniques including constrained optimization — all developed within the context of economic theory.
Prereq: ECON 101, 102; or 150
Students who have not taken Grade 13 or OAC algebra and calculus are strongly advised to take MATH 104.
Students who have taken or are taking a course in mathematics should check with their undergraduate officer to determine if credit will be granted for both courses.

ECON 221 F,W,S 3C 0.5
Statistics for Economists
An introduction to statistical procedures commonly employed by economists. Topics include descriptive statistics, probability distributions, statistical estimation, hypothesis testing and regression analysis.
Prereq: ECON 101, 102; or 150
Students who have taken or are taking a course of similar content in another discipline should check with their Undergraduate Officer or the Arts Registrar's Office to determine if credit will be granted for both courses.

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 150

ECON 232 F,W 3C 0.5
Intermediate Microeconomics
Theory of modern welfare economics with some applications; the meaning and measurement of economic efficiency and equity. General equilibrium theory.
Prereq: ECON 201, 202

ECON 233 W 3C 0.5
Intermediate Microeconomics
An examination of theories of trade structure (Ricardian, Heckscher-Ohlin), the effects of tariffs and multinational corporation behaviour, and adjustment under flexible and fixed exchange rates.
Prereq: ECON 201, 231

ECON 235 W 3C 0.5
Economic Development
The nature of the problem of economic development; theories of economic development; major policy issues in economic development.
Prereq: ECON 201, 202, 231

ECON 310 W 3C 0.5
History of Canadian Economic Development
A study of the economic development of Canada; development theories, industrial structure and national policies analysed in a Classical-Marxian framework.
Prereq: ECON 101, 102 or 150
Formerly ECON 263

ECON 311 F,W 3C 0.5
Mathematical Economics
Mathematical treatment of some micro- and macro-partial and general equilibrium models; programming and other techniques; simple growth models.
Prereq: ECON 201, 202, 211 (or MATH 120B)
Strongly recommended for students who intend to do graduate work in Economics

ECON 321 F,W 3C 0.5
Introduction to Econometrics
Introductory level course in econometrics; includes economic model building and testing, regression and correlation analysis, and price indices.
Prereq: ECON 221

ECON 331 F,W 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), the effects of tariffs and multinational corporation behaviour, and adjustment under flexible and fixed exchange rates.
Prereq: ECON 201, 231

ECON 333 W 3C 0.5
Interregional Economics
An examination of structural characteristics, development and growth in inter-systems. Integration of economic and spatial analysis related to theory and policy through a focus on models such as neoclassical, export-base, shift-share, stages, cumulative-causation, central-place and core-periphery.
Prereq: ECON 201, 231

ECON 341 F,W 3C 0.5
Public Finance
The economic rationale of governmental fiscal activity; cost-benefit analysis; the structure and economic effects of public expenditure and revenues; the analysis of income, consumption and wealth taxes.
Prereq: ECON 102 or 150, 201

ECON 343 F 3C 0.5
Urban Economics
Application of economic analysis to urban and metropolitan areas. Topics include location decisions of households and firms, structure and growth of cities, land and housing market, urban transportation market, urban labour market, and urban public finance — all developed within the context of economic theory. Policy issues will be stressed.
Prereq: ECON 101 or 150
(ECON 201 is recommended)
ECON 344 F 3C 0.5
Consumer Theory
Economic principles for consumer analysis; market responsiveness; conditions causing problems; public and private consumption; alternative economic policies.
Prereq: ECON 201

ECON 345 W 3C 0.5
Industrial Organization
An economic analysis of market structure, behaviour and performance with special reference to the Canadian manufacturing sector.
Prereq: ECON 201

ECON 351 W 3C 0.5
Labour Economics
A study of the supply of labour by individuals and the demand for labour by firms; investment in human capital; trade unions; internal labour markets.
Prereq: ECON 201
ECON 102 is recommended

ECON 353 F 3C 0.5
Population Economics
Population objectives; demographic techniques; economic interrelationships with fertility, mortality and migration; determinants and consequences of current world population changes.
Prereq: ECON 201

ECON 355 W 3C 0.5
Economics of Energy and Natural Resources
An analysis of the economics of conservation, especially the adequacy of the market mechanism as an allocator of resource use over time. Issues concerning the economic behaviour of Canada's fishery, forest, fuel and nonfuel mineral industries will be considered.
Prereq: ECON 201

ECON 361/F, W, S 3C 0.5
Cost-benefit Analysis and Project Evaluation
Methods for evaluating private and public projects; decision rules, efficiency conditions and methods of conducting cost-benefit analysis. Application of the technique.
Prereq: ECON 201
Formerly ECON 241

ECON 363/364 W 3C 0.5/0.5
Contemporary Canadian Problems 1,2
A "topic oriented" seminar course. Problems are selected from a list that includes regulatory economics, poverty, unemployment, industrial policy, safety and so forth. The format assists the student in gaining analytical skill through work on the selected topics.
Prereq: ECON 201, 202

ECON 365 W 3C 0.5
Economic Development of Modern Europe 1780-1973
Prereq: ECON 101, 102; or 150

ECON 361-389 3S each 0.5
Special Topics
One or more special half courses will be offered at different times as announced by the Department.
Prereq: Consent of instructor

ECON 401 F, S 3C 0.5
Advanced Microeconomic Theory
This course considers a number of advanced topics at the forefront of modern microeconomics. Possible Topics: Uncertainty, equilibrium analysis, market structures.
Prereq: ECON 211 or equivalent, 212, 311 is recommended
Preference for admission will be given to fourth-year Honours Economics students. Consent of the instructor or undergraduate officer required for other students.

ECON 402 F, W 3C 0.5
Advanced Macroeconomic Theory
Classical, Keynesian, Monetarist and New Classical models of macroeconomics; recent contributions to the theory of consumption, investment, inflation, inflation expectations, unemployment and economic growth.
Prereq: ECON 211 or equivalent, 221, 301, 302 and permission of the instructor or undergraduate officer for all students who are not registered in the 4th year of an Honours Economics program

ECON 403 W 3C 0.5
Economic Analysis, Forecasting, and Public Policy
The course focuses on the problems of forecasting economic activity (as measured by the principal macroeconomic variables), and of designing and implementing policies to control those variables; topics covered include a critical review of current forecasting models, problems associated with lags of the impact of policies.
Prereq: ECON 301, 302, 321

ECON 404 W 3C 0.5
Advanced Monetary Theory and Policy
A discussion of topics in monetary policy. Topics may include: foundations of monetary theory; portfolio choice; term structure of interest rates; money supply and money demand; decision-making under uncertainty; capital asset pricing models; financial flow analysis; rational expectations and monetary policy.
Prereq: ECON 211, 221, 301 and 302
Recommended: Econ 402, completed or taken concurrently.

ECON 406 W 3S 0.5
Keynes and Post Keynesian Economics
This course draws on Keynes, Fisher, Kalecki, Weintraub, Minsky and others to explore alternatives to current macroeconomic theory and policies seeking solutions to problems of stagflation, debt crises, high interest rates and lagging growth.
Prereq: ECON 301, 302
This course is primarily for fourth-year General and Honours students. However, M.A. students and third-year students who meet the prerequisites may also be admitted.

ECON 410 F 3C 0.5
Economic Thought
A critical survey of the development of Economic Theory from Classical Political Economy to the Keynesian Revolution.
Prereq: ECON 231, 301, 302

ECON 411 F 3C 0.5
Mathematical Economics
Mathematical formulation of economic theory; solutions to systems of simultaneous difference and differential equations; introduction to dynamic models; analysis of stability conditions; introduction to linear and nonlinear programming, input output analysis game theory.
Prereq: ECON 301, 302, 311
ECON 420 F 3C 0.5
Economic Development of the United States, 1607-1975
A survey of U.S. economic development from the beginnings of organized settlement to the crises of the early 1970's, with special emphasis on the methods and techniques applied by the New Economic Historians since 1959.
Prereq: ECON 201, 202 and 321

ECON 421/422 F/W 3C 0.5/0.5 Econometrics 2
Review of linear algebra and development of basic statistical inference; formulation, identification, estimation, and tests of single equation and simultaneous equations; regression models of micro- and macro-economics; empirical models.
Prereq: ECON 201, 202, 211, 221, 321

ECON 431 W 3C 0.5
International Economic Policy
Analysis of selected policy problems of open economies from an institutional perspective. Topics include GATT and trade policy, customs union, new international economic order, multinational firms, exchange rate management and international monetary reform.
Prereq: ECON 301, 302, 331

ECON 441 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, 331

ECON 441 W 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, 331

ECON 442 F 3C 0.5
Comparative Economic Systems
This course concentrates upon the criteria which are relevant for comparing different economic systems, how well various forms of economic theory make comparisons, the development of capitalist and socialist economics, together with the analysis of alternative types of price system and planning.
Prereq: ECON 201, 202

ECON 463A/B
Studies in Political Economy
Either ECON 463A or ECON 463B will be offered in the Winter term. Check departmental listing on course offering.

ECON 463A W 3S 0.5
Political Economy of Capitalist Development
A study of the main tools and models of modern political economy. Micro and macro tools and concepts, based on the work of Robinson, Sraffa, Kaldor, Pasinetti, Rowthorn, Nell, Sweezy and others are integrated in what can be termed the "Classical Marxian" tradition.
Prereq: Consent of instructor or undergraduate officer

ECON 463B W 3C 0.5
The Political Economy of Socialism
An examination of programs for the creation of socialist economy based on the work of Horvat, Nove, Medvedev and others.
Prereq: Consent of instructor or undergraduate officer

ECON 471 F 3C 0.5
Computable General Equilibrium Modelling
Basic concepts and techniques of computable general equilibrium modelling, fixed-point theory and algorithm, data and calibration, system sensitivity, applications in various fields of economics, e.g., taxation, international trade, industrial organization, economic history, economic development, and fixed-price equilibria.
Prereq: ECON 211, 301
(ECON 311, 331, or 341 are recommended)

ECON 472 W 3S 0.5
Advanced Public Policy and Applied Economics
An advanced discussion of selected topics in macroeconomic theory, policy and empirical research. Seminar topics include the role of stabilization policy, the usefulness of income policy and evaluation of Monetarism as practiced by the Bank of Canada.
Prereq: ECON 321, 402 (may be taken concurrently)

ECON 481-489 3S 0.5 each
Special Studies
Research and reading courses under the direction of individual instructors. Admission by consent of instructor.

COURSES NOT OFFERED 1989-90
ECON 442 Economics of the Public Sector 2

ECON 461 F 3S 0.5
Comparative Economic Systems
This course concentrates upon the criteria which are relevant for comparing different economic systems, how well various forms of economic theory make comparisons, the development of capitalist and socialist economics, together with the analysis of alternative types of price system and planning.
Prereq: ECON 201, 202

Department of Electrical Engineering

Professor, Chairman of the Department
J.W. Mark, BASc (Toronto), MEng, PhD (McMaster), PEng

Professor, Associate Dean, Graduate Studies, Faculty of Engineering
J.D. Aplevich, BE (Saskatchewan), PhD (Imperial College, London), PEng

Professor, Associate Dean, Undergraduate Studies, Faculty of Engineering
H.C. Ratz, BASc (Toronto), MS (Massachusetts Institute of Technology), PhD (Saskatchewan), PEng

Associate Professor, Director, Computer Communications Networks Group
G.B. Agnew, BASc, MEng (Waterloo), PEng

Professors
I.F. Blake, BASc, MSc (Queen's), MA, PhD (Princeton), PEng
P.R. Bryant, MSc (London), MA, PhD (Cambridge)
S.G. Chamberlain, MSc, PhD (Southampton)
Y.L. Chow, BEng (McGill), MASC, PhD (Toronto), PEng
J.D. Cross, BSc (Wales), MS, PhD (Carleton), PEng
M.I. Elmasy, BSc (Cairo), MASC, PhD (Ottawa), PEng
J.A. Field, BE (Saskatchewan), MASC, PhD (Toronto), PEng
E.L. Hocquart, BSc, PhD (Imperial College, London), PEng
S.N. Kalra, BSc (Punjab), MS, PhD (Illinois), PEng
R.H. MacPhie, BASc (Toronto), MS, PhD (Illinois)
V.H. Quintana, BEng (Chile), MSc (Wisconsin), PhD (Toronto), PEng
R.S. Ramshaw, BSc, PhD (Nottingham), PEng
Course Descriptions

EL E 123 W,S 3C,1T,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; second order circuits; resonance; power factor.

\(^1\)Alternate weeks.

EL E 126 W,S 3C,1T,3L\(^1\) 0.5

Electromagnetism
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.

\(^1\)Alternate weeks.

EL E 201 F,W 1C 0.0 Seminar
General Seminar

EL E 202 F,S 1C 0.0 Seminar
General Seminar

EL E 205 F,W 3C,1T 0.5

Advanced Calculus for Electrical Engineers 1
Fourier Series; Ordinary differential equations; Laplace transform; applications to linear electrical systems.
Cross-listed as MATH 211

EL E 206 F,S 3C,1T 0.5

Advanced Calculus for Electrical Engineers 2
Partial differentiation, relative maxima and minima, directional derivatives, divergence and curl of vector fields with applications; multiple integrals, double and triple integrals; line and surface integrals, applications of divergence and Stokes theorems. Complex analysis: limits, analytic functions, complex line integral, Cauchy's integral formula, residues. Partial differential equations.
Cross-listed as MATH 212

EL E 208 W 3C,1T,3L\(^1\) 0.5

Electronic Circuit Analysis
This is an introductory course in electronic circuit analysis which follows the first circuits course EL E 123. The topics to be discussed are: Operational amplifier applications, diodes, rectifiers, introduction to MOS and bipolar transistors, basic amplifier circuits, frequency response, elementary treatments of feedback, filters and switching.
Prereq: EL E 123 or equivalent

\(^1\)Alternate weeks.

EL E 222 F,W 3C,1T,3L\(^1\) 0.5

Digital Computers
Prereq: GEN E 121 or equivalent

\(^1\)Open

EL E 224 F,S 3C,1T 0.5

Numerical Methods
Application of computers to engineering problems. Number systems, errors and error propagation. Roots of nonlinear equations. Solution of systems of linear equations. Interpolation and numerical integration. Solution of ordinary differential equations. A non-numeric algorithm (e.g. sorting). Emphasis will be placed on algorithm development and programming style.
Prereq: GEN E 121 or equivalent

EL E 231 F 3C,1T,3L\(^1\) 0.5

Electronic Devices
Review of band theory and doped semiconductors in thermal equilibrium, charge neutrality, mass action law, recombination and transport mechanisms, Boltzmann relations, derivation of p-n junction dc and ac characteristics, charge storage effects. The bipolar transistor; derivation of dc and ac terminal characteristics, equivalent circuits. The Junction Field Effect transistor (JFET) and Metal Oxide Semiconductor FET, derivation of dc characteristics.
Prereq: PHYS 125 or equivalent

\(^1\)Alternate weeks.
EL E 251 F 3C,1T,3L 0.5 Programming Languages and Translators
Data types and representations, operations, sequence control, data control, storage management, language syntax, compilers and interpreters.
Prereq: GEN E 121
1 Project

EL E 252 S 3C,1T,3L 0.5 Data Structures
Introduction to data and data abstraction, fundamental data structures, implementing and manipulating data structures, basic file systems.
Prereq: EL E 251
1 Project

EL E 261 W 3C,1T,3L 0.5 Energy Systems and Components 1
1 Alternate weeks.

EL E 262 F 3C,1T,3L 0.5 Energy Systems and Components 2
Prereq: EL E 261
1 Alternate weeks.

EL E 269 F,W 3C,2T,3L 0.5 Electrical Engineering 2
1 Alternate weeks.
For Mechanical Engineering students only.

EL E 301 W,S 1C 0.0 Seminar
General Seminar

EL E 302 F,W 1C 0.0 Seminar
General Seminar

EL E 316 W,S 3C,1T 0.5 Introduction to Probability Theory
Conditional probability and independence; Bayes' Theorem; random variables; functions of random variables; distribution functions; applications to reliability and failure rates; marginal and conditional distributions; correlation and applications to regression and statistical testing.

EL E 318 F,W 3C,1T,3L 0.5 Communication Systems
Orthogonality and signal representation in continuous time. Fourier spectrum. Fourier transforms and applications to communications. Convolution. Transfer functions and filters. Power spectral density. Amplitude modulation and applications to techniques such as DSB, AM, SSB, etc. Angle modulation and the spectrum of frequency modulated signals. Techniques for the generation and demodulation of FM signals. Introduction to noise and its effects in AM and FM systems.
1 Alternate weeks.

EL E 323 W,S 3C,1T,3L 0.5 Digital Circuits and Systems
1 Open.

EL E 324 W 3C,1T,3L 0.5 Microprocessor Systems and Interfacing
Microprocessor system architecture, busses, memories, peripheral connections, parallel, serial, analog interfaces, magnetic storage media, data communications, testing and debugging.
Prereq: EL E 222, EL E 251, EL E 323
1 Alternate weeks.

EL E 332 S 3C,1T,3L 0.5 Electronic Circuits
Amplifier biasing networks, single and multi-stage small-signal amplifiers, small-signal equivalent circuits; high and low frequency effects; negative feedback amplifiers; oscillators; noise in electronic circuits; introduction to large signal amplifiers.
Prereq: EL E 208, EL E 231
1 Alternate weeks.

EL E 333 W 3C,1T,3L 0.5 Microelectronic Circuits and Devices
The second of a two course sequence covering the following topics: theory of devices, theory of networks, analog circuits, digital circuits, operational amplifiers.
Prereq: EL E 208
Antireq: EL E 332
1 Alternate weeks

EL E 342 W,S 3C,1T 0.5 Electrical Networks 1
Discrete and continuous signals, convolution, network equations, simulation graphs, Fourier series and transform, frequency response of networks, Laplace transformation, z-transform.

EL E 354 W 3C,1T,3L 0.5 Real-Time Operating Systems
Introduction, basic concepts, process management, interprocess communication and synchronization, memory management, resource management, interrupt handling, concurrent programming.
Prereq: EL E 251, EL E 252
1 Project

EL E 360 F 3C,1T 0.5 Electromagnetic Devices
Introduction to electric energy generation, transmission and distribution systems. Transformers. Principles of electromechanical energy conversion. DC, three-phase and single-phase rotating machines. Specialized motors.
Prereq: EL E 126

EL E 371 S 3C,1T,3L 0.5 Transmission Lines and Basic Field Theory
Transmission lines: transmission line equations, steady state (sinusoidal) solution, terminated lines, matching and the Smith Chart. Basic field theory: vector calculus, electrostatic and magnetostatic fields, time-varying fields and Maxwell's equations, plane wave propagation, polarization, reflection, refraction, applied boundary value problems.
Prereq: EL E 126 or equivalent
1 Alternate weeks.
EL E 390 F,W 3C,1T,3L' 0.5
Systems and Control
Alternating weeks.

EL E 401 F,S 1C 0.0
Seminar
General Seminar

EL E 402 W 1C 0.0
Seminar
General Seminar

EL E 403-409, 490-497 0.5
Special Topics in Electrical Engineering
Special courses on advanced topics will be offered from time to time, when resources are available. For current offerings, inquire at the Department.
Prereq: Permission of the instructor.

EL E 408 W 3C,3L' 0.5
Robot Dynamics and Control
Prereq: Permission of the instructor.

EL E 411 F,S 3C,1T 0.5
Digital Communications
Representation of signals, gaussian processes, optimum receiver design, equivalent signal sets, non-white channel noise, maximum likelihood receiver. Performance of coherent and noncoherent communication systems, phase shift keying, frequency shift keying. Information and its measure, source encoding, error-free communication, channel capacity. Error-correcting codes: linear block codes, cyclic codes, convolutional codes.
Prereq: EL E 411 or permission of instructor.

EL E 412 W 3C,1T 0.5
Digital Communications
Representations of signals, gaussian processes, optimum receiver design, equivalent signal sets, non-white channel noise, maximum likelihood receiver. Performance of coherent and noncoherent communication systems, phase shift keying, frequency shift keying. Information and its measure, source encoding, error-free communication, channel capacity. Error-correcting codes: linear block codes, cyclic codes, convolutional codes.
Prereq: EL E 411 or permission of instructor.

EL E 413 W 3C,1T' 0.5
Digital Signal Processing
Project

EL E 417 W 3C,1T,3L' 0.5
Digital Systems Engineering
Complexity in large digital systems. Control of design, interaction complexity, control of consequences of complexity. The topics covered include control unit design, microprogram control, design for testability, fault tolerance, multiprocessor systems.
Prereq: EL E 323
Project

EL E 427 F,W 2C,1T,3L' 0.5
Digital Systems Engineering
Prereq: EL E 222, EL E 316, EL E 318

EL E 428 F,S 3C,1T 0.5
Computer Communications Networks
Prereq: EL E 428
Project

EL E 429 W 2C,1T,3L' 0.5
Computer Structures
Organization and performance of conventional uniprocessors, pipelined processors, parallel processors and multiprocessors; memory and cache structures; multiprocessor algorithms and synchronization techniques; special-purpose architectures.
Prereq: One of EL E 354, EL E 426 or CS 354
Prereq/Coreq: EL E 427

EL E 435 F,S 3C,1T 0.5
Semiconductor Devices
Metal-Semiconductor junctions (Schottky barriers), heterojunctions, solar cell, light emitting diode, photodetector diode, JFETs, MESFETs, MOSFETs, VLSI bipolar and MOS devices, CCDs, Power devices (SCRs, power switching transistors, PIN rectifier diodes).

EL E 436 W 2C,1T,3L' 0.5
Design of Integrated Circuits and Devices
Design and process details of discrete bipolar, JFET and MOSFET devices. Design and implementation of VHSIC and VLSI digital and analog integrated circuits. Process, device and circuit CAD.
Project

EL E 437 W 2C,1T,3L' 0.5
Integrated VLSI Systems
Integrated system design, memory cells and systems. Logic arrays. VLSI design methodologies, applications in digital signal and data processing systems.
Project

EL E 438 F,S 2C,1T,3L' 0.5
Switching and Digital Circuits
Switching characteristics of transistors and diodes, non-sinusoidal wave generation and shaping, comparators, digital integrated circuits, including ECL, L2L, IFL, STL, MOS, CMOS.
Project

EL E 439 W 2C,1T,3L' 0.5
Analog Electronic Circuits
Project

EL E 443 F,S 3C,1T 0.5
Electrical Networks 2
Topics from the following: two-port descriptions of ideal devices, including operational amplifiers; network functions, formulation and solution of network equations; sensitivity calculations in the frequency domain; active network analysis; simple filter design; time domain solutions; simulation; introduction to digital and switched capacitor networks; computer-aided analysis and design of networks.
Prereq: EL E 342 or equivalent
Project
EL E 446  F,S  3C,1T,3L  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 decomposi tion, system realization. The necessary matrix and linear algebra theory is developed as required.

EL E 450  F  2C,1T,3L  0.5
Software Systems
Structured software design, software testing and maintenance. Data structures, arrays, lists, stacks, associative structures. Searching and sorting. Operating system organizations. Real-time software, principals of real-time executive (RTX), kernel, primitives, interprocess communication and synchronization, memory management, interrupts. Block structured languages, actual and formal parameters, recursion, formal description, relationship to machine code. Compilers.

Prereq: EL E 222 or equivalent.
1Project

EL E 455  S  3C,1T,3L  0.5
Software Engineering
Requirement analysis, specifications, software design, software development environments, testing, software project management, quality assurance and control.

Prereq: EL E 354
1Project

EL E 456  W  3C,1T,3L  0.5
Database Systems
Introduction, data models, file systems, database system architectures, query languages, integrity and security, database design.

Prereq: EL E 251, EL E 252
1Project

EL E 459  W  2C,1T,3L  0.5
Sound, Noise and Electroacoustics
An interdisciplinary study of acoustical physics, human response to sound and audio engineering. Main topics include the physics of sound, acoustical measurements, human hearing, environmental noise, electroacoustical systems and transducers.

Prereq: EL E 371 or equivalent
1Every third week.

EL E 463  F,S  2C,1T,3L  0.5
Power Electronics
Characteristics and ratings of power semiconductor devices with emphasis on the thyristor. General methods of achieving design objectives. Performance and analysis of power conversion circuits for both static and rotating loads.

Prereq: EL E 371 or equivalent
1Open

EL E 464  W  3C,3L  0.5
High Voltage and Insulation Engineering
Nature and origin of high voltage surges on power systems. Travelling waves on transmission systems; insulation engineering, electrostatic fields in high voltage apparatus, insulation failure; corona; insulation testing; circuit breakers and surge protection devices; insulation coordination.

1Alternate weeks.

EL E 465  W  3C,1T  0.5
Power Systems
Introduction to system concepts; aspects of power system planning and operation. Energy sources; environmental and resource implications. Per-unit and co-ordinate systems. Representation of equipment such as generators, transformers and transmission lines in system analysis. Analysis of imbalanced systems and faults. Voltage and reactive power control. Load/frequency control. Power transfer and system stability. Introduction to load flow methods. High voltage dc transmission.

EL E 473  W  2C,1T,3L  0.5
Microwave Engineering
Review of Maxwell's equations, rectangular and circular waveguides, microwave circuits, scattering matrix theory, microwave filters, simple waveguide discontinuities, klystrons and magnetrons.

Prereq: EL E 371 or equivalent
1Every third week.

EL E 474  F  2C,1T,3L  0.5
Antenna Engineering
An introduction to the theory of radiation and of antenna and propagation engineering; linear antennas, linear arrays, aperture antennas, frequency independent antennas, measurement theory.

Prereq: EL E 371 or equivalent
1Every third week.

EL E 475  W  3C,1T,3L  0.5
Guided Wave Engineering
Conducting waveguiding structures; rectangular and circular waveguides, microstrip theory and applications, numerical field analysis on microstrip lines, microstrip components. Dielectric waveguiding structures; dielectric slab waveguides, propagation theory for step-index fibres and graded-index fibres. Fibre measurements; loss measurements, time-domain and frequency-domain measurements, measurement of refractive index profiles. Fibre-optical telecommunication systems; system design considerations, fibre characteristics, source and detector characteristics.

Prereq: EL E 371 or equivalent
1Project

EL E 481  F,S  2C,1T,3L  0.5
Design of Analog and Digital Control Systems

1Alternate weeks.

EL E 482  W  2C,1T,3L  0.5
Multivariable Control Systems

Prereq: EL E 446, EL E 481
1Open lab.

EL E 485  W  2C,1T,3L  0.5
Computer Control Applications

Prereq: EL E 426, EL E 481
1Project.
Department of English

Associate Professor, Chairman of the Department
G.E. Slethaug, BA (Pacific Lutheran), MA (Nebraska)

Professor, Associate Chairman and Graduate Officer
J.C. Gray, BA (Washington State), MA (Connecticut), PhD (Syracuse)

Assistant Professor, Associate Chairman and Undergraduate Officer
M.A. Gerhardstein, BA, MA (Montana), PhD (Iowa)

Professor and Co-operative Education Officer
W.R. Macnaughton, BA (Toronto), MA, PhD (Wisconsin)

Professor Emeritus
G.R. Hibbard, BA, MA (London), DLitt (Waterloo)

Professors
L.A. Cummings, AB (Washington), AM (Missouri), PhD (Washington), Recipient of the OCULA (Ontario) Teaching Award
S. Fogel, BA (Carleton), MA (British Columbia), PhD (Purdue) J
J. Gold, BA (Birmingham), PhD (Wisconsin)
K.L. Ledbetter, AB (Central College, Mo.), MA, PhD (Illinois), Recipient of the Distinguished Teacher Award
D.R. Letson, BA (Waterloo), MA (McMaster), PhD (Toronto) J, Recip- iant of the Distinguished Teacher Award
C.F. MacRae, BA (Western Ontario), MA (McMaster), PhD (Toronto)
W.R. Martin, BA, MA, D Litt et Phil (South Africa), Recipient of the Distinguished Teacher Award
W.U. Ober, BA (Washington and Lee), PhD (Indiana)
P.H. Smith, Jr., BA (Harvard), PhD (Pennsylvania)
W.K. Thomas, MA, PhD (Toronto)

Associate Professors
P.D. Beam, BA (Waterloo), MA (McMaster), PhD (Toronto)
R.R. Dubinski, BA, MA (Western Ontario), PhD (Toronto)
A.I. Dust, MA, PhD (Illinois)
H.B. Ellis, BA (Rollins), MA, PhD (Illinois)
R.N. Gosselin, BA (Kansas), MA, PhD (Colorado)
M.W. Higgins, BA (St. Francis Xavier), MA, PhD (York), J
P.M. Hinchcliffe, BA (British Columbia), MA, PhD (Toronto) J
N.C. Hultin, BA (Concordia), MA (Chicago), PhD (Johns Hopkins)
R. Lister, BA, MA, PhD (Toronto)
H.M. Logan, AB (Franklin and Marshall), PhD (Pennsylvania)
E.P. McCormack, MA (Glasgow), PhD (Manitoba) J
C.E. McGee, BA, MA, PhD (Toronto), J
S.E. McMullin, BA, MA (Carleton), PhD (Dalhousie)
J.H. Miller, BA, BLS (McGill), MA, MP hil (Waterloo), PhD (York), R
J.S. North, BA, MA (British Columbia), PhD (Alberta)
E.F. Shields, AB (Chesnut Hill), MA (Villanova), PhD (Illinois)
J.S. Stone, BA, MA (British Columbia), (Retired) *
Assistant Professors
L. Dorney, BA, MA (Louisville), J
D.G. Goodwin, BA, MA, PhD (Toronto)
A.L. Magnusson, BA (Manitoba), MA, PhD (Toronto)
M.G. McArthur, BA (Manitoba), MA, PhD (Western Ontario)
N.F. Randall, BA (Guelph), MA (Waterloo), PhD (York)
J.Z. Segal, BA (McGill), MA, PhD (British Columbia)
H. Froese Tiessen, BA (Winnipeg), MA, PhD (Alberta) G

Course Descriptions

Introductory Notes

1. Although the Department of English provides advisors to help students choose their programs, arrange their courses and conform with the University, Faculty, and Department regulations, students are urged to study the Calendar very carefully because they are themselves responsible for failure to abide by these regulations.

2. Courses normally meet three hours per week; however, each instructor determines the pattern of meetings for his or her courses.

3. In all English courses, emphasis will be placed on student essays written in connection with the reading.

4. Information on availability of courses in this section is accurate at the time of publication. Sometimes, however, course offerings must be altered because of budget constraints or availability of faculty. For precise information on course offerings, students should check with the English Department.

*R* courses are administered by Renison College.

GROUP ONE

Courses in this group count towards a degree as electives in any program in the University. Normally, none of them qualifies as a major credit for a General or Honours program in English. These courses are primarily designed to make students aware of the different functions of language in various contexts and to assist them to improve their writing.
ENGL 109 Introduction to Essay Writing 1
ENGL 110 Introduction to Essay Writing 2
ENGL 129R Introduction to Written English
ENGL 140R The Use of English 1
ENGL 150 English as an Instrument of Thought and Communication 1
ENGL 151 English as an Instrument of Thought and Communication 2
ENGL 240R Form and Function 1
ENGL 241R Form and Function 2

Students completing any of ENGL 109, 110, 141R, 150, 151 with at least a B average may petition the English Department (through the Undergraduate Officer) to accept these courses for English major credit. This option became effective as of the Fall term 1984 and may not be applied retroactively.

ENGL 109 F,W,S 0.5
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 12 short writing assignments are required.

Prereq: ENGL 109

ENGL 110 W 0.5
Introduction to Essay Writing 2
The course deals with the persuasive essay. Attention will be given to the elements of logical thinking and the techniques of persuasion. The demands of the library research paper will be considered.

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.

Students may receive credit for only one of ENGL 109 and ENGL 129R.

ENGL 140R F,W,S 0.5
The Use of English 1
The use and abuse of spoken and written English. The study and evaluation of language as it is used for various purposes (e.g., colloquial, scientific, legal, political, commercial, journalistic, literary) in order to increase critical awareness and to help students to write clearly and effectively.

Prereq: ENGL 109

ENGL 141F 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 150 F,W 0.5
English as an Instrument of Thought and Communication 1
The course is designed to improve the reading and writing of students from all disciplines. In order to develop clarity of thought and critical awareness, students will identify and study in several media the various ends that are served by language: objective reporting; persuasion; argument; and emotional, social, and artistic expression. About eight written exercises are assigned.

Prereq: ENGL 109

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

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 102A F 0.5
The Major Forms of Literature: Short Stories and Drama
A study of short stories and drama to determine how the shape of a literary work contributes to its meaning.

Prereq: ENGL 105A or consent of instructor

ENGL 102B W 0.5
The Major Forms of Literature: Novels and Poetry
A study of novels and poetry to determine how the shape of a literary work contributes to its meaning.

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 F,W,S 0.5
20th-Century Literature in English, 1900-45
A close examination of a representative selection of works by major authors writing in English such as Yeats, Woolf, Lawrence, Eliot, Hemingway, and Faulkner.

Prereq: ENGL 103A or consent of instructor

ENGL 105B W 0.5
20th-Century Literature in English, 1945-Present
A continuation of ENGL 105A. A close examination of a representative selection of works by major authors writing in English such as Thomas, Bellow, Laurence, and Atwood.

Prereq: ENGL 105A or consent of instructor

ENGL 108E F,W 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.

ENGL 108F F 0.5
The Rebel
A study of various works of literature in which the protagonist is a rebel against existing norms. The course will examine a number of rebel types and concepts, moral implications, and final outcomes either in successful realisation or in tragic defeat.
ENGL 108H F,W 0.5  
**Isolation and Alienation**  
The study of a variety of works centering on the theme of man in crisis, the stress being on the individual at variance with his inner self, his fellow man, or his world. The course will discuss the process in which wisdom and maturity are gained as the ultimate products of suffering.

ENGL 108M F 0.5  
**Youth and Adolescence**  
Studies the portrayal of young protagonists as they respond to the mores of adult society; their own physical, mental, and psychological development; and the expectations placed upon themselves and by others.

ENGL 108N W 0.5  
**The Wars**  
Studies the experience of war and attitudes toward it as revealed in literary works from different historical periods.

ENGL 190 F,W,S 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 F 0.5  
**Survey of British Literature 1**  
An historical survey of major figures, types, and trends in British literature from the Middle Ages to the late 18th century.

ENGL 200B W,S 0.5  
**Survey of British Literature 2**  
An historical survey of major figures, types, and trends in British literature from the late 18th century to the present.

ENGL 201 F,W,S 0.5  
**The Short Story**  
This course deals with the history and techniques of the short story, with emphasis upon works by such British, American, and Canadian writers as Henry James, James Joyce, D.H. Lawrence, Ernest Hemingway, and Alice Munro.

ENGL 205R F,W 0.5  
**The Canadian Short Story**  
Exploration of the Canadian short story, from its beginnings — in the bush, in the north, on the land, in the small towns — through the struggles of an urbanizing society to the present. Students will be expected to work in some depth with individual authors.

ENGL 208A F,W 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 F,W 0.5  
**Science Fiction**  
Various examples drawn, for instance, from Utopian and anti-Utopian science fiction, social science fiction, "gadgets" science fiction, parapsychology, and alternate worlds and beings will be considered. Some attention will be given to the historical development of the genre.

ENGL 208C F,W,S 0.5  
**Studies in Children’s Literature**  
This course will deal with classic works of children’s literature, including fantasy written primarily for children. Selections from such authors as Kipling, Woolf, C.S. Lewis, George MacDonald, Kenneth Grahame, and Thurber will be studied.

ENGL 208E F 0.5  
**Women Writers of the 20th Century**  
A study of such major 20th-century writers as Woolf, Heillman, Murdoch, McCarthy, Lessing, Laurence, Plath, and Atwood. Emphasis will be on the concerns of these writers with the roles of women, the writer’s search for new meanings, and their innovations in literary forms.

ENGL 208F A,W 0.5  
**The Literature of Aging**  
This course will focus on literary works that present various aspects of aging, such as changes in physical and mental abilities, relationships with children and grandchildren, coping with disease and death, and the satisfactions unique to the elderly.  
_Cross-listed as GERON 200_

ENGL 208H F,W 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 F,W 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 Carré will be discussed. The course includes an examination of critical approaches to the form of detective fiction.

ENGL 208Q W 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 209 F 0.5  
**Writing Strategies**  
Students practice effective writing along with the study of established models. The goal is to develop language competence to meet a variety of academic, business, and professional situations.  
_prereq: Second-year standing or above  
Counts as an English Major credit as of Fall 1984._

ENGL 210A F 0.5  
**Business and Technical Writing**  
A study of the principles of business and technical writing including the styles, techniques, and forms of business and technical correspondence, application letters and résumés, abstracts, outlines, and technical description, with copious writing practice. Special attention to techniques of editing and presentation. Some practice in oral presentation.  
_prereq: Second-year standing or above_
ENGL 210C F.W.S 0.5
Report Writing
A study in the principles and practice of good report writing including report language and styles and various forms of report organization — various kinds of short reports as well as the long formal research report.
Prereq: Second-year standing or above

ENGL 214 F.W 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.

ENGL 219 S 0.5
Contemporary Usage
An in-depth, applied study of the conventions governing contemporary English grammar, punctuation, syntax, diction, spelling, and sentence structure. In addition, the course will examine variations and changes in conventions; the question of the determiners of correct usage; and the impact of dictionaries, textbooks, journals, large publishing houses, and international wire services on accepted English usage in general and on Canadian usage in particular.
Prereq: Second-year standing or above

ENGL 251A F 0.5
The Practice and Theory of Criticism 1
The study and practice of skills needed for a close, analytical reading of literary texts and for the writing of critical analyses on them; studies of theories concerning literature and literary criticism.

ENGL 251B W,S 0.5
The Practice and Theory of Criticism 2
The continuation of ENGL 251A (see above).
Prereq: ENGL 251A

ENGL 292 F 0.5
Contemporary Issues in Language, Writing, and Rhetoric
The course inductively defines the fields of Rhetoric and Professional Writing through an exploration of contemporary issues in language, writing, and rhetoric, as those issues are identified and dealt with, in the pertinent scholarly and professional journals, by current researchers and their work.
Prereq: Enrolment limited to RPW students

ENGL 305A 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.

ENGL 305B 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

ENGL 306A/B/E/D/E
English Language and Linguistics
A study of basic linguistic principles and concepts, historical and formal.
Formerly ENGL 373 and ENGL 375

ENGL 306A F.W 0.5
Introduction to Linguistics
Introduction to linguistics and the principles of linguistic analysis through an examination of English phonology, forms, syntax, and discourse.
Formerly ENGL 373A

ENGL 306B F 0.5
Modern English Grammar
Introduction to modern English grammar and structure — its meaningful forms and syntax. Several methods of analysis will be employed and evaluated, including the traditional, structural, transformational-generative, and functional.
Prereq: ENGL 306A
Formerly ENGL 375B

ENGL 306E W 0.5
Linguistics and Literature
A study of linguistics and its applications in analyzing the style and language of literature. Topics include the relationship between the structure of language and literature, speech and writing, speech acts and genres, discourse and text.
Prereq: ENGL 306A

ENGL 307A W 0.5
Computer-Aided Learning and Literature
The principles of computer-aided learning and instruction applied to language and literary themes.
Prereq: Computer experience or permission of instructor

ENGL 309A F,W 0.5
Rhetoric: Principles and Practice 1
A study of various theories of rhetoric. Students are assigned several essays in order to practise and apply the principles of rhetoric to discourse.
Prereq: A 200-level writing course or consent of instructor

ENGL 309D S 0.5
Approaches to Style
Theories of style and approaches to the stylistic analysis of both literary and non-literary texts. Students will consider contributions to the study of style from such areas as traditional stylelastics, New Criticism, formalism, affective stylistics, speech act theory, discourse analysis, and sociolinguistics.
Prereq: Consent of instructor

ENGL 309E W 0.5
Speech Writing
The analysis, writing, and performance of speeches. Analysis will focus on the theory of communication and speech models for imitation; writing, on in-class workshops; and performance, on videotaping and student evaluation of speeches.
Cross-listed as DRAMA 323

ENGL 310A F 0.5
Middle English 1

ENGL 310B W 0.5
Middle English 2
A study of Chaucer's Canterbury Tales and related Middle English poems and prose.

ENGL 311A F 0.5
The Novel 1
The study of the novel written in English from its beginnings to the late 19th century.

ENGL 311B W 0.5
The Novel 2
The study of the novel written in English from the late 19th century to the present.

ENGL 313 F 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.
ENGL 314 W 0.5
Canadian Poetry Since 1920

ENGL 315 F 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.

ENGL 316 W 0.5
Canadian Drama
A study of plays by such dramatists as Merrill Denison, Robertson Davies, Gratien Gélinas (in translation), James Reaney, John Coulter, George Ryga, and Michel Tremblay (in translation). Background for 20th-century drama will be provided in lectures. Cross-listed as DRAMA 351

ENGL 325 F 0.5
Reading, Leisure, and Human Development
An introduction to the selection and application of literature in Counselling, Recreation, and community settings. Students will be offered theoretical and experiential instruction in a workshop-style seminar. Assignments will be approximately eight novels or anthologies. A bibliography will be provided. A term paper will be required.

ENGL 335 F 0.5
Creative Writing 1
Aimed at encouraging students to develop their creative and critical potentials, the course consists of supervised practice, tutorials, and seminar discussions.

ENGL 336 W 0.5
Creative Writing 2
Designed to assist advanced creative writers to develop their skills in various genres by means of workshop processes, supervised practice, and critical discussion of one or more major projects.
Prereq: ENGL 335 or consent of instructor

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.

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.

ENGL 345/346/347
Studies in American Literature
(Usually only one or two courses from this series are offered each year.)

ENGL 345B F 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, Stylon, Grau, O'Connor, Wright, and Ellison.
Prereq: ENGL 343 or consent of instructor

ENGL 346C W 0.5
American Fiction
Special emphasis will be given to the works of two or three major American novelists such as Herman Melville and William Faulkner.
Prereq: ENGL 343 or consent of instructor

ENGL 350A F 0.5
17th-Century Non-Dramatic Literature 1
A study of secular and religious lyric poetry by poets such as Donne, Jonson, Herrick, Herbert, Vaughan, and Marvell.

ENGL 350B W 0.5
17th-Century Non-Dramatic Literature 2
A study of selected prose works of Bacon, Burton, and Browne. A more intensive study of Milton's English poetry and a selection of his prose works.

ENGL 362 F 0.5
Shakespeare 1
A study of the plays written before 1599-1600, excluding Julius Caesar.

ENGL 363 W,S 0.5
Shakespeare 2
A study of the plays written after 1599-1600, including Julius Caesar.

ENGL 365/366
Selected Studies
Designed to provide a study in depth of problems and/or authors selected by the instructor. Students interested in initiating such courses are encouraged to do so by bringing their ideas to the attention of individual instructors.
Prereq: Consent of instructor

ENGL 409A/B W 0.5
Writing for Special Purposes 1 and 2
Each term will consist of three or four units on such topics as editing; magazine, newspaper, and editorial writing; advertising and public relations writing; instructional manuals; interpretation of specialized information for general audiences; writing for non-print media; ethics in writing; etc. Substantial use will be made of non-academic experts in the fields covered.
Enrolment limited to fourth-year students in RPW program, or consent of instructor

ENGL 410 A F 0.5
Satire and Sense: The Restoration and Early 18th Century
The Restoration comedy of manners, heroic and high tragedy, poetry of the court wits and other amused commentators on society, and the major writings of Dryden, Swift, Addison, Defoe, and the early Pope.

ENGL 410 B 0.5
Sense and Sensibility: The Middle and Later 18th Century
The probing of mores and manners by Pope and Johnson, the emergence of the novel with Fielding and Sterne, and the transformation (in "the age of sensibility") of literary attitudes and practice from classical to romanticism.

ENGL 430 A 0.5
The Romantic Movement 1
The poetry and critical theory of Blake, Wordsworth, and Coleridge. Emphasis is primarily on poetry; selected minor writers may be considered.

ENGL 430 B 0.5
The Romantic Movement 2
The poetry and critical theory of Byron, Shelley, and Keats. Emphasis is primarily on poetry; selected minor writers may be considered.

ENGL 451 A 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.

ENGL 451 B 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).
ENGL 460A 0.5
British Literature, 1886-1918
A study of works by such writers as
Shaw, Conrad, and Yeats.

ENGL 460B 0.5
British Literature, 1918-1945
A study of works by such writers as
James Joyce, D.H. Lawrence, and T.S.
Eliot.

ENGL 481-492
Senior Seminars
From time to time, the Department may
offer senior special topic seminars in
the following areas. Consult with the
Undergraduate Officer for details.
Prereq: Fourth-year standing
normally, and permission of the
instructor

ENGL 481 (A-Z) 0.5
Special Topic Seminars in Rhetoric
and Professional Writing

ENGL 482 (A-Z) 0.5
Special Topic Seminars in
Linguistics and Lexicography

ENGL 483 (A-Z) 0.5
Special Topic Seminars in Old and
Middle English

ENGL 484 (A-Z) 0.5
Special Topic Seminars in
Elizabethan Literature

ENGL 485 (A-Z) 0.5
Special Topic Seminars in Early
Seventeenth-Century Literature

ENGL 486 (A-Z) 0.5
Special Topic Seminars in
Restoration and Eighteenth-Century
Literature

ENGL 487 (A-Z) 0.5
Special Topic Seminars in
Romantic Literature

ENGL 488 (A-Z) 0.5
Special Topic Seminars in Victorian
Literature

ENGL 489 (A-Z) 0.5
Special Topic Seminars in
Twentieth-Century British Literature

ENGL 490 (A-Z) 0.5
Special Topic Seminars in Canadian
and Commonwealth Literature

ENGL 491 (A-Z) 0.5
Special Topic Seminars in American
Literature

ENGL 492 (A-Z) 0.5
Special Topic Seminars in Critical,
Theoretical, and Generic Studies

ENGL 495A/B 0.5/0.5
Supervision of Honours Essay
A letter grade for ENGL 495A will be
submitted only after the completion of
ENGL 495B.

COURSES NOT OFFERED 1989-90
ENGL 108A
The Hero

ENGL 202A/B
The Bible and Literature

ENGL 203/204
Introduction to Folklore

ENGL 208D
Modern Satire

ENGL 232
The Development of Drama
to 1660

ENGL 233
Drama from 1660

ENGL 240R
Form and Function 1

ENGL 306C
Historical Linguistics

ENGL 306D
The History of English

ENGL 309B
Rhetoric: Principles and
Practice 2

ENGL 309C
Contemporary Rhetorical
Theory

ENGL 312
Literature of the Common-
wealth

ENGL 330A/B
Elizabethan Literature

ENGL 347A
Contemporary American
Literature

ENGL 460C
British Literature 1945 to
the Present

ENGL 470A
Contemporary Critical
Theory

Department of
Environment and
Resource Studies

Associate Professor, Chairman of the
Department
J.E. Robinson, BSc. (York), MES
(York), PhD (Michigan)

Associate Professor, Undergraduate
Officer
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(Columbia), Recipient of the Distingui-
shed Teacher Award

Professors
M. Chandrashekar, BTech (Indian
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MASc, PhD (Waterloo), PEng

G.R. Francis, BA (Toronto), BA
(McGill), MA (British Columbia), PhD
(Michigan)

S. Kumar, BSc, Masc (Punjab), MA,
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MA, PhD (Clark)

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Assistant Professors
R.B. Gibson, BA (York), MA, PhD
(Toronto)

J.J. Kay, BASc (McGill), MASc, PhD
(Waterloo)

M.C. Kesik-Delfgaauw, BSc
(Seventeenth Century)

G.O. Michalanko, BA, PhD (Saskat-
chewan)

Adjunct Faculty
E. Higgs, BIS (Waterloo), MA (Western
Ontario), PhD (Waterloo)

J. Jackson, BA (Windsor)

B. Savan, BSc (Toronto), PhD (London)

Faculty Members of Environment and
Resource Studies holding cross and/or
joint appointments with:
1Geography, Urban and Regional Plan-
ing, and School of Landscape Archi-
tecture, University of Guelph
2Systems Design Engineering
3Planning

Faculty Members holding cross and/or
joint appointments to Environment and
Resource Studies from:
4Systems Design Engineering
Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

ERS 100 F 2C, 1T 0.5 Issue Analysis and Problem Solving for Environmental Studies 1
Designed to complement the introductory overview of ENV S 195 and the introduction to methods and techniques (EHS 190). Selected themes and case examples are analyzed within a framework of concepts and theories from the natural and social sciences. Students undertake practical exercises to develop analytic and problem-solving skills.
Prereq: Honours Environment and Resource Studies students only

ERS 101 W 2C, 1T 0.5 Issue Analysis and Problem Solving for Environmental Studies 2
Continuation of ERS 100.
Prereq: Honours Environment and Resource Studies students only

ERS 150 F 3C 0.5 Environmental Issues: Methods and Techniques
Course will teach basic research skills to complement the problem-solving skills taught in ERS 100/101. Concentration on the "systems approach" and its use in problem solving, with attention to information gathering and organization, quantitative data analysis techniques, and presentation skills. Microcomputers will be used for report generation, information organization and basic data analysis.
Prereq: Honours Environment and Resource Studies students only or consent of instructor

ERS 218 F 3C 0.5 Introduction to Sustainable Environmental and Resource Systems
Examination of patterns and trends in major environmental systems and natural resource use. Analysis of these resources in the context of sustainable development. Local, regional and global systems will be examined.
Prereq: Second-year standing; Honours Environment and Resource Studies students only or consent of instructor

ERS 231 F 2C 0.5 Environmental Issues in a Global Perspective
This course examines the various political, economic and social factors in development and environmental concerns in various Third World countries. Special focus is on health-care systems, agricultural and forestry practices and policies, water management and resource ownership. Students are encouraged to study one country in some depth, and to submit seminars and projects.
Prereq: ENV S 195 or consent of instructor

ERS 241 W 3C 0.5 Introduction to Environmental and Social Impact Assessment
An introduction to means of assessing proposed approaches to environmentally and socially significant problems and opportunities. Special emphasis on the nature and limitations of conventional means of assessing the impacts, and overall desirability of technologies, projects, plans and policies. Close examination of case examples.

ERS 275 A/B/C F, W, S 2R 0.5 Special Readings
Background reading and study in consultation with Faculty. Typically utilized when a student must study a topic in connection with other work, but no course offering that topic is available.
Prereq: Consent of instructor
The letter designation allows this course to be taken more than once for credit

ERS 280 S 1C, 2F, S 2R 0.5 Applied Field Studies
Analysis of selected environmental issues or programs with particular emphasis on applied problem-solving management perspectives. Field trips to chosen sites will be conducted to gather information for analysis. Key organizations/people will be involved in field trips and discussions.
Field trip fee $45 per student

ERS 290 F 4S, wkshp 0.5 Seminar-Workshop
Individual or small group project emphasizing multidisciplinary treatment of environmental problems. Work encouraged on situations of interest to community organizations, government agencies or other groups.
Prereq: Environment and Resource Studies students only

ERS 291 W.S 4S, wkshp 0.5 Seminar-Workshop
Continuation of project begun in EHS 290
Prereq: ERS 290

ERS 295 F 2C, 1S 0.5 Development of Environmental Thought 1
Examination of conflicting positions on how we do and should view the natural world and ourselves, beginning with review of the history of attitudes to the environment and our place in it. Emphasis on evolution of attitudes to human nature and the environment in industrial society, critiques of these attitudes and implications for approaches to modern environmental issues.
Prereq: Environment and Resource Studies students only or consent of instructor

ERS 305 W 2C, 1T 0.5 Ecosystem Perspectives and Analysis
Examination of the concept of the "ecosystem" presented in recent writings about non-equilibrium thermodynamics, ecological paradigms, conservation biology and environmental philosophy. Discussion of the theoretical and practical implications of these contrasting perspectives for issues of research/environmental management and sustainable development.

ERS 318 W 3C 0.5 Case Studies in Sustainable Environmental and Resource Systems
Detailed analysis of selected environmental systems and resource use activities. Particular attention will be given to opportunities for sustainable development and issues in implementation. Case studies will be drawn from local, regional and international experiences.
Prereq: Third-year standing and ERS 218 or consent of instructor

ERS 337 F 3C 0.5 Environmental Impact Assessment
Major problems and issues in the management of environmental impacts stemming from development projects. Synthesis of ecological, economic and institutional aspects. Integrating environmental management with social and economic development policies and programs.
Prereq: ERS 241 or consent of instructor
ERS 338 W 3C 0.5
Social Impact Assessment
Introduction to the background, theory and methodology of social impact assessment (SIA). SIA as a type of social science research and as a key element in achieving more informed and responsible decision-making in society. Experience in SIA design for environmentally-relevant cases.
Prereq: ERS 241 or consent of instructor

ERS 350 W 2C 0.5
Community Action on Environmental Problems
The citizen's role in the solution of environmental problems. The work of various community groups is examined and evaluated. Students select topics of particular interest to them for in-depth study.

ERS 352 2C.1T 0.5
Current Issues in the Canadian North
Introduction to contemporary environmental, social, economic and political issues in Canada's North, principally Yukon, Northwest Territories and Northern Quebec and Labrador. Lectures and tutorials will discuss homeland and frontier perspectives, economic development and environmental conservation, the northern economies, native land claims and political development.
Prereq: Second-year standing

ERS 361 W 3C 0.5
International Communication System and Development
Information and ideas constitute the most basic resource of a people. This course will explore the role of various mass media, newspapers, T.V., cinema, magazines, radio, travellers, in the process of development. What is the nature of mass education in a developing society? How do the media hinder or contribute to social change? These and many related questions will be explored in the context of a number of different societies.

ERS 375A/R/C F,W,S PR 0.5
Special Readings or Seminars on Selected Topics
The letter designation allows this course to be taken more than once for credit.
ERS 490A F,W,S 2C 0.5
Senior Honours Assignment
A project of sufficient scope to demonstrate mastery of problem-solving and communication skills on a selected problem or issue concerning human interrelationships with the environment. Credit weights for 490, 491 and 492 vary depending on the amount of work involved and the depth of the subject matter. Study beyond the 490 level requires faculty approval.
Prereq: Honours Environment and Resource Studies students only
A letter grade for ERS 490A will be submitted only after the completion of ERS 490B

ERS 490B F,W,S 2C 0.5
Senior Honours Assignment
Continuation of ERS 490A
Prereq: ERS 490A

ERS 491A F,W,S 4C 1.0
Senior Honours Assignment
See description for ERS 490A.
Prereq: Honours Environment and Resource Studies students only
A letter grade for ERS 491A will be submitted only after completion of ERS 491B

ERS 491B F,W,S 4C 1.0
Senior Honours Assignment
Continuation of ERS 491A.
Prereq: ERS 491A

ERS 492A F,W,S 6C 1.5
Senior Honours Assignment
See description for ERS 490A.
Prereq: Honours Environment and Resource Studies students only
A letter grade for ERS 492A will be submitted only after the completion of ERS 492B

ERS 492B F,W,S 6C 1.5
Senior Honours Assignment
Continuation of ERS 492A.
Prereq: ERS 492A

Courses Offered in India
Courses on the student academic record with the letter I as part of the course number are offered in India.

COURSES NOT OFFERED 1989-90
ERS 351 Organizations and Environmental Management
ERS 360 Man and Nature
ERS 450 Environmental Design
ERS 470 Environmental Teaching and Learning

Faculty of Environmental Studies
The following persons have wide ranging interests and hence have been appointed to the Faculty of Environmental Studies rather than to a specific Department and/or School:
Associate Professor, Associate Dean, Computing and Communications
R.T. Newkirk,4 BA, MSc, PhD (Western Ontario)
Professor, Director of Teaching Resources and Continuing Education
C.K. Knapper,2 BA Hons (Sheffield), PhD (Saskatchewan)

Professors
P.J. Howarth,1 BA (Cambridge), PhD (Glasgow)
P.H. Nash, BA, MA (California-Los Angeles), CE (Grenoble), MCP, MPA, PhD (Harvard), MCIP, AICP, (Retired)*

Assistant Professor
G.B. Hall,1,2 BA, Hons (Otago, New Zealand), MA, PhD (McMaster)

Adjunct Faculty
K. Elliott, Diploma Creative Arts
S. Garrod,5 BA (McMaster), LLB, MES (York)

Faculty Members of Environmental Studies holding cross and/or joint appointments to:
1Geography
2Psychology, Geography and Planning
3Planning

Faculty Members holding cross and/or joint appointments to Environmental Studies from:
4Planning
5Faculty Member holding joint appointment with Planning.

*Also has Adjunct appointment

Course Descriptions

Course Descriptions
Courses not offered in the current academic year are listed at the end of this section.

Introductory Note
There are a number of courses offered in the Faculty of Environmental Studies or an integrative nature which extend across the academic interests of the four units: School of Architecture, Department of Geography, Department of Environment and Resource Studies, and School of Urban and Regional Planning. The courses are of a general interest and are open to all students in the University. There is not an actual Department of Environmental Studies. Students interested in this area are urged to consult the course offerings of the four individual units mentioned above. These four departments/schools offer a variety of related courses allowing in depth studies of topics covered in the Environmental Studies courses.

ENV S 178 F,W 3C,1L 0.5
Introduction to Environmental Research Methods
Introduction to methods of developing, evaluating and using evidence in Environmental Studies. Methods for summarizing and critical appreciation of data describing environmental systems. Skill development in applying statistical techniques and in using microcomputers as a research tool. While not a prerequisite for this course, CS 100 or a high school computing course is helpful.

ENV G 195 F 2C,1S 0.5
Introduction to Environmental Studies
Theories, methods and concepts in study of the environment. Emphasis on natural and built environment and relationships between elements of the environment. Environmental planning, management, and design discussed.
ENV S 200 F 2C,2L 0.5
Field Ecology
Introduces the main concepts and principles of ecology; the cycling of elements; energetics and structural organization of major ecological systems; population dynamics; impact of natural resource management practices and urban and industrial development on the environment; incorporating environmental quality considerations into development activities. The laboratory sessions include field trips to study natural and disturbed ecosystems, urban and applied ecology.
Prereq: Second, third and fourth year students only
Lab fee of $5
Students may receive credit for only one of ENV S 200 and BIOL 250

ENV S 201 F,W 3C,1.5S 0.5
Introduction to Environmental and Planning Law
Introduction to legal concepts generally and to environmental and planning law concepts in particular. Designed both for students who do not plan to take further in depth legal courses and as a prerequisite for senior legal courses - ENV S 401 and PLAN 402. Topics to be covered include Sources of Law, Nature of Legal Remedies, Common Law, Administrative Agencies, Planning Act, Environmental Protection and Assessment Acts, and Federal Environmental Protection Act.

ENV S 202 W 2C,1L 0.5
Social Science Approaches to Environmental Problems
Research strategies for understanding and addressing environmental problem/opportunity situations based on concepts and methods derived from the social and behavioural sciences. Particular attention is given to determining the appropriate mix of research strategies for a range of situations in terms of data validity and reliability, time and financial constraints, and ethical considerations.
Prereq: Second-year students or consent of instructor

ENV S 220 F 2C,1T 0.5
Environmental Economics
Evaluation of various economic approaches to the environment. The links between economics, sustainable development and the natural environment will be explored and future directions examined.
Prereq: ECON 101 or consent of instructor

ENV S 252 F 3C 0.5
Media Tools for Environmental Studies
Instruction in basic black and white photography relating to photography's role as a media tool; basic darkroom functions, camera operation, composition, photographic theory, and photo essay production. Much of the course work and projects will be done outside the classroom in field situations of environmental concern using initiative in project development. Students are expected to supply their own cameras. A limited number of cameras will be available on a rental basis.
Prereq: ENV S students; others with consent of instructor
Lab fee of $5 for use of ES Student Darkroom
Materials at student's expense

ENV S 278 F 3C,1L 0.5
Advanced Environmental Research Methods
Advanced methods for developing, evaluating and using primary and secondary data in Environmental Studies. Builds upon ENV S 178 by introducing probability and inferential statistics, statistical sampling procedures and hypothesis testing. Standard parametric and nonparametric statistical tests up to the linear regression model and extensions. Modelling of environmental phenomena in space and time using the microcomputer for data entry, storage and analysis.
Prereq: ENV S 178

ENV S 310 F 2C 0.5
Behavioural Studies
An examination of the way we perceive our environment — both natural and man-made — and how it influences our attitudes and behaviour. Students will carry out a number of empirical exercises and projects on various aspects of environmental perception and behaviour.
Prereq: Second, third or fourth-year students only

ENV S 320 W 2C,1T 0.5
Environmental Economics: An Historical Perspective
An introduction to the history of economic thought as it relates to the environment. Approaches taken by economists in different eras will be assessed as to their applicability in the development of environmental policies then and now.
Prereq: ENV S 220 or consent of instructor

ENV S 334 F 3C,1L 0.5
Park Management
Basic administrative procedures in park management. Operational techniques are examined together with general policies of acquisition, operation and development.
Prereq: REC 230
Cross-listed as REC 334
Students may receive credit for only one of ENV S 334 and REC 334

ENV S 378 W 2C,1L 0.5
Applications of Computer Programming in Environmental Studies
The course will provide an opportunity to apply microcomputers as a tool for the analysis of environmental problems. A top-down step-wise refinement approach to problem solving through using micro computer high level programming (currently Pascal) will be followed. The basis of graphics, data structures and their application to map data sets, algorithms for modelling and image processing will also be considered.
Prereq: CS 102 and ENV S 178 or consent of instructors

ENV S 392Z F 2.5
Waterloo in Australia - Victoria
Description in Environmental Studies program section (page 10.6).

ENV S 393Z W 2.5
Waterloo in Australia - Victoria
As 392Z.

ENV S 394Z S 0.5
Waterloo in Australia - Victoria
As 392Z.

ENV S 395Z F 2.5
Waterloo in Australia - Griffith
Description in Environmental Studies program section (page 10.6).

ENV S 396Z W 2.5
Waterloo in Australia - Griffith
As 395Z

ENV S 397Z S 2.5
Waterloo in Australia - Griffith
As 395Z

ENV S 417 S 3S 0.5
Field Studies in Land Use History and Landscape Change
Theory, method, case studies and field work in land use history and landscape change and their applicability to resource and environmental planning and management.
Prereq: Consent of instructor
Lab fee of $20
ENV S 433 W 3C, 2st 0.5

People in Natural Areas
Designing and managing for people in natural areas; behavioural research and its relevance to the design and operation of natural areas and facilities will be emphasized. Means of understanding and involving neighbouring and visiting publics and indigenous people in the design and management of natural areas will be studied.

Prereq: REC/ENV S 334
Cross-listed as REC 433
Students may receive credit for only one of ENV S 433 and REC 433

ENV S 434 W 3C 0.5
Advanced Park Planning and Management
A study of policies, procedures, and practices relative to the management of natural resources. Emphasis is placed on an ecological systems approach to management as it relates to parks at all levels of government.

Prereq: REC/ENV S 334
Cross-listed as REC 434
Students may receive credit for only one of ENV S 434 and REC 434

ENV S 500 W 3C 0.5
Professional Development in Environmental Management
Professional practice issues, such as concepts of professionalism, ethics, the client-consultant relationship, expert testimony, interdisciplinary frameworks, private practice roles versus public or government roles, contract law, liability, communications, media and project management, will be addressed in the context of a studio project related to current environmental management issues.

Prereq: Fourth year students or consent of instructor
Field trip fee: $15.00

COURSES NOT OFFERED 1989-90
ENV S 111 Introduction to the Study of the Future
ENV S 401 Environmental Law
ENV S 411 Alternative Future Environments

Department of Fine Arts

Associate Professor, Chairman
A. Green, BFA (Art Institute of Chicago)

Professor, Undergraduate Officer
V. Burnett, BS (Columbia), MA (California)

Professors
P. Forsyth, AB (Mount Holyoke), MA, PhD (Toronto) Recipient of the Distinguished Teacher Award
N.L. Patterson, BA (Washington)
A.M. Urquhart, BFA (Buffalo)

Associate Professors
M.S. Bird, BA, MA, PhD (Iowa), R E. Kilman, MA, PhD (Toronto)
D.L. MacKay, BFA (Mt. Allison), MFA (Cornell)
A. Roberts, BA (Guelp), MA (Claremont)
J. Uihle, MA (Purkyne's University Brno), PhD (Waterloo)

Assistant Professor
J. Buyers, BFA (York)

Faculty Members holding cross appointments to Fine Arts from:
1Classical Studies
2Religious Studies
R refers to faculty member at Renison College.

Course Descriptions
Students should consult the "Fine Arts Course Offerings" lists, available from the departmental secretary, before each semester, to ensure that the courses they select are offered. Budget restrictions, enrolment and availability of faculty may cause some courses to be withdrawn.

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 3C 0.5
Medieval Art and Architecture
A study of Early Christian Romanesque and Gothic Art.
Prereq: FINE 111 or consent of instructor

FINE 215 3C 0.5
Baroque Art
A study of 17th-century painting, sculpture and architecture in Italy, Spain, Flanders, France and Holland.
Prereq: FINE 111 or consent of instructor

FINE 216 3C 0.5
Art of the 18th Century in Europe
A study of painting, sculpture, graphic arts and architecture in 18th century Europe.
FINE 218A 3C 0.5
The Religious Art of India
An approach to understanding the myths, symbols and spirituality of Indian religion through a study of representative art, Architecture and folk literature of Hinduism, Jainism, and Indian Buddhism. 
Consult Religious Studies
Cross-listed as RS 269

FINE 219 3C 0.5
Canadian Art
A seminar that begins with the art of British and French settlers in the 17th century and concludes with developments in contemporary Canadian Art.

FINE 310 3C 0.5
Greek Art and Architecture
A survey of the art and architecture of the ancient Greek world from the Minoan to the Hellenistic periods. 
Consult Classical Studies
Cross-listed as CLAS 351

FINE 311 3C 0.5
Roman Art and Architecture
A survey of the art and architecture of the Roman world from Etruscan to Imperial times. 
Consult Classical Studies
Cross-listed as CLAS 352

FINE 313 3C 0.5
Special Topics in 18th- and 19th-Century Art
A seminar course that examines the Neoclassic and Romantic currents of art between 1750 and 1850.

FINE 316 3C 0.5
Canadian Native Art
The arts and crafts of Canadian Indian and Inuit peoples are examined with slide lectures, films, and student presentations.

FINE 318 3C 0.5
Canadian Ethnic and Traditional Arts
An historical survey of Canadian ethnic, Folk and traditional arts and crafts with particular focus on the ethnic and traditional arts of the Waterloo Region.

FINE 319A 3C 0.5
Special Topics in 20th-Century Art: 1900-1940
A study of the major innovations in early 20th-century painting, sculpture and architecture. Honours Art History majors interested in the modern period are encouraged to use this course as preparation for the fourth-year Honours presentation. 
Prereq: FINE 211 or consent of instructor

FINE 319B 3C 0.5
Special Topics in 20th-Century Art: 1940-1960
A survey of the major movements during the 20 year period following the beginning of World War II, including Op Art, Action Painting, the Beat Consciousness; Happenings, Pop Art, Assemblage, Post-Painterly Abstraction and Field Painting, and Kinetic and Light Sculpture.

FINE 330 3C 0.5
Fine Arts Exhibition Curatorship
The development, design, documentation, security, conservation, installation, and interpretation of arts and craft exhibitions will be explored through lectures on the history, purpose and function of fine arts exhibitions; gallery visits; student projects; and the creation and presentation of an actual exhibition.

FINE 390 F R 0.5
Selected Subjects in Fine Arts
Research and reading courses under the direction of individual instructors. 
Admission by consent of instructor.

FINE 390A W 3S 0.5
Methods in the History of Art
For students planning a Senior Honours Presentation in Art History. Students will examine methods of formal and stylistic analysis, iconographical interpretation and the application of social and political history to the understanding of works of art. Required of all art history majors who take FINE 490/491 and 490A. 
Admission by consent of instructor.

FINE 391 W R 0.5
Selected Subjects in Fine Arts
Research and reading courses under the direction of individual instructors. 
Admission by consent of instructor.

FINE 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
Course description on last page of Studio Offerings.

FINE 490A F S,Std,R 0.5
Senior Honours Presentation 2
Course description on last page of Studio Offerings.

FINE 491 S,Std,R W 0.5
Senior General Seminar
As in Fine Arts 390A, each student will work under the direction of a Fine Arts faculty member on an advanced research project. Required of all fourth-year general art history majors. 
Admission by permission only.

FINE 491A W 0.5
Senior General Seminar 2
A continuation of FINE 490A.

FILM STUDIES OFFERINGS

FINE 250 F 3L2D 0.5
History of Film 1 (1895-1940)
General history of world cinema in its silent and early sound era, covering the work of outstanding directors, national productions and movements, and their contribution to the film medium's development into a prominent art form of the 20th century. Regular film screenings.

FINE 251 W 3L2D 0.5
History of Film 2 - After 1941
A continuation of FINE 250. From the beginnings of the modern sound cinema (Welles) to the contemporary period. Regular film screenings.

FINE 252 F 2C1D 0.5
Film and the Quest for Meaning 1
An exploration of spiritual themes and issues in the cinema. An assessment of film's special characteristics as an art form capable of addressing the human quest for a significant existence. Emphasis upon the films of Ingmar Bergman. 
Cross-listed as R S 266

FINE 253 W 2C1D 0.5
Film and the Quest for Meaning 2
A consideration of selected themes — death, evil, guilt, fate, alienation, courage, love, redemption — in the films of several of today's leading directors. Emphasis upon a variety of directors from divergent cultural backgrounds. 
Cross-listed as R S 267
FINE 255R 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 denumaniza-
tion, individual and collective goals, social realilies and dreams, and the quest for individual and cultural identity.

FINE 258W 0.5
Canadian Film
A study of Canadian film, from 1895 to the present, based on the screening and analysis of selected films.  
This is a WLU course for Film Studies Majors/Minors only.

FINE 259W 0.5
German Film
A study of major works (English subtitles) of the German cinema, beginning with the "golden age" of the 1920's and emphasizing the New German Cinema created by directors such as Fassbinder, Wenders, Herzog, Straub, Schlondorff and others.  
This is a WLU course for Film Studies Majors/Minors only.

FINE 270W 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 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 351 W 2L,2D 0.5
Central and East European Film
Examination of the development of the motion picture art in Central and Eastern Europe after World War II. Selected works of prominent directors of Czechoslovakia, Hungary, Poland, the USSR, and Yugoslavia will be discussed (Chytilova, Forman, Jancso, Makaveyev, Tarkovsky, Wajda, and others). Regular film screenings.

FINE 352 2L,2D 0.5
The Cinema of Science Fiction
A chronological survey of one of the richest and most intriguing of film genres. Discussion of its aesthetic, philosophical and cinematic aspects. Film screenings will present major international works in this genre (Godard, Kubrick, Lang, Marker, Siegel, Tarkovksy, Truffaut and other directors). Regular film screenings.

FINE 353 2L,2D 0.5
Contemporary Italian Film
A study of major achievements of the Italian cinema in its post-Neo-Realist period. Discussion of the works of major directors since the late 1950's. Antonioni, Bertolucci, Fellini, Olmi, Taviani, Rosi, Visconti and others. Regular film screenings.

FINE 356R/357R 0.5/0.5
Special Topics in Film
Special topics will be announced from year to year.

FINE 359 3G 0.5
Film and Literature in Germany
This course introduces students to significant aspects of modern German culture through film, and links this study with that of literature. It involves viewing and analyzing films and establishing a connection to related literary and cultural traditions.  
Prereq: Open to all students above first year  
Cross-listed as GER 300  
Taught in English

FINE 360 2L,2D 0.5
Film and Television 1
Examination of principles of the audiovisual language and the main structural elements of the cinematic work. Discussion of the relationship between film, television and other arts/media. Regular film screenings.

FINE 361 2L,2D 0.5
Film and Television 2

FINE 380Z and 381Z
Film Studies Seminar
These two courses will offer an introduction to key aspects of motion picture and TV production, film preservation and restoration with visits to studios, film archives, film museums. Screening of selected quality films will be complemented by discussions focusing on material unavailable in Canada. Direct contact between course participants and scholars/students. (Three weeks in Paris and London.)

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 391 W R 0.5
Selected Subjects in Fine Arts
Research and reading courses under the direction of individual instructors.  
Admission by consent of instructor.

FINE 470 F 0.5
Senior Seminar in Film Concepts 1
Film screenings.  
Admission by consent of instructor.

FINE 471 W 0.5
Senior Seminar in Film Concepts 2
Film screenings.  
Admission by consent of instructor.

FINE 490 F S, std,R S, std,R 0.5
Senior Honours Presentation 1
Course description on last page of Studio Offerings.

FINE 490A F std,R 0.5
Senior General Seminar
Course description in Art History offerings.

FINE 491 W S, std,R 0.5
Senior Honours Presentation 2
Course description on last page of Studio Offerings.
STUDIO OFFERINGS

FIN 120 F 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.

FIN 121 W 6 std. 0.5
Fundamentals of Visual Art 2
A continuation of FIN 120 with emphasis on colour.
  Prereq: FINE 120

FIN 220 F 6 std. 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

FIN 220A 6 std. 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

FIN 221 W 6 std. 0.5
Fundamentals of Painting 2
A continuation of the studio projects begun in FIN 220 with a greater emphasis on the development of individual expression.
  Prereq: FINE 220 or consent of instructor

FIN 222 W 6 std. 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

FIN 223 F 6 std. 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 120/121

FIN 223A 6 std. 0.5
Clay Studies
Using a variety of clay bodies and firing techniques, students will explore figurative and abstract sculptural concepts, to develop a working knowledge of clay as a sculptural medium.

FIN 224 F 6 std. 0.5
Introduction to Drawing
Students will make analytical and expressive drawings in a variety of media, in order to develop accurate observation and understanding of form.
  Prereq: FINE 120/121

FIN 225 W 6C std. 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

FIN 226
Printmaking
Introduction to materials and methods of printmaking. Current offerings are given below.

FIN 226A 6 std. 0.5
Printmaking (Intaglio)
An introduction to basic intaglio techniques including etching and engraving through workshops and class demonstrations.
  Prereq: FINE 120/121 or consent of instructor

FIN 226 B 6 std. 0.5
Printmaking (Relief)
An introduction to relief printing including collagraph, wood block, line cut and type using press and non-press materials to make print images in a series of workshops and demonstrations.
  Prereq: FINE 120 or permission of instructor

FIN 226 D 6 std. 0.5
Printmaking (Screen)
An introduction to screen printing, with emphasis on exploration of ink properties and stencil techniques.
  Prereq: FINE 120 or consent of instructor

FIN 226 C 6 std. 0.5
Objective Drawing
Perspective Drawing, Rendering of geometric forms, and techniques of accurate drawing of biological subjects in line, value, and colour, using various drawing media.

FIN 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.

FIN 228A 6C std. 0.5
Expressive Textile Forms
The history of textile arts and problems of design for textile media will be explored combining lectures and studio projects in both 2 and 3 dimensional expressive forms. Traditional textile materials and methods will be applied to the creation of contemporary expressive and autonomous forms. Students will supply their own materials.

FIN 228C 3C std. 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 images are constructed.

FIN 228D 6 std. 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.

FIN 228E 6 std. 0.5
Photography for Artists
Introduction to photographic techniques for use as a tool for artists. Basic techniques will be taught through a series of exercises, with emphasis on applications for creative artistic expression and documentation. Intended for Fine Arts majors. Supplies at student's expense.
  Prereq: FINE 120/121

FIN 228F 6 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 selected from among historic styles such as Homan, Uncial, Bookhand, Gothic, Italic and Fraktur.
FINE 228H W 6std 0.5
Electronic Imaging I
An introduction to the use of the computer for monochrome and colour two dimensional image generation and manipulation. Students will produce 35mm colour transparencies and colour photographic prints to document their work. Intended for Fine Arts majors.
Prereq: FINE 120 or consent of instructor

FINE 320 F 6std 0.5
Advanced Painting I
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

FINE 321 W 6std 0.5
Advanced Painting
A continuation of Fine Arts 320 with a further emphasis on independent problems.
Prereq: FINE 320 or consent of instructor

FINE 322 F 6std 0.5
Advanced Sculpture 1
An exploration of sculpture problems in a variety of media as vehicles for serious creative expression.
Prereq: FINE 222/223

FINE 323 W 6std 0.5
Advanced Sculpture 2
Organization and integration of sculptural concepts in clay to develop a series of representational or abstract sculptures. Clay and glaze technology for oxidation stoneware firing will be stressed.
Prereq: FINE 322

FINE 323A 6S,std 0.5
Assemblage
A two and three dimensional study of the various aspects of assemblage, including visual poetry, processes, events, conceptualization, and structuralism.

FINE 324 F 6std 0.5
Advanced Drawing
A course in which drawing is investigated as a means of expression and communication. The human figure, objects, and the landscape will be studied as sources of artistic imagery. The student will be encouraged to experiment with imagery, to develop personal vision, and to devise individual formal means of expression.
Prereq: FINE 224 or consent of instructor

FINE 325 W 6std 0.5
Advanced Drawing 2
Continuation of FINE 324

FINE 326A 6std 0.5
Advanced Printmaking (Lithography)
An introduction to plate lithography with the emphasis on printmaking as a vehicle for serious creative expression. Integration with other forms of printmaking can be explored by senior printmakers.
Admission by permission of instructor

FINE 328A 6std 0.5
Advanced Calligraphy
A combination of tradition and experiment with the letter as art form. Students will work with traditional materials and explore new or unusual materials or combinations of materials. They will also be encouraged to develop their own classical or experimental projects.
Prereq: FINE 322

FINE 328B 6std 0.5
Advanced Applied Graphics
A continuation of FINE 228D, a critical exploration of commercial illustration, type and symbol of design, multi-colour print reproduction and various other advanced graphsica techniques.
Prereq: FINE 228D

FINE 329 3C,std 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 394A-D 0.5
Fine Arts Abroad
Working in the field with landscape, cityscape, and monuments of art, students will employ a variety of media to develop techniques for visual reportage, documentation, note-taking, and journal-keeping. Individual aesthetic responses to a wide range of subject-matter will be encouraged.

FINE 420 6std 0.5
Senior Graphics Techniques 1
Admission by consent of instructor

FINE 472 F R,std 0.5
Senior Seminar 1
Independent study/practice course under the direction of individual instructors.
Prereq: Consent of instructor

FINE 473 W R,std 0.5
Senior Seminar 2
Independent study/practice course under the direction of individual instructors.
Prereq: Consent of instructor

FINE 474 F R,std 0.5
Senior Seminar 3
Independent study/practice course under the direction of individual instructors.
Prereq: Consent of instructor

FINE 475 W R,std 0.5
Senior Seminar 4
Independent study/practice course under the direction of individual instructors.
Prereq: Consent of instructor

FINE 480 F 3C 0.5
Fine Arts Praxis
A seminar for students in their final year of Fine Arts study, in which studio exercises will be combined with research into current issues in Canadian and International art.
Prereq: Consent of instructor
Department of French

Associate Professor and Chairman of the Department
W.D. Wilson, MA, PhD (Trinity College, Dublin)

Associate Professor and Graduate Officer
P.G. Socken, BA (Toronto), MA (Iowa), PhD (Toronto)

Associate Professor and Undergraduate Officer
H.S. Fournier, BA (Toronto), MA, PhD (Western Ontario)

Professors
A. Ages, BA (Carleton), MA, PhD (Ohio State)

Associate Professors
P.H. Dube, BA, MA (Toronto), PhD (Ohio State)
J.R. Dugan, BA, MA (Toronto), PhD (Yale)
D.W. Russell, BA, MA, PhD (Toronto)

Assistant Professors
C.A. Abbott, BA, MA, PhD (Ohio State), J.J.
J-P. Beaulieu, BA (Sherbrooke), MA (Waterloo), PhD (Ottawa)
R.J. Fournier, BA, MA, PhD (Western Ontario)
G. Losier, BA, MA (Ottawa), PhD (Paris)

Language Instructors
P. Aplevich, BA, MA (Waterloo)
C. Black, MA (Waterloo), Licence é d生 lettres (Grenoble)
J. Forster, BA (Queen's)
H. McLennan, Licence en Phil. Rom. (Brussels), MA (Waterloo), PhD (Western Ontario)
T. Sabaryn, Licence é d生 lettres (Toulouse)
J. refers to faculty members at St. Jerome's College

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

FIRST-YEAR COURSES

1. The Department reserves the right to refuse admission to, and/or credit for, any of its language courses to a student who has, in the view of the Department, a level of competence unsuited to that course.

2. Students with some elementary or secondary school French not exceeding Ontario Grade 10 French or equivalent should enrol in French 151. Those with Ontario Grade 11 French or equivalent should enrol in French 152.

3. Students with Ontario Grade 12 French or equivalent should enrol in French 155.

4. Students with Ontario Grade 13 or Ontario Academic Course French or equivalent, see above, notes 1-6. Also offered at St. Jerome's College.

5. Students may enrol only in courses for which they have secondary school antirequisites with the written permission of the Department of French.

6. All students intending to register in any University of Waterloo French language course at the 100 level (FR 151, 152, 155, 192A, 192B, 195, 196) who have Ontario Grade 13 or Ontario Academic Course French or equivalent must take the French Language Placement Test to be held on Thursday, September 7, 1989 at 11:30 a.m. to 1:30 p.m. in Arts Lecture Hall 116.

7. Students should consult the Departmental brochure "French at Waterloo" for further details, and for any changes in offerings after the Calendar goes to press.

8. Linguistics, Language, Civilization, and Literature courses are listed separately below.

FR 151 F,W,S 3C,1L 0.5
Basic French I
For students with some elementary or secondary school French not exceeding Year Two (Grade Ten in Ontario) or equivalent. Emphasizes comprehension, grammar and basic speaking skills.
Antireq: Ontario Grade 11 French or equivalent. See above, notes 1-6
Also offered at St. Jerome's College.

FR 152 F,W,S, 3C,1L 0.5
Basic French II
A continuation of the work done in FR 151.
Prereq: FR 151 or equivalent
Antireq: Ontario Grade 12 French or equivalent
Also offered at St. Jerome's College.

FR 155 F,W,S 4C,1L 0.5
Intermediate French Language I
A comprehensive study of French grammar and vocabulary. Involves reading, writing and speaking French.
Prereq: FR 152 or Ontario Grade 12 French or equivalent
Antireq: Ontario Grade 13 or Ontario Academic Course French or equivalent. See above, notes 1-6

FR 156 F,W,S 4C,1L 0.5
Intermediate French Language II
A continuation of the work done in FR 155.
Prereq: FR 155

FR 192A F,W 4C,1L 0.5
Advanced French Language 1A
An intensive French Language course. Emphasis will be placed on strengthening oral expression, comprehension of spoken French, reading and writing skills.
Prereq: Ontario Grade 13 or Ontario Academic Course French or equivalent. See above, notes 1-6
Also offered at St. Jerome's College.

FR 192B F,W,S 4C,1L 0.5
Advanced French Language IB
Continuation of FR 192A.
Prereq: FR 192A
Also offered at St. Jerome's College.
FR 193  3C  0.5
French for Francophone Students I
A first level course for francophones and near-fluent speakers of French. Emphasis will be on grammatical accuracy.
Prereq: Consent of department

FR 201  F,W,S  4C,1L  0.5
Advanced French Language I C
A transitional course, enabling students at the Intermediate level in Year I to join the Advanced stream of language courses. Students who successfully complete this course may continue to FR 250.
Prereq: FR 156 or consent of department

FR 250  5C  1.0
Advanced French Language II
Continued intensive study of spoken and written French, with emphasis on more difficult problems of the language. Taught in French.
Prereq: FR 192A and FR 192B or FR 195 and FR 196 or FR 201 or consent of the department.

FR 250A  3C  0.5
Advanced Spoken French II
A course intended to develop the oral and aural skills learned in FR 250. Small group work.
Prereq: FR 250

FR 255  3C,1L  0.5
Business French
A course designed to enable the student to carry on standard business practices in spoken and written French.
Prereq: FR 192, 195/196 or consent of department

FR 293  3C  0.5
French for Francophone Students II
A second level course for francophones and near-fluent speakers of French. In addition to continued emphasis on correct usage, attention will be paid to stylistic improvement.
Prereq: FR 193 or consent of department

FR 300  5C  1.0
Advanced French Language III
Intensive development of writing skills through a study of stylistics and translation. Advanced oral composition will also be emphasized. Taught in French.
Prereq: FR 250 or FR 251 and FR 252 or FR 293 or consent of the department

FR 300A  3C  0.5
Advanced Spoken French III
An advanced level course intended to continue intensive oral and aural skill development.

FR 400  4C  0.5
Advanced French Language IV
Intensive development of advanced comparative stylistics, translation and composition skills. Taught in French.
Prereq: FR 300 or FR 301 and 302 or consent of department

FR 400A  3C  0.5
Advanced Spoken French IV
Further advanced level work to continue intensive oral and aural skill development.
Prereq: FR 300A or FR 400 or consent of department

LINGUISTICS COURSES

Language of Instruction:
Courses are normally taught in French. However, in the case of students not enrolled in a French Major or Honours Program, permission may be given for written assignments and examinations to be done in English.
FR 263  3C  0.5
Aspects of France
An examination of contemporary French society through documents taken from different media.
Prereq: FR 192 or consent of department
Offered at St. Jerome's College

FR 273  3C  0.5
Aspects of Quebec
A presentation of traditional and contemporary Quebec in the fields of the Arts, literature, music, politics and society. Taught in French.
Prereq: FR 192, 198 or consent of department

FR 291  3C  0.5
French Civilization 1
This course traces the cultural development of France from its origin to the French Revolution. Emphasis is given to the study of music, art, architecture, literature, ideas and "daily life" in their historical context.
See Note under FR 292.
FR 292 3C 0.5
French Civilization 2
This course completes the study of the cultural development of France to 1900. After that, the course emphasizes a study of life in these two areas today. Considerable attention will be paid to art, politics, industry, etc. Prereq: FR 291 is recommended.
FR 291 and 292 are taught in English. Open to Arts students in second year and higher, and to others in any year. Students in a French Major, Honours, or Minor Program are encouraged to take this course as an elective.

FR 393A/B 0.5/0.5
French Civilization, 1884-1914
Offered in the Nantes Program.

LITERATURE COURSES

Language of Instruction:
Courses are normally taught in French. However, in the case of students not enrolled in a French Major or Honours Program, permission may be given for written assignments and examinations to be done in English.

FR 195 3C 0.5
French Studies 1
A survey of French civilization and literature prior to the French Revolution and an introduction to the discipline. Language skills will be developed through intensive composition and essay writing. Taught in French.
Prereq: OAC or Grade 13 French or equivalent

FR 196 3C 0.5
French Studies 2
A survey of French civilization and literature from the French Revolution to the present. Continued emphasis on language skills through intensive composition and essay writing. Taught in French.
Prereq: FR 195 or FR 192A or consent of the department

FR 231 3C 0.5
Survey of 17th-Century French Literature
This course will trace the development of French literature from 1600-1700. Taught in French.
Prereq: FR 195 and FR 196 or consent of department

FR 232 3C 0.5
Topics and Problems in 17th-Century French Literature
A more detailed study of writers/works of the classical period. Taught in French.
Prereq: FR 195 and FR 196 or consent of department

FR 253 3C 0.5
Romanticism
This course will deal with French literature between 1789 and 1848. This course will explore the principal literary movement of this period: Romanticism. Taught in French.
Prereq: FR 195 and FR 196 or consent of department

FR 264 3C 0.5
20th-Century French Theatre
The study of a representative number of authors and texts from Ouvadet to Ionesco. Taught in French.
Prereq: FR 195 and FR 196 or consent of department

FR 275 3C 0.5
Contemporary French-Canadian Novel
A study of a limited number of texts by authors such as Gabrielle Roy, André Langlois, Hubert Aquin, Gérard Bessette. Taught in French.
Prereq: FR 195 and FR 196 or consent of department

FR 342 3C 0.5
18th-Century French Literature
This course will trace the development of French literature from 1700-1800. Taught in French.
Prereq: FR 195 and FR 196 or consent of department
Also offered at St. Jerome's College.

FR 343 3C 0.5
Topics and Problems in 18th-Century French Literature
A more detailed study of one or more aspects of the Enlightenment. Taught in French.
Prereq: FR 195 and FR 196 or consent of department

FR 354 3C 0.5
Realism and Naturalism
This course will study the literature from 1848 to 1900. It will cover not only the major writers but also the theories behind the social, artistic and intellectual trends in this part of the century.
Prereq: FR 195 and FR 196 or consent of department
Not open to students who have taken FR 254.

FR 363 3C 0.5
20th-Century French Novel
A survey of the Novel from Proust to the present day through the study of a selection of Key Texts. Taught in French.
Prereq: FR 195 and FR 196 or consent of department

FR 371 3C 0.5
French-Canadian Poetry
A study of its evolution from Octave Crémazie to Anne HÉbert and the present. Taught in French.
Prereq: FR 195 and FR 196 or consent of department

FR 372 3C 0.5
Contemporary Quebec Theatre
A study of contemporary Quebec theatre, from Gratien Gélinas to the present. Taught in French.
Prereq: FR 195 and FR 196 or consent of department

FR 391 3C 0.5
French Women Writers
A study of selected works by women writers in France from the Middle Ages to the twentieth century. The course will focus on the literary features of these works and on their value as reflections of the position of women in French society throughout the period. Taught in French.
Prereq: FR 195 and FR 196 or consent of department

FR 410 3C 0.5
Medieval French Literature
An introduction to French literature of the Middle Ages through the study of representative texts, including excerpts from the epic, courtly and satirical works. Taught in French.
Prereq: FR 195 and FR 196 or consent of department
Offered at St. Jerome's College

FR 421 3C 0.5
French Prose of the Renaissance
Readings in 16th-century literature; Rabelais, Montaigne, etc. Taught in French.
Prereq: FR 195 and FR 196 or consent of department
FR 422 3C 0.5
French Poetry of the Renaissance
Readings in 16th-century poetry:
Marot, the Pliade, the baroque poets, etc. Taught in French.
Prereq: FR 195 or FR 196 or consent of department

FR 451 3C 0.5
Symbolist Poetry
The course will concentrate on the
works of four poets — Baudelaire,
Verlaine, Rimbaud and Mallarmé.
Special emphasis will be placed on the
"explication de texte" as a technique in
the analysis of poetry.
Prereq: FR 195 or consent of department

FR 482 3C 0.5
Study of Individual Authors
Each year a different author is the
subject of specialized study to permit
an in depth exploration of his/her
literary qualities. Taught in French.
Prereq: FR 195 and FR 196 or
consent of department

FR 490-498 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.
Prereq: FR 195 and FR 196 or
consent of department

Course Descriptions

General

Engineering

Associate Professor
C.F.A. Beaumont, BA (McMaster), MA
(Toronto)

Lecturers/Demonstrators
D.A. Fraser, BASc, MSc, B.Ed
(Toronto), PhD (Waterloo)

J. Lowe, BSc (Carleton), Recipient of
the Distinguished Teacher Award
K. Riepert, BASc (Waterloo)

Faculty Members hiring summer
appointment to General Engineering
Freshmen: Applied Mathematics

French Poetry of the Renaissance
Readings in 16th-century poetry:
Marot, the Pliade, the baroque poets, etc. Taught in French.
Prereq: FR 195 or FR 196 or consent of department

Symbolist Poetry
The course will concentrate on the
works of four poets — Baudelaire,
Verlaine, Rimbaud and Mallarmé.
Special emphasis will be placed on the
"explication de texte" as a technique in
the analysis of poetry.
Prereq: FR 195 or consent of department

Study of Individual Authors
Each year a different author is the
subject of specialized study to permit
an in depth exploration of his/her
literary qualities. Taught in French.
Prereq: FR 195 and FR 196 or
consent of department

Introduction to Methods of Mechanical Engineering
An introduction to some of the basic
methods and principles used by engi-
ners, including fundamentals of tech-
nical communication, measurements,
analysis, and design. Some aspects of
the engineering profession, including
standards, safety, and intellectual prop-
erty.
Examples drawn from Mechanical
Engineering.

Introduction to Methods of Electrical Engineering
An introduction to some of the basic
methods and principles used by engi-
ners, including fundamentals of tech-
nical communication, measurements,
analysis, and design. Some aspects of
the engineering profession, including
standards, safety, and intellectual prop-
erty.
Examples drawn from Electrical
Engineering.

Introduction to Methods of Civil Engineering
An introduction to some of the basic
methods and principles used by engi-
ners, including fundamentals of tech-
nical communication, measurements,
analysis, and design. Some aspects of
the engineering profession, including
standards, safety, and intellectual prop-
erty.
Examples drawn from Civil Engi-
neering.

Introduction to Methods of Electrical Engineering
An introduction to some of the basic
methods and principles used by engi-
ners, including fundamentals of tech-
nical communication, measurements,
analysis, and design. Some aspects of
the engineering profession, including
standards, safety, and intellectual prop-
erty.
Examples drawn from Electrical
Engineering.

Introduction to Methods of Electrical Engineering
An introduction to some of the basic
methods and principles used by engi-
ners, including fundamentals of tech-
nical communication, measurements,
analysis, and design. Some aspects of
the engineering profession, including
standards, safety, and intellectual prop-
erty.
Examples drawn from Electrical
Engineering.

Introduction to Methods of Electrical Engineering
An introduction to some of the basic
methods and principles used by engi-
ners, including fundamentals of tech-
nical communication, measurements,
analysis, and design. Some aspects of
the engineering profession, including
standards, safety, and intellectual prop-
erty.
Examples drawn from Electrical
Engineering.

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methods and principles used by engi-
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nical communication, measurements,
analysis, and design. Some aspects of
the engineering profession, including
standards, safety, and intellectual prop-
erty.
Examples drawn from Electrical
Engineering.

Introduction to Methods of Electrical Engineering
An introduction to some of the basic
methods and principles used by engi-
ners, including fundamentals of tech-
nical communication, measurements,
analysis, and design. Some aspects of
the engineering profession, including
standards, safety, and intellectual prop-
erty.
Examples drawn from Electrical
Engineering.

Introduction to Methods of Electrical Engineering
An introduction to some of the basic
methods and principles used by engi-
ners, including fundamentals of tech-
nical communication, measurements,
analysis, and design. Some aspects of
the engineering profession, including
standards, safety, and intellectual prop-
erty.
Examples drawn from Electrical
Engineering.

Introduction to Methods of Electrical Engineering
An introduction to some of the basic
methods and principles used by engi-
ners, including fundamentals of tech-
nical communication, measurements,
anal
**GEN E 301/302 W,S,F,W  4D  0.5**
**Special Directed Studies**
This course is provided to allow enrichment for students in Engineering who have fulfilled the requirements of one or more of the courses in the 3A or 3B term by means of passing a course or courses taken during one or more work terms. The course comprises a special project pursued under the direction of a Faculty member, normally in the Department of the student's program.

*Prereq:* Permission of the Associate Chairman of the Department in which the student is registered.

**GEN E 352 W  3C  0.5**
**Technical Entrepreneurship**
Technical entrepreneurship is examined considering the role of independent business, entrepreneurial behaviour, types of business and enterprises, business structure, sources of venture concepts and capital, company operation and control, and business start-up.

*Prereq:* A course in Engineering Economics (or equivalent).

Restricted to fourth-year Engineering students.

**GEN E 401/402 F,S/W  4D  0.5**
**Special Directed Studies**
This course is provided to allow enrichment for students in Engineering who have fulfilled the requirements of one or more of the courses in the 4A or 4B term by means of passing a course or courses taken during one or more work terms. The course comprises a special project pursued under the direction of a Faculty member, normally in the Department of the student's program.

*Prereq:* Permission of the Associate Chairman of the Department in which the student is registered.

**GEN E 411 S,F  3C  0.5**
**Engineering Law**
General introduction of Law and Common Law Legal Systems; Formation of Contracts, Effect of mistakes on Contracts, Interpretation of Contracts, Breach of Contracts, Legal Remedies; Scope and content of technical specifications; Sale of goods; introduction of the Law of Agency; the Tort of Negligence, Professional Negligence; some aspects of Restrictive Trade Practices; Introduction to Patent Law, ethical aspects of professional practice.

Restricted to fourth-year Chemical, Computer/Electrical and Systems Design Engineering Students.

**GEN E 412 W  3C  0.5**
**Ethics and The Engineering Profession**
An application of philosophical analysis and theories of ethics to issues of moral conduct in the engineering profession. Discussions will include such matters as the social responsibilities of engineers, standards of product safety and liability, the assessment of acceptable risk, conflicts of interest and obligation, professional loyalty and "whistle blowing", use and enforcement of professional codes of ethics, the "democratization" of the profession, and the moral implications of technology.

*Not open to Year One students.*

Cross-listed as PHIL 315.

**GEN E 460 F  3C,2T  0.5**
**Orthopaedic Bioengineering**
Introduction of engineering technology to the field of orthopaedics. Specific topics deal with the repair and reconstruction of portions of the musculoskeletal system affected by trauma or pathological response. Primary study is directed toward the skeletal joints and major load carrying structure.

*Prereq:* Students must have background study in properties and mechanics of materials equivalent to CIV E 204 and CIV E 265. Registration in this course will be assessed on an individual basis through scheduled interviews.

Cross-listed as CIV E 460.

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**Department of Geography**

Professor, Chairman of the Department
W.S. Mitchell, BA, MA (British Columbia), PhD (Liverpool)

Professor, Dean of Graduate Studies
J.S. Gardner, BSc (Alberta), MSc, PhD (McGill), Recipient of the Distinguished Teacher Award

Professor, Dean of the Faculty of Environmental Studies
J.H. Bater, BA, MA (British Columbia), PhD (London)

Associate Professor, Advisor on Interdisciplinary Programs to the Vice-President, Academic and Provost
T.E. Bunting, BA (York), MA (Western Ontario), PhD (Toronto)

Professor, Associate Dean, Undergraduate Studies and Educational Liaison
G.R. McBoyle, BSc, PhD (Aberdeen)

Professor, Associate Chairman, (Graduate Studies)
G. Wall, BA (Lethbridge), MA (Toronto), PhD (Hull)

Assistant Professor, Associate Chairman, (Graduate Studies)
D. Dudycha, BA (Waterloo Lutheran), MA (Waterloo), PhD (London)

Professors
C.R. Bryant, BA, PhD (London)
A. Diem, BA (Wayne State), MA (Clark), PhD (Michigan)
G.T. Guilek, BSc (Cape Town), MA (York), PhD (Toronto)
P.J. Howarth, BA (Cambridge), PhD (Glasgow)
R.M. Irving, BA, MA (Toronto), PhD (Minnesota)
C.K. Knapper, BA Hons (Sheffield), PhD (Saskatchewan)
R.R. Krueger, BA, MA (Western Ontario), PhD (Indiana), Recipient of the Distinguished Teacher Award
E.F. LeeDrew, BA (Toronto), MA, PhD (Colorado)
A.G. McLellan, BSc, PhD (Glasgow)
G.G. Mulamoottil, BSc (Mysore), MSc (Bombay), PhD (Delhi)
J.G. Nelson, BA (McMaster), MA (Colorado), PhD (Johns Hopkins)
R. Preston, BA (Central Washington), MA (Washington), PhD (Clark)
Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

GEOG 101 F,W 2C,2L 0.5
Introduction to Human Geography
An introduction to human geography through a survey of some of the concepts, methods, techniques and applications of geographic analysis to the human cultural environment. Directed towards people-land and location analysis themes.

GEOG 102 F,W 3C,1L 0.5
Introduction to Physical Geography
Emphasis on the natural environment as an integrated system. Selected aspects of weather — climate, water, soils, biota, landforms along with flows of energy, water and matter and their effects on the subsystems of the natural environment.

GEOG 150 W 2C,2L 0.5
Introduction to Cartography and Map Analysis
Basic concepts involved in the analysis and use of existing types of cartographic products. Background theory of the production and reproduction of topographic and thematic maps, including historical development, collection of data and symbolization.

GEOG 201 F,S 2C,2L 0.5
Geomorphology and Soils
The roles of geomorphological and soil forming processes in creating and modifying landscapes. The utility of geomorphological information in our everyday lives.

GEOG 202 W,S 3C 0.5
Location of Economic Activities
The locational structure of economic activities in the context of regional development, with the use of case studies. Basic concepts and tools are used to analyse the location structure of primary, secondary and tertiary activities.

GEOG 204 W 3C 0.5
Soviet Union
Introduction to the geography of the Soviet Union, with a focus on selected problems in urbanization, industrialization, resource use and regional economic development in a planned economy.

GEOG 205 F 2C,2L 0.5
Africa
The geography of modern Africa south of the Sahara in the context of changing attitudes to the continent on the part of the "developed" countries. Attention will focus on problems of the physical, social and economic environments.

GEOG 221 W 3C 0.5
The United States
Focuses on population shifts, urban developments, and regional economic development in the context of the nation and selected regions.

GEOG 226R F 3C 0.5
Food, Agriculture and Integrated Rural Development in the Third World
Population growth and food resources in different areas of the Third World. Focus on possibilities of decelerating population growth and accelerating food production and rural development in selected regions.

GEOG 230 W 3C 0.5
Cultural Geography
The Geography of culture and the role of cultural factors in environmental relationships.

GEOG 231 F 3C 0.5
Cities in Canada
An introduction to some basic concepts in urban studies emphasizing a systematic approach to processes and problems of urban development in Canada.

GEOG 275 F 2C,2L 0.5
Introductory Air Photo Analysis and Remote Sensing
Basic characteristics of various remote sensing techniques and their application in the broad field of geographic and environmental studies. Emphasis on the analysis and interpretation of air photos in 3 dimensions.

GEOG 300 W,S 2C,2L 0.5
Geomorphology and the Southern Ontario Environment
Study of the origin and evolution of land forms of Southern Ontario. Analysis of contemporary geomorphic processes. Study of human impact on geomorphological landscapes. The lectures will be supplemented by field trips and field work required for term projects.

GEOG 301 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 302 W,S 3C 0.5
Location of Economic Activities
The locational structure of economic activities in the context of regional development, with the use of case studies. Basic concepts and tools are used to analyse the location structure of primary, secondary and tertiary activities.

GEOG 303 F 3C 0.5
Cultural Geography
The Geography of culture and the role of cultural factors in environmental relationships.

GEOG 304 W 3C 0.5
Introduction to Human Geography
An introduction to human geography through a survey of some of the concepts, methods, techniques and applications of geographic analysis to the human cultural environment. Directed towards people-land and location analysis themes.

GEOG 305 F 2C,2L 0.5
Africa
The geography of modern Africa south of the Sahara in the context of changing attitudes to the continent on the part of the "developed" countries. Attention will focus on problems of the physical, social and economic environments.

GEOG 321 W 3C 0.5
The United States
Focuses on population shifts, urban developments, and regional economic development in the context of the nation and selected regions.

GEOG 326R F 3C 0.5
Food, Agriculture and Integrated Rural Development in the Third World
Population growth and food resources in different areas of the Third World. Focus on possibilities of decelerating population growth and accelerating food production and rural development in selected regions.

GEOG 330 W 3C 0.5
Cultural Geography
The Geography of culture and the role of cultural factors in environmental relationships.

GEOG 331 F 3C 0.5
Cities in Canada
An introduction to some basic concepts in urban studies emphasizing a systematic approach to processes and problems of urban development in Canada.

GEOG 375 F 2C,2L 0.5
Introductory Air Photo Analysis and Remote Sensing
Basic characteristics of various remote sensing techniques and their application in the broad field of geographic and environmental studies. Emphasis on the analysis and interpretation of air photos in 3 dimensions.

GEOG 300 W,S 2C,2L 0.5
Geomorphology and the Southern Ontario Environment
Study of the origin and evolution of land forms of Southern Ontario. Analysis of contemporary geomorphic processes. Study of human impact on geomorphological landscapes. The lectures will be supplemented by field trips and field work required for term projects.

GEOG 301 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 302 W,S 3C 0.5
Location of Economic Activities
The locational structure of economic activities in the context of regional development, with the use of case studies. Basic concepts and tools are used to analyse the location structure of primary, secondary and tertiary activities.

GEOG 303 F 3C 0.5
Cultural Geography
The Geography of culture and the role of cultural factors in environmental relationships.

GEOG 304 W 3C 0.5
Introduction to Human Geography
An introduction to human geography through a survey of some of the concepts, methods, techniques and applications of geographic analysis to the human cultural environment. Directed towards people-land and location analysis themes.

GEOG 305 F 2C,2L 0.5
Africa
The geography of modern Africa south of the Sahara in the context of changing attitudes to the continent on the part of the "developed" countries. Attention will focus on problems of the physical, social and economic environments.

GEOG 321 W 3C 0.5
The United States
Focuses on population shifts, urban developments, and regional economic development in the context of the nation and selected regions.

GEOG 326R F 3C 0.5
Food, Agriculture and Integrated Rural Development in the Third World
Population growth and food resources in different areas of the Third World. Focus on possibilities of decelerating population growth and accelerating food production and rural development in selected regions.

GEOG 330 W 3C 0.5
Cultural Geography
The Geography of culture and the role of cultural factors in environmental relationships.

GEOG 331 F 3C 0.5
Cities in Canada
An introduction to some basic concepts in urban studies emphasizing a systematic approach to processes and problems of urban development in Canada.

GEOG 375 F 2C,2L 0.5
Introductory Air Photo Analysis and Remote Sensing
Basic characteristics of various remote sensing techniques and their application in the broad field of geographic and environmental studies. Emphasis on the analysis and interpretation of air photos in 3 dimensions.

GEOG 300 W,S 2C,2L 0.5
Geomorphology and the Southern Ontario Environment
Study of the origin and evolution of land forms of Southern Ontario. Analysis of contemporary geomorphic processes. Study of human impact on geomorphological landscapes. The lectures will be supplemented by field trips and field work required for term projects.

GEOG 301 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 302 W,S 3C 0.5
Location of Economic Activities
The locational structure of economic activities in the context of regional development, with the use of case studies. Basic concepts and tools are used to analyse the location structure of primary, secondary and tertiary activities.

GEOG 303 F 3C 0.5
Cultural Geography
The Geography of culture and the role of cultural factors in environmental relationships.

GEOG 304 W 3C 0.5
Introduction to Human Geography
An introduction to human geography through a survey of some of the concepts, methods, techniques and applications of geographic analysis to the human cultural environment. Directed towards people-land and location analysis themes.

GEOG 305 F 2C,2L 0.5
Africa
The geography of modern Africa south of the Sahara in the context of changing attitudes to the continent on the part of the "developed" countries. Attention will focus on problems of the physical, social and economic environments.

GEOG 321 W 3C 0.5
The United States
Focuses on population shifts, urban developments, and regional economic development in the context of the nation and selected regions.

GEOG 326R F 3C 0.5
Food, Agriculture and Integrated Rural Development in the Third World
Population growth and food resources in different areas of the Third World. Focus on possibilities of decelerating population growth and accelerating food production and rural development in selected regions.

GEOG 330 W 3C 0.5
Cultural Geography
The Geography of culture and the role of cultural factors in environmental relationships.

GEOG 331 F 3C 0.5
Cities in Canada
An introduction to some basic concepts in urban studies emphasizing a systematic approach to processes and problems of urban development in Canada.

GEOG 375 F 2C,2L 0.5
Introductory Air Photo Analysis and Remote Sensing
Basic characteristics of various remote sensing techniques and their application in the broad field of geographic and environmental studies. Emphasis on the analysis and interpretation of air photos in 3 dimensions.

GEOG 300 W,S 2C,2L 0.5
Geomorphology and the Southern Ontario Environment
Study of the origin and evolution of land forms of Southern Ontario. Analysis of contemporary geomorphic processes. Study of human impact on geomorphological landscapes. The lectures will be supplemented by field trips and field work required for term projects.

GEOG 301 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 303  W  2C,2L  0.5
Geographical Hydrology
Study of the land based hydrological cycle and water balance with Canadian emphasis. Focus on snowcover, glacier ice, ground ice, streams and lakes and their physical, ecological and socio-economic significance.
Prereq: GEGG 201 and one of GEOG 208 or 309
Field trip expenses: $15 per student

GEOG 304  S  4 FIELD LAB  0.5
Field and Lab Techniques in Geomorphology
An analysis of the range of techniques used by geomorphologists. This course will involve intensive field surveying, mapping and laboratory work.
Prereq: GEOG 300 or EARTH 342 or consent of instructor
Field-trip expenses: $15 per student

GEOG 307  F  2C,1D  0.5
Social Survey Techniques
Social research and the planning process, interview and self administered surveys; questionnaire design; profile data; sampling; data processing; nonsurvey data collection techniques; practical applications.
Prereq: Second- or third-year students with ENVS 178 or consent of instructor
Cross-listed as PLAN 307
Students may receive credit for only one of GEOG 307 and PLAN 307.
Estimated additional cost to student: $10

GEOG 309  F  2C,1D  0.5
Physical Climatology
Principles of physical climatology with emphasis on climate regions of Canada. Topics include radiation and energy balances, general circulation patterns, synoptic development, climatic variability and microclimatology.
Prereq: GEOG 102

GEOG 315  F  3C  0.5
Agricultural Geography
The geographical dimensions of agricultural systems. Diffusion of innovations, regional evolution of agricultural structure and vertical integration. Comparative study of programs of government intervention in agriculture in Canada and Europe. Some field trips.
Prereq: GEOG 202 or consent of instructor

GEOG 317  F  3C  0.5
Nonparametric Statistics
The theory and application of nonparametric statistics, with particular emphasis upon social science problems.
Prereq: ENVS 278 or consent of instructor
Cross-listed as PLAN 317
Students may receive credit for only one of GEOG 317 and PLAN 317

GEOG 318  W  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.
Prereq: ENVS 278 or consent of instructor
Cross-listed as PLAN 318
Students may receive credit for only one of GEOG 318 and PLAN 318

GEOG 319  F  2C,1L  0.5
Economic and Social Techniques for Regional Planning
Critical appraisal of a selection of descriptive and evaluative regional analysis techniques. Economic considerations of regional development. Reliability and applicability of data; input-output analysis; cost-benefit analysis; planning, programming and budgeting systems; and social area analysis.
Prereq: ECON 101, 102 or consent of instructor
Cross-listed as PLAN 319
Students may receive credit for only one of GEOG 319 and PLAN 319

GEOG 320  W  3C  0.5
The Rural-Urban Fringe
Comparative study of the natural, economic and cultural environments of the rural-urban fringe in the Western World. Emphasis on the use, ownership, development and management of land and the interrelationships between the resource base and urban demands on it.
Prereq: GEOG 202 or consent of instructor

GEOG 322  F  2C  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.
Prereq: GEOG 333 F 3C 0.5
Comparative Regional Problems
A geographical analysis of selected regions and current problems. The theme chosen in any given year will vary.
Prereq: GEOG 202 or consent of instructor

GEOG 323  F  3C  0.5
Marketing Geography
Emphasized are consumer behaviour, firm organization and behaviour, and modelling and analysis of commercial location patterns at both inter- and intra-urban scales.
Prereq: ENVS 278 and a third-year urban or quantitative geography course or consent of instructor

GEOG 332  F  3C  0.5
Health and Disease in the Third World
Population geography concepts and issues in studying health related problems. Topics include: morbidity and mortality patterns, "population at risk", malnutrition, poverty, access to modern health care, and alternative health care systems. Regional case studies from the developing countries.
Prereq: Second-year students or higher

GEOG 349  F  3C  0.5
The City as a System
Theories, models, and research procedures in the study of internal urban structure. Focuses on city-wide processes, urban land use, spatial economics, interaction systems, decision-making, urban growth, and the processes of development and redevelopment.
Prereq: GEOG 202 or 251 or consent of instructor
Field trip fee $5-$10

GEOG 350  W  3C  0.5
Regional Urban Systems
Theories, models, and research procedures dealing with the growth and support of urban centres and cities and their role in regional development.
Prereq: GEOG 202 or GEOG 251 or consent of instructor

GEOG 352  W  3C  0.5
The Rural-Urban Fringe
Comparative study of the natural, economic and cultural environments of the rural-urban fringe in the Western World. Emphasis on the use, ownership, development and management of land and the interrelationships between the resource base and urban demands on it.
Prereq: GEOG 202 or consent of instructor

GEOG 353  W.S  3C  0.5
Marketing Geography
Emphasized are consumer behaviour, firm organization and behaviour, and modelling and analysis of commercial location patterns at both inter- and intra-urban scales.
Prereq: ENVS 278 and a third-year urban or quantitative geography course or consent of instructor

GEOG 354  F  2C  0.5
Advanced Marketing Geography
Case study orientation with emphasis on computer modelling and market area analysis.
Prereq: GEOG 353
GEOG 356 F.W 3C 0.5
Resources Management
Reviews selected theories, methods, and terminology related to economic, behavioural, institutional and decision-making aspects of resources and environmental problems. 
Prereq: ENV S 178 or consent of instructor 
Field Trip fee $10-$15

GEOG 357 F.W 3C 0.5
Conservation and Resource Management
History of the conservation movement; ecological principles of conservation and resource management. Analysis, use and planning of recreational resources. Section one of this course uses a self-directed learning approach. 
Prereq: ENV S 200 
Cross-listed as PLAN 357
Lab fee $10-$15
Students may receive credit for only one of GEOG 357 and PLAN 357
Offered by Correspondence only for 1989-90.

GEOG 358 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: Consent of instructor 
Lab fee $10-$15

GEOG 360 F.S 1C,2L 0.5
Preparation of Maps and Illustrations
Equipment, materials and techniques involved in the practical construction of maps and cartographic illustrations. Conventional drafting and plotting procedures, symbolization of data and map editing for reproduction. 
Prereq: GEOG 160 
Lab fee $15-25

GEOG 367 W 3C 0.5
Conservation in Wildland and Resource Management
Consideration of the constraints and guidelines that an application of the principles of ecology place on the planning and management of resources within natural and agricultural ecosystems. The theory and history of this subject will be discussed together with the management of wildlife, forestry, fisheries, parks and open space, and agriculture. 
Prereq: ENV S 200 
Cross-listed as PLAN 367
Lab fee $10-$15
Students may receive credit for only one of GEOG 367 and PLAN 367

GEOG 368 F 3C 0.5
Conservation/Resource Management of the Built Environment
Consideration of the constraints and guidelines that an application of the principles of ecology place on the planning and management of resources within urban and urban shadow ecosystems. The theory and history of this subject will be discussed together with urban ecosystem management, the management of waste, urban open space and parks, rehabilitated sites, and environmentally sensitive areas. 
Prereq: ENV S 200 
Cross-listed as PLAN 368
Lab fee $10-$15
Students may receive credit for only one of GEOG 368 and PLAN 368

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 GEOG 201
Lab fee $20

GEOG 376 W 2C,3L 0.5
Environmental Remote Sensing
Analysis of non-photographic systems of remote sensing (e.g. radar, lidar, SPOT). Study of remote sensing methods and data processing for analysis of physical and human environments. 
Prereq: GEOG 275
Lab fee $10-$15

GEOG 381 F 3C 0.5
The Nature of Geography
The roots and evolution of geographic thought, conceptual approaches and pathways. Past traditions, current issues, and future trends. The politics and sociology of geography as an art, science, and profession. 
Prereq: Third or fourth year geography students only

GEOG 390 F.W 2S 0.5
Honours Thesis Proposal
The development of a research proposal under the supervision of an appropriate faculty member. Normally taken in the third year. Students considering a topic demanding questionnaire data should take GEOG 307 in third year. 
Prereq: Honours Geography students only

GEOG 391 F.W fidlab 0.5
Field Research
One week field camp in which a specific area will be analysed from a geographic point of view. Individual or group analysis of specific field problems. General students may take this course only in fourth year. 
Prereq: Honours or fourth year Geography students only
Estimated cost to student: $125-$150.

GEOG 401 W.S 3S 0.5
Glacial Geomorphology and Some Contemporary Applications
Glacial and fluvio-glacial erosion and deposition and their effects on landscapes. Focus on the environmental influences of glaciation and on practical applications of glacial geomorphologists' techniques and information. 
Prereq: One of GEOG 300, EARTH 342

GEOG 403 W 3S 0.5
Computer Assisted Cartography
Examination of spatial data processing and computer mapping techniques. Emphasis on digital terrain models and thematic mapping applications. 
Prereq: GEOG 160 and ENV S 278 or consent of instructor

GEOG 422 W.S 2S 0.5
Canada
Seminor on geographical regional synthesis as applied to Canada. Study of regions at different scales. Issues of continuing Canadian concern. A self-directed learning approach is emphasized in this course. 
Prereq: GEOG 322

GEOG 425 W 3C 0.5
Africa
Selected aspects of a major region with particular reference to problems of development. Normally the region will be East Africa. Selection of topics will be related to the interests of participants. 
Prereq: GEOG 205

GEOG 450 W 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
16:74 Course Descriptions
Geography
Geological Engineering

GEOG 451 F 1C,3L 0.5
Soils Geography
Prereq: GEOG 201

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 318 and/or GEOG 352

GEOG 461 F 3C 0.5
Land Dereliction and Rehabilitation
Reasons for land dereliction, its processes, and effects.
Prereq: Fourth-year Environmental Studies students or consent of instructor

GEOG 471 F.W 2C,2L 0.5
Advanced Remote Sensing
Principles of earth resource analysis using remotely sensed imagery and digital data with emphasis upon satellite platform sources. The coordination of supplemental imagery and ground truth missions with satellite data in a multi-strategy perspective.
Prereq: GEOG 376
Lab fee $10-$15.

GEOG 475A/B/C F.W,S 2S 0.5 each
Independent Study of Selected Topics
Individual study of specific topics not covered in other courses. Students must develop a brief outline to be filed with the Associate Chairman, Undergraduate Studies. A faculty member must agree to supervise the study.
Prereq: Third- or fourth-year geography students and consent of instructor
The letter designation allows this course to be taken more than once for credit

GEOG 490A F.W,S 3S 0.5
Honours Thesis Preparation
Preparatory work and first draft of thesis.
Prereq: GEOG 390; only fourth year Honours students
A letter grade for GEOG 490A will be submitted only after the completion of GEOG 490D.

GEOG 490B F.W,S 3S 0.5
Honours Thesis Completion
Completion of thesis.
Prereq: GEOG 390 and GEOG 490A; only fourth year Honours students

COURSES NOT OFFERED 1989-90
GEOG 125R Introduction to the Third World
GEOG 126R Development in the Third World
GEOG 127 Regional Problems of Europe
GEOG 203 Regional Geography
GEOG 208 Applied Climatology
GEOG 220A The World Region
GEOG 220B The World Region and World Issues
GEOG 225R Urbanization in the Third World
GEOG 232 Geography of Population
GEOG 311 Regional Industrial Development
GEOG 316 Multivariate Statistics
GEOG 325R Special Topics in Development of the Third World
GEOG 330 Cultural Geography
GEOG 331 Special Topics in Cultural Geography
GEOG 333 Recreation Geography
GEOG 341 Historical Geography of Canada 1
GEOG 342 Historical Geography of Canada 2
GEOG 345 Political Geography
GEOG 359 Geography of Energy
GEOG 400 Climatic and Periglacial Morphology
GEOG 404 Cartographic Production and Design
GEOG 408 Atmospheric Resource Management
GEOG 409 Energy Balance Climatology
GEOG 411 Geography of Manufacturing Firms and Industries
GEOG 414 Energy Resources Management
GEOG 421A Western Europe 1
GEOG 421B Western Europe 2
GEOG 423 Central and Eastern Europe
GEOG 424 Soviet Union
GEOG 430 Field Research in Regional Geography
GEOG 448 Urban Historical Geography
GEOG 462 Land Dereliction and Rehabilitation
GEOG 470 Applied Air Photo Interpretation
GEOG 481 Frontiers in Geography
GEOG 482 Geography in Education

Geological Engineering

Professor, Chairman of the Geological Engineering Board
E.L. Matyas, BASc (Toronto), DIC, PhD (London), PEng

Members of the Board of Geological Engineering

Professor, Dean of the Faculty of Engineering, Department of Civil Engineering
W.C. Lennox, BASc, MSc (Waterloo), PhD (Lehigh), PEng

Professor, Chairman of the Department of Civil Engineering,
R.G. Haas, BSc, MSc (Alberta), PhD (Waterloo), PEng

Associate Professor, Chairman of the Department of Earth Sciences
J.P. Greenhouse, BSc, MSc (British Columbia), PhD (California)

Professors, Department of Earth Sciences
J.A. Cherry, BE (Saskatchewan), MS (California-Berkeley), PhD (Illinois), PEng
M.B. Dusseault, BSc, MSc, PhD (Alberta), PEng
P.F. Karrow, BSc (Queen's), PhD (Illinois)

Associate Professors, Department of Civil Engineering
B. LeLievre, BEng (West Australia), MASc, PhD (Waterloo), PEng
L. Rothenburg, Dipl Phy (Moscow) PhD (Carleton) PEng
J.C. Thompson, BASc (Toronto), MS, PhD (Illinois), PEng

Associate Professor, Department of Earth Sciences
J.-M. Konrad, BSc, Dip Ing (Strasbourg), MSc (Laval), PhD (Alberta), Ing.

Assistant Professor, Department of Chemical Engineering
I. Chatzis, BASc, MASc, PhD (Waterloo), PEng

Research Professor
J.A. Franklin, BSc, MSc, PhD (London) PEng
Department of
Germanic and
Slavic Languages
and Literatures

Professor, Chairman of the Department
S. Hoefert, BA, MA, PhD (Toronto)

Associate Professor, Associate Dean
(Special Programs), Faculty of Arts
D.G. John, BA, MA, PhD (Toronto)

Associate Professor, Associate
Chairman, Graduate Studies
M. Richter, Staatsexamen (Berlin and
Bonn), MA, PhD (Toronto)

Associate Professor, Associate
Chairman, Undergraduate Studies
F. Jakobsh, BA, MA (Manitoba), PhD
(Waterloo)

Professor Emeritus
J.W. Dyck, AB (Berlin), MA (Missouri),
PhD (Michigan)

Professors
E. Heier, BA, MA (British Columbia),
PhD (Michigan) Recipient of the
Distinguished Teacher Award
H.W. Panthel, BA (Waterloo), MA
(Cincinnati), PhD (Waterloo)

Associate Professors
G. Brude-Firnau, Staatsexamen
(Berlin), PhD (Yale)
R. Karpiak, BA, MA (Manitoba), PhD
(Ottawa)
M. Kuxdorf, BA, MA (Waterloo), PhD
(Alberta)
J. Whiton, BA, MA, PhD (Minnesota)
A. Zweers, Doctorandus (Amsterdam),
Lit Dr (Groningen)

Assistant Professors
H. Moysich, Staatsexamen (Heidel-
berg), Dr.phil. (Mainz), Visiting Assis-
tant Professor (DAAD)
H. Naboe, BA, MA, PhD (Toronto)
T. Sommer, BA, MA (Waterloo)
I. Szarycz, MA (Poland), PhD (Ottawa)

Adjunct Faculty
V. Grubišić, MA (Fribourg), PhD (Aix-
en-Provence)
R. Kooststra, BTh (Kampen), Docto-
randus of Theology, DTh (Free
University of Amsterdam)

Course Descriptions

Germanic Engineering

Course Descriptions

Introductory Note
Not all courses listed in this section are
available. Please consult the 1989-90
Course Offerings List or the Depart-
ment for current course information.

In choosing first year courses, students
should read carefully the course
descriptions, consult the Department
Undergraduate Officer, and check the
Department's program section.

GER 101  F,W,S  3C,1L  0.5
First Year German
For students with little or no knowledge
of German. The basic elements of
German grammar with an emphasis on
oral practice and pronunciation.
Language laboratory, introduction to
aspects of German culture and reading
of appropriate graded texts.

GER 101/102 are beginners' courses
for students with little or no knowledge
of German. Not open to students who
have credit for GER 111, 112, Grade 13
or equivalent. If in doubt, consult the
Department.

GER 102  F,W,S  3C,1L  0.5
First Year Scientific German
As GER 101
Prereq; GER 101

GER 111/112 are beginners' courses
for students with little or no knowledge
of German. Not open to students who
have credit for GER 101, 102, Grade 13
or equivalent.

GER 111  F,W,S  3C  0.5
First Year Scientific German
As GER 111
Prereq; GER 111 

Course Descriptions

Germanic and Slavic

Course Descriptions

Adjunct Faculty
D. Best, BSc, PhD (Queen's), PEng
GER 121 F 3C 0.5
Studies in German Literature with Language Practice
An introduction to German literature designed to accomplish the transition from language studies to reading and discussing literary texts. Grammar review, conversation practice, and the reading of selected works.
Prereq: At least Grade 12 High School German, or equivalent
GER 121/122 are first year courses for students who have completed at least Grade 12 High School German or have an equivalent background in the language. If in doubt, consult the Department.

GER 122 W 3C 0.5
Studies in German Literature with Language Practice
As GER 121
Prereq: GER 121, or permission of the instructor

GER 201 F,W 3C 0.5
Second Year German
This course is a continuation of first year GER 101/102. It offers extensive practice in both the spoken and written language. It provides vocabulary building, grammar review, and exercises in pronunciation and comprehension. Language lab.
Prereq: GER 102 or equivalent

GER 202 W 3C 0.5
Second Year German
As GER 201
Prereq: GER 201, or permission of the instructor

GER 211 F 3C 0.5
Intermediate Scientific German
Grammar review and more advanced study of German 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 112 or equivalent

GER 212 W 3C 0.5
Intermediate Scientific German
As GER 211
Prereq: GER 211

GER 251 F 3C 0.5
German Conversation and Grammar Review
Conversation on topics of everyday life as well as on political, social, and cultural aspects of the German-speaking countries. Comprehensive grammar review, vocabulary building, pronunciation, and written practice.
Prereq: At least two years of high school German or equivalent

GER 252 W 3C 0.5
German Conversation and Composition
As GER 251
Prereq: GER 251, or equivalent

GER 252 W 3C 0.5
The Age of Goethe (Classicism)
Reading, interpretation, and critical analysis of representative works (Goethe, Schiller, Hölderlin, etc.).
Prereq: GER 122, 252 or equivalent.

GER 252 W 3C 0.5
The Age of Goethe (Romanticism)
Reading, interpretation, and critical analysis of representative works (Novalis, Tieck, Brentano, etc).
Prereq: GER 122, 252 or equivalent

GER 252 W 3C 0.5
German Thought and Culture
A survey of cultural currents to the 18th century. Lectures will focus on major developments in literature, philosophy, religion, art, architecture, and music as seen against the historical background of the German speaking peoples.
Taught in English
Open to all students above first year

GER 252 W 3C 0.5
The Age of Goethe (Romanticism)
Reading, interpretation, and critical analysis of representative works (Novalis, Tieck, Brentano, etc).
Prereq: GER 122, 252 or equivalent

GER 252 W 3C 0.5
German Thought and Culture
A survey of cultural events from the 18th century to the present. Lectures will focus on major developments in literature, philosophy, religion, art, architecture, and music as seen against the historical background of the German speaking peoples.
Taught in English

GER 252 W 3C 0.5
Post-War Literature
Reading and interpretation of major works since 1945 in prose, drama and poetry. Main authors: Borchert, Böll, Frisch, Dürenmatt, Grass, Eich, etc.
Prereq: GER 122, 252 or equivalent

GER 252 W 3C 0.5
Post-War Literature
As GER 281
Prereq: GER 122, 252 or equivalent
GER 355 F 3C 0.5
The Stage as Forum: German Drama in Translation
Major German dramas will be studied from various points of view, including historical importance, themes, and technique. The course includes theory and selected dramas of such playwrights as Lessing, Goethe, Schiller, Büchner, Brecht and Dürenmatt.
Taught in English.
Prereq: Open to students from all departments; not normally to first year students.
This course is complemented in the Winter term by RUSS 355.
Cross-listed as DRAMA 355

GER 361 F 3C 0.5
Young Germany and Biedermeier
Reading, interpretation and critical analysis of prescribed prose, drama and poetry. (Grillparzer, Mörike, Stifter, Gotthelf, etc.).
Prereq: GER 122, 252 or equivalent

GER 362 W 3C 0.5
Poetic Realism
Reading, interpretation and critical analysis of prescribed prose, drama and poetry (Sturm, Keller, Ludwig, Hebbel, Raabe, Fontane, etc.).
Prereq: GER 122, 252 or equivalent

GER 371 F 3C 0.5
Modern German Literature
Reading, interpretation and critical analysis of prescribed texts relating to the "Modern" and various literary movements around the turn of the century.
Prereq: GER 122, 252 or equivalent

GER 372 W 3C 0.5
Modern German Literature
Reading, interpretation and critical analysis of prescribed texts from the early 20th century to the end of World War II (Kafka, Brecht, etc.).
Prereq: GER 122, 252 or equivalent

GER 391 F 3C 0.5
Masterpieces of German Literature in Translation
A study of significant prose and drama from 1770 to the present representing themes such as Man and Revolution, Duty vs. Inclination, Flesh vs. Spirit, Modern Germany East and West. Works studied include Danton's Death (Büchner), Maria Stuart (Schiller), Demian (Hesse), Galileo (Brecht), and Cat and Mouse (Grass).

GER 392 W 3C 0.5
Masterpieces of German Literature in Translation
As GER 391

GER 395Z F 2.5
Waterloo in Germany Program
Description in Arts program section.

GER 396Z W 2.5
Waterloo in Germany Program
As 395Z.

GER 421 F 3C 0.5
Introduction to German Linguistics
Study of the major linguistic structures of German, especially in contrast to the structures of English. Coverage of phonetics and phonology, morphology and lexicology, syntax and semantics, and differences between spoken and written German.
Prereq: GER 352 or equivalent

GER 422 W 3C 0.5
Introduction to German Linguistics
As GER 421.
Prereq: GER 421

GER 441 F 3C 0.5
Humanism, Reformation and Baroque
Reading, interpretation and critical analysis of prescribed texts (Erasmus, Luther, Sachs, Opltz, Gryphius, Grimmelshausen, etc.).
Prereq: Second-year standing in German

GER 442 W 3C 0.5
Enlightenment and Storm and Stress
Reading, interpretation, and critical analysis of prescribed texts (Lessing, Wieland, Klopstock, Lenz, Klinger, etc.).
Prereq: Second-year standing in German

GER 451 F 3C 0.5
Advanced Conversation, Composition and Stylistics
This course 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, Composition and Stylistics
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, 252 or equivalent
Offered in alternate years

GER 462 F 3C 0.5
Middle High German Literature
Reading and interpretation of samples from the major works of the MHG period, with emphasis on writers of the first "Blütezeit" in German literature (1170 to 1250); Early Minnesang, Walther von der Vogelweide, Nibelungenlied, Hartmann von Aue, Wolfram von Eschenbach, etc.

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, 252 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.

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 with little or no knowledge of Dutch.

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

Introductory Note
Not all courses listed in this section are available. Please consult the 1989-90 Course Offerings List or the Department for current course information.

Russian Workshop in the USSR
A “Total Immersion” Russian language workshop for a full month at the Russian Language Seminar in Leningrad. Daily instruction by Russian faculty at the elementary, intermediate, and advanced levels, according to the proficiency of the students.
Prereq: At least one year of Russian language at the University level or equivalent
Credits: 1.5 for completion of
The Workshop may be attended more than once. However, a maximum of 1.5 credits will normally be granted towards a degree.

RUSS 101 F 3C, 1L 0.5
First Year Russian
A study of Russian grammar and composition with emphasis on oral practice and pronunciation.
Language lab
Open to all university students with little or no knowledge of Russian, except those who have credit for RUSS 111 or 112.

RUSS 102 W 3C, 1L 0.5
First Year Russian
As RUSS 101
Prereq: RUSS 101 or equivalent

RUSS 111 F, S 3C 0.5
First Year Scientific Russian 1
A rapid, intensive course, designed to enable the student to master reading and translating Russian. Special emphasis on international and scientific terminology, ranging over many of the main branches of science. Notwithstanding its simplified approach, the main features of Russian grammar are treated in full.
Taught in English
Open to all students with little or no knowledge of Russian, except those who have credit for RUSS 101 or 102.

RUSS 112 W 3C 0.5
First Year Scientific Russian 2
As RUSS 111.
Prereq: RUSS 111 or equivalent
Taught in English

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
This course is basically a continuation of First-Year Russian. It provides intensive practice in spoken and written Russian. Vocabulary building, comprehension, pronunciation and intonation are stressed.
Prereq: RUSS 102, 112 or equivalent

RUSS 252 W 3C 0.5
Conversation, Composition, Grammar and Phonetics
As RUSS 251
Prereq: RUSS 261 or equivalent

RUSS 261 F 3C 0.5
Introduction to Russian Literary Movements
Reading of representative works from Russian Classicism, Romanticism, 19th Century Realism, and various periods of 20th century Russian literature.
Prereq: RUSS 102 or equivalent

RUSS 262 W 3C 0.5
Introduction to Russian Literary Movements
As RUSS 261
Prereq: RUSS 102 or equivalent

RUSS 271 F 3C 0.5
Russian Thought and Culture
A survey of cultural history from the beginnings to 1905. Lectures will focus on major developments in literature, philosophy, art, architecture, and music as seen against the background of Russia’s historical past. Discussion will be devoted primarily to works of Russian literature.
Taught in English.
Open to all students.

RUSS 272 W 3C 0.5
Russian Thought and Culture
A survey of cultural history from 1905 to the present. Lectures will focus on major developments in literature, philosophy, art, and music as seen against the background of Russia’s historical past. Discussion will be devoted primarily to works of Russian literature.
Taught in English.
Open to all students.

RUSS 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 idiomatic and structure as compared with the target language.
Prereq: RUSS 202 or equivalent

RUSS 312 W 3C 0.5
Theory of Translation
As RUSS 311
Prereq: RUSS 311

RUSS 341 F 3C 0.5
Russian Drama
A study of the origins and development of Russian drama up to 1905. Reading and critical analysis of major works in various genres with emphasis on authors of the nineteenth century.
Taught in English.
Extra work in Russian required of Russian majors only.
Open to all students
Cross-listed as DRAMA 352

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
Cross-listed as DRAMA 353

RUSS 351 F 3C 0.5
Intermediate Conversation and Composition
In principle, this course is a continuation of RUSS 251/252. In terms of vocabulary building, apart from the spoken language, the comprehension of the literary language is especially stressed.
Prereq: RUSS 252 or equivalent

RUSS 352 W 3C 0.5
Intermediate Conversation and Composition
As RUSS 351
Prereq: RUSS 351 or equivalent
RUSS 356 W 3C 0.5
The Stage as Forum: Russian Drama in Translation
Major Russian dramas will be studied from various points of view including historical importance, themes, and technique. The course includes theory and selected dramas of such playwrights as Gogol, Chekhov, Tolstoy, Gorky, Mayakovsky, and Pogodin.
Taught entirely in English.
Fall term: See GER 355
Open to students from all departments; not normally open to first year students
Cross-listed as DRAMA 356

RUSS 361 F 3C 0.5
Russian Short Story
A study of the form and a detailed examination of Russian short stories by major representative writers.
Taught in English.
Extra work in Russian required of Russian majors only
Open to all students

RUSS 362 W 3C 0.5
Russian Short Story
As RUSS 361

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- and 20th-century novels selected from the works of Gorky, Zamyatin, Pasternak, and Solzhenitsyn. Lectures on social and intellectual background.
Taught in English.
Extra work in Russian required of Russian majors only
Open to all students

RUSS 392 W 3C 0.5
Great Russian Novels
Reading and interpretation of 19th- and 20th-century novels selected from the works of Gorky, Zamyatin, Pasternak, and Solzhenitsyn. Lectures on social and intellectual background.
Taught in English.
Extra work in Russian required of Russian majors only.
Open to all students

RUSS 411 3C 0.5
Great Russian Novels
As RUSS 392

RUSS 412 3C 0.5
Great Russian Novels
As RUSS 392

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 RUSS 441
Taught in English
Open to all students

RUSS 445 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 451 F 3C 0.5
Advanced Conversation, Grammar and Composition
As RUSS 445
Prereq: RUSS 451 or equivalent

RUSS 452 W 3C 0.5
Advanced Conversation, Grammar and Composition
As RUSS 445
Prereq: RUSS 451 or equivalent

RUSS 461 F 3C 0.5
20th-Century Russian Literature
Reading, interpretation, and critical analysis of selected fiction and drama (Andreev, Bunin, Gorky, Kataev, Sholokhov, A.N. Tolstoy).
Taught in English.
Extra work in Russian required of Russian majors only
Open to all students

RUSS 462 W 3C 0.5
Twentieth Century Russian Literature
Reading, interpretation, and critical analysis of selected fiction and drama (Arbusov, Bulgakov, Erenburg, Nabokov, Pasternak, Solzhenitsyn). Taught in English.
Extra work in Russian required of Russian majors only
Open to all students

RUSS 466 W 3C 0.5
Great Russian Poets
Translation and analysis of selected works of literary figures from Classicism to Symbolism.
Prereq: RUSS 352 or equivalent

RUSS 471 F 3C 0.5
Russian Poets
Translation and analysis of selected works of literary figures from Classicism to Symbolism.
Prereq: RUSS 352 or equivalent

RUSS 481 F 3C 0.5
Russian Poetry
A study of themes and forms of representative authors of Classicism, Romanticism (Lomonosov, Derzhavin, Pushkin, Lermontov, Nerkrasov, Fet, Tiutchev, etc.).
Prereq: RUSS 102 or equivalent

RUSS 482 W 3C 0.5
Russian Poetry
A study of themes and forms of representative authors from Symbolism to the present (Blok, Esenin, Mayakovsky, Akhmatova, etc.).
Prereq: RUSS 102 or equivalent

RUSS 485 F 3C 0.5
History of Russian Literature
This course deals with the emergence of the Russian national literature, emphasizing the cultural and intellectual setting from the beginning to 1917. Literary movements and major representative works not studied in other courses will be discussed.
Taught in English.
Extra work in Russian required of Russian majors only
Open to all students

RUSS 486 W 3C 0.5
History of Russian Literature
This second part deals with Russian literature up to the present. Literary movements and major representative works not studied in other courses will be discussed.
Taught in English.
Extra work in Russian required of Russian majors only
Open to all students

RUSS 496-498 F,W,S,J,A R 0.5
Reading Courses in Approved Topics
Prereq: Approval of the Department

POLISH

POLISH 101 F 3C 0.5
First Year Polish
The fundamentals of Polish grammar are taught with emphasis on oral practice and pronunciation. An introduction to Polish culture is given as well.
Taught in English
Open to all university students with little or no knowledge of Polish.

POLISH 102 W 3C 0.5
First Year Polish
As POLISH 101
Prereq: POLISH 101 or equivalent
POLISH 201 F 3C 0.5
Intermediate Polish
This course will be conducted largely in Polish and provides intensive practice in grammar, composition and conversation.
Prereq: POLSH 102 or equivalent

POLISH 202 W 3C 0.5
Intermediate Polish
As POLSH 201
Prereq: POLSH 201 or equivalent

UKRAINIAN
UKRAN 101 F 3C,1L 0.5
Beginners’ Ukrainian
For students with little or no prior knowledge of Ukrainian. The basic elements of Ukrainian grammar and composition with emphasis on oral practice and pronunciation. Introduction to aspects of Ukrainian culture.
Open to undergraduate students of all departments.
Recommended to graduate students of Russian as a second Slavic language.
Prereq: UKRAN 101 or equivalent

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 Ukrainian 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 271 F 3C 0.5
Ukrainian Civilization (From the Beginnings to 1800)
This course presents the evolution of Ukrainian civilization from its prehistoric origins to the period of national revival in the late 18th century. Developments in literature, art, architecture, music and the folk arts are examined against the background of Ukrainian history.
Taught in English
Open to all students

UKRAN 272 W 3C 0.5
Ukrainian Civilization (From 1800 to the Present)
Ukrainian 272 examines the artistic, intellectual, spiritual, and material progress of the Ukrainian people in the 19th and 20th centuries. Integral to this course are the cultural aspects of Ukrainian settlement in Canada. Lectures are complemented by audiovisual presentations and readings from Ukrainian and Ukrainian-Canadian literature.
Taught in English
Open to all students

UKRAN 301 F 3C 0.5
Introduction to Ukrainian Literature
Reading and critical interpretation of texts chosen from the works of Skovoroda, Kotliarevsky, Shevchenko, Franko, L. Ukrainka and others.
Taught in English
Open to all students

UKRAN 302 W 3C 0.5
A Critical Survey of Literary Movements In 20th-Century Ukrainian Literature
With special attention to the rise of the new angry generation of poets of the Sixties (V. Symonenko, L. Kostenko, V. Korotych, and others).
Taught in English
Open to all students

CROATIAN
CROAT 101 F 3C 0.5
Introductory Croatian
For students with little or no knowledge of Croatian. The basic elements of Croatian grammar with emphasis on oral practice and pronunciation, along with appropriate graded texts.
Open to all students
Prereq: CROAT 101 or equivalent
Offered in alternate years

CROAT 102 W 3C 0.5
Introductory Croatian
As CROAT 101
Prereq: CROAT 101 or equivalent

CROAT 201 F 3C 0.5
Intermediate Croatian
This course is a continuation of first year Croatian. It offers extensive practice in both the spoken and written language. Vocabulary, cultural comprehension and pronunciation are stressed.
Prereq: CROAT 102 or equivalent

CROAT 202 W 3C 0.5
Intermediate Croatian
As CROAT 201
Prereq: CROAT 201 or equivalent

CROAT 301 F 3C 0.5
Advanced Croatian
This course is conducted in Croatian and provides intensive practice in spoken and written Croatian on the advanced level. Conversation on modern topics will be stressed.
Prereq: CROAT 202 or equivalent

CROAT 302 W 3C 0.5
Advanced Croatian
As CROAT 301
Prereq: CROAT 301 or equivalent

CROAT 371 F 3C 0.5
Croatian Culture and Literature
This course presents the evolution of Croatian culture from the beginnings to the present. Particular emphasis is placed on developments in literature; however, other significant manifestations of Croatian civilization (art, architecture, music) are also examined. Integral to this course are the cultural aspects of Croatian settlements in Canada.
Taught in English
Open to all students

CROAT 372 W 3C 0.5
Croatian Culture and Literature
As CROAT 371
Taught in English
Open to all students
Gerontology

Professor, Director of the Program
W.F. Forbes, BSc, PhD, DSc (London)

Associate Professors, Undergraduate Advisors
J.C. Carlson, MSc, PhD (Massachusetts)
N.H. Charness, BA (McGill), MS, PhD (Carnegie-Mellon)

Associate Professor, Part-time Studies Advisor
P. Naus, PhD (Nijmegen, Netherlands)

Professors
H.S. Cobenzt, BA (Hons (Durham), DMR (North Carolina). FRTPJ, AICP, FSS, MIES
M.E. Woodruff, OD (College of Optometry of Ontario), PhD (Indiana), FAAO

Associate Professor
J.E. Curtis, BA (Sir George Williams), MA (Central Michigan), MA (Cornell)

Assistant Professor
L. Caldwell, BA (Pennsylvania State), MS (North Carolina State), PhD (Maryland)

Adjunct Faculty
C. Kluck Davis, BA (Western Ontario), MA (McMaster)
J.F. Gentileman, BA, MS (Chicago), PhD (Waterloo)
J.A. Jackson, MA, MB, BCHir (Cambridge)
B.D. McPherson, MA (Western Ontario), PhD (Wisconsin)
A. Wister, BA Hons, MA, PhD (Western Ontario)

Course Descriptions

GERON 208 W 0.5
The Literature of Aging
This course will focus on literary works that present various aspects of aging, such as changes in physical and mental abilities, relationships with children and grandchildren, coping with disease and death, and the satisfactions unique to the elderly. Cross-listed as ENGL 208F

GERON 255 W 0.5
The Biology of Aging
An introductory study of the biological processes of aging at the molecular, cellular and systemic levels. Topics include an examination of the theories of aging, methods used to study the aging process, the role of diseases and chronological changes in the organism during senescence. In some cases, the instructor may consider waiving the course prerequisite listed. Cross-listed as SCI 255

GERON 400 S 0.5
Multidisciplinary Seminar on Aging
Faculty and students from various departments meet to discuss individual and population aging from a multidisciplinary perspective. Topics include the definition of aging, the demography of aging, evolutionary and genetic factors, aging as a social process, and human aging patterns. Students wishing to enrol in this seminar must have completed at least six of the courses towards the Certificate and must consult the Director before preregistering.

GERON 401 A/B
Directed Studies in Special Topics
For the student who desires to pursue a particular topic in depth through independent research and/or extensive reading. A faculty member must approve a student's project prior to registration for this course. Open to exceptional students who have permission of the instructor and the director of the program.

GERON 402 W 2C 0.5
Epidemiology of Aging
Factors contributing to various disease processes, with special reference to quantitative evaluation of environmental factors relevant to human disease and aging.

GERON 403 S 2C 0.5
Epidemiology of Aging II
Topics will be selected from the area of epidemiology and mathematical models of disease processes with special reference to heart disease and cancer.
Course Descriptions
Health Studies

Research Assistant Professor
J. Randall Simpson, BSc (Toronto), PhD (Guelph)

Research Associate and Lecturer
R. Walker, BSc, MSc (Western Ontario)

Adjunct Faculty
N. Kroger, BA (Pennsylvania), MPH, PhD (Yale)
A.E. LeBlanc, BA (Queen’s), MSc, PhD (Toronto)
N.F. White, MDCM, DPsych (McGill), FRCP (C) (Royal College)
C.I. Young, BSc (Guelph), MSc (Western Ontario)

Faculty Members of Health Studies holding cross appointments to:
1. Psychology
2. Statistics
3. Recreation and Leisure Studies

Faculty Members holding cross or joint appointments to Health Studies from:
4. Kineiology
5. Psychology
6. Statistics
7. Sociology
8. Urban and Regional Planning

Course Descriptions

Introductory Note
HLTH 101/102 have replaced HLTH 140/141.

HLTH 210 W 3C 0.5
Growth, Development and Aging
The physiology of human growth, development and aging is examined, with special reference to the influence of diet, environment, exercise and disease on the normal processes.
Prereq: BIOL 230, 273 (Formerly BIOL 239)
Cross-listed as KIN 210

HLTH 220 F 3C,1T 0.5
Health and the Family
The course focuses on the family as the basic social unit responsible for the development and maintenance of the effective physical and mental health of its members. The interaction of biological, behavioural, and socio-cultural factors will be considered as the family is examined using a lifespan approach.
Prereq: HLTH 101/102 or 140/141, PSYCH 101 and Recommended SOC 101

HLTH 245 F 3C 0.5
Community Health
This course examines the Canadian health care system by considering organizational principles, health resources and economics, service utilization, health care planning and health promotion strategies. There is a focus on societal and political issues which affect the health of the society through the delivery system.
Prereq: Health Studies students only or permission of instructor

HLTH 246 W,S 3C 0.5
Environmental Health
An introduction to the basic biological and toxicological processes that determine the effects of environmental pollutants on human health. Emphasis is placed on the mechanisms that give rise to chronic or delayed health effects, such as cancer, genetic mutations, and birth defects.
Prereq: KIN 317 or equivalent

HLTH 341 F 3C 0.5
Disease Process
An introduction to the study of biological factors governing the occurrence of disease in human populations, using selected diseases to illustrate disease mechanisms and identification of risk factors.
Prereq: BIOL 230, 273 (Formerly BIOL 233), KIN 317 or equivalent

HLTH 344 W 3C 0.5
Program Evaluation
A comprehensive and systematic introduction to the key concepts, methodologies, and issues related to program evaluation in general and their application to health programs in particular. Administrative and policy implications as well as the technical/methodological evaluation issues that face individuals involved in administering, planning, implementing, and evaluating health programs will be discussed.
Prereq: Basic courses in Statistics and in Research Design

HLTH 346 W,S 3C 0.5
Nutrition
An elementary course in nutrition with special emphasis on diet for sport and certain physiological conditions.
Cross-listed as KIN 346

HLTH 348 W,S 3C 0.5
Social Psychology of Health
Behaviour
The study and application of basic social psychological processes in relation to selected health-related behaviours (e.g. family planning, overeating, smoking, non-medical drug use, cardiovascular risk factors, patient compliance, medical care utilization).
Prereq: PSYCH 101 or consent of instructor
Cross-listed as KIN 348

HLTH 349 F,S 3C 0.5
Principles of Behaviour Modification
A general overview of behaviour modification principles and procedures. Basic principles of reinforcement, punishment, modelling and desensitization are examined as they relate to health behaviour.
Prereq: PSYCH 101 or consent of instructor
Cross-listed as KIN 349

HLTH 360 F 2C,2S 0.5
Occupational Health
Methodological approaches to the detection, assessment and management of toxic hazards (especially carcinogens) in the workplace and external environment. The health effects of chemical toxicants on specific human organ systems (lung, nervous system, immune system, etc.) are also examined.
Prereq: HLTH 340, or permission of instructor
The course emphasizes understanding An investigation of the epidemiology of cation of risk factors.

Epidemiology of Chronic Disease
An examination of the pathology, risk factors and rehabilitation programs related to coronary heart disease. Major emphasis is placed on the cardiorespiratory implications of exercise in the rehabilitation process.
Prereq: KIN 300 or permission of instructor
Cross-listed as KIN 407

Research Project
An independent research project on an approved topic, supervised by a faculty member. Includes an approved proposal and completion of the first 3 chapters of the thesis — Introduction, Review of Literature, and Methods. Recommended for students planning graduate studies.
Offering is contingent on the availability of resources.

Research Project
An independent research project on an approved topic, supervised by a faculty member. Includes data collection, data analysis and presentation of results in thesis form.
Prereq: Completion of HLTH 431
Recommended for students planning graduate studies.
Offering is contingent on the availability of resources.

Advanced Research Project
A course designed to familiarize students with the skills requisite for the formulation, execution and written presentation of an empirical research project. After a general discussion of the pertinent issues, students will be asked to analyse independently a data set related to a topic of interest to Health Studies students and to present this in a thesis format.
Prereq: KIN 222, 330 and CS 316
Students must be enrolled in either fourth-year regular or 3B Co-op of the Health Studies program.

Epidemiology of Chronic Diseases
An investigation of the epidemiology of selected non-communicable diseases. The course emphasizes understanding of epidemiologic methods and identification of risk factors.
Prereq: An introductory statistics course or consent of instructor

Research Project
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 fourth-year students will be admitted.

Seminar in Health Promotion
A seminar for students interested in 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. Depending on student demand and availability of teaching resources, special topics may be presented to small groups in a lecture format. Such topics have included Pharmacology, Behavioural Immunity, Nutrition, The Health Care System.
Prereq: Consult with the Department
the major wars of this century with cultural explanations of the causes of special emphasis on Canada.

A thematic introduction to the development of the world's major civilizations.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Type</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIST 100</td>
<td>Landmarks in World History</td>
<td>Lecture</td>
<td>0.5</td>
<td>A thematic introduction to the development of the world's major civilizations.</td>
</tr>
<tr>
<td>HIST 102C</td>
<td>The Origins of War in the Twentieth Century</td>
<td>Lecture</td>
<td>0.5</td>
<td>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.</td>
</tr>
<tr>
<td>HIST 102E</td>
<td>Canadian History</td>
<td>Lecture</td>
<td>0.5</td>
<td>Selected major themes from pioneer life to Canadian involvement in 20th century wars. Offered at St. Jerome's College</td>
</tr>
<tr>
<td>HIST 102K</td>
<td>Conflict in the Caribbean and Central America</td>
<td>Lecture</td>
<td>0.5</td>
<td>A study of the historical origins and nature of contemporary problems in the Caribbean and Central America.</td>
</tr>
<tr>
<td>HIST 102M</td>
<td>Law and Society in the Middle Ages: 500-1000</td>
<td>Lecture</td>
<td>0.5</td>
<td>A study of the laws and legal procedures of the Early Middle Ages. Anglo-Saxon and Germanic law will be examined along with legal procedures and institutions of that era. Offered at St. Jerome's College</td>
</tr>
<tr>
<td>HIST 102N</td>
<td>The Modern World in Historical Perspective</td>
<td>Lecture</td>
<td>0.5</td>
<td>This course will introduce students, through interrelationships and interaction of selected themes, to contemporary history. Its format includes two interpretive lectures per week plus major films on 20th century crises and discussion groups. Offered at St. Jerome's College</td>
</tr>
<tr>
<td>HIST 200</td>
<td>Twentieth Century History as Documented by Films</td>
<td>Lecture</td>
<td>0.5</td>
<td>A history of the 20th century through films. The First World War, Europe between the Wars, the Second World War, North American society in the 20th century and other political, moral and social themes will be explored.</td>
</tr>
<tr>
<td>HIST 202</td>
<td>The Individual and the Family in History</td>
<td>Lecture</td>
<td>0.5</td>
<td>A survey of the changes in the quality and structure of life with emphasis on love, marriage and the family in the West since the nineteenth century.</td>
</tr>
<tr>
<td>HIST 206</td>
<td>History of Canadian Minorities</td>
<td>Lecture</td>
<td>0.5</td>
<td>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.</td>
</tr>
<tr>
<td>HIST 208</td>
<td>The Cold War: American-Russian Relations Since November, 1917</td>
<td>Lecture</td>
<td>0.5</td>
<td>Traditional and radical historians examine the Cold War: American-Russian rivalry, 19th century; Wilson vs. Lenin; F.D.R., Truman and Stalin; containment, coexistence, and the politics of crisis from 1945 to the present.</td>
</tr>
<tr>
<td>HIST 209</td>
<td>Health, Disease and Medicine in Canadian History, 1500-1984</td>
<td>Lecture</td>
<td>0.5</td>
<td>Starting with American medicine, the course will examine topics such as the rise of the medical and nursing professions, changing public attitudes to health and disease, and the evolution of the Canadian health insurance system.</td>
</tr>
<tr>
<td>HIST 210</td>
<td>History of Law</td>
<td>Lecture</td>
<td>0.5</td>
<td>An historical introduction to law in the Ancient world. Babylonian, Assyrian, Hittite and Roman law and legal practices and concepts will be examined. Offered at St. Jerome's College</td>
</tr>
<tr>
<td>HIST 211</td>
<td>British History to 1603</td>
<td>Lecture</td>
<td>0.5</td>
<td>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. This course is primarily intended for non-history majors. History majors may wish to take one or more of HIST 305, 307 and 308</td>
</tr>
<tr>
<td>HIST 212</td>
<td>British History Since 1603</td>
<td>Lecture</td>
<td>0.5</td>
<td>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. This course is primarily intended for non-history majors. History majors may wish to take one or more of HIST 305, 307 and 308</td>
</tr>
<tr>
<td>HIST 215</td>
<td>The Proper Sphere: Canadian Women in Historical Perspective</td>
<td>Lecture</td>
<td>0.5</td>
<td>This course will examine the history of women in Canada from New France to the present day. The course will focus on the inter-relationship between women and their society, particularly as it affects the issues of work, health, reform and legal status</td>
</tr>
</tbody>
</table>
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 237 F 0.5
Ancient Civilization
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 239 F,S 0.5
History of Modern China, 1911 to the Present
Some of the topics studied in this course include: the three stages of warlordism, the May Fourth Movement and the structure of society in the People's Republic of China.

HIST 240 W 0.5
Twentieth-Century Japanese History
This course will examine the historical influences, both domestic and foreign, which led Japan to follow the course which has brought it to the present status of a powerful Asian nation.

HIST 241 W 0.5
Society and the Sexes in Early Modern Europe
This course will examine the changing importance of gender roles from the 15th to the 18th centuries. It will focus on topics such as sexuality, marriage, the family and the role of women in society and the work force.

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 248 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 249 W 0.5
History of Canadian-American Relations Since 1914
An examination of the history of relations between the two countries since 1914. Topics of a political, economic, social and cultural nature will be studied.

HIST 250 F 0.5
The Art and Craft of History
This course will provide a collegial learning setting within which students will be introduced to techniques of historical writing and research, and some examples of the best of recent historical scholarship.

Highly recommended for Year Two History majors.

HIST 253 F 0.5
Canadian History: The British Period
The evolution of Canadian society in the face of dominant British and American influences.

Offered with St. Jerome's College.

HIST 254 W,S 0.5
Canadian History: The National Period
This course studies the development of Modern Canada. Themes of the course include immigration, industrialization, feminism, labour unrest, and regionalism.

Offered with St. Jerome's College.

HIST 255 F 0.5
The Expansion of England
The history of the British Empire down to the American War of Independence, telling the story of the Tudor seadogs, of the plantation of Ireland, the settlement of the North American mainland, the establishment of slave plantations in the Caribbean, and the earliest British enterprises in Africa, Asia and the Pacific.

HIST 256 W 0.5
The British Empire and Commonwealth
The history of British imperialism between the loss of the American colonies and the Falklands Island War of 1982, tracing the rise of the settlement colonies to dominion status, the huge expansion of the dependent empire during the age of the New Imperialism, the imperial apogee after World War I, and the rapid change from Empire to New Commonwealth after World War II.

HIST 257 W,S 0.5
The United States to 1900
From the British provincial society of the 18th century to the emergence of modern America. Special emphasis on the American character, and on the moral dilemmas of republicanism and democracy: freedom and slavery, equality and competition.

HIST 258 W 0.5
America: Twentieth Century
An analysis of two major themes: how America managed political reform and social change at home, and its emergence as a world power.

HIST 259 W 0.5
Modern African History
An issue-oriented examination of some of the major developments in African political, social and economic history in the 20th century.
HIST 260 W 0.5
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 261 S 0.5
Europe: 14th to 16th Century
A study of 15th- and 16th-century economic, social, political and popular cultural trends. The expansion of Europe to the New World.

HIST 262 F 0.5
Europe: 16th to 18th Century
An introduction to the social and cultural history of Europe (including England) from the 16th century to the French Revolution. The course will focus on topics such as the social structure, daily life, the role of women and the family.

HIST 263 W, S 0.5
Europe: 1789-1945
The growth of nationalism and nation states since the French revolution with attention to the Industrial Revolution, the World Wars, Fascism, Nazism and Stalinism.

HIST 273 F 0.5
Canadian Social History I
This course will cover the period from the early settlement of Canada to the beginnings of urban industrial development. Focus will be on the experiences of Canadians in their daily lives.

HIST 274 W 0.5
Canadian Social History II
The social and cultural development of Canada from the late nineteenth century to the present day

HIST 300 W 0.5
The Idea of History
The course is an introduction to the Philosophy of History and to historiography from the 19th century to the present. It deals with the great theoretical issues influencing historical analysis and with the classics of historical literature. Highly recommended for Year Three History majors.

HIST 305 F 0.5
The English Reformation
A history of the English reformation, expansively considered from the beginnings of the European Reformation to the establishment of the Anglican church in the Revolutionary and Restoration periods in the 17th century.

HIST 307 W 0.5
British History 1760-1867
A study of people, power, thought and culture in the world's first industrializing society.

HIST 320 W 0.5
The History of Modern Quebec
The course will treat the history of Quebec from 1867 to the present. Nationalism, separatism, language and cultural problems, economic and social issues are all examined in their historical context.

HIST 325 F 0.5
History of Canadian Indians to 1870's
"From Freedom to Conquest". The history of Indian-white contact and its effect on the life and culture of the native Canadians.

HIST 326 W 0.5
History of Canadian Indians since 1870's
"Life under coercion" and the "New Indian". The history of Indians on reserves and under government administration. Contemporary themes and issues of concern to native people are examined.

HIST 329 F 0.5
History of the Common Law
The emphasis will be on the early development of the common law in England.

Offered at St. Jerome's College

HIST 339 F 0.5
The History of France in the Nineteenth Century
A study of French society and the four revolutions that influenced it with particular attention to social and institutional forces.

HIST 340 W 0.5
Europe: 1789-1914
This course will examine European society amidst the dramatic changes of the nineteenth century. It will consider class, the family, gender, religion, and institutions during this century of political and social transformation.

HIST 348 W 0.5
The Radical Reformation
A study of 16th century Anabaptism — a religious Reformation movement dissenting from both Protestantism and Roman Catholicism — its origins, its social political and theological content; and its relationship to such independent dissenters as Sebastian Franck.

Offered at Conrad Grebel College.

Cross-listed as R S 322

HIST 350 F 0.5
British West Indian History
A survey history of the British Caribbean, widely defined. Topics emphasized include early colonization, plantations, slave society, abolition and emancipation, the growth of nationalism, independence, and the roots of contemporary problems.

HIST 355 F 0.5
Russian History to 1900
The course will focus on selected themes in the development of Muscovite and Imperial Russia from pre-tsarist times to the beginning of the 20th century.

HIST 356 W 0.5
20th-Century Russia
The course will focus on selected themes in Russia's development in the 20th century including the Soviet period.

HIST 358 W 0.5
The History of Modern Germany: From the Weimar Republic to Reconstruction
A study of Germany from the rise of the Nazis through the War experience, the post-War settlement, the integration of the refugees, the division into East and West, and the economic miracle.

HIST 370 F 0.5
Reformation History
A study of the major sixteenth-century reformers and their intellectual background in humanism and late medieval scholasticism. Special attention will be given to the Lutheran and Reformed traditions and their ideological, social, political expressions.

Offered at Conrad Grebel College.

HIST 387 A, 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.

Offered at St. Jerome's College.

HIST 396 F 0.5
The History of the American South
This course traces the main eras and issues in Southern history from the 16th century to the mid-20th century. Topics examined will include pre-revolutionary and antebellum South, the Trial of Tears, the Civil War and reconstruction, the New South, the "lost cause", the era of Jim Crow, and the search for the central theme.
HIST 397 F.W.S 0.5
Directed Studies in Special Topics
Study in a limited field under tutorial guidance. A high standard of written work will be expected.

HIST 398 F.W.S 0.5
Directed Studies in Special Topics
Study in a limited field under tutorial guidance. A high standard of written work will be expected.

400 LEVEL:
Senior Seminars
Each term of a senior seminar counts 1.0 credit. Seminars with the suffix "A" are reading seminars designed to give students an extensive acquaintance with scholarship in a particular field of history. Seminars with the suffix "B" are research seminars in which students will engage in research on particular topics in that field. Students should preregister for senior seminars, and for HIST 491, Independent Study in Special Subjects.

HIST 400A/B 1.0/1.0
Reformation

HIST 401A/B 1.0/1.0
European

HIST 402A 1.0
Russian

HIST 403A/B 1.0/1.0
Canadian

HIST 405A/B 1.0/1.0
British

HIST 407A/B 1.0/1.0
Imperial

HIST 409A/B 1.0/1.0
American

HIST 491 F.W.S 1.0
Independent Study in Special Subjects

COURSES NOT OFFERED 1989-90
HIST 102B Imperialism in the 20th Century
HIST 102F An Introduction to Western Intellectual History Since the Renaissance
HIST 102J Asian History
HIST 102N Introduction to African History
HIST 102P Nationalities in Eastern Europe Since 1914
HIST 201 Canadian Urban History
HIST 203 Modern Quebec
HIST 204 Life on the Ontario Frontier
HIST 207 Canadian Labour History
HIST 213 Modern Western Popular Culture
HIST 214X Empires and Missionaries
HIST 216 Irish History: Achievements, Unification, Revolt
HIST 219 Local History in Ontario
HIST 230 Church and Revolution in Latin America
HIST 232 Revolutions in Latin America
HIST 233 Civil-Military Relations in Latin America
HIST 238 Ancient Civilization II
HIST 245 Religious and Cultural Minorities in Canada
HIST 302 Medieval Church History from 312 to 1096
HIST 303 Medieval Church History from 1096 to 1449
HIST 308 Britain Since 1867
HIST 311 Western European Cultural History 1600-1950
HIST 319 French-Canadian History
HIST 323 The United States in World Affairs
HIST 342 Mystical and Utopian Movements from the 12th to the 17th Century
HIST 344 Mystical and Utopian Movements II
HIST 345 Minorities in International Perspective
HIST 346 Mennonite History: Special Topics
HIST 385 Canada: From Macdonald to Laurier
HIST 386 Ontario History to Confederation
HIST 389 Canada in World Affairs: From Laurier to Trudeau
HIST 393 Seven Faces of Evil
HIST 435 Ethno-History

Italian

Associate Professor
V.F. Golini, BA (McMaster), MA (Colorado), PhD (California-Berkeley) J

Assistant Professor
G.A. Niccoli, BA, MA, PhD (British Columbia), J

J refers to faculty members at St. Jerome's College

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

THE FOLLOWING COURSES ARE ADMINISTERED BY ST. JEROME'S COLLEGE.

ITAL 101 F,W 3C,1L 0.5
Introduction to Italian Language 1
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 W 3C,1L 0.5
Introduction to Italian Language 2
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 1
Advanced study of grammar. Conversation sessions will be based on intermediate level readings reflecting contemporary Italian Life. Short works by modern writers will also be studied.

Prereq: ITAL 101 or consent of instructor

ITAL 192 W 3C,1L 0.5
Intermediate Italian 2
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

Course Descriptions

See page 16:180 for Course Descriptions.
ITAL 251 F 3C 0.5
Italian Conversation and Composition 1
This course offers extensive practice in idiomatic spoken and written language. Conversation will be based on social, political and cultural aspects of Italian life.
Prereq: ITAL 191 or consent of instructor

ITAL 252 W 3C 0.5
Italian Conversation and Composition 2
A continuation of ITAL 251 with more emphasis on composition based on articles from present day newspapers and magazines.
Prereq: ITAL 251 or consent of instructor

ITAL 291 F 3C 0.5
Italian Culture and Civilization 1
A survey of developments in Italian culture — history, literature and the arts — up to and including the Renaissance.
Prereq: Second-year standing Taught in English

ITAL 292 W 3C 0.5
Italian Culture and Civilization 2
A survey of developments in Italian culture — history, literature, painting, and music — in the post-Renaissance period, with emphasis on modern Italy.
Prereq: Second-year standing Taught in English

ITAL 312 W 3C 0.5
Renaissance Italian Literature
An introduction to the Italian literary production of the 15th and 16th centuries, focusing on selections from the major works of the period, including some by Machiavelli, Ariosto and Tasso.
Prereq: ITAL 191/192 or consent of instructor

ITAL 391 F 2S 0.5
The Modern Italian Novel
A brief study of the development of the Italian novel since Manzoni with concentration on the novels just before and after World War II.
Prereq: ITAL 191 or consent of instructor

ITAL 396 F 3R 0.5
Special Topics/Directed Readings
This course gives the student an opportunity to study authors and works of special interest which are not covered in other courses.
Prereq: Consent of the instructor

ITAL 397 W 3R 0.5
Special Topics/Directed Readings
Winter term of ITAL 396

COURSES NOT OFFERED 1989-90
ITAL 311 Medieval Italian Literature
ITAL 392 Modern Italian Poetry

Department of Kinesiology

Associate Professor, Chairman of the Department
P.J. Bishop, BSc, BPE (Waterloo), MSc (Western Illinois), PhD (Minnesota)

Professor, Dean of the Faculty of Human Kinetics and Leisure Studies
H.G. Marteniuk, BPE, MA (Alberta), EdD (California-Berkeley)

Professor, Associate Dean, Graduate Affairs, Faculty of Human Kinetics and Leisure Studies
M.E. Houston, BSc (Toronto), PhD (Waterloo)

Associate Professor, Associate Dean, Undergraduate Affairs, Faculty of Human Kinetics and Leisure Studies
W.N. Widmeyer, BA (Western Ontario), BPE (McMaster), BPE (California), PhD (Illinois)

Associate Professor, Graduate Affairs
F. Allard, BA, BPE, PhD (Waterloo), Recipient of the Distinguished Teacher Award

Associate Professor, Associate Chairman, Undergraduate Affairs
I.D. Williams, MS, PhD (Illinois)

Associate Professor, Head of School of Anatomy
D.A. Ranney, BA, MD (Toronto), FRCS (England)

Professors
N.J. Ashton, BSc (McGill), MS (Michigan)
H.J. Green, BA, BPE (Queen's), MA (Alberta), PhD (Wisconsin)
R.L. Hughson, BSc (Western Ontario), MSc (British Columbia), PhD (McMaster)
R.W. Norman, BA, BPE (McMaster), MSc (Alberta), PhD (Pennsylvania State)
D.A. Winter, BSc, MSc (Queen's), PhD (Dalhousie), PEng

Associate Professors
L.R. Brawley, BPE (Calgary), MSc (Oregon), PhD (Pennsylvania State)
N. Charness, BA (McGill), MS, PhD (Carnegie-Mellon)
J.E. Curtis, BA, (Sir George Williams) MA (Central Michigan), MA (Cornell)
A.E. Patla, BTech (Indian Institute of Technology), MSc Eng (New Brunswick), PhD (Simon Fraser)
E.A. Roy, BSc (Waterloo), MPE (British Columbia), PhD (Waterloo)
M.T. Sharratt, BA, MA (Western Ontario), PhD (Wisconsin)
N. Theberge, BA (Massachusetts), MA (Boston), PhD (Massachusetts)
J.A. Thomson, BA, MSc (McMaster), PhD (Waterloo)
R. Wells, BSc (Manchester), MEng (McMaster), PhD (Manchester)

Assistant Professors
J.S. Frank, BSc, MSc (Waterloo), PhD (Southern California)
C.L. MacKenzie, BSc, MSc, PhD (Waterloo)
S.M. McGill, BPE (Toronto), MSc (Ottawa), PhD (Waterloo)

Adjunct Faculty
J.A. Israel, MD (Toronto), FRCS (Canada)
D.H. McI avish, MD (Western Ontario), FRCS
G.H. Mann, MB, BS (London), DRCOG (London)

Laboratory Demonstrators
B. Farrance, BSc, MSc (Waterloo)
L.L. Jones, BSc, MSc (Waterloo)
J.S. Larkworthy, BSc (Waterloo)
D.C. Painter, BA (Queen's), MSc (Waterloo)
J.C. Pezzack, BSc, MSc (Waterloo)
C. Russell, BSc (Waterloo)
H.E. Scoggan, BA, MSc (Queen's)

Faculty Members of Kinesiology holding cross and/or joint appointments to:
1Sociology
2Psychology
3Systems Design
4Health Studies
5Optometry

Faculty Members holding cross and/or joint appointments to Kinesiology from:
6Sociology
7Psychology
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 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. No Year One 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.

KIN 210 W 3C 0.5
Growth and Development, and Aging
The physiology of human growth, development and aging is examined with special reference to the influence of diet, environment, exercise and disease on the normal processes.

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 and Health Studies.

KIN 242 W 3C,2L 0.5
Introduction to Movement Disorders
An introduction to selected movement disorders and their implications for physical activity. The movement disorders examined include those which accompany neuromuscular and perceptual-motor impairment, mental retardation, cardiovascular and respiratory disease.

KIN 252 W.S 3C 0.5
Introduction to the Sociology of Sport
An introduction to the characteristics, processes and problems of sport as a social system. In addition, the social psychological aspects of sport involvement are considered.

KIN 255 W 3C,2L 0.5
Introduction to Psychomotor Behaviour
An information processing approach is used to introduce the principles of learning and performing fine and gross motor skills. In addition, social psychological variables are studied as they relate to the facilitation or decrement in learning and performance.

KIN 264C 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 examine children in an applied setting.

KIN 300 F.S 3C,3L 0.5
Physiology of Physical Activity
A study of the effects of physical activity on the muscular, circulatory and respiratory systems and the mechanisms through which the body adapts to activity and environment.

KIN 317 F 3C 0.5
Human Biochemistry
An elementary course in human biochemistry including the metabolism and function of proteins, carbohydrates, lipids, and hormones. Emphasis is placed on the application of biochemical principles to human movement.

KIN 321 W,S 3C,2L 0.5
Introduction to the Biomechanics of Human Movement
Anatomical, neural and mechanical considerations in the qualitative and quantitative analyses of human movement are examined. Concepts related to the biostatics and biodynamics of linked segment models of human motion are introduced.

KIN 330 W,S 3C 0.5
Research Design
An introduction to the basic principles of scientific inquiry in Kinesiology. A systematic treatment of the logic and practice of methods and techniques employed in research related to physical activity with an examination of design, sampling, data gathering and analysis.

KIN 335 W,S 3C,2L 0.5
Evaluation of Human Motor Performance
The nature and methodology of assessment is reviewed from theoretical and empirical perspectives. Taxonomies of motor performance are examined and principles developed for the measurement of specific constructs in field and laboratory situations.

KIN 340 F 3C,2L 0.5
Introduction to Sports Medicine
An introductory course to the area of sports medicine, including the prevention, care and rehabilitation of common sports injuries. Considerable attention is directed towards the mechanisms of traumatic injuries as well as the management of specific injuries and problems in cases of injury care.

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.

KIN 346 W,S 3C 0.5
Nutrition
An elementary course in nutrition with special emphasis on diet for sport and certain physiological conditions.

Cross-listed as HLTH 346
KIN 348 W,S 3C 0.5
Social Psychology of Health Behaviour
The study and application of basic social psychological processes in relation to selected health-related behaviours (e.g. family planning, overeating, smoking, non-medical drug use, cardiovascular risk factors, patient compliance, medical care utilization).
Prereq: PSYCH 101 or consent of instructor
Cross-listed as HLTH 348

KIN 349 F,S 3C 0.5
Principles of Behaviour Modification
A course providing a general overview of behaviour modification principles and procedures. Basic principles of reinforcement, punishment, modelling and desensitization are examined as they relate to health behaviour.
Prereq: PSYCH 101 or consent of instructor
Cross-listed as HLTH 349

KIN 352 F 3C 0.5
Sociology of Aging
An introduction to individual and population aging. Topics discussed include: aging from an historical and comparative perspective; aging in subcultures; aging and the social structure; aging and social processes, aging and the environment; work and retirement; and aging and leisure patterns.
Prereq: SOC 101 and one other SOC course
Cross-listed as SOC 344

KIN 354 W,S 2C,1T 0.5
Social Psychology and Physical Activity
An examination of sport and other forms of physical activity as social situations. Topics such as social facilitation, modelling, person perception, expectancies, group structure, unity, motivation, leadership, conformity, and intergroup relations are introduced in relation to motor performance.
Prereq: PSYCH 101
Cross-listed as REC 307

KIN 356 F 3C 0.5
Information Processing in Human Perceptual Motor Performance
An information processing model of perceptual-motor behaviour is presented. Human performance theory is used to study processes mediating input and output information. Specifically, the subprocesses of storage of information in memory, perception, retrieval of information from memory and execution of movement are examined.
Prereq: KIN 222, 255

KIN 357 W 3C 0.5
Motor Learning
A course focused on the bases and applications of theories of motor learning. Included are selected psychological and neuropsychological processes as they relate to these theories.
Prereq: KIN 222, 255

KIN 401 W,S 3C,3L 0.5
Physiological Adaptations to Physical Activity
An analysis of the physiologic adaptations that occur in response to protracted physical activity and the influence of such adaptations on the response to work in a variety of environmental conditions. Special emphasis is given to the changes occurring in skeletal and cardiac muscles and the neuro-endocrine mechanisms involved.
Prereq: KIN 300 and 317

KIN 402 F 3C 0.5
Hydrospace, Altitude and Aerospace Physiology
An examination of man's cardiorespiratory responses at rest and during work to selected stresses of hyperbaric and hypobaric environments.
Prereq: KIN 300

KIN 405 W 3C,2L 0.5
Exercise Management
An examination of the rationale and procedures used in the development of exercise programs for normally healthy individuals.
Prereq: KIN 300 and 321

KIN 407 W 3C 0.5
The Physiology of Coronary Heart Disease
An examination of the pathology, risk factors and rehabilitation programs related to coronary heart disease. Major emphasis is placed on the cardiorespiratory implications of exercise in the rehabilitation process.
Prereq: KIN 300 or equivalent
Cross-listed as HLTH 407

KIN 416 W 3C 0.5
Neuromuscular Integration
An examination of the neural processes involved in the maintenance of posture and the control of movement.
Prereq: KIN 201 or PSYCH 261 or consent of instructor

KIN 420 W 3C 0.5
Occupational Biomechanics
Biomechanical methods are applied to the study of the effect on the human operator of selected workplace tasks, personal equipment, and work space layout. Examples include the use of EMG and/or computerized models to analyze low back loading during manual lifting, the design of helmets, shoes and office chairs.
Prereq: KIN 425 (may be taken concurrently) or consent of instructor

KIN 425 W 3C,2L 0.5
Biomechanics of Human Movement
The quantitative measurement and analysis of the movement of the human musculo skeletal system. Multisegment dynamic movements will be studied using existing computer programs, with emphasis on kinematics, kinetics and energetics, as well as the use of EMG in the assessment of the control of the movement. Examples are presented from pathological, normal and athletic movement.
Prereq: KIN 321

KIN 426 F 3C,2L 0.5
Biophysical Signal Processing and Control Systems
Basic electricity and electronics required for the understanding of bioelectric recording and electrophysiology. Application of signal processing to biophysical signals encountered in kinesiology. Mathematical modelling of passive and active systems and the control systems (cardiac, respiratory, neuromuscular) associated with human movement.
Prereq: KIN 321, KIN 300 or consent of instructor

KIN 431 1,W,S 0.5
Research Proposal
An independent paper in the form of a research proposal on an approved topic. The topic may include survey, field, laboratory, theoretical, or applied research, program evaluation, mathematical modelling, fitness appraisal, etc. The format is to be determined with the supervisor and may be in chapters or in journal style.
Prereq: Fourth year Honours Kinesiology
KIN 431K Sports Medicine
KIN 431M Anatomy
KIN 431N Movement Disorders
KIN 431O Motor Control
KIN 431P Nutrition
KIN 431Q Gerontology

KIN 432 F,W,S 0.5 Research Project
An independent research project on an approved topic, supervised by a faculty member. This is the completion of the research proposed in KIN 431. The format is to be determined with the supervisor and may be in chapters or in journal style.
Prereq: KIN 431
It is strongly recommended that students planning graduate studies take KIN 431 and KIN 432.

KIN 432A Biomechanics
KIN 432B Biochemistry
KIN 432C Work Physiology
KIN 432E Psycho Motor Behaviour
KIN 432G Sociology of Sport and Physical Activity
KIN 432J Psychology of Human Movement
KIN 432K Sports Medicine
KIN 432M Anatomy
KIN 432N Movement Disorders
KIN 432O Motor Control
KIN 432P Nutrition
KIN 432Q Gerontology

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: Fourth year Honours Kinesiology

KIN 433A Biomechanics
KIN 433B Biochemistry
KIN 433C Work Physiology
KIN 433E Psycho Motor Behaviour
KIN 433G Sociology of Sport and Physical Activity
KIN 433J Psychology of Human movement
KIN 433K Sports Medicine
KIN 433M Anatomy
KIN 433N Movement Disorders
KIN 433O Motor Control
KIN 433P Nutrition
KIN 433Q Gerontology

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 262 or SOC 348

KIN 453 F.S 3C 0.5 The Psychology of Sport and Physical Activity
An introduction to specific psychological topics as they relate to the social psychological behaviour of the individual in motor performance situations. Topics usually examined are personality, anxiety, motivation, attribution.
Prereq: KIN 354

KIN 456 F 3C 0.5 Cognitive Dysfunction and Motor Skill
An examination of issues related to understanding the cerebral organization of motor skill. Discussion of how certain movement disorders are a reflection of disturbances at different stages in the sequence of information processing.
Prereq: One of PSYCH 206, 207, or KIN 356

KIN 470 F,W,S 3C 0.5 Seminar In Kinesiology
An examination of current major issues and trends in Kinesiology. Students select areas of major interest from a series of faculty introduced topics.
Prereq: Fourth year Honours KIN students

KIN 472 F,W,S 0.5 Directed Study in Special Topics
For the student who desires to pursue a particular topic in depth through guided independent research and/or reading. A faculty member must approve a student's project prior to registration. May be repeated in subsequent terms.
Prereq: Consent of department

KIN 472A/B Biomechanics
KIN 472C/D Work Physiology
KIN 472E/F Psycho-Motor Behaviour
KIN 472G/H Social Sciences: Sociology
KIN 472I/J Social Sciences: Psychology
KIN 472K/L Sports Medicine
KIN 472M Teaching
KIN 472N Coaching
KIN 472O Anatomy

KIN 491 F,W 5T 0.5 Clinical Kinesiology - Sports Injuries Assessment
Practical experience in the examination, diagnosis, and treatment of sports injuries under the supervision of a physician and an athletic therapist.
Prereq: KIN students only. Must have at least A in KIN 200 and 340, first aid and athletic injury experience, and consent of instructor

KIN 492A/B F,W 2T 0.25/0.25 Clinical Kinesiology - Cardiac Rehabilitation Practicum
Practical experience with cardiac patients in rehabilitation setting; major emphasis is placed on the cardiovascular implications of exercise and behaviour modification.
Prereq: KIN 300, 407, 349, and experience with high risk patients, plus consent of instructor
Courses may be taken concurrently.

COURSES NOT OFFERED 1989-90
KIN 402 Hydrospace, Altitude and Aerospace Physiology

Department of Management Sciences

Professor, Chairman of the Department
M.J. Magazine, BS (City College of New York), MS (New York University), ME, PhD (Florida), PEng

Associate Professor, Graduate Officer
R.G. Vickson, BSc (British Columbia), PhD (Massachusetts Institute of Technology)

Professor, Associate Chairman, Undergraduate Officer
G.N. Soulis, BSc (Toronto), PEng

Professors
J.A. Buzacott, BSc, BE (Sydney), MSc, PhD (Birmingham)
D.W. Conrath, BA (Stanford), MS (Carnegie Tech), MA, PhD (California-Berkeley), PEng
S.D. Saleh, BA (Cairo), MA, PhD (Case Western Reserve)

Associate Professors
I. Bernhardt, BA (New York), PhD (California-Berkeley)
Course Descriptions

M SCI 211 F,W,S 3C 0.5
Organizational Behaviour 1
Introduction to the concepts of learning, person perception, attitudes and motivation in an organization. Consideration of communication, roles, norms and decision making within a group. Discussion of power, control, leadership and management in light of the above concepts.

M SCI 251 F,W,S 3C 0.5
Probability and Statistics 1

M SCI 261 F,W,S 2C,1T 0.5
Managerial and Engineering Economics 1
This course is designed to satisfy Engineering Economics requirements of the Canadian Accreditation Board. Price and output decisions. Choosing among alternative inputs and production processes. Evaluating alternative investments, equipment service life, and new products.

M SCI 311 F,W,S 3C 0.5
Organizational Behaviour 2
Macro theories of organization and organizational processes are discussed. First half of course examines the development of organizational theories. The second half discusses organizational processes such as conflict and communication control. Throughout, an effort is made to relate course material to organizational structures.

M SCI 331 F,W,S 3C 0.5
Operations Research 1

M SCI 411 F,W,S 3C 0.5
Managerial and Engineering Economics 2
The course is concerned with cost minimizing choices of inputs to production. Topics to be considered are: production functions and cost functions; the relation between "size" and unit cost; labour inputs, labour as a quasi-fixed input; productivity measurement; learning-by-doing; capital inputs, investment rules, capacity decisions under scale economies.

M SCI 432 F,W,S 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 and control of large projects, quality control, reliability/maintenance, facilities layout, job design, production standards and work measurement.

M SCI 441 W 3C 0.5
Management of Information Systems
Structures, functions and processes of development of computer hardware, software and databases for the management of information. Concepts of information, humans as information processors, information management concepts, introduction to information systems analysis.

M SCI 452 W 2C,1T 0.5
Decision Making Under Uncertainty
Review of probability, distribution theory, and classical statistical inference methods. Linear statistical models, analysis of variance, regression. Bayesian analysis, contingent decision making, value of information, utility and risk.

M SCI 461 S,F 2C,1T 0.5
Managerial and Engineering Economics 2
The course is concerned with cost minimizing choices of inputs to production. Topics to be considered are: production functions and cost functions; the relation between "size" and unit cost; labour inputs, labour as a quasi-fixed input; productivity measurement; learning-by-doing; capital inputs, investment rules, capacity decisions under scale economies.

Prereq: M SCI 261 or equivalent

Prereq: M SCI 251 or equivalent

Prereq: M SCI 261 or equivalent

Prereq: M SCI 251 or equivalent
Faculty of Mathematics

DEPARTMENT OF APPLIED MATHEMATICS

Professor and Chairman of the Department
B. Forte, PhD, DSc (Pisa) Habil (Rome)

Professor, Associate Chairman, Graduate Officer
J. Wainwright, BSc ( Natal), PhD (South Africa), Recipient of the Distinguished Teacher Award

Assistant Professor and Associate Chairman, Undergraduate Affairs
B.J. Marshman, BSc, MSc, PhD (Waterloo)

Professors
R.H. Bartole,5 BSc, MS (Michigan), PhD (Stanford)
J. Cizek,1 RNDr (Charles University, Prague), CSc (Czechoslovak Academy of Sciences, Prague), FRSC
C.B. Collins, BSc (London), PhD (Cambridge)
H.F. Davis, SB, SM, PhD (Massachusetts Institute of Technology)
S.G. Davison,2 BSc, MSc, PhD, DSc (Manchester), FinstP
G.M.L. Gladdwell,6 BSc, PhD, DSc (London)
F.O. Goodman,7 BSc, PhD, DSc (London), FinstP, FAIP
W.H. Hui,3 BSc (Peking), PhD, DSc (Southampton)
G.J. Lastman, BASc, MA (British Columbia), PhD (Texas)
S.P. Lipsitz,8 BSc (Natal), MSc (South Africa), PhD (Waterloo)
F.R. McCourt,7 BSc, MSc, PhD (British Columbia)
I.J. McGe, BASc (Toronto), MSc (Waterloo), PhD (Yale)
M.A. McKiernan, BS, MA (Loyola), PhD (ITT)
R.G. McLennahan,8 BSc, MSc (Queen’s), PhD (Cambridge)
J. PaIedus,1 RNDr (Charles University, Prague), CSc (Czechoslovak Academy of Sciences, Prague), FRSC
P.J. Ponzo, BASc, MA (Toronto), PhD (Illinois)
C. Rogers, BA (Oxford), MEd (Toronto), MSc, PhD (Nottingham), FIMA
FinstP
R.B. Simpson,5 BSc, MASc (Toronto), PhD (Maryland)

Associate Professors
C.F.A. Beaumont,4 BA (McMaster), MA (Toronto)
P.A. Forsyth,5 BSc (Western Ontario), MSc (Australian National), PhD (Western Ontario)
J. Froese, BA (Manitoba), MA (Queen’s), PhD (British Columbia)
K.O. Geddes,5 BA (Saskatchewan), MSc, PhD (Toronto)
W.K. Liu,8 BSc, MS, PhD (Illinois)
W.F. Shadwick,9 BSc, MSc (Western Ontario), PhD (London), NSERC University Research Fellow
G. Tenti, Laurea (Rome), MSc, PhD (Toronto)

Assistant Professors
M.C. Chichimico, lic.phy. (Buenos Aires), PhD (Cambridge)
W.L. Seward,9 BSc (Victoria), MSc, PhD (Toronto)
D. Siegel, BA (U.C.L.A.), PhD (Stanford)
M.E. Snyder, BSc (Western Ontario), MSc (Waterloo)
V.M. Zaidan, BSc (Beirut), MA (Dalhousie), PhD (British Columbia)

Research Assistant Professors
N. Kamran, lic.math. (Brussels), PhD (Waterloo), NSERC University Research Fellow
F.C. Vroey, BSc, MMath, PhD (Waterloo), NSERC University Research Fellow

Adjunct Faculty
W.F. Ames, MS (Wisconsin)
J. Carminati, BSc (Victoria), MSc (Melbourne), PhD (Victoria)
D.G. Criffon, BA, MA (Cambridge), PhD (London)
M.A. Donolan, PhD (British Columbia)
W.F. Langford, PhD (California)
J.D. Lawson,5 BASc (Toronto), MSc, PhD (Waterloo), FIMA
H. Rund, PhD (Cape Town), Habilitation (Freiburg)

Faculty Members of Applied Mathematics holding cross appointments to:
1Chemistry
2Physics
3Mechanical Engineering
4General Engineering

Faculty Members holding cross appointments to Applied Mathematics from:
5Computer Science
6Civil Engineering
7Chemistry
8Pure Mathematics
9Physics

Course Descriptions
Mathematics
DEPARTMENT OF COMBINATORICS AND OPTIMIZATION

Associate Professor and Chairman of the Department
I.P. Goulden, BMath, MMath, PhD (Waterloo)

Lecturer, Assistant Dean for External Programs
R.G. Dunkley, BA (Western Ontario)

Professor and Associate Chairman for Graduate Affairs
D.M. Jackson, BA, MA, PhD (Cambridge)

Professor and Associate Chairman for Undergraduate Affairs
D.H. Younger, AB, BS, MS, PhD (Columbia)

Professor Emeritus
W.T. Tutte, BA, MA, PhD (Cambridge), DMath (Waterloo), FRSc, FRSC

Professors
G. Berman, BA, MA, PhD (Toronto)
M.J. Bezt, BMath, MMath (Waterloo), PhD (Waterloo)
J.A. Bondy, BA, DPhil (Oxford)
A.R. Conn, BSc (Imperial College), MSc (Manitoba), PhD (Waterloo)
L.J. Cummings, BSc (Roosevelt), MSc (de Paul), PhD (British Columbia)
J. Edmonds, BA (George Washington), MS (Maryland)
C.D. Godsil, BSc, MSc, PhD (Melbourne)
R.C. Mullin, BA (Western Ontario), MA, PhD (Waterloo)
W.R. Pulleyblank, BA, MSc (Calgary)
R.C. Read, BA, MA (Cambridge), PhD (London)
L.B. Richmond, BSc, MSc (Manitoba), PhD (Alberta)
S.A. Vanstone, BMath, MMath, PhD (Waterloo)

Associate Professors
F. Barahona, Ing (Chile), Dr Ing (Grenoble)
C.J. Colbourn, BSc (Toronto), MMath (Waterloo), PhD (Toronto)
L.J. DiScky, BSc, MA (Arizona), PhD (Wisconsin)
C.E. Haff, BS (Stanford), PhD (Waterloo)
R.A. Honsberger, BA (Toronto), MA (Waterloo)
U.S.R. Murty, BA (Andhra), MA (Osmania), PhD (Indian Statistical Institute)

P.J. Schellenberg, BSc, MA, PhD (Waterloo)
H. Wolkowicz, BSc, MSc, PhD (McGill)

Assistant Professors
A.S. Lewis, BA, MA, PhD (Cambridge)
B.A. Reed, BSc, PhD (McGill)

Lecturer
E. Anderson, BA (McMaster)

Adjunct Faculty
G.E. Andrews, MA (Oregon State), PhD (Pennsylvania)
J. Dennis, BS, MS (Miami), PhD (Utah)
P. Erdős, PhD (Budapest), DSc (Manchester), DMath (Waterloo, Honors Causal), Member (Hungarian Acad. Sci.)
L. Lovász, Dr.R. Nat. (Eotvos L. Budapest), Dr.Math.Sci. (Hungarian Acad. Sci.)
J. Nesetril, MSc (McMaster), CSc (Charles U., Prague)
P.D. Seymour, BA, MSc, DPhil (Oxford)
L. Teirlinck, Licentiaat, PhD (Brussels)

Faculty Members of Combinatorics and Optimization holding cross appointments to:

1. Computer Science
2. Pure Mathematics

J refers to faculty members whose primary association is with St. Jerome’s College

DEPARTMENT OF COMPUTER SCIENCE

Professor and Chairman of the Department
P.-A. Larson, BComm, MBA, PhD (Abo Swedish University)

Professor, Vice President, Academic and Provost
J.A. George, BSc, MSc (Alberta), PhD (Stanford)

Associate Professor, Associate Dean, Undergraduate Studies, Faculty of Mathematics
V.A. Dyck, BMath, MMath (Waterloo)

Professor and Associate Chairman for Graduate Studies
R.H. Bartels, BS, MS (Michigan), PhD (Stanford)

Associate Professor and Associate Chairman for Undergraduate Studies
D.J. Taylor, BSc (Saskatchewan), MMath, PhD (Waterloo)

Professors
K.S. Booth, BS (California Inst. Tech.), MA, PhD (UC Berkeley)
J.A. Brzozowski, BSc, MASc (Toronto), MA, PhD (Princeton)
A.R. Conn, BSc (Imperial College), MSc (Manitoba), PhD (Waterloo)
D.D. Cowan, BSc (Toronto), MSc, PhD (Waterloo)
G.H. Gannett, Cpr U (Unguay), MMath, PhD (Waterloo)
J.W. Graham, BA, MA (Toronto), Recipient of the Distinguished Teacher Award
R.C. Mullin, BA (Western Ontario), MA, PhD (Waterloo)
J.J. Munro, BA (New Brunswick), MSc (British Columbia), PhD (Toronto)
W.R. Pulleyblank, BA, MSc (Calgary), PhD (Waterloo)
R.B. Simpson, BSc, MSc (Toronto), PhD (Maryland)
S.A. Vanstone, BMath, MMath, PhD (Waterloo)
J.W. Wong, BS, MS, PhD (UCLA)
D. Wood, BSc, PhD (London)

Associate Professors
J.C. Beatty, BA (Princeton), PhD (UC Berkeley)
F.J. Burkowski, BSc, MMath, PhD (Waterloo)
S. Christodoulakis, BSc (Athens), MSc (Queen's), PhD (Toronto)
C.J. Colbourn, BSc (Toronto), MMath (Waterloo), PhD (Toronto)
G.V. Cormack, BSc, MSc, PhD (Manitoba)
W.B. Cowan, BSc (Waterloo), PhD (McGill)
L.J. Dickey, BSc, MA (Arizona), PhD (Wisconsin)

P.A. Forsyth, BSc (Western Ontario), MSc (Australian National), PhD (Western Ontario)
K.O. Geddes, BA (Saskatchewan), MSc, PhD (Toronto)
R.N. Goldman, BS (MIT), MA, PhD (Johns Hopkins)
F. Mavaddat, BSc (Tehran), Diploma-Graduate Studies (Netherlands), PhD, DIC (Imperial College)
F.W. Tompa, ScB, ScM (Brown), PhD (Toronto)

Assistant Professors
F. Bacchus, BSc (Alberta), MSc (Toronto), PhD (Alberta)
J.P. Black, BSc (Calgary), Dipl d'Ing (Grenoble), PhD (Waterloo)
P.A. Buhr, BSc, MSc, PhD (Manitoba)

Associate Professor and Associate Chairman for Undergraduate Studies
D.J. Taylor, BSc (Saskatchewan), MMath, PhD (Waterloo)
J. F. Buss, BSc (California Inst. Tech.), PhD (MIT)
E.P.F. Chan, BSc, MSc, PhD (Toronto)
R. Cohen, BA (McGill), MSc, PhD (Toronto)
J. Ebergen, KANDIDAAT, MSc, PhD (Eindhoven)
G. Labahn, BSc, MSc, PhD (Alberta)
A. Lubiw, BSc (Toronto), MMath (Waterloo), PhD (Toronto)
P. L. Ragde, BMath (Waterloo), PhD (UC Berkeley)
B. A. Reed, BSc, PhD (McGill)
W. L. Seaward, BSc (Victoria), MSc, PhD (Toronto)
W. P. Tang, BS (Fudan), PhD (Stanford)
J. H. Vellinga, BA (Western Ontario), MA (Waterloo) (Part-time)
G. E. Weddell, BSc, MSc (British Columbia), PhD (Toronto)

Research Assistant Professors
E. C-H L. Chu, BSc, MSc (Acadia), MMath, PhD (Waterloo), NASA
N. Coburn, BMath, MMath, MMath, PhD (Waterloo), BED (Western Ontario)

Lecturers
H.L. Pell, BA, MSc (Guelph), BASc (Waterloo), P.Eng.
A.B. Pidduck, BASc (Waterloo), P.Eng.

Adjunct Faculty
B.A. Barsky, BSc (McGill), MS (Cornell), PhD (Utah)
K. Cullk, MSc, PhD (Prague), PhD (Czechoslovak Academy of Sciences)
P. H. Dirksen, BSc, MA (Waterloo)
S. Fenton, BES, MA (Waterloo)

W. M. Gentleman, BSc (McGill), MA, PhD (Princeton)
J.H. Johnson, BMath, MMath, PHU (Waterloo)
J. D. Lawton, BASc (Toronto), MSc, PhD (Waterloo), FIMA
J.L. Morris, BSc (Leicester), PhD (St. Andrews), FIMA
J. K. Pachl, RNDr (Prague), PhD (Waterloo)
D. L. Poole, BSc (Flinders), PhD (Australian National)
P. Tanner, BMath (Waterloo), MSc (Carleton)

Faculty Members of Computer Science holding cross and/or joint appointments to:

1. Applied Mathematics
2. Electrical Engineering
3. Psychology

Faculty Members holding cross appointments to Computer Science from:

4. Combinatorics and Optimization
5. Pure Math

J refers to faculty members whose primary association is with St. Jerome's College

DEPARTMENT OF PURE MATHEMATICS

Professor and Chairman of the Department
F. Zorzito, BSc (Windsor), MSc, PhD (Queen's)

Distinguished Professor and Associate Chairman for Graduate Affairs
J. Azez, BA, MA, PhD (Budapest), Habilitat DSc (Hungarian Academy of Sciences), FRSC

Associate Professors and Associate Chairman for Undergraduate Affairs
L.J. Dickey, BSc, MA (Arizona), PhD (Wisconsin)

Professors
J.A. Baker, BA, MA (Saskatchewan), PhD (Waterloo)
S. Burris, BSc, MA, PhD (Oklahoma)
G.E. Cross, BA, MA (Dalhousie), PhD (British Columbia)
L.J. Cummings, BSc (Roosvile), MSc (de Paul), PhD (British Columbia)
K.R. Davidson, BMath (Waterloo), PhD (Berkeley)
D.Z. Djokovic, BSc, PhD (Belgard)
D.A. Higgs, BScHonours (Witwatersrand), MA (Cambridge), PhD (McMaster)
P. Hoffman, BA, MA (Toronto), PhD (Manchester)
P. Kannappan, BScHonours (Namnamla), PHU (Washington)
J.W. Lawrence, BScHonours (Carleton), MSc, PhD (Carleton)
R.G. McLenaghan, BSc, MSc (Queen's), PhD (Cambridge)
C.T. Ng, BSc (Chinese University of Hong Kong), MMath, PhD (Waterloo)
R.A. Staal, BA, MA, PhD (Toronto)
C.L. Stewart, BSc (British Columbia), MSc (McGill), PhD (Cambridge)
F.G.Y. Teng, BSc (Hong Kong), MS (South Carolina), PhD (Illinois)

Associate Professors
W.J. Gilbert, BA, MA (Cambridge), DPhil (Oxford)
A. Kerr-Lawson, BA (Toronto), MA (Chicago), PhD (McMaster)
E. Moskal, BA (Toronto), PhD (Illinois)
W.F. Shadwick, BSc, MSc (Western Ontario), PhD (London), NSERC University Research Fellow

Assistant Professors
K. Hare, BA (Waterloo), MA (Indiana), PhD (British Columbia)
K.A. Rowe, BSc (Toronto), MS (Wisconsin), PhD (Illinois)

Research Assistant Professor
P.A. Mischenko, BSc, MSc, PhD (Toronto), NSERC University Research Fellow

Adjunct Faculty
H. Haruki, MSc, PhD (Osaka)

Faculty Members holding cross appointments to Pure Mathematics from:

1. Applied Mathematics
2. Philosophy
3. Combinatorics and Optimization
4. Computer Science

DEPARTMENT OF STATISTICS AND ACTUARIAL SCIENCE

Professor and Chairman of the Department
J.D. Kelbleisch, BSc, MMath, PhD (Waterloo)

Professor, Dean of the Faculty of Mathematics
J.G. Kelbleisch, BSc (Toronto), MA, PhD (Waterloo)

Professor, Associate Dean, Graduate Studies, Faculty of Mathematics
M.E. Thompson, BSc (Toronto), MSc, PhD (Illinois)

Associate Professor, Associate Chairman, Statistics, Undergraduate Affairs
G.W. Bennett, BSc, BA, PhD (Adelaide)

Associate Professor, Associate Chairman, Actuarial Science
R.L. Brown, BMath (Waterloo), FSA, FCIA, ACAS

Associate Professor, Associate Chairman, Graduate Studies
D.E. Matthews, BA, MA (Western Ontario), PhD (London), DIC

Professors
B. Abraham, BSc (Kurjia), MSc (Guelph), PhD (Wisconsin)
STRATEGY BOARD MEMBERS

Dr. M. Barrados, Principal, Audit Operations, Office of the Auditor General
Mr. G.E. Browne, General Manager, Information Systems, Stelco
Mr. N.P. Hayes, Strategy Board Chairman, Assistant Vice President, Product Development, Northern Telecom Canada Ltd
Mr. C.A. Hayles, Associate, Pat Delbridge Associates Inc.
Mr. R.D. Hosack, National Partner, The Coopers and Lybrand Consulting Group
Mr. W.C. Lovas, Partner, T. Caldwell Partners
Dr. A.K. Mason, Partner, Deloitte, Haskins and Sells
Mr. J.H. Matsui, Director of Custom Research, Environics Research Group Limited
Mr. G.L. Munro, Vice President, Information Systems and Technology, Imperial Oil Limited
Mr. T.E. Negrea

DIVISION OF MATHEMATICS FOR INDUSTRY AND COMMERCE

Director
P.J. Ponzo, Department of Applied Mathematics

Regular Members, Mathematics
F. Barahona, Department of Combinatorics and Optimization
C.F.A. Beaumont, Department of Applied Mathematics
R.G. Dunkley, Department of Combinatorics and Optimization
C.E. Haff, Department of Combinatorics and Optimization
P.-A. Larson, Department of Computer Science
W.R. Pulleyblank, Department of Combinatorics and Optimization
G.E. Weddell, Department of Computer Science
J.B. Whitney, Department of Statistics and Actuarial Science
H. Wolkowicz, Department of Combinatorics and Optimization

Regular Members, University
J.R. Hanna, School of Accountancy
R.A. Klawitter, Co-operative Education and Career Services

M.J. Magazine, Department of Management Sciences
FACULTY OF MATHEMATICS

Introductory Notes

1. Courses with the following prefixes are offered by the Faculty of Mathematics: ACTSC (Actuarial Science), AM (Applied Mathematics), C&O (Combinatorics and Optimization), CS (Computer Science), MATH (non-departmental Faculty courses), 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 with a space is available (see Section 5.3 on page 13.36), these courses are normally open to students in any UW faculty, subject to stated prerequisite requirements (see Section 5.4 on page 13.36).

2. A number of mathematics courses are offered at three different levels for BMath degree credit to accommodate the wide variety of students interested in such courses. The most challenging level, Advanced, is intended for exceptionally gifted students in an Honours program. The second level, Honours, is intended for all Honours students not taking the Advanced courses. The third level, General, is intended for students registered in the three-year General program. In some instances, there are other versions of such courses designed for students in faculties other than Mathematics.

Prerequisites involving these core courses will normally be given in terms of the lowest hierarchy level acceptable (e.g. 'Prereq: MATH 230A/B' implies that MATH 240A/B is also acceptable but MATH 220B is not).

3. Courses offered by the Faculty of Mathematics which have been designed with the academic needs and backgrounds of students in other faculties in mind are identified by a note following the course description. Courses in this category include: CS 100, 102, 212, 316; MATH 103, 104, 106, 111A/B, 113A/B, 114, 115A/B, 116, 118, 210, 211, 212, 213A/B, 215, 216; STAT 202, 204, 304, 311.

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<th>Advanced</th>
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Actuarial Science

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Note
More detailed course descriptions and course outlines are available in the Actuarial Science Undergraduate Handbook.

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 130R or 138
Antireq: ACTSC 222

ACTSC 232 F,S 3C 0.5
Introduction to Actuarial Mathematics
The economics of insurance, utility theory. Application of probability to problems of life and death. The determination of single premiums for insurances and annuities in both the discrete and continuous case.

Prereq: ACTSC 231, MTHEL 305A, STAT 230
Antireq: ACTSC 222

ACTSC 331 F,S 3C 0.5
Life Contingencies - Single Lives
Net annual premiums and net level premium reserves. The effect of expenses. The determination of gross premiums, modified reserves, and non-forfeiture options.

Prereq: ACTSC 232

ACTSC 332 W 3C 0.5
Life Contingencies - Multiple Lives
Joint Life last survivor probabilities, insurances and annuities. Multiple decrement theory. Stable and stationary populations. Introduction to pension mathematics.

Prereq: ACTSC 232

ACTSC 335 F 3C 0.5
OR Applications in Actuarial Science
Problem formulation and solution techniques in linear programming. Project scheduling with applications in insurance. Introduction to dynamic and integer programming.

Coreq: ACTSC 232, MATH 234A or 235, STAT 230
Antireq: C&O 350, 370

ACTSC 338 W 3C 0.5
Graduation of Life Tables
Theory and methods of data graduation with particular reference to life tables.

Prereq: ACTSC 232 or consent of instructor

ACTSC 431 F,S 3C 0.5
Risk Theory

Prereq: ACTSC 232
Coreq: STAT 333

ACTSC 432 F,S 3C 0.5
Loss Distributions and Credibility Theory
Methods of estimation for the distribution of the size of a single loss. Mixing and parameter uncertainty. Deductibles and other applications. Credibility theory.

Prereq: STAT 330

ACTSC 433 W 3C 0.5
Analysis of Mortality Data
Methods of analysis to produce rates for mortality and other decrements.

Prereq: ACTSC 232, STAT 330

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 W 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 are investigated.

Coreq: ACTSC 331, MTHEL 305B

ACTSC 453 F,S 3C 0.5
Basic Pension Mathematics

Prereq: ACTSC 332 or consent of instructor

ACTSC 454 W 3C 0.5
Pension Funding
Group and other generalized cost methods for pension plans. Effects of early retirements, plan design and actuarial assumptions on pension costs. Cost forecasts applied to private and public pension plans - in particular to the CPP.

Prereq: ACTSC 453 or consent of instructor

ACTSC 455 W 3C 0.5
Analysis of Financial Statements
Topics of insurance financial reporting including assets, liabilities, surplus, 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 463 F 3C 0.5
Topics in Casualty Insurance 1
Topics in casualty insurance chosen from areas such as coverages, rate-making and underwriting.

Prereq: ACTSC 232

COURSES NOT OFFERED 1989-90

ACTSC 221 Mathematics of Investment
ACTSC 222 Contingencies
ACTSC 223 Group Life and Health Insurance
ACTSC 337 Finite Differences
ACTSC 391 Topics in Actuarial Mathematics
ACTSC 441 Advanced Topics in Actuarial Mathematics
ACTSC 452 Selection of Risks 2
ACTSC 456 Taxation of Life Insurance
ACTSC 458 Insurance Law
ACTSC 464 Topics in Casualty Insurance 2
ACTSC 491 Seminar in Actuarial Mathematics
ACTSC 492 Seminar in Actuarial Science 2
Applied Mathematics

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes

1. Since the publication of the 1988/89 Undergraduate Calendar, AM courses have undergone a complete renumbering in order to provide a consistent numbering system, common to both undergraduate and graduate courses, in which the three digits convey specifically the level and content of the course.

1988/89 1989/90
Calendar Calendar

AM 260 AM 250
AM 270 AM 251
AM 280 AM 252
AM 340 AM 343
AM 362 AM 333
AM 364 AM 375
AM 365 AM 361
AM 371 AM 353
AM 372 AM 475
AM 380A AM 381C
AM 380B AM 481C
AM 381 AM 351
AM 389 deprecated
AM 391 AM 451
AM 395 AM 371C
AM 399 deprecated
AM 444 AM 435
AM 462 AM 431
AM 463 deprecated
AM 464 deleted
AM 465A AM 373
AM 465B AM 473
AM 466 AM 463C
AM 468 AM 491
AM 472 AM 432
AM 474 AM 433
AM 476 AM 484C
AM 478 AM 492
AM 481A/B AM 453
AM 482 AM 456
AM 485 deprecated
AM 496 AM 477
AM 498 AM 455
AM 499 AM 495
AM 495 AM 465C
AM 499 AM 496
AM 430/40 AM 493/4 (not offered)

2. More detailed course descriptions and course outlines are available in the Applied Mathematics Handbook.

AM 231 F,W 3C,1T 0.5
Calculus 4
Vector integral calculus, including line integrals, Green's theorem, the divergence theorem, and Stokes' theorem, with applications to physical problems. Introduction to the Calculus of Variations. Sequences and series of functions and their applications, including the role of uniform convergence.
Prereq: MATH 237
Antireq: MATH 210, 212, 213B, 220B, 230B, 240B

AM 250 F,W 3C 0.5
Modelling with Ordinary Differential Equations
Overview of the modelling process. Examples of physical systems leading to ordinary differential equations. Applications to Newton's laws of motion, mechanical vibrations, and population dynamics. The emphasis is on the physical derivation and interpretation of the model equations.
Prereq: MATH 130B or 137
Antireq: MATH 215, 216
Formerly AM 260

AM 251 F,W 3C 0.5
Modelling with Systems of Ordinary Differential Equations
Prereq: MATH 138 or 230A, or consent of instructor
Formerly AM 270

AM 252 F 3C 0.5
Foundations of Applied Mathematics
An in-depth look at some of the fundamental principles of applied mathematics, through case studies chosen from classical mechanics of discrete and continuum systems and diffusion processes. Group-theoretic foundations of dimensional analysis. Regular and singular perturbation theory.
Prereq: AM 251 and one of MATH 240A, 247 or AM 251 and one of MATH 230A, 237 plus consent of instructor
Formerly AM 280

AM 331 F,W 3C 0.5
Real Analysis
Topology of R^n, continuity, norms, metrics, completeness. Fourier series and applications, for example, to ordinary differential equations, the heat problem, optimal approximation, the isoperimetric inequality.
Prereq: MATH 230B or 237
Antireq: MATH 322A, PMATH 351
Cross-listed as PMATH 331
Not available for credit to students in Honours Pure Mathematics programs.

AM 332 W,S 3C 0.5
Complex Analysis
Complex numbers; continuity, differentiability, analyticity of functions; the Cauchy-Riemann equations: solution of Laplace's equation; conformal mapping by elementary functions, and applications; contour integration, the Cauchy and allied theorems; Taylor and Laurent expansions, uniform convergence and power series; the residue calculus, and applications.
Prereq: MATH 230B or 237
Antireq: MATH 322B, 323B, PMATH 352
Cross-listed as PMATH 332
Formerly MATH 332B
Not available for credit to students in Honours Pure Mathematics programs.

AM 333 F,S 3C 0.5
Elementary Differential Geometry and Tensor Analysis
Curves in Euclidean 3-Space (E³) and the Serret-Frenet formulae; surfaces in E³ and their intrinsic geometry, Gaussian curvature and the Gauss-Bonnet theorem. Co-ordinate transformations and tensors in n-dimensions; n-dimensional Riemannian spaces; covariant differentiation; geodesics; the curvature, Ricci and Einstein tensors. Applications of tensors in Relativity and Continuum Mechanics.
Prereq: AM 231 or MATH 230B, or consent of instructor
Cross-listed as PMATH 365
Formerly AM 362

AM 343 W 3C 0.5
Discrete Models in Applied Mathematics
Difference equations, Laplace and z transforms applied to discrete (and continuous) mathematical models taken from ecology, biology, economics and other fields.
Prereq: MATH 220B or 227, or consent of instructor
Formerly AM 340

Note: AM XXXC indicates that the new number was previously used for a different course.
AM 351 F,S 3C 0.5
**Ordinary Differential Equations**
Existence and uniqueness theorems; higher order and systems of equations; series solutions and special functions. Laplace transforms. Eigenvalues and eigenfunction expansions; applications to mathematical physics. Sturm's comparison, separation and oscillation theorems.
Prereq: MATH 230B or 237. AM 250 is recommended for non-AM majors.
Formerly AM 381

AM 353 F,W,S 3C 0.5
**Partial Differential Equations 1**
First order partial differential equations and characteristic curves. Second order linear partial differential equations, primarily in two variables: physical origins; classification into hyperbolic, parabolic and elliptic equations; the Cauchy initial value problem and characteristic curves. Derivation and analysis of solutions of the wave equation, heat equation and Laplace's equation, separation of variables and eigenfunction expansions; Fourier integrals; d'Alembert's solution and the propagation of waves; maximum principle for d'Alembert's solution and the propagation of waves. Applications to problems in mechanics are stressed throughout.
Prereq: AM 231 or MATH 230B, or consent of instructor
Formerly AM 351

AM 371C F,S 3C 0.5
**Classical Mechanics**
Prereq: AM 231 or MATH 230B, or consent of instructor
Formerly AM 395

AM 373 W 3C 0.5
**Quantum Mechanics 1**
Critical experiments and old quantum theory. Basic concepts of quantum mechanics: Observables, wavefunctions, Hamiltonians and the Schrödinger equation. Uncertainty, correspondence and super-position principles. Simple applications to finite and extended one-dimensional systems, harmonic oscillators, rigid rotor and hydrogen atom.
Prereq: AM 371C or consent of instructor
Formerly AM 465A

AM 375 W 3C 0.5
**Special Relativity and Electromagnetic Field Theory**
Prereq: AM 333 and AM 371C, or consent of instructor
Formerly AM 364

AM 381C F,S 3C 0.5
**Introduction to Information Theory**
Prereq: Consent of instructor
Cross-listed as PMATH 380A
Formerly AM 380A

AM 431 F 3C 0.5
**Measure and Integration**
Lebesgue measure and integral for the real line; general measure and integration theory, convergence theorems, Fubini's theorem, absolute continuity, Radon Nikodym theorem, $L^p$-spaces.
Prereq: AM/PMA TH 331 or PMATH 351
Cross-listed as PMATH 431 or PMATH 351
Cross-listed as PMATH 431
Formerly AM 462

AM 432 W 3C 0.5
**Functional Analysis**
Banach spaces, linear operators, geometry of Hilbert spaces, Hahn-Banach theorem, open mapping theorem, compact operators, applications.
Prereq: AM 431/PMATH 451 or PMATH 353
Cross-listed as PMATH 453
Formerly AM 472

AM 433 F,S 3C 0.5
**Differential Geometry**
Some global aspects of surface theory, the Euler-Poincaré characteristic, the global interpretation of Gaussian curvature via the Gauss-Bonnet formula. Submanifolds of $R^n$, induced Riemannian metrics, extrinsic and intrinsic curvatures, Gauss-Codazzi equations. Local Lie groups of transformations on $R^n$, infinitesimal generators, the Lie derivative. An introduction to differentiable manifolds, the tangent and cotangent bundles, affine connections and the Riemann curvature tensor. The above topics will be illustrated by applications to continuum mechanics and mathematical physics.
Prereq: AM 333/PMATH 365 or consent of instructor
Cross-listed as PMATH 465
Formerly AM 474
AM 435 W 3C 0.5  
Applications of Algebra  
A survey of undergraduate mathematics with emphasis on the unifying effect of algebraic concepts. This is a cross-disciplinary course: theorems of modern algebra are related to topics chosen mainly from advanced calculus and differential geometry.  
Prereq: MATH 234B or MATH 336  
Formerly AM 444

AM 441 F 3C 0.5  
Numerical Solution of Differential and Integral Equations  
Prereq: CS 374, or CS 337 and consent of instructor. CS 372 is recommended.  
Cross-listed as CS 475

AM 451 W 3C 0.5  
Introduction to Dynamical Systems  
Prereq: AM 351 or consent of instructor  
Formerly AM 391

AM 453 F 3C 0.5  
Partial Differential Equations 2  
A thorough discussion of the class of 2nd order linear partial differential equations with constant coefficients, in two independent variables. Laplace's equation, the wave equation and the heat equation in higher dimensions. Theoretical/Qualitative aspects: well-posed problems, maximum principles for elliptic and parabolic equations, continuous dependence results, uniqueness results (including consideration of unbounded domains), domain of dependence for hyperbolic equations. Solution procedures: elliptic equations - Green's functions, conformal mapping; hyperbolic equations - generalized D'Alembert solution, spherical means, method of descent; transform methods - Fourier, multiple Fourier, Laplace, Hankel (for all three types of partial differential equations); Duhamel's method for inhomogeneous hyperbolic and parabolic equations.  
Prereq: AM 351 and 353, or consent of instructor  
Formerly AM 481A

AM 455 W 3C 0.5  
Control Theory  
Prereq: Consent of Instructor  
Formerly AM 488

AM 456 F 3C 0.5  
Calculus of Variations  
Prereq: AM 231 or MATH 230B, or consent of instructor  
Formerly AM 482

AM 463 C F 3C 0.5  
Fluid Mechanics 1  
Fundamental equations of inviscid fluids, compressibility, vorticity; two and three-dimensional irrotational, incompressible flow. Blasius' theorem, Joukowski hypothesis. Water Wave Motion.  
Prereq: AM 361  
Formerly AM 466

AM 464 C W 3C 0.5  
Fluid Mechanics 2  
Shock wave theory, supersonic flow around a corner, Prandtl-Meyer flow. Dynamics of real fluids, Navier-Stokes equations, exact solutions, Stokes and Oseen flow; Turbulence, Boundary layer theory. Introduction to Geophysical Fluid Dynamics.  
Prereq: AM 463C  
Formerly AM 476

AM 465 C W 3C 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 361  
Formerly AM 495

AM 473 F 3C 0.5  
Quantum Mechanics 2  
Prereq: AM 373 or consent of instructor  
Formerly AM 465B

AM 475 F 3C 0.5  
Introduction to General Relativity  
Prereq: AM 379 or consent of instructor  
Formerly AM 372
AM 477 F 3C 0.5
Statistical Mechanics
Equilibrium statistical mechanics is developed from first principles, based on elementary probability theory and quantum theory (classical statistical mechanics is developed later as an appropriate limiting case). Emphasis is placed on the intimate connections between statistical mechanics and thermodynamics. Although it would be useful, prior knowledge of quantum theory is not necessary.

Prereq: Consent of instructor
Formerly AM 486

AM 481C W 3C 0.5
Applications of Information Theory

Prereq: Consent of instructor
Cross-listed as PMATH 380B
Formerly AM 380B

AM 491 F 3C 0.5
Topics in Applied Mathematics
A selection of special topics given by members of the Applied Mathematics Department.

Prereq: Consent of instructor
Formerly AM 468

AM 492 W 3C 0.5
Topics in Applied Mathematics
A selection of special topics given by members of the Applied Mathematics Department.

Prereq: Consent of instructor
Formerly AM 468

AM 495 F 3C 0.5
Reading Course
Formerly AM 489

AM 496 W 3C 0.5
Reading Course
Formerly AM 499

COURSES NOT OFFERED 1989-90
AM 493 Applications of Mathematics
(Formerly AM 430)
AM 494 Applications of Mathematics
(Formerly AM 440)

C&O 330 F 3C 0.5
Combinatorial Enumeration
The combinatorics of the ordinary and exponential generating functions. Matrix methods, and decompositions. Applications to the enumeration of sequences, permutations, trees, 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 234B or PMATH 336
Offered at St. Jerome's College.

C&O 342 F, S 3C 0.5
Graph Theory 1
An introduction to the ideas, methods and applications of graph theory. Finding shortest paths and maximum matchings in weighted graphs. Determining the connectivity of a graph.

Prereq: C&O 230

C&O 343 W 3C 0.5
Graph Theory 2

Prereq: C&O 342

C&O 350 F, W, S 3C 0.5
Linear Programming

Prereq: MATH 224A or 235
Antireq: ACTSC 335

C&O 351 F, W, S 3C 0.5
Network Flow Theory

Prereq: C&O 350
Nonlinear Programming

One-dimensional optimization. Introduction to unconstrained optimization in several variables including Newton's method, secant methods, conjugate gradient methods and the special case of quadratic forms. Introduction to constrained optimization including the elements of Kuhn-Tucker theory, active set methods and penalty function techniques.

Prereq: MATH 230A, 234A or MATH 235, 237

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 360

Antireq: ACTSC 335

Mathematical Discovery and Invention

A course in problem-solving. 100 problems are studied. Problems are taken mainly from the elementary parts of algebra, geometry, number theory, combinatorics and probability.

Prereq: MATH 130B, 134A/B or MATH 135, 136, 138

Although the mathematics for this course is technically elementary, the course is intended for third and fourth-year students, and the mathematical maturity of a senior student will be assumed.

Combinatorics and Optimization

An introduction to the combinatorial aspects of the real plane. Main topics covered are the enumeration of various sets in the plane. Helly's theorem and combinatorial objects in the plane, Sylvester's Triad Problem, Pick's Theorem, partitioning the interior of a rectangle into squares of different sizes, an introduction to the theory of convex sets in the plane. Heil's theorem and certain ramifications will be explored.

Prereq: MATH 130B, 134A/B or MATH 135, 136, 138

Although the mathematics for this course is technically elementary, the course is intended for third and fourth-year students, and the mathematical maturity of a senior student will be assumed.
C&O 459 F 2C 0.5
Topics in Optimization
An undergraduate seminar in optimization. The primary objective is to study recent work in specific areas of optimization. Course content may vary from term to term.
Prereq: Consent of instructor

C&O 464 W 2C 0.5
Quadratic Programming
A detailed presentation of optimality conditions and effective algorithms for the solution of a quadratic programming problem. All concepts are developed as natural extensions of their counterparts in linear programming. Applications from portfolio analysis, engineering plasticity, regression, pattern recognition.
Prereq: C&O 350

C&O 466 F 2C 0.5
Continuous Optimization
Prereq: C&O 350, 367

C&O 480 F 2C 0.5
History of Mathematics 1
An in-depth examination of the origins of modern mathematics, beginning with examples of Babylonian mathematics. Topics include Pythagorean triples, solution of equations, estimation of pi, duplication of the cube, trisection of an angle.
Prereq: MATH 130B, 134A/B or MATH 135, 136, 138
Although the mathematics for this course is technically elementary, the course is intended for third and fourth-year students, and the mathematical maturity of a senior student will be assumed.

C&O 481 W,S 2C 0.5
History of Mathematics 2
A continuation of C&O 480 (History of Mathematics 1), based on more recent mathematics, beginning with the Fibonacci sequence and including the origins of calculus.
Prereq: MATH 130B, 134A/B or MATH 135, 136, 138
Although the mathematics for this course is technically elementary, the course is intended for third and fourth-year students, and the mathematical maturity of a senior student will be assumed.

C&O 499 F.W.S 2R 0.5
Reading in Combinatorics and Optimization
Prereq: Consent of department

Computer Science

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes

1. The Department of Computer Science has two distinct streams of courses, one for students who have been admitted into a Computer Science Major program, and another especially designed for non-specialists who wish to become sophisticated computer users. Within this context, Computer Science Major programs include Honours Computer Science, Honours Co-op Computer Science with Electrical Engineering Electives, Honours Co-op Computer Science - Information Systems Option, and all Joint and Double Honours BMath programs involving Computer Science as one of the majors.

CS 131 and 132, required in all four-year BMath programs, are normally restricted to students in the Faculty of Mathematics. All other CS courses numbered with a middle digit of 0 through 3 are non-specialist courses. As such, they will normally be open to Computer Science Major students, but they will be available to all other students in the University, subject to resource limitations.

Several CS Major courses are also open to other students. In addition, where resources permit, students with exceptionally high academic standing in other programs may be considered for admission to restricted CS Major courses on an individual basis. To be considered, students should consult a Computer Science Undergraduate Advisor.

2. The Computer Science Department is experiencing demand for its courses beyond available resources. Thus, accessibility to Computer Science courses cannot be guaranteed to all students. Every effort will be made to accommodate those students who preregister during published University preregistration periods. While priority will be given to these preregistrants, admission to specific courses cannot be guaranteed and course substitutions may be required to satisfy degree requirements.

3. Regular students will not normally be permitted to enrol in Computer Science courses during the Spring term. (See section 5.4 on page 13:36.) Co-op students will not normally be permitted to enrol in Computer Science courses while on a work term.

All other part-time students, as well as full-time non-degree and post-degree students, will normally be limited to at most one Computer Science course per term from the non-specialist offerings. (Post-degree students on academic leave from their home institution should consult a Computer Science Advisor to arrange an appropriate selection of courses.) Priority for registration will normally be given to students registered full-time in a degree program.

4. Students in first and second year are limited to one Computer Science course per term. Students in CS Major programs are limited to three CS courses per term in third and fourth year. Other students are limited to two CS courses per term in third and fourth year.

5. Please note that the terms in which courses are offered may deviate from those indicated below. Students are advised to consult the University Course Offerings List published at preregistration time.

6. Students in faculties other than Mathematics should take particular note of the following courses: CS 100, 102, 212, 230, 316.

7. For the purposes of satisfying prerequisites for non-specialist courses, the second entry in each of the following course pairings may normally be substituted for the first entry of that pairing: (CS 230 and 242), (CS 334 and 340), and (CS 335 and 351/354).

Computer Science
8. Students who have demonstrated exceptionally strong academic performance will be permitted to enrol in 600-level CS courses at the discretion of the instructor, if there is available capacity. Courses at the 600 level may not be used to satisfy a program requirement for minimum number of courses in Computer Science at the 400 level, but may be taken in place of additional 400-level courses.

9. The prerequisite phrase “x-year standing” means that a student must be registered in year x or higher.

10. The following courses are offered in conjunction with the Division of Mathematics for Industry and Commerce: CS 330, 432, 438, 446, 448 and 482.

CS 100 F.W,S 2C,2L 0.5
Introduction to Computer Usage
An introduction to universally applicable computer services. Hands-on experience with common software and hardware, supported by examples of applications and social implications chosen from many disciplines. Topics include: electronic mail, word processing, spreadsheets, record management, and hardware and software concepts.
Antireq: CS 131, 132
CS 100 cannot be counted for credit toward a BMath Honours or four-year General degree.

CS 102 F,W,S 3C,2L 0.5
Introduction to Computer Programming
Fundamental techniques of algorithm design and program development. Introduction to a programming language applicable to the student's field of study. Topics include: structured programming, simple data elements, sequential operations, iterative statements, selection statements, data aggregations, functions and subroutines.
Prereq: Computer literacy (e.g. CS 100 or extensive high school computing)
Antireq: CS 131, 132
Divisions of the course will be application-oriented: CS 102 COM (commerce), CS 102 SCI (sciences), CS 102 SSC (social sciences), and CS 102 HUM (humanities). Not all divisions will be offered each term.
CS 102 cannot be counted for credit toward a BMath Honours or four-year General degree.

CS 131 F.W,S 3C,1T,3L 0.5
Principles of Computer Science 1
An introduction to the use of computers in problem solving, including an overview of computer science, introduction to algorithms and structured programming, correctness and efficiency, file and database management, communications, and networks. Labs will emphasize hands-on exposure to modern applications software and to the use and development of appropriate software tools.
Prereq: Full-time degree registration in the Faculty of Mathematics
Antireq: CS 100, 130, 180, 212, 234, 235, 240, 250
Also offered at St. Jerome's College in the Fall term

CS 132 F,W,S 3C,1T,3L 0.5
Principles of Computer Science 2
An introduction to data representation and numerical problem solving, including an overview of programming systems and machine architectures, linked lists, hashing techniques, dynamic storage allocation, techniques for zero-finding and area-finding, solving linear equations, simulation and decidability. Labs will emphasize hands-on exposure to the use and development of appropriate software tools.
Prereq: CS 131 and full-time degree registration in the Faculty of Mathematics
Antireq: CS 100, 102, 140, 180, 212, 234, 235, 240, 250
Also offered at St. Jerome's College in the Winter term

CS 212 F,W,S 3C 0.5
Programming Principles and Practice
High-level languages, including their specification and translation. Structured programming. Use of data structures, including lists and trees. Recursion. Sorting. Introduction to computational complexity and correctness.
Prereq: One of CS 102, 140, or equivalent
Antireq: CS 131, 132, 234, 240, 241, 242
CS 212 cannot be counted for credit toward a BMath Honours or four-year General degree.

CS 230 F,W 3C 0.5
Introduction to Computers and Computer Systems
Prereq: One of CS 132, 212
Antireq: CS 117, 235, 241, 242, 250, EL E 222

CS 241 F,W 2C,1T 0.5
Principles of Computer Science 3
The relationship between high-level languages and the computer architecture that underlies their implementation, including basic machine architecture, assemblers, specification and translation of programming languages, linkers and loaders, block-structured languages, parameter passing mechanisms, and comparison of programming languages.
Prereq: CS 132 and an all-inclusive cumulative math average of at least 60%
Antireq: CS 212, 230, 234, 235, 240, 250

CS 242 F,W,S 2C,1T 0.5
Principles of Computer Science 4
The function of modern operating systems and their relationship to the computer architecture that underlies their implementation, including file systems, I/O and interrupt handling, CPU scheduling and swapping, memory management, parallel processing. The course also includes an overview of computer networking, performance monitoring, modeling and simulation, and the social implications of computing.
Prereq: CS 241
Antireq: CS 117, 212, 230, 234, 235, 240, 250

CS 316 W 3C,1L 0.5
Introduction to Statistical Problem Solving by Computer
This is an applications-oriented course which prepares the nonmathematical student to use the computer as a research tool. Topics include aids for statistical analysis and the preparation of documents such as reports and theses. The course provides sufficient background for application to other problems specific to the individual's field.
Prereq: One statistics course and computer literacy (e.g. CS 100 or high school computing), or consent of instructor
CS 316 cannot be counted for credit toward a BMath degree.
CS 330 F.W,S 3C 0.5
Introduction to Business Systems
A study of application software systems in the business environment. Topics include data models of business functions, file and data base systems, and integrated accounting systems. Students modify an integrated accounting system and also work with a selection of commercially available software systems.
Prereq: One of CS 102, 132, 140, 180, or equivalent, and a knowledge of accounting (e.g. ACC 101 or ACC 121/122)
CS 330 cannot be counted for credit in a Computer Science Major program.

CS 334 F,S 3C 0.5
Data Types and Structures
Top-down design of data structures. Using representation independent data types. Introduction to commonly used data types, including lists, sets, mappings, and trees. Selection of data representation.
Prereq: CS 230 or 234, and third-year standing
Antireq: CS 340
CS 334 cannot be counted for credit in a Computer Science Major program.

CS 335 W 3C 0.5
Computing Systems
A study of those hardware and software components comprising a computing system, with an emphasis on the role of operating systems in the support of programming activities. Topics include: computer architecture; input/output; operating systems; linkers, loaders, and libraries.
Prereq: CS 230 or (CS 234 and 235)
Antireq: CS 350, 351
CS 335 cannot be counted for credit in a Computer Science Major program.

CS 337 W 3C 0.5
Introduction to Numerical Analysis
Pitfalls in computation; solution of linear algebraic equations; polynomial interpolation: least squares; numerical integration and differentiation. The intent is to expose students to the theory behind modern algorithms for solving mathematical problems.
Prereq: CS 132 or 140, MATH 134B or 136, MATH 130B or 138, and third-year standing. MATH 226 or (MATH 230B and 244A) is recommended.
Antireq: CS 372, 374
CS 337 cannot be counted for credit in a Computer Science Major program.

CS 340 F,W,S 3C 0.5
Data Structures
Levels of data description and their role in the design of structures. Design of data representations for primary and secondary store. Introduction to the analysis of algorithms.
Prereq: CS 240 or 242, C&O 230, and third-year standing in a Computer Science Major program
Antireq: CS 334

CS 350 F,W 3C 0.5
Machine Structures
The intent is to give a basic understanding of what goes on inside a computer, of machine architecture, and of some fundamental operating system services. Topics include: detailed introduction to hardware; representation of data; memory; central processor; addressing schemes; input/output; linking and loading.
Prereq: CS 250 or EL E 222, and third-year standing in a Computer Science Major program. CS 358 or EL E 323 is strongly recommended.
Antireq: CS 242, 335, 351
The final offering will be Winter, 1990.

CS 351 F,W,S 3C 0.5
Digital Design and Architecture
Boolean algebra. Design and analysis of both combinational and sequential circuits. Registers, counters, memory, programmable logic. CPU control logic, the arithmetic-logic unit. Input/output and interrupts.
Prereq: CS 242 and third-year standing in a Computer Science Major program
Antireq: CS 335, 350, 358, EL E 323

CS 355 F.W,S 3C 0.5
Software Systems
An introduction to the system software of modern computing systems, with an emphasis on the management of hardware resources and the support of multiple processes. Major topics: object-oriented programming, critical sections and synchronization, primitives for concurrency control, the deadlock problem, memory management, file systems, introduction to distributed computing.
Prereq: CS 340 and third-year standing in a Computer Science Major program. CS 351 is recommended.
This course has been revised for students who have taken CS 242, Winter, 1990 will be the last offering of the old version and simultaneously the first offering of the new version. In that term, students who have taken CS 244, 242 should select the MCS division of CS 354; students who have taken CS 240, 250 should select the MCQ division.

CS 360 F.W 3C 0.5
Introduction to the Theory of Computing
Models of computers including finite automata and Turing machines. Basics of formal languages with applications to syntax of programming languages. Unsolvable problems and their relevance to the semantics of programming. Concepts of computational complexity including algorithm optimality.
Prereq: CS 240 or 242, C&O 230, and third-year standing

CS 372 F,W,S 3C 0.5
Introduction to Scientific Computation: Numerical Linear Algebra
Pitfalls in computation. Direct solution of linear algebraic systems. Iterative solution of linear algebraic systems. Least-squares computations. Iterative solution of f(x) = 0. Minimization of functions of several variables.
Prereq: CS 132 or 140, MATH 230B or 237, MATH 234A or 235
Antireq: CS 337

CS 374 F,W,S 3C 0.5
Introduction to Scientific Computation: Numerical Approximation
Prereq: CS 132 or 140, MATH 230B or 237, MATH 234A or 235
Antireq: CS 337

CS 380 F,W,S 3C 0.5
Modern Operating Systems
A study of those hardware and software components comprising a computing system, with an emphasis on the role of operating systems in the support of programming activities. Topics include: detailed introduction to hardware; representation of data; memory; central processor; addressing schemes; input/output; linking and loading.
Prereq: CS 250 or EL E 222, and third-year standing in a Computer Science Major program. CS 358 or EL E 323 is strongly recommended.
Antireq: CS 242, 335, 351
The final offering will be Winter, 1990.

CS 355 F,W,S 3C 0.5
Digital Design and Architecture
Boolean algebra. Design and analysis of both combinational and sequential circuits. Registers, counters, memory, programmable logic. CPU control logic, the arithmetic-logic unit. Input/output and interrupts.
Prereq: CS 242 and third-year standing in a Computer Science Major program
Antireq: CS 335, 350, 358, EL E 323

CS 355 F.W,S 3C 0.5
Software Systems
An introduction to the system software of modern computing systems, with an emphasis on the management of hardware resources and the support of multiple processes. Major topics: object-oriented programming, critical sections and synchronization, primitives for concurrency control, the deadlock problem, memory management, file systems, introduction to distributed computing.
Prereq: CS 340 and third-year standing in a Computer Science Major program. CS 351 is recommended.
This course has been revised for students who have taken CS 242, Winter, 1990 will be the last offering of the old version and simultaneously the first offering of the new version. In that term, students who have taken CS 244, 242 should select the MCS division of CS 354; students who have taken CS 240, 250 should select the MCQ division.

CS 360 F.W 3C 0.5
Introduction to the Theory of Computing
Models of computers including finite automata and Turing machines. Basics of formal languages with applications to syntax of programming languages. Unsolvable problems and their relevance to the semantics of programming. Concepts of computational complexity including algorithm optimality.
Prereq: CS 240 or 242, C&O 230, and third-year standing

CS 372 F,W,S 3C 0.5
Introduction to Scientific Computation: Numerical Linear Algebra
Pitfalls in computation. Direct solution of linear algebraic systems. Iterative solution of linear algebraic systems. Least-squares computations. Iterative solution of f(x) = 0. Minimization of functions of several variables.
Prereq: CS 132 or 140, MATH 230B or 237, MATH 234A or 235
Antireq: CS 337

CS 374 F,W,S 3C 0.5
Introduction to Scientific Computation: Numerical Approximation
Prereq: CS 132 or 140, MATH 230B or 237, MATH 234A or 235
Antireq: CS 337

CS 380 F,W,S 3C 0.5
Modern Operating Systems
A study of those hardware and software components comprising a computing system, with an emphasis on the role of operating systems in the support of programming activities. Topics include: detailed introduction to hardware; representation of data; memory; central processor; addressing schemes; input/output; linking and loading.
Prereq: CS 250 or EL E 222, and third-year standing in a Computer Science Major program. CS 358 or EL E 323 is strongly recommended.
Antireq: CS 242, 335, 351
The final offering will be Winter, 1990.
CS 430 F 3C 0.5  
Applications Software Engineering  
An investigation into the role and function of software engineering practice in the construction of computer based systems. Topics include: requirements and specification; documentation techniques; analysis and design; implementation; testing and maintenance; management issues.  
Prereq: CS 230 or 234, and a CS half-credit labelled CS 330 or higher, and third-year standing  
Coreq: CS 335 is recommended  
Antireq: CS 446  
CS 430 cannot be counted for credit in a Computer Science Major program.

CS 432 F,S 3C 0.5  
Business Systems Analysis  
Prereq: CS 334 or 438, and third-year standing  
Antireq: CS 442  
CS 432 cannot be counted for credit in a Computer Science Major program.

CS 435 W 3C 0.5  
Topics in Computing Systems  
An overview of some more advanced computer techniques, with an emphasis on their application in the analysis and design of systems. Topics include: data communication, queuing theory fundamentals; 2-D graphics; advanced software and hardware architectures; computer selection.  
Prereq: CS 335 and third-year standing  
CS 435 cannot be counted for credit in a Computer Science Major program.

CS 437 W 3C 0.5  
Simulation by Computer  
An introduction to the basic techniques of simulation. Discrete simulation models; random number generators; the SIMSCRIPT and GPSS languages; analysis of simulation output; continuous simulation models and the CSMP language.  
Prereq: CS 230 or 234, STAT 220, and third-year standing  
Antireq: CS 457  
CS 437 cannot be counted for credit in a Computer Science Major program.

CS 438 F,W,S 3C 0.5  
Computer Applications in Business: Data Bases  
A user-oriented approach to the management of large collections of data. Methods used for the storage, selection and presentation of data. Common data base management systems.  
Prereq: One of CS 230, 234, 330, and third-year standing  
Antireq: CS 448  
CS 438 cannot be counted for credit in a Computer Science Major program.

CS 442 F,S 3C 0.5  
Principles of Programming Languages  
An exposure to important concepts and issues in contemporary programming languages. Data types, abstraction, and polymorphism. Program structure. Lambda calculus and functional programming, logic programming, object-oriented programming. Semantics of programming languages. Critical comparison of language features and programming methodologies using examples drawn from a variety of programming languages including Lisp, Prolog, ML, Ada, Smalltalk, Icon, APL, and LISP. Programming assignments involve the use of some of these languages.  
Prereq: CS 340 and fourth-year standing in a Computer Science Major program.

CS 444 W 3C 0.5  
Compiler Construction  
Prereq: CS 340, 360 and fourth-year standing in a Computer Science Major program.

CS 446 F,W,S 3C 0.5  
Software System Design and Implementation  
An investigation into the role and function of software engineering practice in the design and implementation of computer based systems. Topics include: structural design; procedural design; testing and reliability; management topics; programming languages and coding; portability techniques; maintenance; performance measurement and analysis.  
Prereq: CS 240 or 242, and fourth-year standing in a Computer Science Major program. CS 354 is recommended.  
Antireq: CS 430  
CS 446 cannot be counted for credit in a Computer Science Major program.
CS 454 F,W,S 3C 0.5
Distributed Systems
An introduction to distributed systems, emphasizing the multiple levels of software in such systems. Specific topics include fundamentals of data communications, network architecture and protocols, local-area networks, concurrency control in distributed systems, recovery in distributed systems, and clock synchronization.
Prereq: CS 354 and fourth-year standing in a Computer Science Major program; CS 350 or 351 is recommended.

CS 457 W 3C 0.5
Queueing Models: Analysis, Simulation, and Computer Applications
An introduction to the basic results of queueing theory and the techniques of discrete event simulation. Emphasis is placed on the application of queueing models to computer systems and computer communication networks.
Prereq: STAT 231, 333, CS 240 or 242, and fourth-year standing in a Computer Science Major program
Antireq: CS 457

CS 458 F,S 3C 0.5
Design of Microprocessor-Based Systems
An introduction to the design of digital systems such as those used in microcomputers, control and industrial applications, or those dedicated to specific tasks. Topics include: digital electronics, microprocessors, memory chips and systems, standard and specialized peripheral chips, development and integration systems, and case studies. Laboratory-oriented: small teams design and implement microprocessor-based systems.
Prereq: CS 351 or 358, and fourth-year standing in a Computer Science Major program. CS 360 is recommended for those students who do not have CS 351.

CS 462 F 3C 0.5
Formal Languages and Parsing
Prereq: CS 360 and fourth-year standing

CS 464 W 3C 0.5
Computational Complexity Theory
The classification of problems according to the computational resources required for their solution, with emphasis on properties of feasible computations rather than on specific algorithms. Topics include: time and space complexity, tractable and intractable problems, computation using randomness, parallel computation.
Prereq: CS 360 and fourth-year standing

CS 466 F,S 3C 0.5
Algorithm Design and Analysis
Design of good algorithms and analysis of the resources they consume. Lower bounds on the resource requirements of algorithms to compute certain functions. Problems from the following areas are discussed in this light: sorting and order statistics, data structures, arithmetic computations, the NP-complete problems.
Prereq: CS 340 and fourth-year standing. CS 360 is recommended.

CS 472 W 3C 0.5
Numerical Linear Algebra
Prereq: CS 372, or CS 337 and consent of instructor. CS 374 is recommended.

CS 473 F 3C 0.5
Numerical Linear Programming
Methods for the minimization and maximization of piecewise linear functions and linear functions subject to linear constraints, with applications to linear programming and data fitting. Emphasis is on algorithms, numerical considerations and software implementation.
Prereq: One of CS 372, C&O 350, or CS 337 and consent of instructor. CS 374 is recommended.
Cross-listed as C&O 458

CS 476 F 3C 0.5
Numerical Solution of Differential and Integral Equations
Prereq: CS 374, or CS 337 and consent of instructor. CS 372 is recommended.
Cross-listed as AM 441

CS 482 F,W,S 3C 0.5
Techniques in Systems Analysis
Techniques in organization and management theory. Organization of large software systems. Data base concepts. Implementation of computer based information systems. Survey of current topics of interest such as distributed processing, microcomputers and on-line systems.
Prereq: CS 340 and fourth-year standing in a Computer Science Major program
Coreq: CS 448
Antireq: CS 432

CS 486 F,W,S 3C 0.5
Introduction to Artificial Intelligence
Prereq: CS 240 or 242, and fourth-year standing in a Computer Science Major program

CS 487 W 3C 0.5
Introduction to Symbolic Computation
An introduction to the use of computers for symbolic mathematical computation, involving traditional mathematical computations such as solving linear equations (exactly), analytic differentiation and integration of functions, and analytic solution of differential equations.
Prereq: CS 240 or 342, PMATH 334 or consent of instructor, and fourth-year standing
Mathematics

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

MATH 010 F, W, S 0.0
Non-Credit Year One Testing Slot
All students enrolled in one or more of MATH 130A/B, 134A/B, 135, 136, 137, 138, 140A/B, 144A/B, 145, 146, 147, 148, and CS 131, 132 are automatically enrolled in a non-credit lab that is scheduled one evening each week from 7:00 to 9:00 p.m. This time slot appears as MATH 010 entry on student timetables and is reserved for mid-term tests in the above courses. This time slot is used only on those evenings when mid-term tests are scheduled.

MATH 020 F, W, S 0.0
Non-Credit Year Two Testing Slot
All students enrolled in any second-year mathematics course offered by the Faculty of Mathematics, with the exception of various service courses designed for students in other faculties, are automatically enrolled in a non-credit lab that is scheduled from 5:00 to 7:00 p.m. Tuesday and Thursday each week. This time slot is used only on those days when mid-term tests are scheduled.

MATH 103 F 3C, 1T 0.5
Introductory Algebra (For Arts or Social Science Students)
An introduction to applications of algebra to business, the behavioural sciences, and the social sciences. Topics will be chosen from set theory, permutations and combinations, binomial theorem, probability theory, systems of linear equations, vectors and matrices, mathematical induction.
Prereq: Grade 12 Mathematics or equivalent.

MATH 104 W 3C, 1T 0.5
Introductory Calculus (For Arts or Social Science Students)
An introduction to applications of calculus in business, the behavioural sciences, and the social sciences. The models chosen will include the study of polynomial, rational, exponential and logarithmic functions; elementary analytic geometry; linear and quadratic systems of equations. The major concepts introduced to solve problems are: rate of change; optimization; growth and decay; and integration.
Prereq: Grade 12 Mathematics or equivalent.

MATH 111A F 3C, 1T 0.5
Algebra
Elementary number theory, number systems, mathematical induction, binomial theorem, complex numbers, polynomials.
Prereq: Grade 12 Mathematics or equivalent. Grade 13 or OAC Algebra is recommended but not required.
Antireq: MATH 134A, 135, 144A, 145
This course is designed for students in the Faculties of Arts and Science and students in the three-year BMath General program. It cannot be counted for credit toward a BMath Honours or four-year General degree.
MATH 111B W.S 3C,1T 0.5
Linear Algebra and Solid Geometry
Determinants, vectors, matrices, elementary solid geometry, systems of linear equations.
Prereq: Grade 12 Mathematics or equivalent. Grade 13 or OAC Algebra is recommended but not required. MATH 111A is not a required prerequisite for MATH 111B.

Antireq: MATH 114, 134B, 136, 144B, 146

This course is designed for students in the Faculties of Arts and Science and students in the three-year BMath General program. It cannot be counted for credit toward a BMath Honours or four-year General degree.

MATH 113A F 3C,2T 0.5
Calculus 1
The derivative, differentiation, higher order derivatives, implicit functions, differentials, applications of the derivative. The definite integral. Differentiation and integration of the logarithmic, exponential and trigonometric functions.
Prereq: Grade 13 or OAC Calculus
Antireq: MATH 106, 113A, 115A, 130A, 137, 140A, 147

This course is designed for students in the Faculties of Arts and Science and students in the three-year BMath General program. It cannot be counted for credit toward a BMath Honours or four-year General degree.

MATH 113B W 3C,2T 0.5
Calculus 2
Prereq: MATH 113A

This course is designed for students in the Faculties of Arts and Science and students in the three-year BMath General program. It cannot be counted for credit toward a BMath Honours or four-year General degree.

MATH 115A F 3C,2T 0.5
Calculus 1 (For Co-op Physics and Chemistry Students)
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 or OAC Calculus
Antireq: MATH 106, 113A, 116, 130A, 137, 140A, 147

Not open to students in the Faculty of Mathematics.

MATH 115B W.S 3C,2T 0.5
Calculus 2 (For Co-op Physics and Chemistry Students)
Prereq: MATH 115A

Not open to students in the Faculty of Mathematics.

MATH 116 F 3C,2T 0.5
Calculus 1 (For Engineering Students)
Review of limits and sequences, and inverse functions; the definite integral; techniques and applications of integration; sequences and series of numbers, and convergence.
Prereq: MATH 113A or equivalent

This course is designed for students in the Faculties of Arts and Science and students in the three-year BMath General program. It cannot be counted for credit toward a BMath Honours or four-year General degree.

MATH 118 W.S 3C,2T 0.5
Calculus 2 (For Engineering Students)
Approximation and the mean value theorem; power series and applications of power series; functions of two variables and properties of surfaces in space.
Prereq: MATH 116

Formerly MATH 110B
Not open to students in the Faculty of Mathematics.

MATH 130A 3C,1T 0.5
Calculus 1
Functions and limits, differentiation of trigonometric, logarithmic and exponential functions, the chain rule, Rolle’s theorem, the mean value theorem, extreme value theorem, applications of the derivative, the differential, the definite integral, fundamental theorem of calculus.
Prereq: Grade 13 or OAC Calculus
Antireq: MATH 106, 113A, 115A, 116, 137, 140A, 147

This course is being replaced in the Faculty core by MATH 137 effective Fall, 1989. MATH 130A will not be offered after Spring, 1989.

MATH 130B F,W 3C,1T 0.5
Calculus 2
Techniques of integration, applications of the integral, indeterminate forms, Taylor’s theorem, convergence of sequences and series, power series.
Prereq: MATH 130A

This course is being replaced in the Faculty core by MATH 138 effective Winter, 1990. MATH 130B will not be offered after Winter, 1990.

MATH 134A 3C,1T 0.5
Algebra
Basic set theory, cardinality, elementary number theory, number systems, polynomials.
Prereq: Grade 13 or OAC Algebra
Antireq: MATH 111A, 135, 144A, 145

This course is being replaced in the Faculty core by MATH 135 effective Fall, 1989. MATH 134A will not be offered after Winter, 1989.

MATH 134B 3C,1T 0.5
Linear Algebra 1
Systems of equations, vector spaces, matrices, determinants, geometric applications.
Prereq: Grade 13 or OAC Algebra
MATH 134A is recommended but not required.
Antireq: MATH 111B, 114, 136, 144B, 146

This course is being replaced in the Faculty core by MATH 136 effective Fall, 1989. MATH 134B will not be offered after Spring, 1989.
MATH 135 F,W 3C,1T 0.5
Algebra
A study of the basic algebraic systems of mathematics: the integers, the integers modulo n, the rational numbers, the real numbers, the complex numbers and polynomials.
Prereq: OAC Algebra or equivalent
Antireq: MATH 11A, 134A, 144A, 145
This course replaces MATH 134A in the Faculty core effective Fall, 1989.
MATH 135 is also offered at St. Jerome's College in the Fall term.

MATH 136 F,W,S 3C,1T 0.5
Linear Algebra 1
Prereq: OAC Algebra or equivalent. MATH 135 is recommended but not required.
Antireq: MATH 111B, 114, 134B, 144B, 146
This course replaces MATH 134B in the Faculty core effective Winter, 1990. MATH 136 is also offered at St. Jerome's College in the Winter term.

MATH 137 F,W,S 3C,1T 0.5
Calculus 1
Review of limits and inverse functions. Riemann sums and the definite integral. The fundamental theorem and applications of integration. Introduction to sequences and series; tests for convergence.
Prereq: OAC Calculus or equivalent
Antireq: MATH 111B, 114, 134B, 116, 130A, 140A, 147
This course replaces MATH 130A in the Faculty core effective Fall, 1989. MATH 137 is also offered at St. Jerome's College in the Fall term.

MATH 138 F,W,S 3C,1T 0.5
Calculus 2
Prereq: MATH 137
Antireq: MATH 113B, 115B, 118, 130B, 140B, 148
This course replaces MATH 130B in the Faculty core effective Winter, 1990. MATH 138 is also offered at St. Jerome's College in the Winter term.

MATH 140A 3C 0.5
Calculus 1
MATH 140A is an advanced-level, enriched version of MATH 130A.
Prereq: Grade 13 or OAC Calculus and a Grade 13 or OAC math average of at least 85%, or consent of instructor
Antireq: MATH 106, 113A, 115A, 116, 130A, 137, 147
This course is being replaced by MATH 147 effective Fall, 1989. MATH 140A will not be offered after Fall, 1988.

MATH 140B 3C 0.5
Calculus 2
MATH 140B is an advanced-level, enriched version of MATH 130B.
Prereq: MATH 140A or consent of instructor
This course is being replaced by MATH 148 effective Winter, 1990.
MATH 140B will not be offered after Spring, 1989.

MATH 144A 3C 0.5
Algebra
MATH 144A is an advanced-level, enriched version of MATH 134A.
Prereq: Grade 13 or OAC Algebra and a Grade 13 or OAC math average of at least 85%, or consent of instructor
Antireq: MATH 111A, 134A, 135, 145
This course is being replaced by MATH 145 effective Fall, 1989. MATH 144A will not be offered after Fall, 1988.

MATH 144B 3C 0.5
Linear Algebra 1
MATH 144B is an advanced-level, enriched version of MATH 134B.
Prereq: MATH 144A or consent of instructor
Antireq: MATH 111B, 114, 134B, 136, 146
This course is being replaced by MATH 146 effective Winter, 1990.
MATH 144B will not be offered after Spring, 1989.

MATH 145 F 3C 0.5
Algebra
MATH 145 is an advanced-level, enriched version of MATH 135.
Prereq: OAC Algebra (or equivalent) and an OAC math average of at least 85%, or consent of instructor
Antireq: MATH 111A, 134A, 135, 144A
This course replaces MATH 144A effective Fall, 1989.

MATH 146 W,S 3C 0.5
Linear Algebra 1
MATH 146 is an advanced-level, enriched version of MATH 136.
Prereq: MATH 145 or consent of instructor
Antireq: MATH 111B, 114, 134B, 136, 144B
This course replaces MATH 144B effective Winter, 1990.

MATH 147 F 3C 0.5
Calculus 1
MATH 147 is an advanced-level, enriched version of MATH 137.
Prereq: OAC Calculus (or equivalent) and an OAC math average of at least 85%, or consent of instructor
Antireq: MATH 106, 113A, 115A, 116, 130A, 137, 140A
This course replaces MATH 140A effective Fall, 1989.

MATH 148 W,S 3C 0.5
Calculus 2
MATH 148 is an advanced-level, enriched version of MATH 138.
Prereq: MATH 147 or consent of instructor
Antireq: MATH 113B, 115B, 118, 130B, 138, 140B
This course replaces MATH 140B effective Winter, 1990.

MATH 210 F,W 3C 0.5
Advanced Calculus (For Chemical Engineers)
Partial differentiation, the gradient, multiple integrals with applications, line and surface integrals, divergence and curl, theorems of Green and Stokes. Applications to physical problems.
Prereq: MATH 118
Antireq: AM 231, MATH 212, 213B, 220B, 230B, 240B.
Not open to students in the Faculty of Mathematics.

MATH 211 F,W 3C,1T 0.5
Advanced Calculus 1 (For Electrical Engineers)
Fourier series; Ordinary differential equations; Laplace transform; applications to linear electrical systems.
Prereq: MATH 118
Cross-listed as EL E 205
Not open to students in the Faculty of Mathematics.
MATH 212 F,S 3C, 1T 0.5
Advanced Calculus 2 (For Electrical Engineers)
Prereq: MATH 211
Antireq: AM 231, MATH 210, 213B, 220B, 230B, 240B
Cross-listed as EL E 206
Not open to students in the Faculty of Mathematics.

MATH 213A F 3C 0.5
Calculus 3 (For Science Students)
Prereq: MATH 113B or 115B
Coreq: MATH 111B
Antireq: AM 231, MATH 210, 212, 220B, 230B, 240B
Not open to students in the Faculty of Mathematics.

MATH 213B W,S 3C 0.5
Calculus 4 (For Science Students)
Prereq: MATH 213A or equivalent
Antireq: AM 231, MATH 210, 212, 220B, 230B, 240B
Not open to students in the Faculty of Mathematics.

MATH 215 F,W 3C 0.5
Differential Equations (For Chemistry Students)
Prereq: MATH 113B or 115B, or equivalent
Antireq: AM 250, MATH 216
Not open to students in the Faculty of Mathematics.

MATH 216 F,S 3C 0.5
Differential Equations (For Physics or Chemical Engineering Students)
Prereq: One of MATH 113B, 115B, 118, or equivalent
Antireq: AM 250, MATH 215
Not open to students in the Faculty of Mathematics.

MATH 220A F 3C, 1T 0.5
Advanced Calculus 1
Differential calculus for functions of several variables.
Prereq: MATH 130B
Coreq: MATH 134B
Not open to Honours Mathematics students.
This course is being replaced by MATH 227 effective Fall, 1990. MATH 220A will not be offered on campus after Fall, 1990.

MATH 220B W 3C, 1T 0.5
Advanced Calculus 2
Prereq: MATH 220A
Antireq: AM 231, MATH 210, 212, 213B, 230B, 240B
Not open to Honours Mathematics students.
This course will not be offered on campus after Winter, 1991.

MATH 224A F 3C 0.5
Linear Algebra 1
Linear transformations, eigenvalues and eigenvectors. Applications selected from computer graphics, cryptography, differential equations, quadratic forms, conic sections.
Prereq: MATH 111B or equivalent
Antireq: MATH 224A, 234A, 235, 244A, 245
Not open to Honours Mathematics students.
This course replaces MATH 224A effective Fall, 1990.

MATH 224B W 3C 0.5
Abstract Algebra 1
Elementary group and field theory and other topics in algebra.
Prereq: MATH 134A, 224A
Antireq: MATH 224B, 244B, PMATH 336
Not open to Honours Mathematics students.
This course will not be offered on campus after Winter, 1991.

MATH 225 F 3C 0.5
Linear Algebra 2
Linear transformations, eigenvalues and eigenvectors. Applications selected from computer graphics, cryptography, differential equations, quadratic forms, conic sections.
Prereq: MATH 111B or equivalent
Antireq: MATH 225, 234A, 235, 244A, 245
Not open to Honours Mathematics students.
This course replaces MATH 225 effective Fall, 1990.
MATH 230B F,W,S 3C,1T 0.5 Advanced Calculus 2
Integral calculus of functions of several variables; multiple integrals, iterated integrals; change of variables, applications to area and volume calculations. Line integrals, Green's Theorem and path independence. Sequences and series of functions; uniform convergence and power series.
Prereq: MATH 230A
Antireq: AM 231, MATH 210, 212, 213B, 220B, 240B
This course is being replaced by AM 231 effective Winter, 1991. MATH 230B will not be offered after Fall, 1990. MATH 230B is also offered at St. Jerome's College in the Winter term.

MATH 234A F,W,S 3C 0.5 Linear Algebra 2
Linear transformations, eigenvalues, characteristic polynomials, inner products.
Prereq: MATH 134B
Antireq: MATH 224B, 225, 235, 244A, 245
This course is being replaced in the Faculty core by MATH 235 effective Fall, 1990. MATH 234A will not be offered after Winter, 1990. MATH 234A is also offered at St. Jerome's College in the Winter term.

MATH 234B F,W,S 3C 0.5 Abstract Algebra 1
Groups, fields and other topics in abstract algebra.
Prereq: MATH 134A, 234A
Antireq: MATH 224B, 244B, PMATH 336
This course is being replaced by PMATH 336 effective Winter, 1991. MATH 234B will not be offered after Fall, 1990. MATH 234B is also offered at St. Jerome's College in the Winter term.

MATH 235 F,W,S 3C 0.5 Linear Algebra 2
Linear transformations, eigenvalues and eigenvectors. Applications selected from computer graphics, cryptography, differential equations, quadratic forms, conic sections.
Prereq: MATH 136
Antireq: MATH 224A, 225, 234A, 244A, 245
This course replaces MATH 234A in the Faculty core effective Fall, 1990. MATH 235 is also offered at St. Jerome's College in the Fall term.

MATH 237 F,W,S 3C,1T 0.5 Calculus 3
Calculus of functions of several variables. Limits, continuity, differentiability, the chain rule, Taylor's formula. Optimization problems, mappings, the Jacobian. Multiple integrals.
Prereq: MATH 136
Coreq: MATH 136
This course replaces MATH 230A in the Faculty core effective Fall, 1990. MATH 237 is also offered at St. Jerome's College in the Fall term.

MATH 240A F,W 3C 0.5 Advanced Calculus 1
MATH 240A is an advanced-level, enriched version of MATH 230A.
Prereq: MATH 140B or consent of instructor
This course is being replaced by MATH 247 effective Fall, 1990. MATH 240A will not be offered after Winter, 1990.

MATH 240B F,W,S 3C 0.5 Advanced Calculus 2
MATH 240B is an advanced-level, enriched version of MATH 230B.
Prereq: MATH 240A or consent of instructor
Antireq: AM 231, MATH 210, 212, 213B, 220B, 230B
This course will not be offered after Fall, 1990.

MATH 244A F 3C 0.5 Linear Algebra 2
MATH 244A is an advanced-level, enriched version of MATH 234A.
Prereq: MATH 146 or consent of instructor
Antireq: MATH 224A, 225, 234A, 235, 244A
This course replaces MATH 244A effective Fall, 1990.

MATH 247 F,W 3C 0.5 Calculus 3
MATH 247 is an advanced-level, enriched version of MATH 237.
Prereq: MATH 148 or consent of instructor
Coreq: MATH 136 or 146
This course replaces MATH 240A effective Fall, 1990.

MATH 322A F 3C 0.5 Introduction to Real Analysis
Sequences and series, functions and continuity, Laplace transforms, Fourier series, applications.
Prereq: MATH 220A. MATH 220B is recommended but not required.
Antireq: AMP/MATH 331, PMATH 351
Not open to Honours Mathematics students.
This course will not be offered on campus after Fall, 1991.

MATH 322B W 3C 0.5 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. The emphasis will be on applications.
Prereq: MATH 220B
Antireq: AMP/MATH 332, MATH 332B, PMATH 352
Not open to Honours Mathematics students.
This course will not be offered on campus after Winter, 1992.

MATH 324 F 3C 0.5 Abstract Algebra 2
Topics in abstract algebra: groups, rings, fields and applications.
Prereq: MATH 224B
Antireq: PMATH 334, 344
Not open to Honours Mathematics students.
This course will not be offered on campus after Fall, 1991.
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  
Antireq: AM/PMA TH 332, MATH 322B, PMATH 352  
Not available for credit to students in Honours Pure Mathematics programs.

COURSES NOT OFFERED 1999-90  
MATH 226A Elementary Differential Equations 1  
MATH 226B Elementary Differential Equations 2

Mathematics Electives

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Note  
MTHEL courses are not restricted to students in the Faculty of Mathematics. When taken by Mathematics students, MTHEL courses count as non-mathematics courses.

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.

MTH EL 206A F,S 2C 0.5  
Introduction to Mathematics Education  
Current trends in education, professional practices and administration, the role of the department head, lesson planning, techniques of teaching, evaluation of students, special students, extracurricular activities, the relationship between elementary and secondary school mathematics, audio-visual materials.  
Prereq: Consent of instructor.  
This course is normally open only to students in the Co-op Math/Teaching Option.

MTHEL 305A F.W 3C 0.5  
General Life Insurance 1  
Types of Life Insurance contracts and their uses, basis of risk measurements, modified valuation methods, non-forfeiture values, dividend formulae, selection of risks, substandard risks, and principles of reinsurance.  
Prereq: MATH 2308 or 237  
Antireq: MATH 322A, PMATH 351  
For students in programs outside of Pure Mathematics.  
Not available for credit to students in Honours Pure Mathematics programs.

MTHEL 305B W,S 3C 0.5  
General Life Insurance 2  
Legal aspects of life insurance, settlement options, principles of group and industrial insurance, organization and structure of life insurance companies, financial statements, the mathematics underlying insurance taxation.  
Prereq: MTHEL 305A

Pure Mathematics

Course Descriptions

Introductory Note  
More detailed course descriptions and availability information may be obtained upon request from the Pure Mathematics Department.

PMATH 331 F,W 3C 0.5  
Real Analysis  
Topology of R^n, continuity, norms, metrics, completeness, Fourier series, and applications, for example, to ordinary differential equations, the heat problem, optimal approximation, the isoperimetric inequality.  
Prereq: MATH 230B or 237  
Antireq: MATH 322A, PMATH 351  
Cross-listed as AM 331  
For students in programs outside of Pure Mathematics.  
Not available for credit to students in Honours Pure Mathematics programs.

PMATH 332 W,S 3C 0.5  
Complex Analysis  
Complex numbers, continuity, differentiability, analyticity of functions; the Cauchy-Riemann equations; solution of Laplace's equation; conformal mapping by elementary functions, and applications; contour integration, the Cauchy and allied theorems; Taylor and Laurent expansions, uniform convergence and power series; the residue calculus, and applications.  
Prereq: MATH 230B or 237  
Antireq: MATH 322B, 332B, PMATH 352  
Cross-listed as AM 332  
Formerly MATH 332B  
Not available for credit to students in Honours Pure Mathematics programs.

PMATH 334 F,W,S 3C 0.5  
Introduction to Rings and Fields  
Rings, ideals, factor rings, homomorphisms, finite and infinite fields, polynomials and roots, field extensions, algebraic numbers, and applications, for example, to Latin squares, finite geometries, geometrical constructions, error-correcting codes.  
Prereq: MATH 134A, 234A or MATH 135, 235  
Antireq: MATH 324, PMATH 344  
For students in programs outside of Pure Mathematics.  
Not available for credit to students in Honours Pure Mathematics programs.
PMATH 336 F,W 3C 0.5
Introduction to Group Theory
Groups, subgroups, normal subgroups, quotient groups, morphisms. Products of groups. Permutation groups.
Symmetry groups.
Prereq: MATH 135, 235
Antireq: MATH 224B, 234B, 244B
Formerly MATH 234B
This course replaces MATH 234B effective Winter, 1991.

PMATH 340 W 3C 0.5
Elementary Number Theory
An elementary approach to the theory of numbers; the Euclidean algorithm, congruence equations, multiplicative functions, solutions to Diophantine equations, continued fractions, and rational approximations to real numbers.
Prereq: MATH 224B or 225
Antireq: PMATH 440
This course will be of interest to all math students.

PMATH 344 F,S 3C 0.5
Introduction to Rings and Fields
Groups, rings, fields and applications.
Prereq: MATH 134A, 234A or MATH 135, 235
Antireq: MATH 324, PMA TH 334
PMATH 344 may be substituted for PMATH 354 whenever this is a requirement in an Honours program.

PMATH 351 F,S 3C 0.5
Real Analysis
Metric spaces, compactness, completeness, continuity, convergence, integration, function spaces.
Prereq: MATH 230B or 237, or consent of instructor
Antireq: AM 331, MATH 322A, PMATH 331
Formerly PMA TH 351A
PMATH 351 may be substituted for AMP/MATH 331 whenever this is a requirement in an Honours program.

PMATH 352 F,S 3C 0.5
Complex Analysis
Analytic functions, Cauchy's theorem, Laurent series, the residue theorem, integral evaluation, Mobius and other conformal maps.
Prereq: MATH 230B or 237, or consent of instructor
Antireq: AM/PMA TH 332, MATH 322B, 332B
PMATH 352 may be substituted for AMP/MATH 332 or MATH 332B whenever these are requirements in an Honours program.

PMATH 353 W 3C 0.5
Fourier Analysis
Applications of PMATH 351 concepts to Fourier series, differential equations and other topics.
Prereq: PMATH 351
Formerly PMA TH 351B

PMATH 356 W 3C 0.5
Geometry
Prereq: MATH 224B or 225
This course will be of interest to all math students.

PMATH 365 F,S 3C 0.5
Elementary Differential Geometry and Tensor Analysis
Curves in Euclidean 3-space ($E^3$) and the Serret-Frenet formulæ; surfaces in $E^3$ and their intrinsic geometry, Gaussian curvature and the Gauss-Bonnet theorem. Coordinate transformations and tensors in $n$ dimensions; $n$-dimensional Riemannian spaces, covariant differentiation, geodesics, the curvature, Ricci and Einstein tensors. Applications of tensors in Relativity and Continuum Mechanics.
Prereq: AM 231 or MATH 230B, or consent of instructor
Cross-listed as AM 333

PMATH 367 W 3C 0.5
Set Theory and General Topology
Intuitive set theory, metric spaces, point set topology.
Prereq: MATH 230A or 237

PMATH 380A F,S 3C 0.5
Introduction to Information Theory
Applications of Information Theory
Prereq: Consent of instructor
Cross-listed as AM 481C

PMATH 399
Readings in Pure Mathematics

PMATH 430A F,W,S 3C 0.5
Introduction to Mathematical Logic 1
Prereq: PMATH 432
This course will be of interest to all math students.

PMATH 430B 3C 0.5
Introduction to Mathematical Logic 2
Continuation of PMATH 430A. Gödel's incompleteness theorem (in outline). Logicism, intuitionism, formalism. Selected topics (some of intuitionistic logic, modal logic, the representation theorem for Boolean Algebras normally are treated).
Prereq: PMATH 430A
This course will be of interest to all math students.

PMATH 432 F 3C 0.5
Mathematical Logic
First order languages and theories.
Antireq: PMATH 430A
PMATH 432 is more specialized and presented at a more advanced level than PMATH 430A.

PMATH 440 W 3C 0.5
Analytic Number Theory
An introduction to elementary and analytic number theory; primitive roots, law of quadratic reciprocity, Gaussian sums, Riemann zeta-function, distribution of prime numbers.
Prereq: AM/PMA TH 332 or MATH 332B or PMATH 352
Antireq: PMATH 340
Next offered in Winter 1990, and each alternate Winter thereafter.
PMATH 441 W 3C 0.5
Algebraic Number Theory
An introduction to algebraic number theory; unique factorization, Dedekind domains, class numbers, Dirichlet's unit theorem, solutions of Diophantine equations, Fermat's 'last theorem'.
Prereq: PMATH 334 or 344
Next offered in Winter 1991, and each alternate Winter thereafter.

PMATH 443 3C 0.5
Multilinear Algebra
Continuation of linear algebra. Main topics: representations of endomorphisms, structure of bilinear forms, multilinear products.
Prereq: PMATH 334 or 344

PMATH 445 W 3C 0.5
Ring Theory
Continuation of the theory of rings and modules.
Prereq: PMATH 334 or 344

PMATH 446 F 3C 0.5
Group Theory
Permutations, Cayley Theorem, Sylow Theorem, Jordan-Hölder Theorem, nilpotent and solvable groups, direct and semidirect products, free groups.
Prereq: PMATH 334 or 344

PMATH 447 F 3C 0.5
Field Theory
Field extensions and Galois theory.
Prereq: PMATH 334 or 344
Next offered in Fall 1990

PMATH 451 F 3C 0.5
Measure and Integration
Lebesgue measure and integral for the real line, general measure and integration theory, convergence theorems, Fubini's theorem, absolute continuity, Radon Nikodým theorem, L^p-spaces.
Prereq: AM/PMATH 331 or PMATH 351
Cross-listed as AM 431

PMATH 452 W 3C 0.5
Topics in Complex Analysis
The Riemann mapping theorem and several topics such as analytic continuation, harmonic functions, elliptic functions, entire functions, univalent functions, special functions.
Prereq: PMATH 352

PMATH 453 W 3C 0.5
Functional Analysis
Banach spaces, linear operators, geometry of Hilbert spaces, Hahn-Banach theorem, open mapping theorem, compact operators, applications.
Prereq: PMATH 353 or AM 431/PMATH 451
Cross-listed as AM 432

PMATH 463 3C 0.5
Differentiable Manifolds
Topics chosen from: Charts and atlases, Manifolds and Diffeomorphisms, Tangent Spaces, Submanifolds, Vector Bundles, Tensor and Exterior Algebras, Differential Forths, Oriented Manifolds and Geometry, Homogeneous Spaces and Lie Groups.
Prereq: PMATH 365 or consent of instructor

PMATH 465 F,S 3C 0.5
Differential Geometry
Some global aspects of surface theory, the Euler-Poincaré characteristic, the global interpretation of Gaussian curvature via the Gauss-Bonnet formula. Submanifolds of E^n, induced Riemannian metrics, extrinsic and intrinsic curvatures, Gauss-Codazzi equations. Local Lie groups of transformations on R^n, infinitesimal generators, the Lie derivative. An introduction to differentiable manifolds, the tangent and cotangent bundles, affine connections and the Riemann curvature tensor. The above topics will be illustrated by applications to continuum mechanics and mathematical physics.
Prereq: AM 333/PMATH 365 or consent of instructor
Cross-listed as AM 433

PMATH 467 3C 0.5
Topology
Topics from algebraic, combinatorial and geometric topology.
Prereq: PMATH 234B or PMATH 336, PMATH 367

PMATH 470 3C 0.5
Functional Equations
Cauchy's, Pexider's, and similar equations. Equations for polynomials and trigonometric functions. Reduction to different equations. Applications.
Prereq: Consent of instructor

PMATH 499
Readings in Pure Mathematics

Statistics

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes

1. The following courses are offered in conjunction with the Division of Mathematics for Industry and Commerce: STAT 331, 332, 333, 335, 371, 443

2. More detailed course descriptions and course outlines are available in the Statistics Undergraduate Studies Handbook.

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
For Science students only.

STAT 220 F 3C,1T 0.5
Introduction to Statistical Methods 1
Introduction to design of experiments; descriptive statistics (histograms, summary statistics, stem and leaf plots, correlation); probability (the normal and binomial distributions, other continuous and discrete distributions); chance variability (linear combinations of random variables, the central limit theorem).
Prereq: MATH 113B or equivalent
Not open to Honours Mathematics students.
Antireq: STAT 230, 240
STAT 221 W 3C,1T 0.5
Introduction to Statistical Methods 2
Chance models (applied to measurement error and genetics); tests of significance (one- and two-sample z- and t-tests); simple linear regression (including analysis of variance and parameter estimation); survey sampling (including estimation of means, totals and proportions in simple random sampling).
    Prereq: STAT 220
    Antireq: STAT 231, 241

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, or MATH 137 and second-year standing
    Antireq: STAT 220, 240
    Also offered at St. Jerome’s College in the Fall term.

STAT 231 F,W,S 3C,1T 0.5
Statistics
Estimation, tests of significance, probability plots. Contingency tables, normal distribution theory, simple linear regression.
    Prereq: MATH 230A or 237, and
    Antireq: STAT 221, 241
    Also offered at St. Jerome’s College in the Winter term.

STAT 240 F,W 3C 0.5
Probability
STAT 240 is an advanced-level enriched version of STAT 230.
    Prereq: MATH 130B or 138
    Antireq: STAT 220, 230

STAT 241 W,S 3C 0.5
Statistics
STAT 241 is an advanced-level enriched version of STAT 231.
    Prereq: MATH 230A or 237, and
    Antireq: STAT 221, 231

STAT 304 W 2C,1L 0.5
Statistics for the Physical Sciences 2
Linear regression. Introduction to the design of experiments. Completely randomized and randomized block designs. Analysis of variance.
    Prereq: STAT 202 or 204
    For Science students only.

STAT 311 F 3C 0.5
Regression and Sampling Methods for Accounting
Review of tests of significance, confidence intervals, and properties of the normal distribution. Normal linear models. Elementary sampling theory.
    Prereq: A one-term course in statistics or probability
    Open only to students in Honours Arts Accounting Programs.

STAT 321 W 3C 0.5
Applied Regression Analysis
    Prereq: STAT 221
    Not open to Honours Mathematics students.
    Antireq: STAT 331

STAT 322 F 3C 0.5
Application of Sampling Surveys
The planning of surveys; simple random sampling; stratified sampling; ratio and difference estimators; cluster and systematic sampling.
    Prereq: STAT 221
    Not open to Honours Mathematics students.
    Antireq: STAT 332

STAT 330 F,W 3C 0.5
Statistical Theory and Methods
    Prereq: MATH 230B or 237, and
    Antireq: STAT 211

STAT 331 F,W,S 3C 0.5
Applied Linear Models
    Prereq: MATH 234A or 235, and
    Antireq: STAT 231

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 231 or equivalent
    Antireq: STAT 322

STAT 333 F,W,S 3C 0.5
Applied Probability
    Prereq: STAT 230

STAT 335 W 3C 0.5
Statistical Process Control
    Prereq: One of STAT 231, M E 202, M SCI 251, SY DE 214, or consent of the instructor

STAT 340 F 3C 0.5
Experimental Design
Introduction to designed experiments. Basic experimental designs. Factorial arrangement of treatments. Confounding and fractional replication. Selected topics.
    Prereq: STAT 331 or consent of instructor

STAT 431 W 3C 0.5
Applications of Regression Models
Review of the normal linear model; response surface methodology; non-linear normal models; linear models for binary data and cross-classification; log linear models for contingency tables; selected topics.
    Prereq: STAT 331

STAT 433 F,W 3C 0.5
Stochastic Processes
Point processes. Renewal theory. Stationary processes. Selected topics.
    Prereq: STAT 333 or consent of instructor

STAT 434 F 3C 0.5
Statistical Computing
Problems associated with the analysis of stochastic systems and statistical data by computer; simulation techniques, numerical algorithms, programming for statistical problems and statistical packages.
    Prereq: STAT 331
Department of Mechanical Engineering

Professor, Chairman of the Department
H.F. Sullivan, BASc (Waterloo), AM, PhD (Princeton), PEng

Professor, Associate Chairman
Graduate Studies
R.J. Pick, BASc (British Columbia), MSc (Imperial College), PhD (Waterloo), PEng

Professor, Associate Chairman
Undergraduate Studies
A.B. Strong, BASc (Waterloo), MSc (London), PhD (Waterloo), PEng

Professors
K.G. Adams, BSc (Queen's), MASc, PhD (Waterloo), PEng
G.C. Andrews, BASc, MASc (British Columbia), PhD (Waterloo), PEng
G.M. Bragg, BASc (Toronto), PhD (Cambridge), PEng
E. Brundrett, BASc (Ontario Agricultural College), BASc, MASc, PhD (Toronto), PEng
D.J. Burns, BSc, PhD (Bristol), PEng, CEng
R.N. Dubey, BSc (Hons), (Patna), BSc (Eng) (Bihar), PhD (Waterloo), PEng
D. French, BSc (Aston), CEng, PEng
K.G.T. Hollands, DASC (Toronto), PhD (McGill), PEng
J.H.G. Howard, BSc (Queen's), MSC, PhD (Birmingham), PEng
W.H. Hu,² BSc (Peking), PhD, DSc (Southampton)
H.W. Kerr, BASc, MASc, PhD (Toronto), PEng
J.G. Lenard, BSc, MSC, PhD (Toronto)
H.R. Martin, BSc, MSC (Queen's Belfast), PhD (Queen's Belfast), PEng
P. Niessen, BSc (McMaster), MASc, PhD (Toronto), PEng
K.R. Piekariski, Dipl Ing (London), PhD (Cambridge), PEng, (Retired)³
A. Plumentree, BSc, PhD (Nottingham), PEng, CEng, FIM
G.D. Railhby, BSc, MSc, MEsc (Western Ontario), PhD (Minnesota), PEng, Recipient of the Distinguished Teacher Award
G.E. Schneider, BASc, MASc, PhD (Waterloo)
P.R. Slawson, BASc, MASc, PhD (Waterloo), PEng
M.M. Yovanovich,¹ BSc (Queen's), MS (Buffalo), ME, ScD (Massachusetts Institute of Technology)

Associate Professors
G.A. Davidson, BASc, PhD (Toronto), PEng
A.M. Hale, BSc, MA (New Brunswick), BASc (Toronto), MASc, PhD (Waterloo), PEng

Assistant Professors
S. Badi, BTech (ITT, Kanpur), MASc (British Columbia), PhD (Victoria)
R.A. Fraser, BSc (Queen's, Kingston), MA, PhD (Princeton)
M.F. Golnaraghi, BSc, MSc (Worcester), PhD (Cornell)
J.A. Hussisson, BSc, PhD (Trinity College, Dublin)
F.M. Ismail, BSc, MSc (Alexandria), PhD (McMaster)
S.B. Lambert, BASc (Waterloo), MSc (Queen's, Kingston), PhD (Waterloo)
J.B. Medley, BASc, MASc (Waterloo), PhD (Leeds), PEng
M. Renksizbulut, BSc (Robert College), MSc (Middle East Technical), PhD (Northwestern), PEng
G.D. Stubay, BASc (Waterloo), MSc (Stanford), PhD (Waterloo), PEng
R.A. Vann, MSc, PhD (Warsaw Technical)
D.C. Weckman, BASc, MASC, PhD (Waterloo), PEng
E.J. Weckman, BSc, MSc, PhD (Waterloo)

Research Assistant Professor
A.P. Brunger, BASc, ME, PhD (Toronto), PEng

Adjunct Faculty
C.J. Beingsessier, BSc, MASc, PhD (Toronto), PEng
R.G.R. Lawrence, QC
U.H. Mohaupt, BASc, MASc, PhD
G.A. Morgan, PhD (Waterloo), PEng
J.A. Schey, Dipl Ing, CSC (Budapest), Dr. ing. h.c. (Stuttgart), PEng

Laboratory Director
M. Kaptain, Dipl Ing (Holland), MASc (Waterloo)

Faculty Member of Mechanical Engineering holding cross appointment to:
¹Electrical Engineering
²Applied Mathematics
³Also has Adjunct Appointment

Introductory Notes
1. All courses extend over 1 term only, and consist of 3 hours of lectures.
per week unless otherwise specified.

2. In general, the only prerequisites are the core courses, unless otherwise specified.

**Course Descriptions**

**ME 126** F,S 2C,4L 0.5  
**Engineering Concepts 2**  
A continuation of GEN E 115 with applications of graphics, measurement and other analytic principles applied to introductory problems in the various disciplines of Mechanical engineering; an introduction to engineering design methods as applied to Mechanical Engineering and including specification development, information-gathering, concept formulation, feasibility analysis and report writing.  
Prereq: GEN E 115

**ME 200** F,W 1C 0.0  
**Introduction to Mechanical Engineering 1**  
Discussion of Structure of Mechanical Engineering curriculum, operation of Department, Faculty, University, technical societies.

**ME 201** F,W 3C,1T 0.5  
**Advanced Calculus**  
Infinite series; Tests for absolute; conditional, uniform convergence; power series; series expansions; differentiation and integration. Partial differentiation; total derivatives; estimation of errors; chain rule; geometry; maxima and minima; Taylor series; Jacobians. Multiple integration; areas, centroids, moments of inertia, centres of gravity. Vector analysis; gradient divergence, curl, Laplacian, integral theorems.

**ME 202** F,W 3C,1T 0.5  
**Statistics for Engineers**  
Equivalent to M SCI 251

**ME 203** F,S 3C,1T 0.5  
**Ordinary Differential Equations**  

**ME 212** F,W 3C,1T 0.5  
**Dynamics**  

**ME 215** F,S 3C,3L 0.5  
**Structure and Properties of Materials**  

**ME 219** F,W 3C,1T 0.5  
**Mechanics of Deformable Solids 1**  
Concept of equilibrium, force analysis of structures and structural components, equilibrium of deformable bodies, stress and strain concepts, stress-strain relationships, stress analysis of prismatic members in axial, shearing, torsional and flexural deformations, shear force and bending moment diagrams.

**ME 220** F,S 3C,1T 0.5  
**Mechanics of Deformable Solids 2**  
A general treatment of the behaviour of structural components from the study of stress and strain in solids. Topics include super-position, energy theorems, theories of failure, elastic and inelastic analysis of symmetrical bending, torsion of circular members, columns and stability, and virtual work.

**ME 250** F,S 3C,1T 0.5  
**Thermodynamics 1**  

**ME 262** F,S 3C,1T,3L 0.5  
**Introduction to Microprocessors and Digital Logic**  
Number systems, codes and coding, minimization techniques applied to design of logic systems. Component specifications. Discussion of microprocessors, memory and I/O logic elements. Microcomputer structure and operation. I/O modes and interfacing. Machine language and Assembler programming. Design and application of digital systems for data collection and control of pneumatic hydraulic and machine systems. Laboratory work includes the use of microcomputers.

**ME 300** F,W,S 1C 0.0  
**Introduction to Mechanical Engineering 2**  
Technical specialties in Mechanical Engineering, discussion of options, curriculum, seminars and technical topics in the various options.

**ME 305** W,S 3C,1T 0.5  
**Partial Differential Equations**  

**ME 321** W,S 3C,3L,1T 0.5  
**Kinematics and Dynamics of Machines**  
M E 322  F,W  3C,1T  0.5
Mechanical Design 1
Analysis and synthesis of machine elements. Factors affecting working stresses, fatigue, creep and impact considerations. Design of shafting, springs, screws, clutches, brakes and gears.

M E 330  W,S  3C,3L  0.5
Control of Properties of Materials

M E 340  F,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  W,S  3C,1T,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,1T  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  W,S  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.

M E 360  F,W  3C,1T  0.5
Introduction to Control Systems

M E 362  F,W  3C,1T  0.5
Fluid Mechanics 2
Basic equations of two-dimensional flow, potential flow, exact viscous solutions, introduction to lubrication, boundary layers, and introduction to turbulence. Turbomachinery fundamentals and applications. Selected advanced topics.

M E 370  F,W  1C,3L  0.5
Mechanical Engineering Laboratory
Experiments and supporting lectures to introduce the techniques of measurement used in such areas of Mechanical Engineering as controls, fluid mechanics, heat transfer, manufacturing processes, and solid mechanics. Students will work in groups and formal laboratory reports will be required.

M E 400  F,W,S  1C  0.0
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 401  F,W  3C  0.5
Law for the Professional Engineer
The Canadian Legal System, Forms of Business Organizations, Tort Law, the role of the professional; Contract Law, the Elements of a Contract, Statute of Frauds, Misrepresentation, Duress and Undue Influence, Mistake, Contract Interpretation, Discharge of Contract; Breach of Contract and fundamental breach; Agreements between the client and Engineer; General Law, the Mechanics' Lien Act, comparative discussion of the Professional Engineers Act as it relates to the earlier statute, Intellectual Property and Industrial Property.

It is intended to prepare the student for the examination in law which must be written by the Engineer for the Association of Professional Engineers of the Province of Ontario. This course is restricted to senior Mechanical Engineering students.

M E 402  W  3C  0.5
Patenting for Engineers
An overview of intellectual property: copyright, industrial design, trademark, design, and trade secrets. Ownership of intellectual property. Invention optimization. Patenting: history, legal context, infringement, searching, writing and understanding patent claims, preparing patent drawings, patent application preparation, submitting the application to the Canadian or United States patent offices, dealing with the examiner, foreign patents. Selling and licencing technology. Litigation.

M E 423  F,S  3C,1T  0.5
Mechanical Design 2
A continuation of the M E 322 course in analysis and synthesis of machinery, including advanced analysis of machine elements such as clutches, brakes, couplings, journal bearings and gears. Advanced machine design concepts such as reliability, optimization and techniques for stimulating innovative design. A synthesis project involving the machine elements studied is usually included.

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.
Mechanical Engineering

M E 447 F,S 3C,1L 0.5
Automation and Robotics
The principles of automatic machinery and computer controlled industrial processes. Introduction of automation to the workplace and its impact on production, costs and labour. Computer modelling of the production process. Review of robot types, their characteristics and sensor technology related to their use. Industrial process control, the use of computers and programmable controllers in industrial environments. Case studies in automatic machine design, component feeders and parts handling.

M E 448 F,W 3C 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 material handling systems as basic components of a manufacturing facility and system. Equivalent to M SCI 432

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 loads on buildings; effects of the thermal environment; air conditioning and calculations.

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 F,S 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 463 F,W 3C 0.5
Tribology 1
The science of friction, lubrication and wear. The topography and contact mechanics of real surfaces. The measurement of friction and wear. Friction and wear theories for elastic and plastic contact. Lubrication mechanisms; hydrostatic, hydrodynamic, elastohydrodynamic, boundary, extreme pressure, and solid film. Physical and chemical properties of lubricants. Bearings and their selection.

M E 469 F,S 3C 0.5
Introduction to the Environmental Sciences

M E 482 F,W,S 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 a continuation of M E 212 and M E 521. Basic kinematic and dynamic concepts are extended. The emphasis is on vector methods, general kinematic relationships, planar and three-dimensional motion, gyroscopic effects, variational mechanics, Lagrange's equation and Hamilton's equations. Computer simulation of non-linear systems is discussed and a project involving computer simulation is usually assigned.

M E 525 F,S 3C 0.5
Mechanical Vibrations in Machines
Fundamentals of mechanical vibration, transient and forced vibrations, vibration of mechanical systems with one-, two- and multi-degrees of freedom, vibration measurement and isolation, continuous system, modal analysis.

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 533 W 3C 0.5
Composite Materials
Fibres, particulates and matrices. Consideration of the interface between the matrix and the fibre or particulate. Geometrical arrangements of fibres within laminates and their influences on elastic and strength properties. Strength of laminates and short fibre composite materials. Consideration when designing with composite materials. Fatigue, notch sensitivity and environmental deterioration.
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.

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.

Middle East Studies

Course Descriptions

Middle East Studies courses and approved courses are listed in Chapter 15.

MES 200 F 0.5
Introduction to the Middle East
An interdisciplinary introduction to the Middle East, its geography, history, culture, religious and political diversity.

MES 302A-D F,W 0.5
Directed Studies on the Middle East
This is an independent, directed studies project on a Middle East topic Students select an appropriate advisor, agree on a topic, obtain approval from the MES Director of the Option, and work with the advisor.
Prerequisite: MES 200, plus either two courses from the Middle East Content Courses or consent of the instructor

Music

Associate Professor, Chairman
W.R. Maust, BS (EMC), BMus (Peabody Conservatory), MMus, PhD (Indiana)

Associate Professors
L. Emra, ARCT (Toronto), BS (CMBC), BMus (Wilfrid Laurier), MMus, PhD (Northwestern)
H. Martens, ARCT (Toronto), LRSM, BA, MA (Minnesota), PhD (Columbia)

Assistant Professors
K. Hull, ARCT (Toronto), BA (Waterloo), BMus, MMus (Western Ontario), MFA (Princeton)
C. Weaver, BMus, MMus, DMus (Indiana)

Part-time Lecturers
W. Bartley, BA (Toronto)
N. Brown, BA (Alberta), MME, PhD (Kansas)
E. Graham, BMath, MASc (Waterloo)
G. Holmes, BSc (Columbia)
D. Huron, BMus (Waterloo), MMus (York)
M. Jarrett
A. Martin, ARCT, BMus (Toronto), MMus (Eastman)
H. Renglich, BMus, MMus (McGill)
V. Sawi, BM (McGill), MM (New England Conservatory, Boston)
R. Shantz, BMusEd (Goshen), MMusEd (South Methodist)
M. Wood

Studio Instructors
Hans Bauer, Vienna State Academy, Juilliard: Violin
Cedric Coleman, BM, MM (New England Conservatory, Boston); Bassoon
Lynn Gangbar, Classical Guitar
George Greer, BMus (Toronto); Double Bass
Douglas Haas, Kantor (Stuttgart); Harpsichord
Carolyn Hagedorn, Flute
John Ielimers, DMus (Queen's), MMus (Indiana), Cello
Kenneth Hull, ARCT (Toronto), BA (Waterloo), BMus, MMus (Western Ontario), MFA (Princeton); Piano
Margaret Elgisen Hull, BSc (Waterloo), Voice
Carol Lavell, BMus (Toronto); French Horn
Peter Maness, Trombone
James Mason, BM (Shenendoah Conservatory), MM (Catholic U., Washington); Oboe
Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Note
Students should consult their faculty advisor regarding how term courses with credit weights other than 0.5 are counted for degree credit in their program.

MUSIC 100 F,W,S 3C 0.5
Introduction to Music
The techniques, terminology, forms and styles of Western music through lectures and listening, as exemplified by great works from all eras of music history.

MUSIC 101 F,W,S 2L 0.25
Music Ensemble
The study of selected music literature through rehearsals and performance in one of the Music Department's ensembles: University Choir, Chapel Choir, Chamber Choir, Concert Band, Stage Band, Orchestra. Regular attendance at rehearsals and performances is required. Offered on a credit/fail basis. For musical reasons, admission to any particular ensemble is at the discretion of the director.

MUSIC 102 F,W,S 2L 0.25
Music Ensemble
See MUSIC 101 for course description.

MUSIC 111 F,W,S 3C,1L 0.5
Fundamentals of Music Theory
An introduction to the primary skills of music practice emphasizing the reading and writing of musical notation. Students will learn elementary keyboard, listening, and sight-singing skills. For students with minimal musical background. Does not fulfill music major or minor requirements.

MUSIC 125 F 3C 0.5
Popular Music and Culture
An examination of the styles, forms and development of twentieth-century popular music. The social, commercial and technological aspects of popular music are considered.

MUSIC 200 W 3C 0.5
The Symphony
A survey of the great symphonies from Haydn to Stravinsky, through lectures and listening. A portion of the course will be devoted to works being performed by the Kitchener-Waterloo Symphony Orchestra during the term.

MUSIC 201 F,W,S 2L 0.25
Music Ensemble
See MUSIC 101 for course description.

MUSIC 202 F,W,S 2L 0.25
Music Ensemble
See MUSIC 101 for course description.

MUSIC 221 W 3C 0.5
Women and Music
A study of the role of women in music from antiquity to the present, emphasizing both "classical" and "popular" music within social, cultural settings of Western and Third World countries.

MUSIC 231 W 3C 0.5
Psychology of Music
The study of music from a behavioural science perspective. Topics include auditory and musical perception, music cognition, musical aptitudes and abilities, learning and pedagogy, creativity and aesthetic experience, emotive human responses, and the social psychology of musical activities.

MUSIC 241 S 3C 0.5
Principles of Music Therapy
An introduction to the history, theory, and practice of music in therapy. Emphasis on the function of music in personal development and the therapeutic application of music for the physically and mentally handicapped, and the socially maladjusted.

MUSIC 250 F,W,S 3C,1L 0.5
Music Theory 1
The study of basic melodic, harmonic and voice leading concepts including an introduction to figured bass, and functional harmony. Ear training, sight-singing and keyboard lab sessions will be integrated with written and analytical work.

MUSIC 251 W 3C,1L 0.5
Music Theory 2
The study of harmony, counterpoint and form of 18th and early 19th century music. Sight-singing, ear training and keyboard lab sessions will be integrated with written and analytical work.

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. Gregorian chant, liturgical drama, mass, motet, secular songs, and instrumental music are studied.

MUSIC 254 W 3C 0.5
Baroque and Classical Music
The study of music of the Baroque and Classical eras from 1600 to 1800. A survey of major genres by Monteverdi, Schuetz, Purcell, Bach, Handel, Haydn, Mozart and others.

MUSIC 266 F,W std 0.5
Music Studio
Individual instruction in Voice, Piano, Organ, Classical Guitar and orchestral instruments. This course is available only to Music majors and minors.

MUSIC 267 F,W,S std 0.5
Music Studio
See MUSIC 266 for course description.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Title</th>
<th>Description</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUSIC 273</td>
<td>S, 3 C</td>
<td>Traditional Folk Music</td>
<td>A delineation of the characteristic motifs in folk music as found in Great Britain, Canada, the United States and Australia. Various folk instruments will be introduced.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 274</td>
<td>W, 3 C</td>
<td>Introduction to Jazz</td>
<td>A survey of the development of jazz schools and individual styles as well as a study of melodic, harmonic, and rhythmic improvisation. Styles will be demonstrated through recordings and live performance.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 275</td>
<td>F, S, 3 C</td>
<td>Computer Applications in Music</td>
<td>A comprehensive survey of computer applications in the creation, production and study of music. Prereq: MUSIC 100 or consent of instructor. Previous programming experience is recommended but not essential.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 301</td>
<td>F, W, S</td>
<td>Music Ensemble</td>
<td>See MUSIC 101 for course description.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 355A/355B</td>
<td>0.5/0.5</td>
<td>Music and Culture in Vienna</td>
<td>A Spring seminar to be taught in Vienna and environs. The course includes daily lectures and attendance of music performances during the Vienna Music Festival, as well as tours of places relating to the culture of Vienna. Prereq: MUSIC 100 or consent of instructor. Offered Spring 1990.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 360</td>
<td>F, 3 C</td>
<td>Music of the Church</td>
<td>A study of the music and the philosophies of music of the Christian church from the beginning to the present. Singing and/or listening to the music will be an integral part of the course. Prereq: MUSIC 100 or consent of instructor.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 370</td>
<td>F, 3 C, 1L</td>
<td>Music Theory 3 (19th Century)</td>
<td>The study of chromatic harmony as well as melodic and formal aspects of 19th century music. Ear training, sight-singing and keyboard lab sessions will be integrated with written and analytical work. Prereq: MUSIC 251 or consent of instructor.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 371</td>
<td>W, 3 C, 1L</td>
<td>Music Theory 4 (20th Century)</td>
<td>The study of the compositional aspects of 20th century music, including extended tonality, atonality, 12-tone writing, neo-classical idioms, and contemporary compositional procedures. Lab sessions will cover non-tonal melodic reading and complex chord structures. Prereq: MUSIC 370.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 372</td>
<td>E, C, L, 0.5</td>
<td>Composition Seminar</td>
<td>Creative and critical potential is developed through supervised practice, tutorials and seminars. Free composition, style emulation, arranging and orchestration will be dealt with. Prereq: MUSIC 251 or consent of instructor.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 374</td>
<td>W, 4 L</td>
<td>Electroacoustic Music and MIDI Applications</td>
<td>The study of electroacoustic music and MIDI applications in sequencing and programming with synthesizers and computers. Composition, analysis and history of electroacoustic music, as well as practical studio experience, are included. Prereq: MUSIC 251 or consent of instructor. Studio fee.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 375</td>
<td>F, S, 3 C</td>
<td>Music of the Romantic Period (19th Century)</td>
<td>The study of chromatic harmony as well as melodic and formal aspects of 19th century music. Ear training, sight-singing and keyboard lab sessions will be integrated with written and analytical work. Prereq: MUSIC 251 or consent of instructor.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 377</td>
<td>W, 3 C, 1L</td>
<td>Music Theory 4 (20th Century)</td>
<td>The study of the compositional aspects of 20th century music, including extended tonality, atonality, 12-tone writing, neo-classical idioms, and contemporary compositional procedures. Lab sessions will cover non-tonal melodic reading and complex chord structures. Prereq: MUSIC 370.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 378</td>
<td>F, W</td>
<td>Directed Study in Music</td>
<td>Prereq: Advanced standing in music and consent of instructor. Studio fee.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 379</td>
<td>F, W</td>
<td>Directed Study in Music</td>
<td>Prereq: Advanced standing in music and consent of instructor. Studio fee.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 380</td>
<td>F, W</td>
<td>Directed Study in Music</td>
<td>Prereq: Advanced standing in music and consent of instructor. Studio fee.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 381</td>
<td>F, W</td>
<td>Directed Study in Music</td>
<td>Prereq: Advanced standing in music and consent of instructor. Studio fee.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 382</td>
<td>F, W</td>
<td>Directed Study in Music</td>
<td>Prereq: Advanced standing in music and consent of instructor. Studio fee.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 383</td>
<td>F, W</td>
<td>Directed Study in Music</td>
<td>Prereq: Advanced standing in music and consent of instructor. Studio fee.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 384</td>
<td>F, W</td>
<td>Directed Study in Music</td>
<td>Prereq: Advanced standing in music and consent of instructor. Studio fee.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 385</td>
<td>F, W</td>
<td>Directed Study in Music</td>
<td>Prereq: Advanced standing in music and consent of instructor. Studio fee.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 386</td>
<td>F, W</td>
<td>Directed Study in Music</td>
<td>Prereq: Advanced standing in music and consent of instructor. Studio fee.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 387</td>
<td>F, W</td>
<td>Directed Study in Music</td>
<td>Prereq: Advanced standing in music and consent of instructor. Studio fee.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 388</td>
<td>F, W</td>
<td>Directed Study in Music</td>
<td>Prereq: Advanced standing in music and consent of instructor. Studio fee.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 389</td>
<td>F, W</td>
<td>Directed Study in Music</td>
<td>Prereq: Advanced standing in music and consent of instructor. Studio fee.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 390</td>
<td>F, W</td>
<td>Special Topics in Music</td>
<td>A Spring Seminar to be taught in Vienna and environs. The course includes daily lectures and attendance of music performances during the Vienna Music Festival, as well as tours of places relating to the culture of Vienna. Prereq: MUSIC 100 or consent of instructor. Offered Spring 1990.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 391</td>
<td>F, W</td>
<td>Special Topics in Music</td>
<td>A Spring Seminar to be taught in Vienna and environs. The course includes daily lectures and attendance of music performances during the Vienna Music Festival, as well as tours of places relating to the culture of Vienna. Prereq: MUSIC 100 or consent of instructor. Offered Spring 1990.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 466</td>
<td>F, W</td>
<td>Music Studio</td>
<td>A Spring Seminar to be taught in Vienna and environs. The course includes daily lectures and attendance of music performances during the Vienna Music Festival, as well as tours of places relating to the culture of Vienna. Prereq: MUSIC 100 or consent of instructor. Offered Spring 1990.</td>
<td></td>
</tr>
<tr>
<td>MUSIC 490A/B</td>
<td>F, W, S</td>
<td>Senior Honours Seminar</td>
<td>A research seminar required of all honours students. The topics will vary from year to year depending on the interests of the students and instructor(s).</td>
<td></td>
</tr>
</tbody>
</table>

**COURSES NOT OFFERED 1999-90**

- MUSIC 150 Survey of Music History 1
- MUSIC 151 Survey of Music History 2
- MUSIC 204 Vocal Literature
- MUSIC 265 Piano Literature
- MUSIC 272 Traditional Folk Music of Canada
- MUSIC 280 Canadian Music
- MUSIC 332 Musical Aesthetics and Criticism
- MUSIC 353 Music of the Romantic Period (19th Century)
- MUSIC 354 Music of the Twentieth Century
- MUSIC 372 Choral Music, Repertoire and Techniques 1
- MUSIC 373 Choral Music, Repertoire and Techniques 2
Course Descriptions
Optometry

School of Optometry

Professor, Director of School, Associate Dean of Science for Optometry
J.G. Swak, BSc (Montreal), MS (Indiana), PhD (Cornell), OD (Pennsylvania College of Optometry), FAAO

Professor, Associate Director
A.P. Cullen, Dip Opt (City University-London), MSc (Saskatchewan), OD (Pennsylvania College of Optometry), PhD (City University-London), FAAO, FBCO, DCLP

Professor, Graduate Officer
T.D. Williams, OD (College of Optometry of Ontario), MS, PhD (Indiana), FAAO, Recipient of the Distinguished Teacher Award

Lecturer, Undergraduate Officer
B.E. Robinson, OD (Waterloo), MPH (Washington), FAAO

Assistant Professor, Admissions Officer
M.M. Spafford, OD, MSc (Waterloo), Recipient of the Distinguished Teacher Award

Professor Emeritus
E.J. Fisher, BA, MA (Toronto), DSc (Pennsylvania College of Optometry), FAAO*

Professors
W.K. Adrian,2 Dipl-Ing, Dr-Ing (TH Darmstadt), Dr habil, apl Professor (Karlsruhe)
W.M. Lyle, OD (College of Optometry of Ontario) MS, PhD (Indiana), FAAO, (Retired)*
A.R. Remole, BFA (Manitoba), OD (College of Optometry of Ontario), MS, PhD (Indiana), FAAO
G.C. Woo, OD (College of Optometry of Ontario), MS, PhD (Indiana), LOSC (Melbourne), FVCO, FAOO, DiplV, (on leave)
M.E. Woodruff, OD (College of Optometry of Ontario), PhD (Indiana), FAOO, (Retired)*

Associate Professors
R.D. Beauchamp, BA (McMaster), MA, PhD (Brown)
M.G.E. Callender, BSc (Sir George Williams), OD (College of Optometry of Ontario), MSc (Waterloo), MPhil (Aston), FAOO
J.V. Lovasik, BSc (McGill), OD, MSc, PhD (Waterloo), FAOO

D.A. Ranney,2 BA, MD (Toronto), FRCS (England)
R.D. Seim, BA (Queen's), PhD (Waterloo)

Assistant Professors
W.R. Baker, BSc (Queen's), OD, MSc (Waterloo), PhD (Cambridge)
M.C. Campbell, BSc (Toronto), MSc (Waterloo), PhD (ANU), FAAO, NSERC University Research Fellow
B.R. Chou, BSc (Toronto), OD, MSc (Waterloo), FAAO
M.J. Dougherty, BSc (London), MSc, PhD (Warwick)
J.G. Flanagan, BSc (Optom), PhD (Aston) MBCO
D. Fonn, Dip Opt (S.A.), M Optom (NSW), FAAO
J.K. Hovis, OD, MS (Ohio State), PhD (Indiana)
J.G. Strong, OD, MSc (Waterloo), Chief of Clinics

Clinical Faculty
D.B. Buck, OD (College of Optometry of Ontario). FAOO
P.K. Hrynnchak, OD (Waterloo)
R. Pace, OD (Waterloo), FAAO
A.D. Pietkin, BS (Adelphi), BS, OD (Pennsylvania College of Optometry)
K.M. Robertson, OD, MSc (Waterloo), FAOO
L. Sorbara, OD (Waterloo), FAAO
R.J. Taricani, OD (Waterloo)
R.C. Trevino, BA (Maryland), OD (Illinois College of Optometry)
R. Wiggins, BS, OD (Indiana), FAAO

Adjunct Faculty
I. Baker, OD (College of Optometry of Ontario), FAOO
E.L. Buchner, OD (College of Optometry of Ontario)
S. Hoffman, MD, DPH (Toronto)
R.G.R. Lawrence, O.C.
T. Liu, BSc Med (Hons), MB, BS (Sydney), FRACP, FRCP (C)
M.J. Samek, OD (College of Optometry of Ontario), MSc (Waterloo)
R. Schumacher, MD (Toronto)
S. Zigman, BA, MS, PhD

Faculty Members of Optometry holding cross appointments to:

1. Biology
2. Systems Design Engineering
3. Kinesiology
4. Psychology

*Also has Adjunct appointment

Clinical Faculty — Part-time (1988-89)
M. Acs, BSc (Toronto), OD (Waterloo)
W.B. Andrews, BA, OD (Waterloo), FAAO
W.R. Andrews, OD (College of Optometry of Ontario)
J. Bender, OD (Waterloo)
A. Bernardi, BSc, OD (Waterloo)
D.R. Bock, OD (Waterloo)
R.R. Bock, OD (College of Optometry of Ontario)
J. Brisson, OD (Waterloo)
I. Brown, OD (Waterloo)
L. Calder, OD (Waterloo)
R. Chen, OD (College of Optometry of Ontario)
C. Chiarelli, OD (Waterloo)
C. Dessureault, OD (Waterloo)
P. Devineni, BSc, OD (Waterloo)
J.L. Dippel, OD (Waterloo)
K. Dumbleton, BSc (HONS) (UWIST, Cardiff), MSc (Waterloo), MBCO
P. Ellisson, OD (Waterloo)
D.R. Guerin, OD (Waterloo)
P. Goemans, BSc (Hons), OD (Waterloo)
G.A. Grant, OD (College of Optometry of Ontario), FAOO
K. Hadley, OD (Waterloo)
L. Kuhn, OD (Waterloo)
S. Leet, OD (Waterloo)
D. Lutz, OD (Waterloo)
K. Majors, OD (Waterloo)
C. Matyas, OD (Waterloo)
S. Merali, OD (Waterloo)
J. Militello, OD (Waterloo)
R.E. Miller, BSc (Toronto), OD (Waterloo)
K. Muth, OD (Waterloo)
L. Neufeld, BSc, OD (Waterloo)
J. Newman, OD (Waterloo)
B. Pierce, BSc, OD (Waterloo)
M. Pollock, OD (Waterloo)
R. Sanger, BSc, OD (Waterloo)
R.I. Scheid, OD (Waterloo)
P. Shaw, OD (Waterloo)
C. Splagi, OD (Waterloo)
S. Tait, OD (Waterloo)
R. Teeper, OD (Waterloo)
V. Timpano, OD (Waterloo)
J.S. Walcott, OD (Waterloo)
R.L. Wilson, OD (Waterloo)
G. Young, OD (College of Optometry of Ontario)
Course Descriptions

Introductory Note
Students in other disciplines may register for Optometry courses only upon the approval of the Associate Dean of Science for 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 ultrastructure of ocular tissues. The embryology and comparative anatomy of the eye will be emphasized. The relationship of the eye to the vascular supply of the head and the nervous system will be studied. This course is credited only upon completion of OPTOM 114.

OPTOM 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.

OPTOM 106 F 3C,3L,1T 0.5
Geometrical Optics
Prereq: PHYS 121/121L, 122/122L, MATH 113A/B

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 survey techniques.

OPTOM 111 W 3C,3L 0.5
Physiological Optics
Prereq: OPTOM 106

OPTOM 114 W 3C,2L 0.5
Anatomy of the Eye and Associated Structures
A continuation of OPTOM 104
Prereq: OPTOM 104

OPTOM 115 W 4C,1T 0.5
General Pathology
A continuation of 105.
Prereq: OPTOM 105

OPTOM 116 W 3C,4L 0.5
Ophthalmic Optics 1
Prereq: OPTOM 106

OPTOM 211 W 3C,3L 0.5
Physiological Optics
Prereq: OPTOM 106

OPTOM 241 F 3C,3L 0.5
Physiological Optics
Ocular motility: Kinematics of eye movements, muscle actions, measurements of eye movements, types of eye movements, innervational systems subserving eye movements, clinical application.
Prereq: OPTOM 111

OPTOM 242 F 3C,3L 0.5
Clinical Optometry
Lectures and laboratories on clinical techniques for examination of the optical properties of the eye.
Prereq: OPTOM 111

OPTOM 244 F 3C,2L 0.5
Neurophysiology of Vision
The neural processing of colour, brightness, movement and form by the retina, lateral geniculate, cortex, superior colliculus and other brain centres. Neural mechanisms underlying binocular depth perception, the accommodative response and eye movement.
Prereq: OPTOM 104/114

OPTOM 245 F 3C 0.5
Ocular Pathology
Signs, symptoms, clinical detection of primary and secondary ocular disease; instrument techniques; record keeping, patient counselling, referral procedures; management of ocular emergencies; primary health care responsibilities.
Prereq: OPTOM 105/115

OPTOM 246 F 3C,4L 0.5
Ophthalmic Optics 2
Prereq: OPTOM 106/116

OPTOM 251 W 3C,3L 0.5
Physiological Optics
Prereq: OPTOM 241

OPTOM 252 W 3C,3L 0.5
Clinical Optometry
Clinical techniques for the examination of the binocular relations of the nonstrabismic patient, with particular emphasis on the study of the relationship between accommodation and convergence. Techniques of 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
Methods of analysing clinical data emphasizing differential diagnosis, scientific control of psycho-physical measurements, prognosis, recommended therapies, and the clinical applications of the visual sciences.
Prereq: OPTOM 252

OPTOM 344 F 2C 0.5
Sensory Physiology
Peripheral and central nervous system pathways. The skin senses, pain and adaptation to pain, especially as they relate to cornea. The vestibular sense and its influence on eye-movements, muscle sensory organs, including those in extra-ocular muscles, audition, olfaction, taste, visceral sensations and the origin of headaches.

OPTOM 346 F 2C,4L 0.5
Optimal Optics 3
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.
Optometry Clinic

Optometry students are taught how to provide full scope optometric care within a clinical environment. In addition to primary care, students are instructed in the provision of ocular health, electrodiagnostic, binocular vision, contact lens, aniseikonia, low vision and optical services to the clinic patient population. Students also take part in a variety of outreach programs which provide optometric services to special populations including geriatric, preschool and mentally retarded groups. Practical and oral comprehensive examinations in clinical optometry are held in the final examination period of the winter term. Students may be allowed no more than two attempts to pass all parts of the comprehensive examinations. Repeated failure of these examinations may result in dismissal from the program. These exams may be considered by the Council of the College of Optometrists of Ontario to constitute part of the Ontario licensure requirements.

Prereq: OPTOM 348A/B, 364, 418

OPTOM 449 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.

Prereq: Successful completion of OPTOM 348, 418

OPTOM 450 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 450 W 2S 0.5
Senior Seminar
A continuation of OPTOM 450.

OPTOM 499A-E W 5
Comprehensive Examinations
Written comprehensive examinations in Anatomy and Physiology, Pathology and Pharmacology, Physiological Optics, Ophthalmic Optics, and Optometry are held in the final examination period of the winter term, fourth professional year. Graduation in Optometry is contingent upon the successful completion of these examinations which may be considered by the Council of the College of Optometrists of Ontario to constitute part of the Ontario licensure requirements. Students may be allowed no more than two attempts to pass all parts of the comprehensive examinations. Repeated failure of these examinations may result in dismissal from the program.

Prereq: Successful completion of all previous Optometry courses
Course Descriptions

A) CORE COURSES

PACS 201 F, 2C, 2D 0.5
Roots of Conflict and Violence
An examination of the influential theories of the nature and roots of human conflict on both the interpersonal and intergroup level. Contributions of the behavioural and social sciences, as well as the humanities, will be explored.

PACS 202 W 2C, 2D 0.5
Conflict Resolution
Special emphasis on the means of conflict resolution or management. Included are critical assessments of negotiation, arbitration, confrontation, litigation, violence and nonviolent resistance, and other models of conflict resolution.

PACS 301A-F 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 302W 3S 0.5
Special Topics in Peace and Conflict Studies 2
Same as 301 above.

PACS 499A/B F, W 0.5
Senior Honours Essay Seminar
Each Honours student will work on a research paper and will meet regularly with other students working on similar projects to discuss and evaluate their own work.

A letter grade for PACS 499A will be submitted only after completion of PACS 499B.

B) INTERDISCIPLINARY PACS COURSES

PACS 230 F 3S 0.5
The Politics of Nonviolence
An examination of the possibilities of a nonviolent approach to resolving human conflict with special emphasis on the nature and uses of power, the nature of the nation state and the problem of relating a personal ideal to the realities of communal life.

PACS 250 F, S 3S 0.5
The Nuclear Crisis
A team-taught analysis of the characteristics, capabilities and environmental implications of nuclear weapons; of historical and contemporary origins of the arms race and disarmament efforts; and of psychological and philosophical issues related to the arms race, deterrence and disarmament.

PACS 271 F 3S 0.5
Introduction to Peace Research 1
A study of current research in the developing field of "peace research" including studies of personality and aggression, international tension, causes and predictability of war, United Nations voting patterns, disarmament studies and peace activism.

PACS 272 W 3S 0.5
Introduction to Peace Research 2
A continuation of PACS 271, above.

PACS 350 3S 0.5
Canada and the Nuclear Crisis
An examination of Canadian Public policy responses to nuclear weapons including Canadian participation in weapons production, Canadian membership in a nuclear alliance and other defence agreements, and Canadian initiatives in arms control and disarmament.

Prereq: PACS 250 or consent of the instructor.

PACS 390A/B F, W, S 0.5
Field Studies in Peace and Conflict
An independent study course requiring reading, research and a paper on issues related to the application of peace and conflict studies theory within a field setting, either in Canada or abroad.

Prereq: PAS 200
Department of Philosophy

Professor, Chairman of the Department
B.P. Hendley, BA (Marquette), MA, PhD (Yale)

Professor, Associate Dean, Graduate Affairs, Faculty of Arts
R.A. George, MA, PhD (Michigan State)

Associate Professor, Associate Chairman and Graduate Advisor
R.H. Horner, BA, MA (Montana), PhD (Washington)

Associate Professor, Associate Chairman and Undergraduate Advisor
J.W. Van Evra, BA (Valparaiso), MA, PhD (Michigan State)

Professors
E.J. Ashworth, BA, MA (Cambridge), PhD (Oxford)
F. Centore, BSc (Canisius), MA (Maryland), PhD (St. John's)
L.L. Haworth, BA (Rollins), MA, PhD (Illinois)
J.R. Horne, BA, MA (Western Ontario), BTh (Huron), PhD (Columbia)
J.S. Minas, BA (Wayne), PhD (Illinois)
J.F. Narveson, BA (Chicago), MA, PhD (Harvard)
D.D. Roberts, BA (Roosevelt), MA, PhD (Illinois)
B.H. Suits, BA, MA (Chicago), PhD (Illinois), Recipient of the Distinguished Teacher Award

Associate Professors
W.R. Abbott, BA (Kenyon), PhD (Ohio State)
C.G. Brunk, BA (Wheaton), MA, PhD (Northwestern), G

G.T. Campbell, BA (Western Ontario), PhD (Laval), J, Recipient of the Distinguished Teacher Award

D.T. DeMarco, BS (Stonehill, Mass.), MA, PhD (St. John's)
A. Kerr-Lawson, BA (Toronto), MA (Chicago), PhD (McMaster)
M.F. McDonald, BA (Toronto), MA, PhD (Pittsburgh)
A.C. Minas, BA, MA, PhD (Harvard)

Assistant Professors
J.A. Novak, BA (DePaul), PhD (Notre Dame)
J. Wubnig, BA (Swarthmore), MA, PhD (Yale)

Faculty members holding joint appointments to Philosophy from:
'Pure Mathematics
G refers to faculty members at Conrad Grebel College

J refers to faculty members at St. Jerome's College

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes

1. Students must consult the Department before preregistering in upper-year courses. Final details of the courses which will actually be offered in the next academic year, including special subject courses, are available at preregistration time.

2. Any two term courses in philosophy can be used to satisfy the Group AI(r) requirements.

3. Courses suffixed with "J" are administered by St. Jerome's College.

PHIL 102B F,W 3C 0.5
Introduction to Social and Political Philosophy
An introduction to basic concepts and principles in classic and contemporary social and political philosophy. Differing views on basic questions are examined, with applications to such issues as capital punishment, welfare provisions, taxation, natural resource ownership, and terrorism.

PHIL 102C F,W 3C 0.5
Philosophy of Life
"Who am I?" "What can I hope for after death?" "How can I tell what to do?" "What can I know?" are questions that have led many to philosophize. The course will examine what lifestyles and attitudes major philosophers, stoics, skeptics, pleasure-seekers, mystics, pragmatists, etc. have promoted, and why.

PHIL 120J F 3C 0.5
Philosophy of Life and Death
A study of what some of the great philosophers have said about the meaning of life and death and the transition from life to death. Students are urged to raise questions and help direct discussion.

PHIL 130J W 3C 0.5
Philosophy of Discontent
A study of what some of the great philosophers have said about the causes of discontent. Social disobedience and the extent to which ethical principles can be altered to accommodate changing conditions are possible topics for discussion.

PHIL 140 F,W,S 3C 0.5
Introduction to Formal Logic
Elementary sentence and predicate logic. Translation from English into formalism, decision methods and deductions. This course is a preparation for courses in the foundations of mathematics, scientific methods, and more advanced logic courses.

PHIL 101X F,W,S 3C 0.5
Introduction to Formal Logic
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 200A/B
Great Works of Western Philosophy
An examination of some of the greatest writings in Western Philosophy.
Students will be encouraged to come to a critical appreciation of such masterworks as Plato's Republic, Descartes' Discourse on Method, Hobbes' Leviathan, Hume's Enquiry, Kant's Prolegomena, Nietzsche's Zarathustra, and an outstanding work in contemporary philosophy.

PHIL 200A F S 3C 0.5
Great Works of Western Philosophy: Part 1
Outstanding works from the ancient and medieval periods.

PHIL 200B W 3C 0.5
Great Works of Western Philosophy: Part 2
Outstanding works from the early modern and contemporary periods.

Either PHIL 200A or PHIL 200B may be taken separately.

PHIL 200J F 3C 0.5
Intentional Logic
An introduction to the understanding of how words are used, the formation of propositions, the construction of arguments and the examination of fallacies to help the student argue with order, facility and without error.

PHIL 201 3C 0.5
Love
A philosophical analysis of different forms and functions of love. Among the topics to be considered: love and sexuality, religious love, love and knowledge. Classical and contemporary sources will be treated.

PHIL 202 F W 3C 0.5
Philosophy of Women and Men
A study of issues arising from current relations between men and women: masculinity, femininity and androgyne; love, marriage and its alternatives; sexuality, parenthood, abortion, pornography, rape.

PHIL 204J W 3C 0.5
Philosophy and Culture
An analysis of the philosophical assumptions of Western popular culture as reflected in various mass media and in current modes of production and consumption.

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 207 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 209 F 3C 0.5
Philosophy in Literature
Philosophical themes (such as alienation, freedom and responsibility) will be explored through appropriate literary works (for example, works by Aeschylus, Dostoevsky, Kafka, and Twain).

PHIL 210J W 3C 0.5
Philosophy of Human Nature
What is Man? What is man's place among other creatures? Is man an accident of evolution? What are the major views on man as a species? How are love and sex aspects of man's life?

PHIL 215 F W 3C 0.5
Professional and Business Ethics
Study of ethical and moral issues that typically arise in professional and business activity. What responsibilities to society at large do people in such business and professional activities as teaching, engineering, planning, architecture and accounting have? How far should professional autonomy extend?

PHIL 216 W 3C 0.5
Rational Behaviour and Decision-Making
An elementary introduction to the subject of 'rational' behaviour and decision-making for individuals and groups. Emphasis is on the definition 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 220 F 3C 0.5
Moral Issues
The aim of this course is to improve the student's understanding of ethical ideas and principles by careful discussion of selected concrete moral issues, such as abortion, euthanasia, capital punishment, and violence. Choice of issues is partly determined by student interest.

PHIL 221 F 3C 0.5
Ethics 1
This course is intended to be both a history of and an introduction to moral philosophy. Views on the foundations of ethics of the great philosophers from classical antiquity to about 1900 are systematically examined. Writers studied include: Plato, Aristotle, Aquinas, Kant, Mill and Nietzsche.

PHIL 224 W 3C 0.5
Mankind and Nature
A philosophical study of the relationship between mankind and nature; historical and current philosophies of the natural world, including the place and responsibilities of human beings; problems of ecological imbalance and collapse.

PHIL 226 F 3C 0.5
Ethics and the Life Sciences
An investigation of some critical ethical issues in human research and therapy. Includes discussions of the right to live and the right to die, behaviour control (e.g. psychosurgery, behaviour modification and psychotherapy), human experimentation (including "informed consent" and fetal research) and genetic engineering.
PHIL 230 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 discussion of such concepts as insanity, irrationality, the supernatural, and the miraculous.

PHIL 237 3C 0.5
Introduction to the Philosophy of Religion
A critical discussion of basic religious concepts. Among the topics covered will be faith, miracles, religious experience, immortality, and arguments for the existence of God.

PHIL 241 F, W, S 3C 0.5
Intermediate Logic
Axiom systems of logic are developed and compared with natural deduction procedures. Then certain properties of these logical systems, such as consistency, completeness and compactness, will be investigated.
Prereq: PHIL 140 or consent of the instructor.

PHIL 242 W 3C 0.5
Extensions and Applications of Elementary Logic
The classical logic introduced in PHIL 140 will be extended to form systems of modal logic, including logics of obligation, belief and knowledge, necessity, and temporal order. Essentialism, future contingency, 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 260 J W 3C 0.5
Issues in Higher Education
Why go to university? What are the present realities in Canada? What is the role of the liberal arts? The primary interest will be upon what can be done in practice rather than upon ideal schemes.

PHIL 265 F 3C 0.5
The Existentialist Experience
An introduction to the existentialist view of man using both literary and philosophical texts from such authors as Kierkegaard, Unamuno, Nietzsche, Ortega y Gasset, Camus, Sartre, Heidegger and others.

PHIL 300 W 3C 0.5
The Western Philosophical Tradition (to 1600)
An intensive overview of the major recurring themes in Western intellectual history from both an historical and philosophical viewpoint.
Prereq: Second-year standing

PHIL 300 X W 3C 0.5
Thought
An examination of major writings that have shaped present-day consciousness. Works by such thinkers as Marx, Darwin, Freud, Nietzsche and Mill will be included.

PHIL 301 J W 3C 0.5
The Western Philosophical Tradition (1600 to present)
Descartes to Existentialism.
Prereq: Second-year standing

PHIL 302 W 3C 0.5
Modern Feminism
A critical examination of contemporary feminist thought in philosophy, focusing on topics of current concern to feminist writers and to the class.
Prereq: Consent of instructor

PHIL 311 F 3C 0.5
Philosophy of Education 1
A philosophical analysis of classical and contemporary theories of education, with a view to formulating a clear workable concept of education, its aims and methods.
Prereq: At least second year standing or consent of instructor

PHIL 312 W 3C 0.5
Philosophy of Education 2
An introduction to current work in the field. Issues to be considered may include: the desirability and content of a core curriculum, methods of moral development, the problem of indoctrination, gender and education, computers and education, and peace education.

PHIL 315 W 3C 0.5
Ethics and the Engineering Profession
An analysis from the standpoint of philosophical ethics of moral issues arising in professional engineering practice. Issues include the social responsibility of engineers, conflict of interest and obligation, morally acceptable levels of risk, and moral implications of technology.
Cross-listed as GEN E 412

PHIL 318 J 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 3C 0.5
Philosophy of Law: Part 1
An investigation of alternative views of law and legal reasoning forms the core of this course. Law's relations to morality, social practice, and politics are considered. Important legal judgments as well as leading philosophers of law will be considered.
This is a required course for the Legal Studies Option.
PHIL 327B 3C 0.5
Philosophy of Law: Part 2
An examination of areas within the law in which philosophical problems and methods are featured prominently. Topics such as liberty, responsibility and liability, punishment, rights and possessions are considered.
Prereq: PHIL 327A or consent of the instructor

PHIL 329 W 3C 0.5
War, Peace and Justice
An intensive study of the moral issues involved in war and armed revolution. Critical evaluation of "just war" theories and international rules of warfare is pursued as well as the moral arguments for and against pacifism and conscientious objection.
Prereq: PHIL 102B or 322 or consent of instructor

PHIL 331 3C 0.5
Aesthetics
Philosophical consideration of works of art and the problems of beauty using selected readings to enable the student to recognize and formulate his own views in a philosophic manner.
Prereq: Two term courses in Philosophy or consent of instructor

PHIL 350 3C 0.5
Epistemology 1
An examination of such problems as meaning criteria, primary data, and the importance of certainty to knowledge.
Prereq: Two term courses in philosophy

PHIL 351 3C 0.5
Epistemology 2
An examination of the problem of defining knowledge, of naturalized epistemology, and of such problems as a priori knowledge and the existence of other minds.
Prereq: Two term courses in philosophy

PHIL 359 W 3C 0.5
Philosophy of the Formal Sciences
A study of philosophical problems concerning mathematics. Topics discussed include formalism, intuitionism, logicism, the mathematical paradoxes, and other topics in foundations and metamathematics.
Prereq: At least second-year standing or consent of instructor

PHIL 362 W 3C 0.5
Philosophy of the Social Sciences
Problems about the fundamental methods and aims of the social sciences generally, and problems specific to Psychology, Sociology, Political Science, etc., and their relations to one another will be considered.
Cross-listed as SOC 371

PHIL 380 F 3C 0.5
History of Ancient Philosophy 1
From the beginnings to Plato.
Prereq: One term course in Philosophy or consent of instructor
Cross-listed as CLAS 361

PHIL 381 W 3C 0.5
History of Ancient Philosophy 2
From Aristotle to the close of classical antiquity.
Prereq: One term course in Philosophy or consent of instructor
Cross-listed as CLAS 362

PHIL 382 3C 0.5
Medieval Philosophy 1
The early period to the 13th century. Among those considered will be Augustine, Boethius, Anselm and Abaiard.
Prereq: One term course in Philosophy or consent of instructor

PHIL 383 3C 0.5
Medieval Philosophy 2
The later period from the 13th century. Among those considered will be Bonaventure, Aquinas, Scotus, and Ockham.
Prereq: One term course in Philosophy or consent of instructor

PHIL 384 F 3C 0.5
History of Modern Philosophy 1
Earlier period beginning with Descartes.
Prereq: One term 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 term 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 term course in Philosophy or consent of instructor

PHIL 387 W 3C 0.5
20th Century Philosophy
A study of major themes of 20th century philosophy through representative works of Russell, Moore, Carnap, Wittgenstein, Husserl and others.
Prereq: One term course in Philosophy or consent of instructor

PHIL 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 the College Discipline Co-ordinator

PHIL 418J W 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.
Prereq: One course in moral philosophy or consent of instructor

PHIL 420/421 3C 0.5
Studies in Ethics
Special topics in ethics, as announced by the Department.
Prereq: At least one term course in ethics

PHIL 422 F 3C 0.5
Political Philosophy 1
Philosophical analysis of central concepts in political theory and its relation to moral and metaphysical problems of various periods.
Prereq: At least one term course in ethics

PHIL 423 3C 0.5
Political Philosophy 2
A detailed discussion of contemporary theories.
Prereq: At least one term course in ethics

PHIL 435/436 3C 0.5
Studies in Philosophy of Religion
A study of a particular philosopher or problem, as announced by the Department.
Prereq: Consent of instructor
PHIL 440A/B
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.
Pre: At least one term 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 441/442 3C 0.5
Studies in Logic
Special topics in logic, as announced by the Department.
Pre: At least one of PHIL 241, 242, 440A, 440B, P MATH 430A

PHIL 450J F 3C 0.5
Being and Existence
An advanced course for the serious student, delving into the notions of reality, being, essence, existence, analogy, etc. The techniques of linguistic analysis will be employed. Also, the very possibility of any kind of metaphysics will be discussed.
Pre: Third-year standing or consent of instructor

PHIL 451J W 3C 0.5
The Thomistic Tradition in Philosophy
An examination of the work of Thomas Aquinas, his philosophical relation to his times, and the revival of Thomism in the modern era.
Pre: Two term courses in Philosophy and third-year standing, or consent of instructor

PHIL 455 3C 0.5
Metaphysics 1: Ontology
Studies in the nature of being, with special emphasis on material objects and their properties, and on causation.
Pre: Consent of instructor

PHIL 456 3C 0.5
Metaphysics 2: Cosmology
Metaphysical problems in the areas of space, time and motion.
Pre: Consent of instructor

PHIL 463 3C 0.5
Philosophy of Language
Issues in the philosophy of language, such as synonymy, propositions, meaning, semantics, reference.
Pre: At least two term courses in philosophy or consent of instructor

PHIL 464 3C 0.5
Philosophy as Linguistic Analysis
A consideration of ordinary language analysis as a method for solving philosophical problems, and a comparison of it with structural linguistics.
Pre: At least two term courses in philosophy or consent of instructor

PHIL 465 3C 0.5
Existential Philosophy
An in depth study of the thoughts of a major figure such as Kierkegaard, Unamuno, Nietzsche, Heidegger, Sartre, Camus, Marcel, Jaspers, Ortega y Gasset.
Pre: Consent of instructor

PHIL 470 3C 0.5
Phenomenology
A critical examination of the issues and methods of phenomenology, including the attempts to understand the uses and ramifications of phenomenological methods through the working out of particular analyses. The basic writings of phenomenologists such as Husserl and Merleau-Ponty will be used.
Pre: Two term courses in Philosophy or consent of instructor

PHIL 471-484 3C 0.5
Special Subjects
One or more term courses will be offered at different times, as announced by the Department.
Pre: Consent of instructor

PHIL 496J-497J F,W 0.5 each
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.
A letter grade for PHIL 496J will be submitted only after the completion of PHIL 496B or PHIL 496J.

PHIL 499J F,W 0.5
Tutorial and Honours Essay
Students wishing to enrol in 499J should consult the St. Jerome's College Discipline Co-ordinator.
Pre: PHIL 499A

PHIL 118J The Moral Life
PHIL 206J Philosophy of Science
PHIL 333J Contemporary Philosophical Problems in Art

Department of Philosophy

Professor, Chairman of the Department
I.R. Dagg, BSc (Manitoba), MS (Pennsylvania State), PhD (Toronto)

Associate Professor, Associate Chairman of the Department
D. Hemming, BSc, PhD (Bristol)

Professor, Dean of the Faculty of Science
D.E. Brodie, BSc, MSc, PhD (McMaster)

Associate Professor, Associate Dean, Undergraduate Studies, Faculty of Science
H.M. Morrison, BSc, PhD (Edinburgh)

Professor, Director (GWP)
R.K. Pathria, BSc, MSc (Punjab), PhD (Delhi), Recipient of the Distinguished Teacher Award

Professor, Graduate Officer
R.A. Moore, BSc, MSc (McMaster), PhD (Alberta)

Associate Professor, Graduate Officer
J.K. Brandon, BSc, PhD (McMaster), MA (Cambridge)
Course Descriptions

Physics

**Professor, Undergraduate Officer**
J.A. Cowan, BSc (Manitoba), MA, PhD (Toronto)

**Associate Professors, Undergraduate Officers**
H.K. Ellenton, BSc (Western Ontario), MA (Toronto)
K.A. Woolner, BSc (London)

**Professor Emeritus**
W.B. Pearson, DFC, MA, DSc (Oxford), DSc (Waterloo), FRSC, FCIC, (Retired)*

**Professors**
A. Anderson, MA, DPhil (Oxford), Recipient of the Distinguished Teacher Award
R.A. Aziz, BA, MA, PhD (Toronto)
G.A. Bakos, MA (Braislava), MA, PhD (Toronto), (Retired)*
F.W. Boswell, BA, MA, PhD (Toronto)
S.G. Davison, PhD, DSc (Manchester)
M.P. FitzGerald, BSc, MSc (Toronto), PhD (Case)
F.O. Goodman, BSc, PhD, DSc (London), FirstP, FAIP
T.E. Gough, BSc, PhD (Leicester)
J. Grindlay, BSc (Glasgow), DPhil (Oxford)
N.R. Isenor, BSc (Acadia), MSc, PhD (McMaster)
J. Kruuv, BASc (Waterloo), PhD (Western Ontario)
J.W. Leech, BSc, PhD (London), FirstP, (Retired)*
J.R. Lepock, BS, MS (W. Virginia), PhD (Pennsylvania State)
J.D. Leslie, BASc (Toronto), MS, PhD (Illinois)
A.D.S. Nagi, BA, BSc, MSc (Panjab), PhD (Delhi)
J.L. Ord, BASc (Toronto), MS, PhD (Illinois)
M.M. Pintar, BSc, MSc, PhD (Ljubljana)
L.W. Reeves, BSc, PhD, DSc (Bristol), FRSC, FCIC
J.J. Slocan, BSc, PhD (Queen’s)
H.J.T. Smith, BSc, PhD (London)
R.A. Snyder, BSc, PhD (Western Ontario)
S.F. Wang, DSc (Nagoya)
P.S. Wesson, BSc (London), PhD (Cambridge), FRAS, NSERC University Research Fellow

**Associate Professors**
J.M. Corbett, BASc (Toronto), MSc, PhD (Waterloo)
A.E. Dixon, BSc (McMaster), MA, MSc (Dalhousie), PhD (McMaster)
P.C. Eastman, BSc, MSc (McMaster), PhD (British Columbia)
J.P. Frenhouse, BSc, MSc (British Columbia), PhD (California), Recipient of the Distinguished Teacher Award

G.L. Harris, BA (Mount Holyoke College), MA (Wesleyan), PhD (Toronto)
C.C. Lim, BA (DePauw), MA (Nebraska), PhD (Toronto), (Retired)*
S.P. Lipshitz, BSc (Natal), MSc (South Africa), PhD (Witswatersrand)
W.K. Liu, BSc, MS, PhD (Illinois), NSERC University Research Fellow
R.B. Mann, BSc (McMaster), MSc, PhD (Toronto), NSERC University Research Fellow
H. Peemoeller, BSc (Winnipeg), MSc (Victoria), PhD (Waterloo), NSERC University Research Fellow
B.H. Torrie, BASc (Toronto), PhD (McMaster)
J. Vanderkooy, BEng, PhD (McMaster)

**Assistant Professors**
M. Fich, BSc (Waterloo), MSc, PhD (California, Berkeley)
J.W. Hepburn, BSc (Waterloo), PhD (Toronto), NSERC University Research Fellow
K.I. Leung, BSc, PhD (Waterloo)
D.C. Nokes, BASc, MSc, PhD (Toronto)

**Research Assistant Professor**
G. Scholz, BSc (Simon Fraser), MSc (McMaster), PhD (Simon Fraser), NSERC University Research Fellow

**Adjunct Faculty**
R.B. Barnett, BSc (McGill), MSc (McGill), PhD (Toronto)
J.A. Blackburn, BSc (Manitoba), MSc, PhD (Waterloo)
W.E. Harris, BSc, (Alberta), MSc, PhD (Toronto)
H.H. Jorch, BSc (Waterloo), MSc, PhD (Guelph)
J. Liu, BSc, DipEd (Hong Kong), DSc (Laval)
H.B. Michaels, BSc, MSc, PhD (Toronto)
C.J. Moore, BSc, MSc, PhD (Waterloo)
L.A.A. Read, BA, BS, (McMaster), PhD (Waterloo)
G. Scales, Dottore in Chimica (Genova), LibDoc, FCIC

**Senior Demonstrators**
A.B. Haner, BSc, MSc (Waterloo)
D.S. McVicar, BSc (Waterloo)

**Demonstrators**
J.L. Gardner, BSc (Waterloo)
C.R. Jayawarden, BSc (Waterloo)

Faculty Members of Physics holding cross appointments to:
1. Biology
2. Chemistry
3. Applied Mathematics

**Course Descriptions**

Courses not offered in the current academic year are listed at the end of this section.

**Introductory Note**
Prerequisites are given as a guide to the student and may be waived with the consent of the instructor.

**PHY 001 0.0 Pre-University Physics**
This course covers the topics in Ontario Grades 11 to 13 essential for first year university physics. The course includes mechanics, gravitation, vibrations and waves, heat, electricity, light and optics. Successful completion of this course fulfills the University admission requirements where high school Physics is necessary.

**No University Credit. Offered by Correspondence only.**

**PHY 010 F W S 1C 0.0 Physics Seminar**
This seminar brings together Honours Physics (including Co-op) students in Years 2, 3, and 4, to receive information concerning the Physics Department and to hear invited speakers.

**PHY 103 W 3C,3L,2T 0.5 Mechanics in Human Movement**
An introduction to the physical principles required for an understanding of the mechanisms of human movement.

**Prereq: MATH 106**
For Kinesiology students.
Lab alternate weeks; optional tutorial.

**PHY 105 F 3C,3L,2T 0.5 Electrical Science**
Basic electricity, magnetism and electronics. An introduction to the physical principles required for an understanding of the electrical instruments used in Kinesiology.

**Prereq: PHYS 103**
For Kinesiology students.
Lab alternate weeks, optional tutorial.
PHYS 249L F,S 3L 0.25
Introduction to Waves and Diffraction Laboratory
For students taking PHYS 249
Lab alternate weeks

PHYS 250 F 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.
Prerequisite: First year physics and calculus
Antirequisite: PHYS 275
Offered by Correspondence only in 1989-90.

PHYS 252 F 3C 0.5
Electricity and Magnetism 1
Coulomb's law, electric fields, Gauss' law, potential, capacitance, properties of dielectrics, current, resistance, electrostatic force, D.C. circuits, A.C. circuits, instrumentation.
Prerequisite: First year physics and calculus
Recommended for students in Honours programs

PHYS 253 W,S 3C 0.5
Electricity and Magnetism 2
Magnetic fields, Ampère's law, induced electromotive forces, magnetic devices, magnetic properties of materials, inductance, Maxwell's equations, electromagnetic waves.
Prerequisite: PHYS 252, MATH 216
Corequisite: MATH 213B
Physics majors must take PHYS 253L with this course

PHYS 253L W,S 3L 0.25
Electricity and Magnetism Laboratory
For students taking PHYS 253.
Lab alternate weeks.

PHYS 256 F 3C 0.5
Geometrical and Physical Optics
Prerequisite: First year physics and calculus
Physics majors must take 256L with this course.
Recommended for students in Honours programs.

PHYS 256L F 3L 0.25
Optics Laboratory
For students taking PHYS 256.
Lab alternate weeks

PHYS 259 W,S 3C 0.5
Crystallography and X-Ray Diffraction
Space lattices, symmetry, crystal structure, crystal geometry and stereographic projections. Electronic structure of atoms and atomic bonding in solids. Theory of X-ray diffraction, X-ray methods and the reciprocal lattice. Crystal formation, crystal defects and physical properties of crystals.
Prerequisite: First year physics and calculus
Corequisite: 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 1
Prerequisite: First year physics and calculus, MATH 216

PHYS 275 F 3C 0.5
Astrophysics 1 - The Solar System
The planets, Newtonian gravity and celestial mechanics, the formation of stars and planets, meteorites, asteroids, comets, planetary interiors, planetary surfaces, planetary atmospheres, the origin of life.
Students with a weak background in Mathematics or Physics might do well to take SCI 238 first. The content and level of the core material of PHYS 275 will remain the same. Additional material will change from year to year to keep students abreast of current developments in the subject.

PHYS 301 W 3C 0.5
Physical Techniques for Biologists 1

PHYS 334 F,S 3C 0.5
Quantum Physics 2
Prerequisite: PHYS 234, MATH 213A/B
Antirequisite: CHEM 355

PHYS 352 F,S 3C 0.5
Analog Electronics
DC and AC circuit theory, p and n materials, pn diodes, junction and FET transistors. Transistor amplifiers and their equivalent circuits. Operational amplifiers. Feedback, oscillators and power supplies.
Prerequisite: Knowledge of determinants, elementary calculus and elementary electricity
Corequisite: PHYS 352L

PHYS 352L F,S 3L 0.25
Analog Electronics Laboratory
For students taking PHYS 352
Lab alternate weeks.

PHYS 353 W 3C 0.5
Digital Electronics
Logic gates, flip-flops and shift registers. Binary numbers and Boolean algebra. An introduction to microprocessors is discussed based on the 6800. This will include arithmetic logic units, parallel input/output ports, assembly language and a number of examples.
Prerequisite: PHYS 122
Corequisite: PHYS 353L

PHYS 353L W 3L 0.25
Digital Electronics Laboratory
For students taking PHYS 353
Lab alternate weeks.

PHYS 358 F,S 3C 0.5
Thermodynamics
Thermodynamic systems, equation of state, the laws of thermodynamics with applications. Change of phase.
Prerequisite: PHYS 122, MATH 213A/B and 216

PHYS 359 W 3C 0.5
Statistical Mechanics
Prerequisite: PHYS 358
PHYS 360A F,S 3L 0.25
Intermediate Laboratory
Selected experiments in mechanics, atomic physics, solid state physics, optics and electronics.
Prereq: PHYS 263, MATH 213A/B
18 hours of experiments

PHYS 360B W 3L 0.25
Intermediate Laboratory
Continuation of 360A.
Prereq: PHYS 263, MATH 213A/B
18 hours of experiments

PHYS 363 W 3C 0.5
Classical Mechanics 2
Prereq: PHYS 263, second year calculus
Primarily intended for Honours Physics students.

PHYS 364 F,S 3C 0.5
Mathematical Physics 1
Vector analysis and applications. Vector operators using curvilinear coordinates. Cartesian tensors. Inertia tensor; stress, strain and rate of strain tensors. Applications to elasticity, fluids, electromagnetism and relativity.
Prereq: MATH 213A/B and 216
Primarily intended for Honours Physics students.

PHYS 365 W 3C 0.5
Mathematical Physics 2
Prereq: MATH 213A/B and 216
Primarily intended for Honours Physics students.

PHYS 366 F 2C 0.5
Geophysics 1
Prereq: PHYS 121/122, MATH 113A/B
Cross-listed as EARTH 368

PHYS 369 W 3C 0.5
Geophysics 2
The geology of the ocean basins. Topics in physical oceanography. Physical properties of ocean water, heat budget of the world oceans. Oceanic circulations. Coriolis effects. Some idealized current regimes.
Prereq: PHYS 121/122, MATH 113A/B
Cross-listed as EARTH 369

PHYS 371A F,S 3L 0.25
Intermediate Laboratory
Further experiments in atomic, nuclear and solid state physics, optics and electronics. For honours students who are taking PHYS 360A.
18 hours experiments.

PHYS 371B W 3L 0.25
Intermediate Laboratory
Continuation of 371A. For honours students who are taking PHYS 360B.
18 hours experiments.

PHYS 375 W 3C 0.5
Astrophysics 2 - Stellar Astronomy
Stellar spectra, spectral classification. Observational techniques, motions of stars, properties of stars, stellar distances, open clusters, globular clusters, stellar populations, gas, dust, the galactic plane, the galactic halo, galactic rotation. Statistical methods. Stellar evolution.
Prereq: PHYS 275 or consent of instructor

PHYS 380 W 3C 0.5
Molecular Biophysics
Behaviour of biological macromolecules, protein structure and function, weak interactions, physical techniques for determination of macromolecular structure, structure and function of nucleic acids, protein synthesis, energy in biological systems, molecular growth and evolution.
Prereq: Year One Physics and Chemistry, or consent of instructor

PHYS 381 F 3C 0.5
Cellular Biophysics
Structure and function of cellular membranes, membrane lipid and protein structure and dynamics, membrane potential and ion transport, nerve conduction, vision and interaction of light with membranes, muscle contraction and energy transduction.
Prereq: Year One Physics and Chemistry, or consent of instructor

PHYS 432 W 3C 0.5
Physics of Solid State Devices
The theories of solid state physics are applied to explain the operation and use of several modern electronic devices, including the p-n junction, transistors, thyristors, tunnel diodes, field effect devices, optical devices, etc.
Prereq: PHYS 435

PHYS 433 F 3C 0.5
Introductory Quantum Mechanics
Prereq: PHYS 354, 364, and 365

PHYS 434 F 3C 0.5
Solid State Physics
Introductory concepts in crystal diffraction and the reciprocal lattice. Crystal bonding. Lattice vibrations, thermal properties of insulators, free-electron theory of metals, band theory. Semiconductors.
Prereq: Completion of Year Three Honours Physics

PHYS 437A F,W P 0.5
Research Project
A research project in any area of Physics approved by the course coordinators. The student is required to submit a written report and present a summary of the project orally, before the end of the term of registration.
Prereq: Completion of all third year honours physics program requirements and registration in the fourth year of an honours physics program. Students with <70% average in the third year core are advised not to take this course. Enrolment will be limited.
PHYS 437B W P 0.5
Research Project (continued)
A continuation of the project undertaken in Physics 437A. The student is required to submit a written report and present a summary of the project by poster and/or orally before the end of the term of registration.
Prereq: Completion of Physics 437A and approval of the course coordinators

PHYS 441A/B 3C 0.5/0.5
Electromagnetic Theory
A generalized treatment of the basic laws of electricity and magnetism, mathematical techniques for the problems of electrostatics, solution of Maxwell's equations in free space and the study of plane waves, theory of wave guides and introduction to radiation.
Prereq: PHYS 263, PHYS 364/365
No credit or grade is given for the first term course unless the two term sequence, PHYS 441A/B, is completed.

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, 434

PHYS 445 W 3C 0.5
Modern Optics
Prereq: PHYS 256, 354

PHYS 453 W 3C 0.5
Advanced Analogue Electronics
A variety of topics in the operation of systems. Transistors, modern circuit techniques, noise, stability under feedback, information theory, and possible student motivated topics. Includes laboratory demonstrations.
Prereq: PHYS 352/353

PHYS 454 W 3C 0.5
Quantum Mechanics
Prereq: PHYS 454.
PHYS 454 is strongly recommended for students intending to do graduate work.

PHYS 455 F 3C 0.5
Nuclear and Particle Physics
Nuclear structure, interactions of nuclear radiations with matter, radioactive decay, nuclear reactions, nuclear force, elementary particles.
Prereq: PHYS 354.

PHYS 464 F 3C 0.5
Mathematical Physics 3
Applications to Physics of the theory of functions of a complex variable.
Prereq: PHYS 364/365

PHYS 465 W 3C 0.5
Mathematical Physics 4
Theory and applications of integral transforms, integral equations and Green's functions. Applications of nonlinear mathematics.
Prereq: PHYS 464

PHYS 475 F 3C 0.5
Astrophysics 3 - Extragalactic Astronomy
Properties and origin of galaxies, quasars, clusters of galaxies, observational cosmology, the big-bang theory, introduction to general relativity and Riemannian geometry, the origin and fate of the Universe.
Prereq: PHYS 375 or consent of instructor
The content and level of the core material of PHYS 475 will remain the same. Additional material will change from year to year to keep students abreast of current developments in the subject.
School of Urban and Regional Planning

Professor, Director
L.R.G. Martin, BA (Queen's), MA, MRP, PhD (Syracuse). MCIP

Associate Professor, Associate Dean
J.T. Horton, BA (Wheaton), MA (Northwestern)

Professor, Associate Dean, Graduate Studies, Faculty of Environmental Studies
J.G. Walker, BSc (London), MA, PhD (Toronto)

Associate Professor, Associate Director

Associate Professor, Graduate Officer
M.E. Haight

Associate Professor, Associate Director, Computing and Communications, Faculty of Environmental Studies
R.T. Newkirk, BA, MSc, PhD (Western Ontario)

Associate Professor, Graduate Officer
M.E. Haigh, BA, BSc, MSc, PhD (McMaster)

Assistant Professor, Undergraduate Officer
N.M. Lazarowich, BA (Saskatchewan), MA, MCP, PhD (Cincinnati)

Professors
H.S. Coblietz, BA Hons (Durham), MRP (North Carolina), AICP, FSS
L.O. Gertler, MA (Queens), MA (Toronto), FCIP
D.W. Hoffman, BSA, MSA (Toronto), PhD (Waterloo), (Retired)
K. Izumi, BArch (Manitoba), MCP (Massachusetts Institute of Technology), ARCA, FRAIC, CMAOP (Retired)
C.K. Krueger, BA Hons (Sheffield), PhD (Saskatchewan)
R.R. Krueger, BA (Western Ontario), PhD (Indiana)
J.G. Nelson, BA (McMaster), MA (Colorado), PhD (Johns Hopkins)
J.B. Theberge, BScA (Guelph), MSc (Toronto), PhD (British Columbia)
D.F. Walker, BSc (London), MA, PhD (Toronto)
S.M. Weaver, BA, MA, PhD (Toronto)

Associate Professors
S. Herzog, BArch (Toronto), MRAIC
B. Hyma, BSc, MSc (Madras), MA (Sheffield), PhD (Pittsburgh)
S.C. Lerner, BA (Ohio State), MA (Chicago), Recipient of the Distinguished Teacher Award

N.E.P. Pressman, BArch (McGill), MArch, urb des (Cornell), Cert USP (Manchester), MCIP, AICP, AIU
G.B. Pridde, BA (Western Ontario), MA, PhD (Clarks)
S.G. Rich, MCIP, MRAIC, (Retired)*
J.B. Robinson, BA (Toronto), MES (York), PhD (Toronto)
W.I. Studinski, BA, BSW (McGill), MSc, DSW (Western Reserve)
R.C. Suffling, BSc, Hons (Wales), PhD (Guelph)

Assistant Professors
P. Filion, BA, MA, PhD (Montreal)
G.B. Hall, BA, Hons (Otago, New Zealand), MA, PhD (McMaster)
B. Moore Milroy, BA (McGill), M.urb. (Montreal), PhD (British Columbia)
J.E. Robinson, BSc (Waterloo), MES (York), PhD (Michigan)
M.E. Tyler, BSc (Brandon), MDes, PhD (Calgary)

Lecturer
K. Hammond, BLA (Guelph)

Adjunct Faculty
G. Davidson, BA (Toronto), MA (Waterloo), PhD (Western Ontario), MCIP, OPPi
M. Dorfman, BComm (Montreal), MSc (Toronto), MCIP, OPPi
S. Garrod, BA (McMaster), LLD, MES (York)
W. Green, BES (Waterloo), MCIP, OPPi

Faculty Members of Planning holding cross and/or joint appointments to:

1. Biology
2. Geography
3. Health Studies
4. Environmental Studies

Faculty Members holding cross and/or joint appointments to Planning from:

Anthropology

Environmental Studies

Geography

Environment and Resource Studies

Also has Adjunct appointment

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

PLAN 100A F 4C, 1D 0.5
Introduction to Urban and Regional Planning Concepts and Techniques
The development of contemporary planning concepts and principles; the nature, purpose and scope of urban planning; the planning process and decision-making in a democratic society. Methodological aspects of designing a planning program: identification of objectives and constraints, conduct of basic surveys and analysis, plans and policies preparation, evaluation and implementation.

Prereq: Planning students only
Estimated additional cost to student: $5

PLAN 100B W 4C, 1D 0.5
Continuation of PLAN 100A.

Prereq: PLAN 100A, Planning students only
Estimated additional cost to student: $20

PLAN 120 W 3C 0.5
Participatory Planning
An introduction to types of participatory planning initiated either by planners or by citizens' groups and directed toward changing built and natural environments. Concepts such as individualism, class, family, ethnicity and community are introduced in order to show how they relate to environmental attitudes and behaviour.

Prereq: Planning students only

PLAN 156 W 2C, 1D 0.5
Introduction to Urban and Regional Planning Concepts
An introduction to contemporary planning ideas for students whose subsequent work might bring them in contact with professional planners. Planning concepts and principles; the development of contemporary planning ideas; the nature, purpose and scope of urban and regional planning; the planning process and decision making in a democratic society.

Prereq: None

(Not available for credit to planning students). Restricted to first and second year students in other programs.)
PLN 199  F,W  3 std  0.5  
Graphics for Planning  
Basic instruction in graphic techniques used in planning. Emphasis will be placed on the use of graphics for the communication of ideas.  
Prereq: Planning students or consent of instructor  
Estimated additional cost to student:  $60  
Lab fee $15  
Materials at student's expense

PLAN 232  F  4C  0.5  
Rural Planning and Development  
Advanced analysis of the process followed for rural planning and development in Canada and other selected countries. Problems and their solutions as noted in various jurisdictions are presented. Emphasis is placed on government approaches to planning and development.  
Prereq: Second-year Planning students or consent of instructor

PLAN 255  W  2C,2wkshp  0.5  
Planning Surveys and Analyses  
Sources of data for planning, their assembly and analysis. Emphasizes the sources, methods of collection and analysis of urban and regional data resources. Particular attention paid to data base management and applications related to population projects, transportation and the location of urban facilities. Introduction to the principles of geographic information systems. Oriented toward group research projects. There will be a one-day field excursion.  
Prereq: PLAN 100 or consent of instructor  
Estimated additional cost to student:  $10

PLAN 256A  F  2C,2std  0.5  
Environmental Design 1  
Design concepts in Urban and Regional Planning illustrated by recent work. Individual and group projects in planning design in urban and regional settings, using graphic, model and verbal presentations.  
Prereq: Second year Planning or Environmental Studies students with consent of instructor

PLAN 256B  W  2C,2std  0.5  
Environmental Design 2  
Continuation of PLAN 256A.  
Prereq: PLAN 256A

PLAN 259  W  2C,2wkshp  0.5  
Regional Planning and Economic Development  
The relationship of economic planning to regional planning. Concepts of economic development and models of regional development planning. Case studies and examples are drawn from federal regional development efforts in Canada and/or from Third World nations. Workshops focus on regional planning and development at both a conceptual and empirical level.  
Prereq: One of PLAN 100, 156 or consent of instructor

PLAN 270  W,S  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

PLAN 275A/B/C  F,W,S  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.  
The letter designation allows this course to be taken more than once for credit

PLAN 300A  F  3wkshp,2fldlab  0.5  
Seminar/Workshop Project in Urban and Regional Planning 1  
An integrated approach to the analysis of communities; identification and synthesis of factors related to function, structure, environmental context, regional framework, etc., in the preparation of comprehensive development programs. A major project undertaken in small project groups. Project reports summarizing findings are completed and presented at end of term. Field trip related to theme of problems includes follow-up discussion, assignments and preparation of individual research paper.  
Prereq: Third-year Planning students only  
Estimated additional cost to student:  $70

PLAN 300B  W,S  3wkshp,2fldlab  1.0  
Seminar/Workshop Project in Urban and Regional Planning 2  
The transformation of analytical concepts of community into planning designs on selected sites. On-site visits, collection and analysis of field data and relevant social, economic, physical and administrative information. Public presentations of analyses, plans and proposals as well as preparation of comprehensive reports.  
Prereq: PLAN 300A

PLAN 301  F,S  4 std  0.5  
Urban Design  
A study of the design of the environment in urban and regional contexts through lectures and studio projects.  
Prereq: Planning students or consent of instructor

PLAN 307  F  2C,1D  0.5  
Social Survey Techniques in Planning  
Social research and the planning process; interview and self-administered surveys, questionnaire design; sampling, non-survey data collection techniques; practical applications.  
Prereq: Second or third year Planning students with ENV S 178; other ENV S students with consent of instructor  
Cross-listed as GEOG 307  
Students may receive credit for only one of PLAN 307 and GEOG 307
PLAN 317 F 3C 0.5
Nonparametric Statistics
The theory and application of nonparametric statistics, with particular emphasis upon social science problems.
Prereq: ENV S 278 or consent of instructor
Cross-listed as GEOG 317
Students may receive credit for only one of PLAN 317 and GEOG 317

PLAN 318 W 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.
Prereq: ES 278
Cross-listed as GEOG 318
Students may receive credit for only one of PLAN 318 and GEOG 318

PLAN 319 F 2C,1L 0.5
Economic and Social Techniques for Regional Planning
Critical appraisal of a selection of descriptive and evaluative regional analysis techniques. Economic considerations of regional development. Reliability and applicability of data; input-output analysis; cost-benefit analysis; planning, programming and budgeting systems; and social area analysis.
Prereq: ECON 101, 102 or consent of instructor
Cross-listed as GEOG 319
Students may receive credit for only one of PLAN 319 and GEOG 319

PLAN 322 S 3C 0.5
Canadian Regional Issues
Selective study of Canadian development issues pertaining to the use of land, urbanization, regional and resource development; issues will be related to structural and functional forces that are characteristics of the major regions of Canada, e.g. Atlantic Provinces, British Columbia.

PLAN 330 W,S 2C,1S 0.5
Urban Social Planning
This course looks at social planning as a way of attacking urban social problems. It will examine the different types of social planning and the relationship between physical and social planning.
Prereq: SOC 101 or consent of instructor

PLAN 357 F,W 4C 0.5
Conservation and Resource Management
History of the conservation movement; ecological principles of conservation and resource management. Analysis, use and planning of recreational resources. Section one of this course uses a self-directed learning approach.
Prereq: ENV S 200
Cross-listed as GEOG 357
Estimated additional cost to students: $10.
Students may receive credit for only one of PLAN 357 and GEOG 357
Offered by Correspondence only for 1989-90

PLAN 359 F 3C 0.5
Regional Planning: Program Development and Implementation
An examination of current regional planning programs (objective, policies, strategies and plans), with regard to both their development and implementation in the context of various institutional structures, arrangements and intergovernmental relations. Emphasis will be given to the process of implementing and monitoring programs in different jurisdictional and administrative settings.
Prereq: Planning students or consent of instructor

PLAN 359 F 3C 0.5
Regional Planning: Program Development and Implementation
An examination of current regional planning programs (objective, policies, strategies and plans), with regard to both their development and implementation in the context of various institutional structures, arrangements and intergovernmental relations. Emphasis will be given to the process of implementing and monitoring programs in different jurisdictional and administrative settings.
Prereq: Planning students or consent of instructor

PLAN 360 W 3C 0.5
Technology in Urban and Regional Planning
The influence of transportation, communications, and water and sewage systems on the form, function and development of cities and regions; the application of this knowledge in urban and regional planning.

PLAN 367 W 3C 0.5
Conservation in Wildland and Resource Management
Consideration of the constraints and guidelines that an application of the principles of ecology place on the planning and management of resources within natural and agricultural ecosystems. The theory and history of this subject will be discussed together with the management of wildlife, forestry, fisheries, parks and open space, and agriculture.
Prereq: ENV S 200
Cross-listed as GEOG 367
Lab fee $10-15
Students may receive credit for only one of PLAN 367 and GEOG 367

PLAN 368 F 3C 0.5
Conservation/Resource Management of the Built Environment
Consideration of the constraints and guidelines that an application of the principles of ecology place on the planning and management of resources within urban and urban shadow ecosystems. The theory and history of this subject will be discussed together with urban economanagement, the management of waste, urban open space and parks, rehabilitated sites, and environmentally sensitive areas.
Prereq: ENV S 200
Cross-listed as GEOG 368
Lab fee $10-15
Students may receive credit for only one of PLAN 368 and GEOG 368

PLAN 370 F 2C 0.5
Land Development Planning
An examination of planning issues related to the economics and financing of public and private development projects including shopping plazas, residential subdivisions, and new towns. The course focuses on sources of financing, financial programming, effects of planning decisions on land values, and techniques of project evaluation.
Prereq. PLAN 255 or consent of instructor

PLAN 380 S (Oxford) 3C 1.0
Theory and Practice of Planning in the U.K.
Familiarization with the contribution of U.K. theory and practice to Canadian planning. A study of development of U.K. planning from mid-eighteenth century to present with reference to new town and urban redevelopment.
Prereq: Third year planning students or consent of instructor. Students register on a Letter of Permission. Additional course fee.

PLAN 390 W,S 3C No credit weighting
Senior Honours Essay Proposal
A training course for developing a research proposal for the Senior Honours Essay. Students will develop a research proposal under direction of a faculty member. Types of research which can be employed in the development will be discussed as well as the methods available. Students will present proposals as a mode for evaluating their participation.
Prereq: Third year planning students only
A systems approach to change and development of change strategies by plans, policies and programs. Case studies are used to measure the quality and performance of plans, policies and programs.

A seminar course on problems confronting native peoples in Canada with particular emphasis on basic societal conditions and how community planning and development can assist in ameliorating these conditions in a collaborative manner with reference to the development of social policy.

A design studio workshop involving site planning projects which integrate design and the natural processes of landscape and climate. Topics will vary.

A seminar course on the environmental and related technologies and the role 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.

A seminar course on some current and changing social philosophies, the image of man, the notions of ethics, morality, authority, equity, etc., the role and responsibility of (urban and regional) planners in the creation of a more "healthful" environment.

A seminar course on the environmental sources and causes of disease and illness, the concepts of health, e.g., medical, scientific, economic, political, etc., the health services and facilities and related technologies and the role and responsibility of (urban and regional) planners in the creation of a more "healthful" environment.

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.

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.
Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Note
Extensive descriptions of the content of Political Science courses are available in the Department at the time of preregistration.

PSCI 101A F 0.5 Introduction to Politics 1
An introduction to the nature of politics and to the conflict of political ideas within the setting of a liberal democracy. The purpose is a clearer understanding of conservatism, liberalism and socialism.

PSCI 101M F 0.5 Introduction to Public Policy
This course is an introduction to the process of policy making. Students will be given an opportunity to examine, in the context of several examples, the factors affecting choices among policy alternatives. In addition, questions about the range of alternatives and the implementation of policies will be addressed.

PSCI 102 consists of a series of courses dealing with different aspects of politics. Students should select the course which most closely corresponds to their interest.

First-year winter term courses will be drawn from the following list:

PSCI 102D W 0.5 The Political Process in the Modern Democracies
A study of power and influence in the modern democracies, based on an examination of 3 contending models in the political process - the liberal-democratic or popular rule model, the pluralist model, and the elitist model.

PSCI 102E W 0.5 Political Rights and Obligations
An introductory examination of the idea of individual rights as a limitation on the political process. Students will be given an opportunity to examine, in the context of several examples, the factors affecting choices among policy alternatives. In addition, questions about the range of alternatives and the implementation of policies will be addressed.

PSCI 102N W 0.5 The Politics of Nationalism and Ethnicity
An examination of the roots of nationalism, and the impact of nationalism and ethnicity on the political process and political change.

PSCI 214 2C,1L 0.5 Quantitative Analysis
An introduction to the use of quantitative methods in Political Science. Only a rudimentary understanding of mathematics is required.

Prereq: Second-year standing
Students who have taken or are taking a course of similar content in another discipline should check with their Undergraduate Officer or the Arts Registrar's Office to determine if credit will be granted for both courses.

PSCI 225 F 2C,1T 0.5 The History of Political Theory 1
A survey of the principal ideas of Western political theorists from the earliest times to the 17th century.

Prereq: Second-year standing

PSCI 226 W 2C,1T 0.5 The History of Political Theory 2
A survey of the principal ideas of Western political theorists since the 17th century.

Prereq: Second-year standing

PSCI 231 F,W 0.5 Government and Business in Canada
An examination of the political environment in which business functions in Canada with particular emphasis on the constraints and opportunities conditioned by government intervention in and interaction with the private sector.

Prereq: Second-year standing
<table>
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<tr>
<th>Course Code</th>
<th>Sections</th>
<th>Credits</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSCI 255</td>
<td>F,W</td>
<td>0.5</td>
<td>The Politics of Western Industrial Nations</td>
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<tr>
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<td>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.</td>
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<tr>
<td>PSCI 256</td>
<td>W</td>
<td>0.5</td>
<td>The Politics of Western Industrial Nations II</td>
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<tr>
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<td>This course will examine a number of ways by which developed countries have tried to overcome the contemporary &quot;crisis&quot;. Topics to be discussed include economic planning and participation, wage controls, corporatism, decentralization and authoritarianism. Prereq: Second-year standing.</td>
</tr>
<tr>
<td>PSCI 260A</td>
<td>F,S</td>
<td>2C,1D</td>
<td>Canadian Government and Politics 1</td>
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<td>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.</td>
</tr>
<tr>
<td>PSCI 260B</td>
<td>W,S</td>
<td>2C,1D</td>
<td>Canadian Government and Politics 2</td>
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<td>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: PSCI 260A or consent of instructor.</td>
</tr>
<tr>
<td>PSCI 264</td>
<td>F</td>
<td>2C</td>
<td>American Government and Politics</td>
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<td>The theory and practice of the American political system as revealed by the institutions and operations of American national government. No prereq for students in the second year and above.</td>
</tr>
<tr>
<td>PSCI 268</td>
<td>W</td>
<td>2C,1T</td>
<td>British Government and Politics</td>
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<td>An examination of the uniquely British characteristics of the British political system. No prereq for students in the second year and above.</td>
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<tr>
<td>PSCI 271</td>
<td>F</td>
<td>2C,1L</td>
<td>Political Behaviour 1</td>
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<td>Empirical approaches to the study of politics are examined in light of their assumptions, aspirations, and critics. No prereq for students in the second year and above.</td>
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<tr>
<td>PSCI 272</td>
<td>W</td>
<td>U</td>
<td>Political Behaviour 2</td>
</tr>
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<td></td>
<td>An examination of the political attitudes and behaviour of men and women in different political systems. Prereq: Second-year standing.</td>
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<tr>
<td>PSCI 281</td>
<td>F</td>
<td>2C</td>
<td>International Politics</td>
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<td>This course studies the transformation of the international system stressing East-West, Rich-Poor, and North-South perspectives and interactions. No prereq for students in the second year and above.</td>
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<tr>
<td>PSCI 282</td>
<td>W</td>
<td>2C</td>
<td>Foreign Policy</td>
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<td>This course studies the roots of foreign policy behaviour of selected western and non-western (particularly Asian) states. Prereq: PSCI 281 or consent of instructor.</td>
</tr>
<tr>
<td>PSCI 291</td>
<td>F,S</td>
<td>3C</td>
<td>The Canadian Legal Process</td>
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<td></td>
<td>An analysis of the manner in which the Common Law functions, together with an examination of the structure and jurisdiction of the Canadian court systems. Taught by a member of the legal profession. Prereq: Open to all students in the second year and above.</td>
</tr>
<tr>
<td>PSCI 292</td>
<td>W,S</td>
<td>3C</td>
<td>Issues in Canadian Criminal Law</td>
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<td>Rational principles and concepts applicable to current emotional criminal issues are analyzed by a practising crown attorney, for example, abortion, euthanasia, pornography, seat belts, homosexuality, marijuana, police power, civil rights, criminal trial, jury, capital punishment, prisons, etc. Prereq: Open to all students in the second year and above.</td>
</tr>
<tr>
<td>PSCI 295</td>
<td>F</td>
<td>0.5</td>
<td>Public Sector Management</td>
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<td>This course examines the functions of management with major emphasis placed on employee relations, values, communication, motivation and team management. Prereq: Second-year or consent of instructor.</td>
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<tr>
<td>PSCI 315</td>
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<td>0.5</td>
<td>Research Design in Political Science</td>
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<td>Introduction to the logic and limitations of experimental and non-experimental research designs. Selected studies of politics are examined to demonstrate how plausible threats to validity are made less plausible with appropriate design and data analysis. Prereq: PSCI 214 or consent of instructor.</td>
</tr>
<tr>
<td>PSCI 321</td>
<td>F</td>
<td>2L</td>
<td>Marxist Theory</td>
</tr>
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<td>A basic introduction to the political and social thought of Karl Marx from the early writings to Das Capital. Prereq: None.</td>
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<tr>
<td>PSCI 322</td>
<td>W</td>
<td>2L</td>
<td>Marxism after Marx</td>
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<td>A selective study of developments in Marxist theory and political movements after Marx. Prereq: None.</td>
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<tr>
<td>PSCI 323</td>
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<td>0.5</td>
<td>Ancient Political Philosophy</td>
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<td>A selective examination of political philosophy during the classical period in Greece. Prereq: Consent of the Instructor.</td>
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<tr>
<td>PSCI 324</td>
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<td>0.5</td>
<td>Modern Political Philosophy</td>
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<td>A selective examination of political philosophy in the modern period. Prereq: Consent of instructor.</td>
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<tr>
<td>PSCI 331</td>
<td>F</td>
<td>2C</td>
<td>Public Administration 1</td>
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<td>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: PSCI 260A and 260B or consent of instructor.</td>
</tr>
<tr>
<td>PSCI 332</td>
<td>W,S</td>
<td>2S</td>
<td>Public Administration 2</td>
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<td>Analysis of problems and issues in the field applying the knowledge gained in PSCI 331. Prereq: PSCI 331 or consent of instructor.</td>
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<tr>
<td>PSCI 333</td>
<td>W</td>
<td>0.5</td>
<td>Administrative Law</td>
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<td>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: PSCI 331 or consent of instructor.</td>
</tr>
</tbody>
</table>
PSCI 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: PSCI 260A and 260B or 341 or consent of instructor

PSCI 343 F 2C 0.5
Canadian Municipal Government
A study of the assumptions, structures and performance of municipal government in Canada with reference to metropolitan and regional structural innovations (particularly in Ontario).
Open to students in the third year and above with at least 1 previous course in Political Science.

PSCI 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: PSCI 343 or consent of instructor.

PSCI 350A F 3C 0.5
The Politics of the Developing Areas 1
An introduction to the politics of Asia, Africa and Latin America focusing upon the political roots of poverty in the developing areas. Topics include the impact of world trade, colonization, multinationals and foreign aid.
No prereq for students in the third year and above.

PSCI 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.

PSCI 351 F 2S 0.5
Federal and Consociational Political Systems
Federal and Consociational Political Systems are examined with emphasis on processes of political integration, patterns of conflict resolution, and the impact of modernization on political development.
Prereq: Consent of the Instructor

PSCI 362A F 0.5
Soviet Government and Politics I
An examination of conceptual frameworks for the study of politics in the Soviet Union, and the environment and institutions of the Soviet political system.
Prereq: Third-year standing or consent of instructor

PSCI 362B W 0.5
Soviet Government and Politics II
This course examines policy-making and implementation in the Soviet Union, and the dynamics of change in the Soviet political system.
Prereq: PSCI 362A or consent of instructor

PSCI 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: PSCI 260A and 260B or 260A and consent of instructor

PSCI 372 W 0.5
Political Parties and Interest Groups
An examination of the roles of interest groups and political parties in influencing government policy. The origins, tactics, structures and impact of these two avenues of political participation will be compared. Discussion will focus on Canadian examples.
Prereq: Third-year standing or consent of instructor

PSCI 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

PSCI 380A F 0.5
World Politics I
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.

PSCI 380B W 0.5
World Politics II
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.
Prereq: Open only to students in the third year and above

PSCI 381 W 0.5
Foreign Policies of South Asian States
The course (1) defines the central issues in each country's foreign policy; (2) discusses the factors which shape the decision making processes; and (3) evaluates the impact of these policies on regional and international thinking.

PSCI 390-396 0.5
Special Studies
From time to time courses of special study may be added to the program at the third year level. Students wishing to take such courses should consult the Department's Undergraduate Officer.

PSCI 422 0.5
Conflict of Political Ideas in Canada
A course designed to introduce students to some of the major ideas about politics and democracy which Canadians have developed in the course of this century. Conservatism, liberalism, socialism, agrarian protest, politics, and nationalism will be considered in their historical context. In particular, the course will address the issues of democracy and industrialization in Canada and will examine closely the conflicting liberal, socialist and conservative notions of progress and political community.

PSCI 426 0.5
Selected Subjects in Political Philosophy
A selective treatment of basic themes in political philosophy in the modern and pre-modern times.
Prereq: For third-year Political Science students, but open to others with prereq of PSCI 225, 226, 323, or 324, or consent of instructor

PSCI 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: PSCI 225, 226, 323, or 324
Course Descriptions
Political Science

PSCI 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

PSCI 431 F 0.5
Canadian Public Policy
An examination of the way that policy processes and institutions have responded to problems of governing, especially at the federal level in Canada.
Prereq: PSCI 260A, 260B, 331 or consent of instructor

PSCI 433 0.5
Public Policy and Underdevelopment in the Third World
An examination of industrial strategies, agricultural programs and energy policies of selected Third World countries focusing upon the political obstacles, both domestic and foreign, to the achievement of the long term integrated planning required for the alleviation of poverty in the Third World.
Prereq: Fourth-year standing or consent of instructor

PSCI 434 F 0.5
Comparative Public Administration
A comparative survey of public administration in both developed and developing areas. The focus is on the rise of the administrative state in a variety of cultural and political contexts.
Prereq: PSCI 331 or consent of instructor

PSCI 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

PSCI 436 F 3S 0.5
Comparative Public Policy: The Politics of Food
PSCI 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

PSCI 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

PSCI 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: PSCI 260A and 260B or 341 or consent of the instructor

PSCI 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: PSCI 260 or 341 or consent of instructor

PSCI 451 F 0.5
Comparative Communist Systems: Eastern Europe
A comparative examination of political institutions and processes in the communist states of Eastern Europe.
Prereq: Fourth-year standing or consent of instructor

PSCI 452 F 0.5
Comparative Civil-Military Relations - Soviet Union and Eastern Europe
A seminar on the military and politics in the Soviet Union and Eastern Europe since World War II; how the military system affects and, in turn, is affected by the political system and society.
Prereq: Fourth-year standing or consent of instructor

PSCI 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

PSCI 454 W 3S 0.5
Comparative Politics
Selected topics in the politics of the Third World.
Prereq: Fourth-year standing or consent of instructor

PSCI 461 F 2C,1S 0.5
Problems in Canadian Politics 1
Selected aspects of Canadian national politics.
Prereq: Fourth-year standing or consent of instructor

PSCI 462 W 0.5
Problems in Canadian Politics 2
Selected aspects of Canadian provincial politics.
Prereq: Fourth-year standing or consent of instructor

PSCI 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

PSCI 473 2S 0.5
Voting Behaviour
Prereq: PSCI 214, 373 or consent of instructor

PSCI 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

PSCI 476 W 0.5
Research Seminar in Political Behaviour
A research-oriented seminar on selected theoretical works in political behaviour, with an emphasis on the development of research projects dealing with Canadian topics.
Prereq: Consent of the instructor

PSCI 479 2S 0.5
Senior Research Seminar: Violence in the Political Process
Politics can be brutal. This seminar deals with violence in the political process. The focus is on the relationships between the society and the coercive apparatus of the state.
Prereq: Third- or fourth-year standing

PSCI 481 2S 0.5
Research Seminar on World Politics
An examination of research on the causes and consequences of interstate warfare.
Prereq: PSCI 380 or consent of instructor
Department of Psychology

Professor, Chairman of the Department
T.G. Waller, BS, MS (Southern Mississippi), PhD (Vanderbilt)

Professor, Dean of the Faculty of Arts
R.K. Banks, BA, MA, PhD (Toronto)

Associate Professor, Associate Dean for Undergraduate Affairs and Computing, Faculty of Arts
G.A. Griffin, BA (Colgate), MA, PhD (Wisconsin), Recipient of the Distinguished Teacher Award

Professor, Deputy Chairman
M.P. Zanna, BA, PhD (Yale)

Associate Professor, Associate Chairman, Graduate Affairs
J.A. Cheyne, BA (Waterloo Lutheran), MA, PhD (Waterloo)

Associate Professor, Associate Chairman, Undergraduate Affairs
N. Charness, BA (McGill), MS, PhD (Carnegie-Mellon)

Professors
K.S. Bowers, BA, PhD (Illinois)
M.P. Bryden, SB (MIT), MSc, PhD (McGill)
W.C. Corning, BA (Heidelberg), PhD (Rochester)
D.P. Crowne, BA (Antioch College), EdD (Rochester), PhD (Purdue)
J.A. Dyal, BA (Oklahoma), PhD (Illinois)
C.K. Knapper, BA (Sheffield), PhD (Saskatchewan)
H.M. Lefcourt, BA (Antioch College), MA, PhD (Ohio State)
M.J. Lerner, BA, MA (Ohio State), PhD (New York)
R.G. Marteniuk, BPE, MA, PhD (Alberta), EdD (California)
D. Menchenbaum, AB (City College of New York), MA, PhD (Illinois)
P.M. Menkik, BA (Knox), MA, PhD (Virginia)
S. Reins, MD, SCs (Charles)
H. Ross, BA (Toronto), PhD (North Carolina)
M.A. Ross, BA (Toronto), MA, PhD (North Carolina)
P.M. Rowe, BA (Toronto), MA, PhD (Dartmouth), PhD (McGill)
K.H. Rubin, BA (McGill), MS, PhD (Penn State)
D.A. Sprott, BA, MA, PhD (Toronto), FSS
R.A. Steffy, BA (Albert, MA, PhD (Illinois)

M.D. Vogel-Sprott, BA (McMaster), MA, PhD (Toronto)
D.L. Wahisten, BS (Alma College), PhD (California, Irvine)

Associate Professors
D.M. Amoroso, BA, MA (Toronto), PhD (Waterloo)
J.M. Anglin, BA (Toronto), PhD (Harvard)
D. Besner, BA (Loyola College), MSc (Memorial), PhD (Reading), NSERC University Research Fellow
K. Bloom, BSc (Loyola), MA, PhD (North Carolina)
P.E. Bowers, BA (Queen's), MA, PhD (Illinois)
T.F. Cadell, BA (British Columbia), MA (Massachusetts), PhD (Wisconsin)
A.J.R. Cameron, BA, MA, PhD (Waterloo)
J.M. Cornell, BA, MS, PhD (Washington)
W.B. Cowan, BSc (Waterloo), PhD (McGill)
J.G. Holmes, BA, MA (Carleton), PhD (North Carolina)
S. Hymel, BSc, MA, PhD (Illinois)
P. Jolicouer, BSc (McGill), PhD (Harvard)
R.H. Lahue, BSc (Fordham), PhD (Waterloo), R
G.E. MacKinnon, BA (Queen's), PhD (John Hopkins)
P. J. Naas, BA, PhD (Nijmegen), J
J.E. Orlans, BA (Western Ontario), MA (Detroit), MA, PhD (Michigan), J
E.A. Roy, BSc (Waterloo), MPE (British Columbia), PhD (Waterloo)
R.D. Seim, BA (Queen's), PhD (Waterloo)
J. Theis, BA (Western Ontario), MA (Notre Dame), PhD (Windsor) J
J.A. Van Evra, BA (Valparaiso), MA (Bowling Green), PhD (Michigan State), J
P.E. Wainwright, BSc (Rhodes), MA, PhD (Waterloo)
E.E. Ware, BA, MA (Richmond), PhD (Illinois)
E.Z. Woody, BA (Reed), MS (Oxford), PhD (Oke)

Assistant Professors
R.L. Cohen Silver, BA, PhD (Northwestern)
G.T. Fong, AB (Stanford), PhD (Michigan)
D.W. Griffin, BA (British Columbia), AM, PhD (Stanford)
M.M. Moretti, BA (Brock), MA, PhD (Simon Fraser)

Adjunct Faculty
J.R. Amkrau, RS (Portland State), MA, PhD (Denver)
D.S. Barnes, BA, MA (Western Ontario)

PSCI 483 F 3S 0.5
Power Politics and World Order Studies
This theory course examines the evolution of the international system; the capacity of the system of states to cope with the demands on it; meanings of international and regional power and order.
Prereq: Fourth-year standing or consent of the instructor

PSCI 484 W 3S 0.5
Contemporary Strategies: Theories and Policies
The course examines strategic studies and their premises, the evolution of strategic thinking, the role of national policies of military power. Strategic concepts are studied with specific reference to military policies of regional powers.
Prereq: Fourth-year standing or consent of instructor

PSCI 490-498 0.5 each
Special Subjects
From time to time courses of special study may be added to the program at the fourth year level. Students wishing to add such courses should consult the Department's Undergraduate Officer.

PSCI 499A/B F, W, 0.5/0.5
Special Honours Essay
Students wishing to undertake a senior honours essay in their fourth year should consult the Department's Undergraduate Officer.
A letter grade for PSCI 499A will be submitted only after the completion of PSCI 499B.

COURSES NOT OFFERED 1999-90
PSCI 102C Politics in Action
PSCI 312 Approaches to Survey Analysis in Political Science
PSCI 312 Provincial Politics
PSCI 341 Provincial Politics
PSCI 352 Comparative Legislative Systems
PSCI 375 The Politics of Self-Management
PSCI 424 Contemporary Socialist and Communist Thought
PSCI 476 Research Seminar in Political Behaviour
Course Descriptions

Psychology

R.J. Dart, BS (Washington), MA, PhD (Waterloo)
B.S. Francis, BS (Ursinus), MA, PhD (Arizona)
J.J. Hartford, MD (Toronto)
S.P. Lollis, BSc, MSc (California), PhD (Waterloo)
C.B. Lowry, BA (McGill), MA, PhD (Waterloo)
R.E. Mann, BA, MAsc, PhD (Waterloo)
L. Rose-Krasnor, BA (Boston), MAsc, PhD (Waterloo)
J.L. Williams BA, MA (Alberta), PhD (Missouri)

Faculty Members of Psychology holding cross appointments to:
1Optometry
2Kinesiology
3Health Studies
4Systems Design Engineering

Faculty Members holding cross appointments to Psychology from:
5Environmental Studies
6Kinesiology
7Statistics
8Health Studies
9Computer Science

J refers to faculty members at St. Jerome's College
R refers to faculty members at Renison College

Introductory Note
See departmental course listing catalogue for specific terms of the various course offerings in 1989-90.

PSYCH 101 F.W.S 3C 0.5
Introductory Psychology
A general survey course designed to provide the student with an understanding of the basic concepts and techniques of modern psychology as a behavioural science.

Students may receive credit for only one of PSYCH 101 or PSYCH 120R
Also offered at St. Jerome's College.

PSYCH 102A 3C 0.5
Applied Psychology
Applications of Psychological research to contemporary concerns: personnel selection, training and evaluation, management and organizations, human factors engineering, man and environment, consumer behaviour, clinical, counselling and community psychology.
Prereq: PSYCH 101

PSYCH 102B 3C 0.5
Nature, Nurture and Human Behaviour
The role of heredity and environment in the development of intelligence, mental disorders, and criminal behaviour.
Prereq: PSYCH 101

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.
Prereq: PSYCH 101

PSYCH 102D 3C 0.5
Psychology of Consciousness
Modes of thinking, emotion, creativity, and altered states of consciousness.
Prereq: PSYCH 101

PSYCH 102E 3C 0.5
Psychological Intervention
Applications of Psychology to human coping problems and growth with emphasis on analyzing critically current treatment methods.
Prereq: PSYCH 101
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.
Prereq: PSYCH 101

PSYCH 102G 3C 0.5
Introduction to Neuroscience
The relation between brain as a substrate and mind as a process is an important scientific and philosophical problem. In this course, those biological aspects of brain function will be discussed which are directly related to the functioning of the human mind.
Prereq: PSYCH 101

PSYCH 102H 3C 0.5
Psychology and the Nuclear Threat
The course will examine the ways in which psychological concepts and theory can be applied to understanding our reactions to nuclear threat and to improving international relations.
Prereq: PSYCH 101

PSYCH 200 3C, 1, 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.

See the undergraduate secretary regarding overlapping courses from your major before taking this course. Students who have credit in PSYCH 292 or its equivalent (see overlapping content note, Grading System, Item 6, p. 8.7) may not receive credit for this course.

PSYCH 203 F.W 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
Priority enrolment for Psychology majors.

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
Priority enrolment for Psychology majors.

PSYCH 207 F.W 3C 0.5
Cognitive Processes
An examination and evaluation of selected topics dealing with human learning, thinking, concept formation, memory and language.
Prereq: PSYCH 101
Priority enrolment for Psychology majors.

PSYCH 211 F.W 3C 0.5
Developmental Psychology
An examination of the process and factors of human development.
Prereq: PSYCH 101
Priority enrolment for Psychology majors.
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.
Prereq: PSYCH 101

PSYCH 214 3C 0.5

Psychology of Adolescence
A study of the psychological processes in the second decade of human development. Consideration is given to such areas as intellectual, emotional and social growth, and identity formation. Current concepts, issues, and research are stressed.
Prereq: PSYCH 211
Also offered at St. Jerome's College.

PSYCH 217 3C 0.5

Aging and Basic Psychological Processes
What processes change as adults age? Is the idea of age-related decline in functioning a myth? The course deals with processes such as memory, perception, intelligence, and problem-solving. It also outlines the problems in 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

PSYCH 235 3C 0.5

Psychological Perspectives on Gender and Sex
The course focuses on the existence of and bases for sex and gender differences with emphasis on biological, psychological and cultural issues.
Prereq: PSYCH 101 (PSYCH 211 is recommended)

PSYCH 236 F, W 3C 0.5
A Psychological Analysis of Human Sexuality.
This course will examine psychological and social psychological theories and empirical investigations of human sexuality.
Prereq: PSYCH 101 or permission of instructor
Offered at St. Jerome's College.

PSYCH 253 F, W 3C 0.5

Social Psychology
An introduction to the scientific study of social behaviour and social influences on behaviour. Theories and research on such topics as attitude change and persuasion, stereotypes and prejudice, conformity and obedience to authority, altruism, conflict, attraction and love will be introduced.
Students may receive credit for only one of PSYCH 253 or PSYCH 220R.
Prereq: PSYCH 101
Priority enrolment for Psychology majors.
Cross-listed as PSYCH 220R

PSYCH 254 3C 0.5

Interpersonal Relations
A psychological analysis of social interaction. The development of interpersonal attraction from first impressions to long-term relationships. The roots of hostility, conflict and communication problems.
Students may receive credit for only one of PSYCH 254 or PSYCH 221R.
Prereq: PSYCH 253
Cross-listed as PSYCH 221R

PSYCH 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
Priority enrolment for Psychology majors.

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
Priority enrolment for Psychology majors.

PSYCH 291 F 3C,2L 0.5

Basic Research Methods
An introduction to the methods used in psychological research. Methods for observing behaviour and the procedures used to summarize these observations are emphasized.
Prereq: PSYCH 101 and second year Honours standing in Psychology
See overlapping content note (Grading Systems, Item 6, on p. 8.7)

PSYCH 292 W,S 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 second year Honours standing in Psychology
See overlapping content note (Grading Systems, Item 6 on p. 8.7)

PSYCH 305 3C 0.5

Sensory Processes
A consideration of data and theory concerning sensory processes. Topics will include psychophysical methodology, sensory mechanisms, and the neuropsychological basis of perceptions.
Prereq: PSYCH 206

PSYCH 307 3C 0.5

Cognitive Neurology
An introduction to current human experimental neuropsychology. The course will review evidence for brain-behaviour interactions obtained from studies of human brain damage and from investigations of the normal brain. Topics such as the representation of language, hemispheric specialization, memory, spatial ability, dyslexia, movement disorders and affective disorders will be considered.
Prereq: One of PSYCH 206, 207, 261, or KIN 356
PSYCH 310 3C 0.5
Social Development
This course will be concerned with contemporary issues in psychological study of social development. The course will be organized around a few central issues such as those of continuities and discontinuities of development and the relations between social and cognitive development.
Prereq: PSYCH 211

PSYCH 311 3C 0.5
Behaviour and Development of Human Infants
The purposes of this course are to study the behaviour and development of human infants, to gain direct experience with infants, and to examine community attitudes and resources available for infant care.
Prereq: PSYCH 211 or permission of instructor

PSYCH 312 3C 0.5
Learning Disabilities
A critical examination of the concept of learning disability and of current issues in the assessment and remediation of learning problems.
Prereq: PSYCH 211, 212, or 213
Also offered at St. Jerome's College.
Students may receive credit for only one of PSYCH 160 or PSYCH 312

PSYCH 314 3C 0.5
Cognitive Development
A consideration of psychological research and theory concerned with the origins and development of cognition in humans. Traces the development of such cognitive skills as problem solving, memory, concept formation, language, and other symbolic capacities from birth to adulthood. Cultural influences on cognitive development will also be considered.
Prereq: PSYCH 101

PSYCH 317 3C 0.5
The Emotionally Disturbed Child
An examination of children's psychological disorders from several major perspectives with an emphasis on current research findings. Theoretical and clinical issues are considered.
Prereq: PSYCH 211
Offered at St. Jerome's College.

PSYCH 333 3C 0.5
Industrial/Organizational Psychology
An introduction to the methods and problems in Industrial Psychology.
Prereq: PSYCH 101

PSYCH 334 F,W,S 3C 0.5
Theories of Individual Counselling Psychology
An introduction to the methods, theories and problems in individual Counselling Psychology.
Prereq: PSYCH 101
Also offered at Renison College and St. Jerome's College.

PSYCH 335 3C 0.5
Personality and Behaviour Change
Forms of psychological intervention that produce important changes in the way people think, feel and behave including psychoanalysis, behaviour therapy, brainwashing, cult conversions, deprogramming, hypnosis, biofeedback and meditation.
Prereq: PSYCH 101

PSYCH 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, compensation systems.
Prereq: PSYCH 333

PSYCH 340 3C 0.5
Community Psychology
The nature and origin of deviant behaviour. The adequacy of existing social structures and institutions in the treatment of various personal problems is assessed.
Prereq: PSYCH 253
Offered at St. Jerome's College.

PSYCH 341 3C 0.5
Psychology of Early Childhood Education
An introduction to theories and issues in early childhood education. Topics include issues differentiating preschool programs and application of psychological theory/research to early education.
Prereq: PSYCH 211

PSYCH 344 3C 0.5
Theories of Group Counselling
Contemporary theories on the therapeutic application of group processes. Issues such as group development, leader skills and training, selection of members, problems encountered in both process and outcome research will be examined.
Prereq: PSYCH 101
Offered at St. Jerome's College.

PSYCH 345 3C 0.5
Interpersonal Processes in Critical Situations
The course will examine reactions to victims of misfortunes such as serious physical and mental illness, natural disaster, poverty and discrimination.
Prereq: PSYCH 253

PSYCH 355 F,W 3C 0.5
Personality Theory
An examination and evaluation of some of the outstanding theories of personality.
Students may receive credit for only one of PSYCH 355 or PSYCH 322R
Prereq: PSYCH 101
Priority enrolment for Psychology majors.
Cross-listed as PSYCH 322R
Also offered at St. Jerome's College

PSYCH 357 F,W 3C 0.5
Psychopathology
The nature and origin of deviant behaviour.
Students may receive credit for only one of PSYCH 357 or PSYCH 323R
Prereq: PSYCH 101
Priority enrolment for Psychology majors.
Cross-listed as PSYCH 323R
Also offered at St. Jerome's College

PSYCH 361 (A-Z) 3C 0.5
Special Topics in Advanced Physiological Psychology
This course continues and extends PSYCH 261. Departmental listings of topics should be consulted.
Prereq: PSYCH 261 or permission of the instructor

PSYCH 363 (A-Z) - 366 (A-Z) 3C 0.5
Special Subjects
These courses will be offered at different times as announced by the Department.
Consult departmental listings for topics and prerequisites.

PSYCH 391 F 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 252 and third year Honours standing in Psychology
See overlapping content note (Grading Systems, item 6 on p. 8.7)
PSYCH 392  W.S  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 in Psychology.

PSYCH 393  2S,2L  0.5
Research in Developmental Psychology
Open only to students in a Psychology Honours Program.
Prereq: PSYCH 211 and 391 (acceptable as a corequisite)

PSYCH 394  2S,2L  0.5
Research in Perceptual and Cognitive Processes
Open only to students in a Psychology Honours Program.
Prereq: PSYCH 206 or 207 and 391 (acceptable as a corequisite)

PSYCH 395  2S,2L  0.5
Research in Social Psychology
Open only to students in a Psychology Honours Program.
Prereq: PSYCH 253 and 391 (acceptable as a corequisite)

PSYCH 396  2S,2L  0.5
Research in Biopsychology
Open only to students in a Psychology Honours Program.
Prereq: PSYCH 261 and 391 (acceptable as a corequisite)

PSYCH 397  2S,2L  0.5
Research in Personality and Psychopathology
Open only to students in a Psychology Honours Program.
Prereq: PSYCH 355 or 357 and 391 (acceptable as a corequisite)

PSYCH 398  2S,2L  0.5
Research in Learning and Motivation
Open only to students in a Psychology Honours Program.
Prereq: PSYCH 203 or 271 and 391 (acceptable as a corequisite)

PSYCH 422A/B  F,W  0.5/0.5
Principles and Practice in Early Childhood Education II
An examination of the various aspects of planning and administration in early childhood education programs. Topics include: Practical applications of Piaget's theory; parent education. Students must achieve at least a B grade to remain in the E.C.E. program.
Prereq: PSYCH 322A/B and 323A/B or 325A/B
A grade for PSYCH 422A will be submitted only after the completion of PSYCH 422B

PSYCH 423A/B  F,W  25/25
Practicum in Early Childhood Education II
Practicum for advanced students in early childhood education. These course require a total of 300 hours of fieldwork over two terms. Possible placements include preschool, daycare, kindergarten, and specialized programs. The time will be distributed between regular weekly responsibilities and block placements of full-time work. Students must achieve at least a B grade to remain in the E.C.E. program. Must be taken concurrently with PSYCH 422A/B.
Prereq: PSYCH 322A/B and 323A/B or 325A/B
A grade for PSYCH 423A will be submitted only after the completion of PSYCH 423B

PSYCH 425A/B  F,W  1.0/1.0
Practicum in Early Childhood Education B
Practicum for advanced students in early childhood education. These courses require a total of 400 hours of fieldwork over two terms. Possible placements include preschool, daycare, kindergarten, and specialized programs. The time will be distributed between regular weekly responsibilities and block placements of full-time work. Students must achieve at least a B grade to remain in the E.C.E. program. Must be taken concurrently with PSYCH 422A/B.
Prereq: PSYCH 322A/B and 325A/B
A grade for PSYCH 425A will be submitted only after the completion of PSYCH 425B

PSYCH 440A/B  F,W  0.5/0.5
Group and Individual Counselling
The practice of counselling in terms of current psychological theories and research. The demonstration and development of these concepts are aided by personal participation, exercises, role play and videotape simulation.
Prereq: PSYCH 334 and 344 or suitable alternative and permission of instructor
Offered at St. Jerome's College.
A grade for PSYCH 440A will be submitted only after the completion of PSYCH 440B.

HONOURS SEMINARS
Consult departmental listings for topics and pre-requisites for 1989-90. Open to third and fourth year Honours Psychology or Make-Up Psychology students, or by consent of the instructor.

PSYCH 450 (A-Z)  2S  0.5
Honours Seminar in the History of Psychology

PSYCH 451 (A-Z)  2S  0.5
Honours Seminar in Learning Psychology

PSYCH 452 (A-Z)  2S  0.5
Honours Seminar in Perception Psychology

PSYCH 453 (A-Z)  2S  0.5
Honours Seminar in Developmental Psychology

PSYCH 454 (A-Z)  2S  0.5
Honours Seminar in Educational Psychology

PSYCH 455 (A-Z)  2S  0.5
Honours Seminar in Social Psychology

PSYCH 456 (A-Z)  2S  0.5
Honours Seminar in Personality Psychology

PSYCH 457 (A-Z)  2S  0.5
Honours Seminar in Clinical Psychology

PSYCH 458 (A-Z)  2S  0.5
Honours Seminar in Cognitive Processes

PSYCH 459 (A-Z)  2S  0.5
Honours Seminar in Motivation Psychology

PSYCH 461 (A-Z)  2S  0.5
Honours Seminar in Physiological Psychology

PSYCH 462 (A-Z)  2S  0.5
Honours Seminar in Heredity and Development Psychology

HONOURS SEMINARS
Consult departmental listings for topics and pre-requisites for 1989-90. Open to third and fourth year Honours Psychology or Make-Up Psychology students, or by consent of the instructor.
Topics

Introductory Psychology (Special Program)

PSYCH 480 (A-Z) F,W,S 1S 3L 0.5
Directed Studies in Special Topics
This is an opportunity for independent experimental research or extensive reading. Before a student can register for this course, a proposal outlining the course as agreed to by both the student and the professor, should be filed with the undergraduate secretary. A maximum of one term course in directed studies may be used toward the five Psychology electives required for the General Program and a maximum of two term courses towards the Psychology electives required in the Honours Program.

Prereq: Open to third and fourth year Psychology students who have a cumulative Psychology average of 75% or better

PSYCH 499A/B/C F,W,S 0.5/0.5/0.5
Honours Thesis
Each student will work under the direction of a member of the department on a Research Project. The project will involve an empirical study and/or a critical integrative review of some issue or issues in the research literature of Psychology. The result of this investigation will be presented by the student in the form of a thesis which will be examined critically by members of the department. Although a thesis supervisor normally comes from within the Psychology Department, approval for other thesis supervisors may be sought from the course co-ordinator. Students may choose to begin 499 in their third or fourth year. PSYCH 499A and PSYCH 499B will be submitted only after the completion of PSYCH 499C.

The following courses are administered by Renison College. Since these courses are intended primarily for students in the Social Development Studies program, students planning a General or Honours Psychology program must consult their faculty advisor concerning Psychology major credit for these courses.

PSYCH 120R F 3C 0.5
Introductory Psychology
Cross-listed as PSYCH 101

PSYCH 121R W 3C 0.5
Introductory Psychology (Special Topics)

PSYCH 220R F 3C 0.5
Social Psychology
Cross-listed as PSYCH 253

PSYCH 221R W 3C 0.5
Interpersonal Interaction
Cross-listed as PSYCH 254

PSYCH 322R F 3C 0.5
Personality Theory
Cross-listed as PSYCH 355

PSYCH 323R W 3C 0.5
Abnormal Psychology
Cross-listed as PSYCH 357

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 and Leisure Studies

Professor, Chairman of the Department
S.L.J. Smith, BA (Wright State), MA (Ohio State), PhD (Texas A&M)

Professor, Associate Dean, Computer Applications, Faculty of Human Kinetics and Leisure Studies
E.M. Avedon, BSS (William and Mary), MA, EdD (Columbia)

Assistant Professor, Associate Chairman, Graduate Affairs
R.C. Mannell, BA (McMaster), MPE, PhD (Windsor)

Lecturer, Associate Chairman, Undergraduate Affairs
A. Gilbert, BA, MA (Waterloo)

Professors
G. Wall, BA, MA (Toronto), PhD (Hull)
J. Zuzanek, MA (Moscow State University), CSc (Prague Institute of Sociology), PhD (Charles University, Prague)

### Faculty Members of Recreation and Leisure Studies

Adjunct Faculty
D. Ng, BA (Lingnan), MA (Carver), MS, REd (Indiana)

Faculty Members of Recreation and Leisure Studies holding cross appointments to:
1. Sociology
2. Geography

Faculty Members holding cross appointments to Recreation and Leisure Studies from:
3. Geography
4. Health Studies

### Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

REC 100 3C 0.5
Introduction to the Study of Leisure and Recreation and Leisure Services
An overview of the field of recreation emphasizing the understanding of leisure phenomena as well as an introduction to various leisure service resources.

REC 200 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 3C 0.5
Sociology of Leisure
Nature and extent of leisure phenomena in contemporary society.
Examination of institutional and formal organizational aspects, social role, social research strategies employed in the study of leisure.
Prereq: SOC 101
Cross-listed as SOC 347

REC 204 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 205 3C,1L 0.5
Social Psychology of Leisure
A study of the effects of personality and social factors in shaping how people perceive, experience and respond to discretionary time. Current theory and research focusing on the impact of leisure on the socio-psychological adjustment of the individual, and applications to human problems associated with leisure will be examined.
Prereq: PSYCH 101

REC 209 2C,2L 0.5
Computer Applications in Leisure Services
Theory and application in leisure service management and programming. Examination of computer impact on leisure service industry.
Prereq: CS 100 or consent of instructor

REC 210 3C 0.5
Introduction to Leisure Service Management
Using a wide variety of leisure service agencies as examples, this course focuses on the management functions of planning, organizing, influencing and controlling. Topics include marketing, budgeting, leadership, staffing, goal setting, motivation, communication and problem solving.

REC 220 2C,2L 0.5
Program Management and Evaluation
The scope of recreation program planning, design, delivery and evaluation is examined along with current associated issues and trends. Emphasis is placed on the planning and evaluation process and its existence as a core element in any recreation and leisure services organization.

REC 230 3C 0.5
Outdoor Recreation Resources Management
A study of major facets of outdoor recreation programs and facilities from a variety of approaches; history, values, attitudes, economics, ecology, law, policy planning and trends. The emphasis is on providing a knowledge base for decision-making by managers. It includes the role of selected governmental, voluntary and private sectors bodies.

REC 235 3C 0.5
Introduction to Recreation for Special Populations
This course is designed to introduce the broad scope of recreation for special populations. Students will develop an understanding of skills and competencies, societal and individual attitudes, barriers, programming and disabling conditions and the role of recreation and leisure services as applied to the wide variety of populations. Emphasis is on aspects of human behaviour which influence participation in leisure.

REC 251 3C 0.5
Recreation and Disability
This course is designed to explore the etiology and issues relevant to the broad spectrum of people who are challenged or disabled. Study will focus on physical, intellectual and emotional or behavioural disabilities.
Prereq: REC 250

REC 255 3C 0.5
Leisure Education — Concepts and Practices
This course covers concepts, theories, and practices of leisure education. Various models, assessment tools, and intervention strategies of leisure education are discussed. Also, settings for leisure education are examined including: school-based programs, job-related programs, institutional programs and transitional programs.
Prereq: REC 250

REC 270 3C 0.5
Research Design Applicable to Leisure Studies
An introduction to the methods and techniques of research as applied to leisure studies and services. General consideration will be given to the technical problems involved in various stages of research methodology with emphasis on the logic underlying the research process.
Prereq: Second-year standing

REC 280 3C,1L 0.5
Travel and Tourism
The scope and nature of travel and tourism as contemporary leisure experiences. Economic, political and social ramifications, research strategies employed, implications for the future.

REC 300 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: Third-year standing or consent of instructor

REC 304 3C 0.5
Community and Cultural Development
A study of major issues of Canadian cultural policy from a socio-historical, political and sociological perspective. Students will examine and organizational structure of the arts and major cultural agencies, and discuss social, economic and administrative aspects of professional, amateur, commercial and public art organizations and services.
Prereq: REC 301 or 305 or consent of instructor

REC 310 3C 0.5
Commercial Recreation Business Development
Students will develop an idea for a small recreation business and will then determine whether or not the idea is feasible. The course emphasizes marketing research, organizational structure, short and long range planning, financial analysis and promotions.
Prereq: REC 210, BUS 721 and third- or fourth-year standing

REC 321-329 0.5
Selected Topics in Recreation and Leisure Studies

REC 323 3C 0.5
Advanced Seminar in Leisure Service Management
This course is designed to allow students to combine their business/public administration courses, job experiences and leisure service management issues in a small group setting. Managerial problems are identified and alternative solutions are generated by examining the problems from both a research perspective and a practitioner's perspective.
Prereq: Fourth-year Standing, Business Option or Public Administration Option
16:156 Course Descriptions
Recreation and Leisure Studies

REC 331 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 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 333 3C 0.5
Recreation Geography
The environmental implications of existing and potential recreational demands. Recreation travel, site capability, economic and ecological impact models will be considered as well as the behavioural aspects of amenity resources.
Cross-listed as GEOG 333

REC 334 3C,1L 0.6
Park Management
Basic administrative procedures in park management. Operational techniques are examined together with general policies of acquisition, operation and development.
Prereq: REC 230, REC 332 or equivalent and third- or fourth-year standing
Cross-listed as ERS 334

REC 350 3C 0.5
Principles and Procedures of Therapeutic Recreation
This course is designed to examine techniques, tools, knowledge and skills required to design, plan, develop and facilitate therapeutic recreation programs in a variety of settings for individuals and groups.
Prereq: REC 251 or consent of instructor

REC 355 2C 0.5
Issues and Problems in Therapeutic Recreation
This course is designed to explore and examine problems and issues associated with the delivery of therapeutic recreation services. Current issues and trends with regard to professionalization of therapeutic recreation, service delivery models, and administration of services will be covered.
Prereq: REC 251 and REC 350 or consent of instructor

REC 361 3C 0.5
Aging and Leisure
Social parameters of the aging process with particular reference to the Leisure Service Industry.
Prereq: Third-year standing or consent of instructor

REC 370 0.5
Directed Study in Special Topics
For the student who desires to pursue a particular topic in depth through guided independent study. A faculty member must approve a student's project prior to registration. Students may take only two directed studies courses for undergraduate degree. See REC 475.
Prereq: Faculty approval

REC 371 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.
Prereq: REC 270 and third-year standing

REC 380 3C 0.5
Recreation and Tourism Analysis
Descriptive quantitative indices for tourism and recreation development, trend extrapolation, forecasting, market evaluation. Emphasis is on applications of quantitative methods.
Prereq: REC 371

REC 401 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: ECON 101 and third-year standing or consent of instructor

REC 402 3C 0.5
Colloquium on Religion and Leisure
Theological notions as they relate to theories of leisure. Contemporary trends and behaviour which affect organized religion and other leisure-related institutions.
Prereq: ECON 101 or 332 or consent of instructor

REC 406 0.5/0.5
Comparative Recreational Systems
A study of multi-national recreation systems. Course meets on campus and in the field in other countries. Full term study over a period of 6-8 weeks. Laboratory fee varies with field observation.

REC 409 3C,1L 0.5
Computerized Database Applications in Leisure and Cultural Agency Management
Analysis of information handling tasks. Theory and design of database applications. Students are required to design and produce an operational application.
Prereq: CS 100 and REC 200 or equivalent and third- or fourth-year standing

REC 410 3C,1L 0.5
Planning of Recreation Facilities
A course to introduce the students to the planning, design and management of recreation areas and facilities.
Prereq: REC 210 or 332 or consent of instructor

REC 416 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 REC 332 or a full credit in Geography, or consent of instructor

REC 432 3C,1L 0.5
Visitor Management and Interpretation
Concepts, philosophy and practices of visitor management and interpretation related to the use, conservation and preservation of cultural and natural heritage areas.
Prereq: REC 332 or consent of instructor

REC 433 3C 0.5
People in Natural Areas
Designing and managing for people in natural areas. Behavioural research and its relevance to the design and operation of natural areas and facilities will be emphasized. Means of understanding and involving neighbouring and visiting public and indigenous people in the design and management of natural areas will be studied.
Prereq: REC 334/ERS 334
Cross-listed as ERS 433
REC 434 3C 0.5
Advanced Park Planning and Management
A study of policies, procedures, and practices relative to the management of natural resources in parks. Emphasis is placed on an ecological systems approach to management as it relates to parks at all levels of government.
Prereq: REC 334/ERS 334
Cross-listed as ERS 434.

REC 435 3C 0.5
Recreation Resource Policy
A study of polices, policy development and policy gaps related to recreation resources in Canada. Based on a literature review and discussion of decision-making procedures, roles and tools used in the recreation field; students are required to research real and theoretical situations for seminar presentation.
Prereq: REC 230 or consent of instructor

REC 436 3C, 1L 0.5
Marine Recreation and Conservation
Analysis of current issues, management concepts and processes related to recreational use and conservation of coastal and offshore areas. International examples will be used to highlight approaches to conflict resolution.
Prereq: REC 334 or equivalent

REC 455 3C 0.5
Senior Seminar in Therapeutic Recreation
This course is designed to facilitate an in-depth exploration and analysis of philosophical issues and interdisciplinary theories to discuss how they relate to therapeutic recreation practice and research.
Prereq: REC 251, 350, 355 and fourth-year standing

REC 470/471 3C 0.5/0.5
Research Project
An independent research project on an approved topic supervised by a faculty member. Required of all students enrolled in the Honours Recreation and Leisure Studies program.
REC 470 includes an approved design and completion of the first segment of the paper.
Prereq: REC 270, 371
REC 471 requires the completion of the project begun in REC 470.

REC 475 0.5
Directed Study in Special Topics
For the student who desires to pursue a particular topic in depth through guided independent research. A faculty member must approve a student's project prior to registration. Students may take only two directed studies courses for undergraduate degree. See REC 370.
Prereq: Faculty approval

REC 480 3C 0.5
Tourism Planning, Development and Marketing
Covers the role of tourism in economic and community development, and the roles of government and industry in formulating tourism policy. Students learn through case studies and practical assignments.
Prereq: REC 302

COURSES NOT OFFERED 1989-90
REC 323A Advanced Seminar in Leisure Service Management
REC 435 Recreation and Resources Policy

Department of Religious Studies

Associate Professor and Chairperson
M.D. Bryant,3 BA (Concordia College), STB (Harvard), MA, PhD (St. Michael's) R

Associate Professor and Undergraduate Officer
A.F. Thompson, BA (Toronto), BTh (Huron), MA (Western Ontario), STM, PhD (McGill)

Professors
F.C. Gérard,6 MA (College St. Dominique, France), BD, STM (McGill), PhD (Hartford Seminary Foundation) P
J.W. Miller, BA (Goshen), MA (New York), BD (Princeton), ThD (Basel) G

Associate Professors
W.J. Blidstein, BA (Western Ontario), STB (Gregorian), MA (Windsor), STD (Anglicum) J
M.S. Bird1 BA, MA, PhD (Iowa) R
A.L. Evans, BA (Toronto), BD (Emmanuel), STM (McGill), DMin (Andover-Newton) P
M.W. Higgins, BA (St. Francis Xavier), MA, PhD (York), J

R.D. Legge, BA (Transylvania), STB (Harvard), PhD (McMaster) P
M.T. Malone, BA (University College, Dublin), MA, PhD (Toronto) J
D.J. Sahas, BA (Athens), STM (Christian Theological Seminary), PhD (Hartford Seminary Foundation) P
R.J. Sawatsky,2 BA (Bethel, Kansas), MA (Minnesota), MA, PhD (Princeton), G

Assistant Professors
M. Kiley, BA (Boston), STM, PhD (Harvard) J
A.J. Reimer, BA (Manitoba), MA, PhD (St. Michael's) G

Instructors
R. Kooistra, BTh (Kampen), DTh (Amsterdam) P
S.A. MacDonald, BA, STB (Western Ontario), MA (San Francisco) J
T. Yoder Neufeld, BA (Manitoba), MDiv (Harvard) G

Faculty designated with suffix G (Conrad Grebel), J (St. Jerome's), P (St. Paul's), and R (Renison) are located in the respective Colleges.

Faculty Members of Religious Studies holding cross appointments to:
1 Fine Arts
2 History
3 Social Development Studies

Course Descriptions

Recreation and Leisure Studies

Religious Studies

Introductory Note
Numbers below the course description indicate the area of Religious Studies to which the course belongs. Explanation is provided in the Arts program section.

RS 100A-K
Introduction to Religion
An introduction to Religion, religious phenomena, beliefs, ideas, practices and experience through the study of material and examples from the various fields in Religious Studies.

RS 100A, F, W 3C 0.5
Religions of the East
An introduction to the religious traditions of the East: history, religious beliefs and practices of Hinduism, Buddhism, Confucianism, Taoism and Shinto.
Area 1
Religion of ancient Israel as seen in its cultural setting in the ancient Near East.

Area 3

RS 100E F,W,S 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

RS 100F J,F,W 3C 0.5 Biblical Studies 2
A survey of the literature, history and religious thought of the Christian community during the New Testament period as seen in its cultural setting in the Greco-Roman world.

Area 3

RS 100H F,W 3C 0.5 Catholic Theology
A study of the principal teachings of the Christian Faith affecting Catholics today. Topics will include Bible and Tradition; worship and sacraments; authority; changing views concerning laity, women, ministry, and ecumenism.

Area 4

RS 100K F,W 3C 0.5 Introduction to Theology
The basics of Christian theology explored systematically and historically: theological language, revelation and truth, God and creation, sin and the fall, Christ and salvation, tradition and church, consummation and the end of history.

RS 105 F 3C 0.5 Elementary Biblical Hebrew
An introductory course designed to tender a reading knowledge of Biblical Hebrew: the sounds and forms of the language followed by the reading of selected texts from the Hebrew Bible.

Cross-listed as R&C 140-3C Taught at WLU

RS 105B W 3C 0.5 Elementary Biblical Hebrew
A continuation of the introduction to Biblical Hebrew.

Cross-listed as R&C 140-3C Taught at WLU

RS 106A F 3C 0.5 New Testament Greek
An introduction to Greek grammar with appropriate grammatical exercises and development of vocabulary.

Area 3

RS 106B W 3C 0.5 New Testament Greek
A continuation of the study of Greek grammar with an exegetical study of some texts from the Gospel of Mark.

Area 3

RS 200 F 3C 0.5 The Study of Religion
An exploration of the nature of religion through: 1) the history of the study of religion, 2) exposure to varying methods and ways of approaching religious phenomena, and 3) consideration of accounts of religious experience.

Area 3

RS 201 F 3C 0.5 New Testament Greek
A continuation and completion of the study of the Greek Grammar of the New Testament, with appropriate exercises and a number of readings of the Greek New Testament and the Didache.

RS 205 W 3C 0.5 The Hebrew Prophets
A study of the prophetic movement from Amos to Malachi in the historical, social, and religious context of Israel and the ancient Near East.

Area 3

RS 208 F 3C 0.5 The Parables of Jesus
Detailed examination of the stories Jesus told, their form, method, message, and significance for religious thought, past and present.

Area 3

RS 209 W 3C 0.5 The Apostle Paul: Life and Letters
An examination of the career and thought of Paul as seen in his letters and in the Acts of the Apostles.

Area 3

RS 213 W 3C 0.5 Hinduism
A study of the development of religious thought in India from the Vedic Period to the present. The course will combine an historical survey with a study of representative texts from the religious, philosophical, social and political thought of the Hindus.

Area 1

RS 214 F 3C 0.5 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

RS 215 F 3C 0.5 Religion in China
An historical overview of the primary expressions of Chinese spirituality, from the Ancient Period to the 20th century. Special attention will be given to the interaction between the indigenous traditions (folk religion, Confucianism, Taoism) and Buddhism.

Area 1

RS 220 F 3C 0.5 Evangelical Christianity
A descriptive, historical and theological review of the wing of North American Christianity known as evangelicalism, fundamentalism, or revivalism.

Area 2

RS 221 W 3C 0.5 Sects, Cults and New Religious Movements
An analysis of minority religions considered deviant by the dominant society such as the Amish, Mormons, and Jehovah's Witnesses with special consideration of the recent new religious movements including Unification (Moonies), Scientology and Krishna consciousness.

Cross-listed as SOC 263 Area 5

RS 229 F 3C 0.5 The Cult of Mary
This course will explore the origins, development and forms of the cult of Mary in the Christian tradition with particular focus on contemporary insights and concerns.

Area 4

RS 229 F 3C 0.5 The Cult of Mary
This course will explore the origins, development and forms of the cult of Mary in the Christian tradition with particular focus on contemporary insights and concerns.

Area 4
RS 230 F,W 3C 0.5
History of Christianity
The development of Christianity in its Roman Catholic, Eastern Orthodox and Protestant traditions from the time of Christ to the present.
Cross-listed as HIST 235
Area 2

RS 231 W 3C 0.5
History of Christian Thought
An analysis of the major theological developments in the Christian traditions from the apostolic era to the present.
Area 4

RS 236 F,W 2C,1D 0.5
Human Sexuality and Christian Morality
An investigation of the moral implications of an evolving sexual consciousness in the Christian tradition.
Prereq: Second year standing or consent of instructor
Area 4

RS 256 W 3C 0.5
Current Ethical Issues
An examination of specific current individual and social problems such as human sexuality, social justice, urban decay, and human rights, in the light of Christian moral consciousness.
Area 4

RS 257 F 3C 0.5
The Thought and Practice of Christian Peacemaking
An introduction to historical and current Christian thought and practice of peacemaking; focus on persons, movements, organizations, and on issues like pacifism, non-resistance, non-violent resistance, and on the spirituality of peacemaking.

RS 260 W 3C 0.5
Issues in Science, Technology and Religion
A study of the questions raised by the interaction of religious faith with modern scientific and technological approaches to understanding the physical, social and psychological dimensions of our world.
Area 5.

RS 266 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 FINE 252
Film fee $5.00.
Area 5

RS 267 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 FINE 253
Film fee $5.00.
Area 5

RS 269 F 3C 0.5
The Religious Art of India
An approach to understanding the myths, symbols and spirituality of Indian religion through a study of representative art, architecture and folk literature of Hinduism, Jainism, and Indian Buddhism.
Cross-listed as FINE 218A
Area 5

RS 270 F 3C 0.5
Psychology of Religion
A study of theories of the psychological nature of religious experience, the sources of religious belief and the religious significance of psychological phenomena. Topics include faith, doubt, evangelism, conversion, faith healing, mysticism, drugs and religious experience, tongues-speaking.
Area 5

RS 271 W 3C 0.5
Personality and Religion
A study of the psychology of personality in its relationship between personality and religious thought, experience and behaviour.
Area 5

RS 272 W 3C 0.5
Sacred Places
From Mecca to Benares, Stonehenge to Chartres — a consideration of sacred cities, shrines, rivers, mountains, worship centres and other places which have inspired the spiritual imagination of individuals and communities within various religious traditions.

RS 291 A-D
Studies in the History of Religion
Consult Department for offerings 1989-90.

RS 292 A/B J,F,W 0.5/0.5
Women in the Church
A multi-disciplinary examination of the evolution of the relationship between women and the church in the Christian tradition.
Area 5

RS 293A/B F/W 3C/3C 0.5/0.5
Religious Experience of the Young
A multi-faceted examination of the religious development of the pre-adult, including such considerations as the moral, psychological, philosophic, sociological, sacramental and spiritual aspects.
Area 5

RS 298
Directed Reading in Special Subjects

RS 302 F,W 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.
Prereq: RS 100F or consent of instructor
Area 3

RS 305B W 3C 0.5
Intermediate New Testament Greek
Prereq: RS 106 or consent of instructor.
Area 3

RS 307A A-D
Selected Topics in Biblical Studies
Special topics will be offered in the Winter, 1989-90. Consult Department.
RS 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: RS 100F or consent of instructor
Area 3

RS 311 W 3C 0.5
Hindu Scriptures
Selected Vedic Hymns and Upanishads, as well as the Bhagavad Gita and Ramayana will be read in translation and analyzed with the help of a variety of modern commentaries.
Prereq: RS 100A or 213
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
Cross-listed as HIST 348

RS 331A F 3C 0.5
The Church in the Modern World
A study of the recent transformation of the Roman Catholic Church through the events, movements, personalities, and historical realities of the past fifty years.
Area 2

RS 331B W 3C 0.5
The Church in the Modern World
A critical study of the church’s roles in contemporary secular society.
Area 2

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 340 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 2

RS 350 W 3C 0.5
Christian Spirituality and Mysticism
A study of the spiritual experience and mystical knowledge of great Christian mystics, from the desert fathers and Hesychasts in the Eastern Orthodox tradition to the mystical schools of the Western Catholic tradition.
Prereq: RS 230 or 231 or consent of instructor
Area 2

RS 355 W 3C 0.5
Interreligious Encounter and Dialogue
A study of the encounter and dialogue of men and women of different faiths, emphasizing movements, figures and ideas central to the contemporary scene. Both bilateral, for example, Christian-Buddhist, and multilateral developments will be explored.
Prereq: RS 200 or 221, or courses in Eastern religions, or consent of instructor
Area 5

RS 365 W 3C 0.5
Interreligious Encounter and Dialogue
A study of the encounter and dialogue of men and women of different faiths, emphasizing movements, figures and ideas central to the contemporary scene. Both bilateral, for example, Christian-Buddhist, and multilateral developments will be explored.
Prereq: RS 200 or 221, or courses in Eastern religions, or consent of instructor
Area 5

RS 369A-F
Study-Travel Seminar in Religion
Consult Department for offerings
1989-90

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 373 W 3C 0.5
Folk Religion: Custom, Belief and Ritual
This course examines ethnographically aspects of religious practice and expression, emphasizing understandings of symbol and belief. Taking the perspective of folklore theory, it looks particularly at socio-cultural contexts, performances, practitioners and expressive creations.

RS 375 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.
Prereq: RS 270 or 271 or consent of instructor
Area 5

RS 382 W 3C 0.5
Theology of Marriage
A study of the development of the theology of marriage in the Christian tradition.
Prereq: RS 236/256 or 281/282 or consent of instructor
Area 4

RS 383 W 3C 0.5
Shapers of the Roman Catholic Tradition
An examination of some influential thinkers in the Christian tradition who have played a critical role in Roman Catholic theology; including individuals like Augustine, Thomas Aquinas, John Henry Newman, Karl Rahner.
Prereq: RS 100H or RS 230 or RS 231 or consent of instructor
Area 4

RS 398-399 F,W,S
Directed Reading in Special Subjects

RS 400A 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 490B F,W 0.5
Honours Seminar
A continuation of the above.
Faculty of Science

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes

1. The Faculty of Science offers the following courses of a general nature intended for students registered in other Faculties (Arts, Environmental Studies, Engineering, Mathematics, Human Kinetics and Leisure Studies) as well as for Science students desiring electives.

2. Normally, no more than three of the Science credits may be applied towards any Science degree program. (Students in Liberal Science programs may be applied towards any Science degree program.)

SCl 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,1T 0.5
Technical Writing and Speaking
Retrieving information and imparting the information you have to others; the art of speaking and writing; modern aids to producing scientific papers, reports, letters, etc.; and common errors in writing.

SCI 219 F 2C 0.5
Chemistry in Modern Society
The impact of chemistry on modern society will be considered by discussion of a number of topics including: marijuana and other non-medical drugs; food additives; birth 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, the galaxy, galaxies and the universe. Open to first-year or upper-year students.

Not for Engineering, Mathematics or Science students.

SCI 238 W S 3C 0.5
Descriptive Astronomy
A survey course in astronomy intended for Mathematics, Engineering and Science students. Newtonian developments in the solar system, the Sun and planets, stars, the Milky Way, galaxies and cosmology.

Open to first-year or upper-year students in all faculties.

Students interested in the above courses in Astronomy (i.e. SCI 237, 238) should note that because of overlapping material both courses may not be taken for credit, only the one most suitable to their background. Students with a weak background in Physics and/or Mathematics may well find it advisable to take SCI 238 before taking PHYS 275.
SCI 250 W 3C 0.5
Environmental Geology
The influence of geological factors on the natural environment: natural hazards; efforts of engineering works on the environment; geological aspects of water resources and water disposal with particular attention to solid waste (garbage) and deep well injection of liquid wastes.
Prereq: Students will find a course in Physical Geography or Earth Sciences to be an advantage. Students whose major field is Earth Sciences may not take this course for credit.
Antireq: EARTH 358

SCI 251 F 0.5
Human Genetics
An examination of recent advances in human heredity including the genetics, cytological and biochemical aspects of individual inheritance. The principles of human population genetics will be discussed. The social implications of some of the modern discoveries will be stressed.
Students whose major field is Biology may not take this course for credit.
Offered by Correspondence only for 1989-90.

SCI 252 W 0.5
Biology and Society
A topical approach to problems of human society directly related to biological systems. Areas for discussion in any one year will be chosen from a wide range of topics. These will be dealt with both from the theoretical and practical aspects of modern biology. Open to first year or upper year students.
Students whose major field is Biology may not take this course for credit.
Offered by Correspondence only for 1989-90.

SCI 255 W 2C 0.5
The Biology of Aging
An introduction to the biological mechanisms of aging at the molecular, cellular and systemic levels. Topics to be discussed will include the theories of aging, methods for studying the aging process, the role of diseases in aging and chronological changes in organisms during aging.
Cross-listed as GERON 255

SCI 260 W 3C 0.5
The Science of Senses
Vision, hearing, smell, taste and other senses. A multidisciplinary view of some of the basic principles underlying these, with emphasis upon concepts which are common to all senses. Various aspects of the senses (e.g. social consequences of sensory impairment, aesthetics, historical theories of sensory function) are discussed and demonstrated.
Liberal Science Core Course

SCI 261 W 3C 0.5
Models in Science
Origins and rise of some important scientific models. Resistance to and acceptance of new models. Strengths and weaknesses of some current models. Examples will be drawn from three different areas of science, and may vary from year to year.
Liberal Science Core Course

SCI 263 F 3C 0.5
Science and Society
Social and economic impacts of science. Analysis of biotechnology as an area of science expected to have substantial impacts on modern society. Aspects of this issue will be critically examined in this team-taught, multi-disciplinary course.
Prereq: Successful completion of one year of Honours or General studies.
Year One students will not be admitted to this course.
Liberal Science Core Course

SCI 265 W 3C 0.5
Scientists and the Science Community
Professionalism, ethical and political issues, and other aspects of how science is done will be raised. Memoirs and other writings of scientists about their science will be included in the readings.
Prereq: Successful completion of one year of Honours or General studies.
Year One students will not be admitted to this course.
Liberal Science Core Course

SCI 267 F 3C 0.5
Topics in History and Philosophy of Science
Selected areas or cases chosen may vary from year to year. Current theme: measurement.
Liberal Science Core Course

SCI 268A-Z
Experimental Course
Occasional courses, for example taught by a visiting faculty member, or under development for future permanent status.
Liberal Science Core Course

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 351 F.W,S 0.5
Human Biology 1
An introduction to selected topics in human physiology and consideration of factors that influence normal physiological function. Topics discussed include the structure and mechanisms of action of nerves, muscles, the cardiovascular and respiratory systems.
Antireq: BIOL 273 (Formerly BIOL 233)
Offered by Correspondence only for 1989-90.

SCI 352 F.W,S 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 273 (Formerly BIOL 233)
Offered by Correspondence only for 1989-90.

SCI 355 F 2C 0.5
Biological 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.
Offered in 1989 and alternate years thereafter.

SCI 360 F.W 1T 0.5
Liberal Science General Essay
Details available from the Liberal Science Office. For students in their third year of Liberal Science only.
SCI 410 0.5
Technical Report
(for Students in Co-op Applied Chemistry, Co-op Applied Physics, Co-op Applied Earth Sciences, Co-op Biology and Co-op Biochemistry only)
Technical reports covering work-term assignments are submitted by all Co-op Science students. These will be carefully evaluated for technical content and writing ability. Students admitted to a Co-op program with advanced standing should consult with the Department of Co-operative Education regarding sequence of work terms and satisfaction of work report requirements. A word Grading system will be used and will range from Excellent to Unsatisfactory. This course will be added to the student's transcript at the completion of Year 4 and will be given 0.5 course credit; this credit is in addition to the regularly required number of course credits shown in the program listings.

SCI 453 F 2C 0.5
Marine Ecosystems and the Human Impact
Study of the oceans from a biological point of view, and consideration of the effects of exploitation and pollution upon the animals and plants that inhabit them.
Students whose major field is Biology may not take this course for credit.

SCI 454 W 2C 0.5
Biology of Freshwater Pollution
Study of lakes, rivers and streams from a biological point of view, and consideration of the effects of pollution upon the animals and plants that inhabit them.
Not available to students who have taken BIOL 451.
Students whose major field is Biology may not take this course for credit.

SCI 462 F 2C 0.5
Biology of Food Production
A survey of world food production from the biologist's viewpoint. Topics: nutrition; food chains; origins of agriculture; basic plants and animal food crops; primitive and modern scientific agricultural practices and the environmental implications of each.

SCI 468A/B F.W 2C 0.5/0.5
Liberal Science Senior Seminar
A forum for intensive discussion of topics of interest with resident or visiting speakers.
Prerequisite: Year Four standing in Liberal Science or in another program with consent of instructor. Enrolment may be limited.

SCI 469 F.W 1T 0.5
Liberal Science General Essay
Details available from the Liberal Sciences Office. For students in their final year of Liberal Science only.

COURSES NOT OFFERED 1989-90
SCI 201 Contemporary Science 2
SCI 202 Energy
SCI 312 Physics of Music 1

Social Development Studies

Professor, Principal of Renison College
I.L. Campbell,* BA (Carleton), MSc (Econ) (London), FRSA, R

SCI 201 Contemporary Science 2
SCI 202 Energy
SCI 312 Physics of Music 1

Sessional Associate Professor
J.T. Harris, BMus (Temple), MSW (Pennsylvania), R

Assistant Professors
T. Bronner, BA (Waterloo), MSW (WLU), R
J. Majonis, BA, MA (CUNY), MSW (SUNY, Albany), PhD (Toronto)
K. Mott, BA (WLU), BD (Union Theo., Vancouver) MSW (SUNY, Buffalo)

Lecturers
M. Campbell, BA, MA (Waterloo), R
P. Derry, BA, MA, PhD (Western), CPsych, R
R. Finch, BA (UW), MSW (WLU), R
C. Gillin, BSc (Pittsburgh), MA, PhD (Windsor)
P. Gove, BA (Waterloo), BSW (WLU), R
C. Hollidge, BA (Waterloo), MSW (WLU), R
N. Millard, ARTC (Royal Conservatory), BA, MSW (WLU)
M. Pejmer, BA (Waterloo), MSW (WLU)
D. Pulman, BRe (Briercrest), MDiv (Tilburg), MA (Waterloo), R
J. Turner, BA, DSW, MSW (Toronto), R
V. Wall, BA, MSW (Toronto)
A. Wilson, BA (Clarke), MA (Iowa), MSW (WLU), R
J. Zinkann, BA (Toronto), LLB (Osgoode), MWS (WLU), R

Adjunct Faculty
B. Abbott, BA (Waterloo), MSW (WLU), R
J. Bambreck, BA, MA (Guelph), PhD (Windsor), R
B. Bell-Rowbotham, BA, MA (Western), R
A. Bross, BA (Waterloo), MSW (WLU), R
L. Fusco, BA (Hofstra), MA (Chicago)
D. Payne, BA (Sir George Williams), MSW (WLU), R
M. Thompson, STh (Wycliffe), RN (Wellesley), BA (Waterloo), MSW (WLU), R

Faculty Members of Renison College holding cross appointments to:
1 Political Science
2 Religious Studies
3 Geography
4 Psychology
5 Sociology
6 Fine Arts
R refers to faculty members at Renison College.
Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

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,W,S 3C 0.5
Lifespan Processes: The Normal Events
An examination of the significant psychosocial events during the lifespan with consideration of the impact of crises. Topics may include attachment, loss, stress, identity crisis, role change, mid-life transition.

ISS 220R W,S 3C 0.5
Changing Concepts of Childhood
Childhood has changed as a social and cultural concept. This course will trace these changes, examining sociological, psychological, cross-cultural, historical and political factors. Art and literature will also be used to reflect attitudes about childhood.

ISS 250R F 3C 0.5
Social Statistics
This introductory level statistics course will emphasize the collection, manipulation, descriptive presentation and statistical analysis of social research data using a variety of qualitative and quantitative methods.

Prereq: Second year standing and at least two term courses in the social sciences or consent of the instructor

See overlapping content note (Grading Systems, item 6) on page 9:7

ISS 251R W 3C 0.5
Social Research
Introduction to the philosophy and methodology of applied social science research including treatment of the problems and strategies of research design and execution.

Prereq: Second year standing and at least two term courses in the social sciences or consent of the instructor
ISS 250R or its equivalent also recommended.

ISS 320R F 3C 0.5
Critical Encounter with the Nature of Man
An attempt to increase students' understanding of human nature and deepen their awareness of some fundamental issues in the life of 20th century man. The approach is interdisciplinary with emphasis on such themes as the meaning of self-knowledge, loneliness and anxiety, freedom and purpose in human life, and the nature of human happiness.

Prereq: Courses in at least one of the Social Sciences or Philosophy, or consent of instructor.

ISS 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. Relating on research, popular literature, and life experiences, students examine social change, the future, adult development and adjustment.

Prereq: ISS 150R or consent of instructor

ISS 350E F,S 3C 0.5
Family Law and Social Work
Consideration of the court system; investigation of divorce mediation, court mandated custody, access and juvenile predispositional assessment, child welfare, psychiatric advocacy, corrections, and highlighting of professional, ethical, confidentiality, civil and criminal liability issues for social workers.

Prereq: Second-year standing

ISS 350H S 3C 0.5
Values and the Contemporary Family
An exploration of how religious, economic, political and other social institutions shape values in our society, and what impact society's changing values are having upon marriage and the family.

Prereq: At least two social science courses
Cross-listed as SOCWK 350H

ISS 398R/399R F,W,S R 0.5/0.5
Independent Study
Interdisciplinary focus, in greater depth than is available in other courses, on a selected area of concern to the student. Available to individuals or small groups of third or fourth year Social Development Studies students and arranged with one of the program's faculty members.

Prereq: Permission of Undergraduate Officer

ISS 499A/B F,W,S T 0.5/0.5
Senior Honours Essay
The essay will normally be related to the student's chosen theme area, supervised by one faculty member, and critically examined by faculty from all areas of the program.

Prereq: Open to senior honours students only
A letter grade for ISS 499A will be submitted only after the completion of ISS 499B

PSYCHOLOGY

PSYCH 120R F .3C 0.5
Introductory Psychology
Basic concepts and techniques of modern psychology as a behavioural science, with special emphasis on social aspects of behaviour. Topics may include the nervous system, perception, learning, memory, cognition, motivation, emotion, development, personality, social influences, psychopathology and psychotherapy.

Students may receive credit for only one of PSYCH 120R or PSYCH 101

PSYCH 121R W 3C 0.5
Introductory Psychology (Special Topics)
A continuation of PSYCH 120R with in-depth study of some selected topics.

Prereq: PSYCH 120R
Students may receive credit for only one of PSYCH 121R or PSYCH 102

PSYCH 322R F 3C 0.5
Personality Theory
An examination of the major theories of personality including consideration of the psychoanalytic, dispositional, humanistic, and behavioural models.

Prereq: An introductory Psychology course
Cross-listed as PSYCH 355
Students may receive credit for only one of PSYCH 322R or 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 as PSYCH 357
Students may receive credit for only one of PSYCH 323R or PSYCH 357
THEORIES OF INDIVIDUAL COUNSELLING

An introduction to the methods, theories and problems in individual counselling psychology.

Prereq: An introductory Psychology course

SOCWK 221R F,W,S 3C 0.5
Social Casework I
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 222R F,W,S 3C 0.5
Social Group Work
Presentation of some of the theoretical constructs necessary for an understanding of social group work as well as an introduction to methodology and interventions.

Prereq: SOCWK 120R or consent of instructor

SOCWK 230R W 3C 0.5
A Christian Perspective on Social Work Practice
The course explores the relevance and impact of the Christian faith in social work practice and examines some of the ethical issues and value conflicts facing the Christian and non-Christian social worker in practice today.

Prereq: SOCWK 120R or consent of instructor

SOCWK 320R W 3C 0.5
Social Casework II
Considers some of the intellectual components of the social work skills necessary for working with individuals. Social work theories of the individual will be examined in order for the student to learn some clinical applications relevant to the casework relationship.

Prereq: SOCWK 220R or consent of instructor

SOCWK 321R F,W,S 3C 0.5
Social Work with Families
Presentation of some of the theoretical constructs necessary for an understanding of the family in the social work relationship as well as an introduction to methodology and interventions.

Prereq: SOCWK 120R or consent of instructor

SOCWK 322R F,W,S 3C 0.5
Community Organization I
An examination of social work practice as it relates to functional and geographical communities. The course will explore the theoretical foundations of organization practice as well as a variety of models.

Prereq: SOCWK 120R or consent of instructor

SOCWK 326R F 3C 0.5
Philosophy and History of Social Welfare
Social welfare from early civilization to the present. The effects of religious, political, economic, and cultural factors on social welfare development and the continuing influence of inherent attitudes, philosophies and values on this complex institution. Focus on the Canadian social welfare system.

Prereq: SOCWK 120R or consent of instructor

SOCWK 350D F,W 3C 0.5
Social Casework III
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.

Prereq: SOCWK 320R and consent of instructor

SOCWK 350E F 3C 0.5
Social Casework Techniques
Theoretical and practical consideration of conceptual and interpersonal techniques relevant to the practice of clinical social work. Topics may include formation and use of case histories, interviewing, treatment plans, therapist-client contracts, process-recording, client disengagement.

SOCWK 350F F,W 3C 0.5
School Social Work
The history, theory and practice of school social work in North America, particularly in Ontario. Applying theories to cases, students learn how the school social worker helps children confront problems like family breakdown and school phobia.

Prereq: SOCWK 120R
SOCWK 350H S 3C 0.5
Values and the Contemporary Family
An exploration of how religious, economic, and political and other social institutions shape values in our society, and what impact society's changing values are having upon marriage and the family.
Prereq: At least two social science courses
Cross-listed as ISS 350H

SOCWK 355R F,W,S,J 3C 0.5
Child Maltreatment: Identification and Prevention
The objectives of this course are to provide an understanding of the dimensions and causes of child maltreatment, to develop skills identifying cases of this social problem and to explore current methods of management and treatment of persons involved in child maltreatment situations.
Prereq: SOCWK 120R or consent of instructor

SOCWK 356R F,S 3C 0.5
Mental Retardation and the Family
A critical application of social work theory to real situations involving the social, emotional and physical functioning of the family that has a mentally retarded member. Will also include consideration of the impact of current social policies.
Prereq: SOCWK 120R or consent of instructor

SOCWK 357R W,J 3C 0.5
Family Violence
An application of the principles and models of medical, psychogenic, and sociogenic adjustment to an understanding of family violence. The treatment of victims of family violence, the prevention of such violence, and social policies affecting family welfare are considered.
Prereq: SOCWK 120R or consent of instructor
Antireq: SOCWK 350B

SOCWK 358R 3C 0.5
Medical Social Work
Analysis of social work in the medical setting, concentrating on identification and treatment of emotional, family, and community aspects of illness. Emphasis is on the concrete application of professional social work to health care while comparing medical and social work values and concepts of illness.
Prereq: SOCWK 120R or consent of instructor

SOCWK 360A/B J,J 3C/3C 0.5/0.5
Family Violence: An Advanced Seminar
Social Work concepts and practices introduced in preceding family violence courses will be considered in depth. Over the course of two terms a seminar format will be used to explore etiological and intervention issues pertaining to the various forms of family violence.
Prereq: SOCWK 355R and 357R or consent of instructor
A letter grade for SOCWK 390A will be submitted only after the completion of SOCWK 390B

SOCWK 367R W,S 3C 0.5
Social Work with the Elderly
An examination of social work theory and practice concerning the needs of the elderly. Social work strategies of intervention with the healthy and frail aged will be considered from the individual, group, family, community, and bureaucratic perspectives.
Prereq: SOCWK 120R or consent of instructor

SOCWK 390A/B J,J 3C/3C 0.5/0.5
Family Violence: An Advanced Seminar
Social Work concepts and practices introduced in preceding family violence courses will be considered in depth. Over the course of two terms a seminar format will be used to explore etiological and intervention issues pertaining to the various forms of family violence.
Prereq: SOCWK 355R and 357R or consent of instructor
A letter grade for SOCWK 390A will be submitted only after the completion of SOCWK 390B

SOCWK 398R/399R F,W,S,R 0.5/0.5
Independent Study
An independent in-depth study of a selected area of concern to the student within the discipline of Social Work. Available to individuals or small groups of third or fourth year Social Development Studies students and arranged with one of the faculty members from the program.
Prereq: Permission of Undergraduate Officer

SOCIOLOGY

SOC 120R W 3C 0.5
Fundamentals of Sociology
An examination of the fundamental concepts of Sociology and their application in seeking to understand the changing patterns and life-styles taking place specifically in Canada, and in general, within North American society.
Students may receive credit for only one of SOC 120R or SOC 101

SOC 223 F,S 3C 0.5
Deviance: Perspectives and Processes
The deviance-making process is examined in a variety of social contexts. Examines the emergence of rules and control agencies, the processes by which persons become involved in deviant activities, and the contingent factors affecting their careers as deviants.
Prereq: An introductory Sociology course or consent of instructor

SOC 227R S 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 237R 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 369R W 3C 0.5
The Sociology of Spoiled Identity
Spoiled identity resulting from deviant status inhibits if not prevents acceptance and social mobility. Consequences of spoiled identity, inward status positions, and deviant criminal and "social" adaptations are examined from a symbolic interactionist perspective.
Prereq: An introductory Sociology course

SOC 369R F 3C 0.5
Custodial and Rehabilitative Institutions
"Total institutions" are concerned with resocialization of "inmates". This course considers the structure of maximum security prisons, mental hospitals, isolated work environments and concentration camps, emphasizing their philosophies, their organization, their goals, and their effectiveness in modifying and controlling behaviour.
Prereq: An introductory Sociology course
Course Descriptions

SOC 398R/399R F,W,S 0.5/0.5
Independent Study
An independent in-depth study of a selected area of concern to the student within the discipline of Sociology. Available to individuals or small groups of third or fourth year Social Development Studies Majors and arranged with one of the faculty members from the program.

Prereq: Permission of Undergraduate Officer

COURSES NOT OFFERED 1989-90
ISS 231R Social Ideas, Social Policy and Political Practice 2
ISS 240R Art and Society
ISS 350C Children in Difficulty: Biosocial Perspectives
ISS 350F Values in the Social Sciences
ISS 350I Individualism and the Family Life Cycle
PSYCH 220R Social Psychology
PSYCH 221R Interpersonal Interaction
PSYCH 369R Advanced Topics in Counselling Psychology
SOC 220R The Individual, Society and Religion
SOC 221R Master Trends in Modern Society
SOC 328R Canadian Ethnic and Cultural Minorities
SOCWK 121R Contemporary Social Problems
SOCWK 365R Medical Social Work

Society, Technology and Values

Course Descriptions

STV 100 0.5
Society, Technology and Values: An Introduction
This introductory, team-taught course examines the social implications of new developments in technology. The theme of the course in a particular term is determined by the instructors.

Prereq: None

STV 200 0.5
Society, Technology and Values: Projects Course
A self-directed group learning exercise focusing on a particular technology in its societal context or, alternatively, on a commonly held value and its interaction with one or more technologies.

Prereq: Registration in the STV Option and successful completion of STV 100 or consent of the instructor

STV 400 0.5
Society, Technology and Values: A Senior Project
An independent but supervised research project at the level of a senior honours essay or equivalent.

Prereq: Registration in the STV Option normally at the fourth-year level and successful completion of STV 200

Department of Sociology

Professor, Chairman
D. Kubat, MA (Kansas), PhD (L. Maxmillian, Munich)

Associate Professor, Associate Chairman for Graduate Studies
J. Goyder, BA (Bishop's), MA, PhD (McMaster)

Associate Professor, Associate Chairman for Undergraduate Studies
J. Goyder, BA (Bishop's), MA, PhD (McMaster)

Professors
H. J. Faildell, BA, BSc, MA (Sydney), PhD (Australian National), FRSC, (Retired)*
W. F. Forbes, BSc, PhD, DSc (London), DIC, ARCS
R. D. Lambet, MA, MA (McMaster), PhD (Michigan)
D. McPherson, MA (Western Ontario), PhD (Wisconsin)
C. Redekop, BA (Goshen), MA (Minnesota), PhD (Chicago) G
E. W. Vaz, BA, MA (McGill), PhD (Indiana), (Retired)*
K. Westhues, BA (Conception), MA, PhD (Vanderbilt), Recipient of the Distinguished Teacher Award
A. Wipper, BA, MA (McGill), PhD (California, Berkeley)
J. Zuzanek, MA (Moscow State University), CSc (Prague Institute of Sociology), PhD (Charles University, Prague)

Associate Professors
J. E. Curtin, BA (Sir George Williams), MA (Central Michigan), MA (Cornell)
J. Desroches, BA (Waterloo), MA (Toronto), PhD (Waterloo), J
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, UK), R
R. C. Prus, BA (Manitoba), MA, PhD (Iowa)
M. Shimpo, BA (International Christian, Japan), MA, PhD (British Columbia)
N. Theberge, BA (Massachusetts), MA (Boston), PhD (Massachusetts)

Assistant Professors
P. J. Carrington, BA (Harvard), MA, PhD (Toronto)
Courses not offered in the current academic year are listed at the end of this section.
SOC 216 2C 0.5
Language, Society, and Identity
A sociology of language is provided with particular reference to the relationship between language, (Canadian) society, and identity. Included are various sociolinguistic issues such as the role of language in shaping the (re)construction of diverse realities.

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 221 2C 0.5
Canadian Society
An introductory survey of Canadian society. This course will examine issues in the socio-historical development of Canadian society. Its present social structure, organizations and ideologies.

Formerly SOC 103

SOC 222 2C 0.5
Juvenile Delinquency
A systematic analysis and criticism is presented of biological, psychological, psychoanalytical and sociological theories of juvenile delinquency. Attention is given to statistics and contemporary research with special emphasis on the distribution and types of delinquent subcultures.

Prereq: SOC 101 or consent of instructor

SOC 223 2C 0.5
Deviance: Perspectives and Processes
The deviance-making process is examined in a variety of social contexts. Examines the emergence of rules and control agencies, the processes by which people become involved in deviant activities, and the contingencies affecting their careers as deviants.

Prereq: SOC 101 or consent of instructor

Also offered at Renison College

SOC 224 2C 0.5
Law and Order: Regulating Deviance
Focusing on the "processes and 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 226 3C 0.5
Juvenile Justice
An examination of theories of juvenile justice, juvenile law, and the structure and operations of juvenile systems, especially in Canada.

Prereq: SOC 222 or consent of instructor

SOC 227 2C 0.5
Criminology
An analysis and criticism of the major theories of criminal behavior. Emphasis is given to the relationship between social structure and criminal behavior; types of criminal behavior such as drug addiction, burglary and homicide in contemporary society.

Special attention is given to Canadian data.

Prereq: SOC 101 or consent of instructor

SOC 228 0.5
Sociology of Corrections
Decisions to process offenders and the role of social factors in the Canadian criminal justice system are critically examined. Focal issues include police discretion, the legal profession and prison systems.

Prereq: SOC 101

SOC 231 2C 0.5
Sociology of Science
This course will explore the production of scientific knowledge in its social historical content, using a case study approach. Specific topics will include scientific objectivity, diseases in social context, selective bias and the logic of positivism.

Prereq: SOC 101 or consent of the instructor

SOC 232 2C 0.5
Technology and Social Change
This course relates the prospect of social change to issues such as the division of labour, automation, technology and ecology, "post-industrial" society, small scale technology, workers' control and the domination of nature.

Prereq: SOC 101

SOC 233 2C 0.5
Social Psychology of Beliefs and Attitudes
Examines the sources, organization and distribution of beliefs and attitudes and their significance for the individual and society.

Prereq: SOC 101 or PSYCH 101 or consent of instructor

SOC 234 2C 0.5
Social Psychology and Everyday Life
Introducing students to symbolic interaction, a sociological social psychology. This course examines: the impact of culture on socialization experiences; the development of self-identities and social reputations; and interaction patterns in a variety of casual, occupational and deviance contexts.

Prereq: SOC 101 or consent of instructor

Formerly SOC 104

SOC 236 2C 0.5
Social Movements
The analysis of varieties of social movements and their relationships to social organization and social change.

Prereq: SOC 101 or consent of instructor

SOC 237 2C 0.5
Collective Behaviour
The sociological analysis of the behaviour of crowds, mobs, publics and related phenomena and their relationships to social organization and social change.

Prereq: SOC 101 or consent of instructor

Formerly SOC 106

SOC 238 2C 0.5
Sociology of Marketing and Sales
This course considers the (social) processes by which people "do business". Focusing on day to day exchanges, ongoing relationships within the business and consumer community are examined from an interactionist perspective.

Prereq: SOC 101 or consent of the instructor

SOC 242 2C 0.5
Industrial Sociology
Special emphasis is given in lectures, reading and assignments to the particular problems facing industrial Canada, especially in reference to regionalism, elitism, the multinational enterprise and the problem of foreign ownership.

Prereq: SOC 101 or consent of instructor

SOC 243 2C 0.5
Occupational Sociology
An introduction to the study of work and occupations; the problems of occupational choice, occupational socialization and identification; the concepts of career and career mobility; the professionalization process, the nature of professions; the impact of occupation on life styles, leisure and retirement.

Prereq: SOC 101 or consent of instructor
SOC 245 2C 0.5
**Interpersonal Communication**
An introduction to the process and functions of communication in dyadic or small group settings. Emphasis is directed toward increasing student understanding of communication in face-to-face contexts.
**Prereq:** SOC 101 or consent of instructor

SOC 246 2C 0.5
**Mass Communication**
This course provides an introduction to the social processes and functions of mass media communication — with particular reference to the Canadian context. Emphasis is focused on the relationship between mass communication and the ongoing reconstruction of social reality.
**Prereq:** SOC 101 or consent of instructor

SOC 247 2C 0.5
**Death and Society**
The course deals with the current literature on death and dying. Patterns of mortality as affecting different social groups and as reflecting differential life chances of individuals in society are described. North American issues of death and dying are considered against an historical background.
**Prereq:** SOC 101 or consent of instructor

SOC 248 2C 0.5
**Health, Illness and Society**
The course focuses on the social aspects of health and illness, including social causes of illness, the social process of becoming ill, and the social consequences of being defined as ill.
**Prereq:** SOC 101 or consent of instructor

SOC 249 3C 0.5
**Sociology of Mental Disorders**
An examination of sociological research and theory in the field of mental illness, especially as it relates to the family. Such topics as psychiatric hospitals, public attitudes and social stigma, aftercare and rehabilitation, and the epidemiology of mental illness will be examined.
**Prereq:** SOC 101 or permission of the instructor
Offered at St. Jerome’s College

SOC 250 3C 0.5
**Contemporary Japanese Society**
An introduction to the basic institutions and cultural values in contemporary Japanese society. Topics will include family, community, religion, education, work, social stratification, ethos, and the economic behaviour of Japan overseas.
Offered at St. Jerome’s College

SOC 252 2C 0.5
**Migration and Society**
An overview of international migration, particularly during this century; a survey of statistical sources and theoretical explanations of migration. A section of the course will be on the history of immigration to Canada, migration within Canada, and Canadian immigration policies in the context of world migration.
**Prereq:** SOC 101 or consent of instructor

SOC 253 2C 0.5
**Population in Canadian Society**
Study of the basic demographic processes in the population of Canada. Demographic implications for selected social institutions. Use of Canadian enumeration and registration data.
**Prereq:** SOC 101 or consent of instructor

SOC 254 2C 0.5
**Comparative Social Structure**
General theoretical and methodological issues facing comparative sociology; comparative methods at work in the treatment of Western and non-Western societies (including Canada).
**Prereq:** SOC 101 or consent of instructor

SOC 256 2C 0.5
**Ethnic and Racial Relations**
Relations between different racial and cultural groups, analysis of majority-minority group status with special reference to Canada.
**Prereq:** SOC 101 or consent of instructor
Offered at St. Jerome’s College

SOC 263 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 R S 221
Offered at Conrad Grebel College.

SOC 284 2C 0.5
**Sociology of Religion**
Religion is defined broadly and its relation to phenomena like totalitarian movements, psychoanalysis and drug experience examined. The features common to all religions are explained, viz. myth, dogma, church, ritual, ethics and religious experience.
**Prereq:** SOC 101 or consent of instructor
Also offered at St. Jerome’s College.

SOC 265 2C 0.5
**Political Sociology**
The sociological analysis of the institutionalization of power, political movements, parties, conflict and its accommodation.
**Prereq:** SOC 101 or consent of instructor

SOC 266 2C 0.5
**Sociology of 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 267 2C 0.5
**Social Statistics**
A basic course in sociological statistics, sampling, central tendency, probability, co-variance, as illustrated in specifically sociological data.
**Prereq:** SOC 101 or consent of instructor
See overlapping content note (Grading Systems, item 6) on page 8:7

SOC 280 F,W 2C,2L 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 307 W 2C 0.5
Problems in Contemporary Education
A study of problems arising from the interplay between institutionalized education and the forces of rapid social change in the contemporary society. It emphasizes the changing roles of the learners and instructors and social dimensions of newer learning theories and programs. Themes will be selected and studied in depth on a seminar basis. 
Prereq: SOC 101 and 207
Offered at Conrad Grebel College.

SOC 310 2S 0.5
Seminar in Group Dynamics
An analysis of naturally occurring and experimental groups from a social structural perspective. The study of processes of internal differentiation, integration, authority, etc, and the relationships between small groups and their environments.
Prereq: SOC 101 or consent of instructor

SOC 321 F.W C 0.5
Methods 1
An introductory survey of the research techniques employed by sociologists. The formulation of research designs appropriate to various kinds of intellectual problems in social science is stressed. Equivalent to: ERS 150, PSCI 315, PSYCH 291, REC 270A, ISS 251R.
Prereq: SOC 101 or consent of instructor

SOC 322 W 2C 0.5
Methods 2
Continuation of Methods 1. The course involves seminar meetings emphasizing the critical evaluation of research techniques.
Prereq: SOC 280 and SOC 321 or consent of instructor

SOC 329 2C 0.5
Crime as Business
Examines the interrelatedness of crime and business, looking not only at the extent to which (1) crime represents business for its practitioners and (2) the criminal activities of legitimate business people, but also (3) the agencies regulating crime.
Prereq: SOC 101 and 1 Sociology course in the 220 series

SOC 332 2C 0.5
Canadian Multiculturalism
A seminar dealing with multicultural attitudes and beliefs in Canadian society, especially within the majority English and French Canadian populations.
Prereq: An introductory course in a Social Science

SOC 336 2C 0.5
Sociology of Professions
An examination of the distinctive nature of professions, professional recruitment, socialization and identification, professional careers, the professionalization of occupations, relationship to government, professional specialization, status, power and mobility of professionals.
Prereq: SOC 101

SOC 340 2C 0.5
Complex Organizations
Examines the role of large-scale organizations in industrial society, and their impact and influence. Illustrations will be drawn from commerce and industry, as well as education, health services, and government.
Prereq: SOC 101 and SOC 242

SOC 342 2C 0.5
Sociology of Industrial Relations
Using sociological concepts and theories, the course will examine the nature of the relationship between employers and employees, current issues facing unions and management, and the character of accommodation which may be realized between the two.
Prereq: SOC 101 and SOC 242

SOC 343 2C 0.5
Sociology of Health Care
Examination of the organizations which provide health care, including assumptions under which they operate, interactive roles played by all members, including patients, alternative arrangements for providing health care, and the social positions held by health professionals.
Prereq: SOC 101 or consent of instructor

SOC 344 3C 0.5
Sociology of Aging
An introduction to individual and population aging. Topics discussed include: aging from an historical and comparative perspective; aging in subcultures; aging and the social structure; aging and social processes; aging and the environment; work and retirement; and aging and leisure patterns.
Prereq: SOC 101 and 1 other Sociology course
Cross-listed as KIN 352

SOC 347 3C 0.5
Sociology of Leisure
Nature and extent of leisure phenomena in contemporary society. Examination of institutional and formal organization aspects, social role, social research strategies employed in the study of leisure.
Prereq: Two term courses in sociology
Cross-listed as REC 201

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 203 and KIN 252

SOC 354 2C 0.5
World Population Problems
Comparative analysis of population problems across societies. Focus is on social institutions and their relationships to population. Emphasis on fertility and family planning.
Prereq: SOC 101 and SOC 253

SOC 360 2C 0.5
Social Psychology and Political Participation
A seminar examining the relations between the social psychological characteristics of Canadians and their political behaviour, with an emphasis on public opinion and voting.
Prereq: SOC 101 or consent of instructor

SOC 364 2C 0.5
Social Change
A systematic review and analysis of sources, patterns, processes, and consequences of social change in developing countries, the role of ideas, and the breakdown and reorganization of social structure.
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 W 2C 0.5
Sociology of Law
Special attention will be paid to the growing public awareness of the failure of law to provide justice or social control in a number of situations. Local judges, lawyers and police officials are invited to discuss such issues as the jury system, police and violence, civil rights and mass media.
Prereq: Third-year standing or by permission
Offered at Conrad Grebel College

SOC 371 3C 0.5
Philosophy of Social Science
Problems about the fundamental methods and aims of the social sciences generally, the problems specific to Psychology, Sociology, Political Science, etc., and their relations to one another will be considered.
Prereq: Some previous work in a Social Science or in Philosophy
Cross-listed as PHIL 362

SOC 378 3C 0.5
Sociology of Women
An examination of the growing sociological literature on women's roles, experiences, realities, problems and challenges. Particular emphasis is placed on critiques of traditional sociological theory and methodology and the emergence of new theories and methodologies which better reflect women's experiences.
Prereq: SOC 101 and 206, or consent of instructor

SOC 382 3C 0.5
Survey Methodology
The design of sample surveys. Survey procedures from the conceptual level through sampling, measurement, questionnaire design, administration and analysis of responses are illustrated within the context of practical examples and student projects.

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 305 is recommended)

SOC 410 2C 0.5
Qualitative Methods: Field Research
An application of symbolic interactionist theory, this course examines the contingencies affecting data collection and analysis of ongoing group life. While doing field work, students have an opportunity to examine basic features of interactionist thought.
Prereq: SOC 101
Formerly SOC 380

SOC 411 2C 0.5
Sociological Inquiry
This course gives students practical experience in the formulation and execution of research questions. Emphasis is on integrating theory into research. A seminar format tutors the course to student interests, allowing students to work out research ideas using feedback from the seminar. The class assignment will allow for rewriting and modification and could be used as the basis of honours essays, graduate work or preparation for employment.

SOC 415 2C 0.5
Social Networks
A survey of applications of the concept of the network in studying social structures. Examples will be drawn from diverse areas, such as interpersonal relations, community studies, social support, interorganizational relations, elites, deviant groups, etc.
Prereq: SOC 101 or consent of instructor

SOC 421 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 280 or equivalent or consent of instructor
Formerly SOC 381

SOC 440A-X S,F,W 0.5
Directed Readings
Selected readings and essay assignments under the direction of a faculty member.
Prereq: Fourth-year standing in Sociology

SOC 440A F,W,S 0.5
Directed Readings in Deviance, Criminology, and Corrections.

SOC 440B F,W,S 0.5
Directed Readings in Social Psychology

SOC 440C F,W,S 0.5
Directed Readings in Social Inequality

SOC 440D F,W,S 0.5
Directed Readings in Quantitative Methods and Statistics

SOC 440E F,W,S 0.5
Directed Readings in Social Theory

SOC 440H F,W,S 0.5
Directed Readings in the Family

SOC 440J F,W,S 0.5
Directed Readings in the Marketplace

SOC 440K F,W,S 0.5
Directed Readings in Industry, Work and Complex Organizations

SOC 440N F,W,S 0.5
Directed Readings in Religion

SOC 440Q F,W,S 0.5
Directed Readings in Demography

SOC 440S F,W,S 0.5
Directed Readings in Developing Nations

SOC 440V F,W,S 0.5
Directed Readings in Sex Roles

SOC 440X F,W,S 0.5
Directed Readings in Medical Sociology

SOC 499A/B F,W,S 0.5/0.5
Senior Honours Essay
Required for all Honours students in Sociology or by election by Joint Honours students in their fourth year. For students electing Honours Sociology (Canadian Studies), the essay should bear on some topic of particular sociological significance for Canadian society.
Prereq: Fourth-year Sociology Honours

A letter grade for SOC 499A will be submitted only after the completion of SOC 499B

Sociology courses offered at Renison College are listed in the Social Development Studies section.
Course Descriptions

COURSES NOT OFFERED 1989-90
SOC 254 Comparative Social Structure
SOC 326 Issues in Third-World Development
SOC 377 Studies in the Sociology of the Mennonites

Spanish

Department of Spanish

Associate Professor and Chairman of the Department
A. Fama, BA (Brock), MA (Western Ontario), PhD (SUNY at Buffalo)

Assistant Professor, Undergraduate Officer
M. Gutiérrez, BA, MA (McGill), PhD (Laval)

Associate Professor
C.M. Fernández, Lic en Arq (Madrid), MA (Tulane), D Lit et Phil Universitas Complutensis (Madrid)

Language Instructor
P. Graham, BA (McMaster)

Participating Adjunct Faculty at Wilfrid Laurier University

Professor
A.A. Borrás, BA (Kentucky), MA (Indiana), PhD (Pennsylvania State)

Assistant Professor
M. Ratcliffe, BA, MA (Carleton), PhD (Toronto)

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Students with a knowledge of Spanish not acquired in an academic institution must write a placement test before registering in a language course.

SPAN 101 F,W 3C,1L 0.5
Introduction to Spanish 1
Intensive drill in the fundamentals of grammar, comprehension and speaking. Some reading, translation and composition. The language laboratory is used as an integral part of the course.

For students with no previous knowledge of Spanish.

SPAN 102 F,W 3C,1L 0.5
A continuation of SPAN 101.
Prereq: SPAN 101 or consent of Department (WLU 101/151-40).

SPAN 201A F 3C,1L 0.5
Intermediate Spanish 1
For students with some knowledge of Spanish. Seeks to reinforce the language, both oral and written, through selections from literary works and grammar review. Language laboratory also used to increase understanding and speaking skills.

Prereq: SPAN 102 or consent of Department (WLU 121/171-30).

SPAN 201B W 3C,1L 0.5
Intermediate Spanish 2
A continuation of SPAN 201A.
Prereq: SPAN 201A or consent of Department (WLU 122/172-03).

SPAN 204 W 3C 0.5
Spanish Civilization 2
A continuation of SPAN 203.
Taught in English.

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 16th 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 16th 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, history and problems of Spanish America from pre-Columbian times to the present.

Taught in English.

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.

SPAN 227 F 3C 0.5
Survey of Spanish American Literature 1
Literary trends and most significant works from the conquest to the 19th century.

Prereq: SPAN 201B (WLU 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. Introduction to commercial Spanish. Essay writing, translation and discussion.

Prereq: SPAN 201B 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 265 F 3C 0.5
Spanish Short Story
Selected stories from outstanding writers in Spain, primarily of the 20th century.

(WLU 204/254-3)

SPAN 266 W 3C 0.5
The Spanish American Short Story
Selected stories from outstanding writers of the 19th and 20th centuries in Spanish America.

(WLU 214/264-03)
The Generation of '98: Fiction
A study of selected works of Valle Inclán, Azorín, Baroja and Unamuno.
Prereq: SPAN 208
(WLU 330/480-20)

SPAN 344 F,W 2T 0.5
Special Topics in Hispanic Studies
By special arrangements, an individual student or a small group of students will follow a course of study under the supervision of a faculty member.
(WLU 317/467-20).

SPAN 351A F 2C 0.5
Advanced Composition and Conversation 1
Writing of essays and discussion based on selected themes or topics relating to Spain or Spanish America.
Prereq: SPAN 251B
(WLU 301/351-20).

SPAN 3452 W 2C 0.5
Advanced Composition and Conversation 2
A continuation of SPAN 351A.
Prereq: SPAN 351A
(WLU 302/352-02).

SPAN 388 F 2C 0.5
Contemporary Spanish American Theatre
A study of the most important dramatists of Latin America. Particular attention will be paid to the political, historical, cultural and esthetic context which form the work studied.
Prereq: SPAN 206
(WLU 309/359-20)

SPAN 497 W 2C 0.5
The Novel in South America
A study in depth of the major novelists of Spanish America outside Mexico, with emphasis on the 20th century.
Prereq: SPAN 228 or consent of Department
(WLU 329/479-20)

COURSES NOT OFFERED 1989-90
SPAN 311A Applied Spanish Stylitics 1
SPAN 311B Applied Spanish Stylitics 2
SPAN326 The Spanish Golden Age: Theatre and Poetry
SPAN333 Modern Spanish American Poetry
SPAN334 Modern Spanish American Prose
SPAN387 Women and Spanish American Literature
SPAN498 The Novel in Mexico

Studies in Sexuality, Marriage and the Family

Associate Professor, Director
P.J. Naus, BA, PhD (Nijmegen), J

Course Descriptions

SMF 201 A/B F,W 3C 0.5/0.5
Introduction to Sexuality and Sex Education
A multidisciplinary examination of human sexuality and sex education.
Offered at St. Jerome's College
Formerly: ARTS 249A/B

SMF 201A F 3C 0.5
Introduction to Sexuality and Sex Education 1
A broad multidisciplinary overview of perspectives on human sexuality.
Formerly: ARTS 249A
Prereq: PSYCH 236

SMF 201B W 3C 0.5
Introduction to Sexuality and Sex Education 2
A multidisciplinary examination of selected topics in human sexuality. The significant principles of sex education and some of its most relevant methods and programs will be discussed.
Formerly: ARTS 249B
Prereq: SMF 201A or PSYCH 236 or consent of the instructor

SMF 202 A/B F,W 3C 0.5/0.5
Introduction to Marriage and the Family
A multidisciplinary examination of marriage and the family.
Offered at St. Jerome's College
Formerly: ARTS 250A/B

SMF 202A F 3C 0.5
Introduction to Marriage and the Family 1
A broad multidisciplinary overview of perspectives on marriage and the family.
Formerly: ARTS 250A

SMF 301A/B F,W 3C 0.5/0.5
Advanced Study of Sexuality and Sex Education
Formerly: ARTS 349A/B

SMF 301A F 3C 0.5
Advanced Study of Sexuality and Sex Education 1
An in-depth and multidisciplinary examination of some theoretical perspectives on human sexuality.
Formerly: ARTS 349B
Prereq: SMF 301A or consent of the instructor

SMF 301B W 3C 0.5
Advanced Study of Sexuality and Sex Education 2
An in-depth and multidisciplinary examination of some special and selected topics in the area of human sexuality and sex education.
Formerly: ARTS 349B
Prereq: SMF 301A or consent of the instructor

SMF 302A/B F,W 3C 0.5/0.5
Advanced Study of Marriage and the Family
An advanced, multidisciplinary examination of some perspectives on marriage and the family.
Offered at St. Jerome's College
Formerly: ARTS 350A/B

SMF 302A F 3C 0.5
Advanced Study of Marriage and the Family 1
An advanced multidisciplinary examination of some theoretical perspectives on marriage and the family.
Formerly: ARTS 350A
Prereq: SMF 202A or consent of the instructor
SMF 302B  W  3C  0.5
Advanced Study of Marriage and the Family

An advanced multidisciplinary examination of some special and selected topics in the area of marriage and the family.

Formerly: ARTS 350B
Prereq: SMF 302A or consent of the instructor

SMF 303A/B  F.W  3C  0.5/0.5
Introduction to Marriage and Family Therapy

An introductory course in clinical intervention in marriage and the family.

Offered at St. Jerome's College

SMF 303A  F  3C  0.5
Introduction to Marriage and Family Therapy 1

This course will examine the clinical treatment of marriages and families by adopting a structural frame of reference and using a family life cycle perspective. The objective is to develop a useful model for intervention in marriages and families.

Prereq: SMF 202A or consent of the instructor

SMF 303B  W  3C  0.5
Introduction to Marriage and Family Therapy 2

Starting from the theoretical basis established in SMF 303A, this course will give students an idea of the practice of marriage and family therapy by having them observe (through viewing videotapes and films) clinical interventions in families and having them role-play strategies for such interventions.

Prereq: SMF 303A or consent of the instructor

SMF 403  W  3C  0.5
Independent Study: Special Topics in Marriage and the Family

An independent, in-depth study, based on empirical research and/or extensive reading, of a topic in the area of marriage and the family. The project must be approved by the academic supervisor of the course prior to registration. Open to students in the SMF Honours option.

Prereq: SMF 302B or consent of the instructor

Department of Systems Design Engineering

Professor, Chairman
M. Chandrashekar, 1 BTech (Indian Institute of Technology, Kanpur), MASc, PhD (Waterloo), PEng

Professor, President of the University
D.T. Wright, BASc (Toronto), MS (Illinois), PhD (Cambridge), DEng (Carleton), LLD (Brock) DSc (Memorial), LLB (Concordia), LHD (Northeastern), PEng

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

Professor, Associate Chairman, Graduate Studies
K.W. Ho, 2 BASc, MASc, PhD (Waterloo), PEng

Associate Professor, Associate Chairman, Undergraduate Studies
M.E. Jerigan, SB, SM, PhD (Massachusetts Institute of Technology), PEng, Recipient of the Distinguished Teacher Award

Professors
W.K. Adrian, 3 Dipl-Ing, Dr-Ing (TH Darmstadt), Dr habil, (Karlsruhe)
M.P. Bryden, 4 SB (MIT), MSc, PhD (McGill)
T.M. Fraser, MB, ChB (Edinburgh), MSc (Ohio State), LMCC, FACPMP, PEng, (Retired)
K. Huseyn, MSc (Istanbul), PhD (London), DSc (Eng)(London), PEng

Recipient of the Distinguished Teacher Award
H.K. Kesavan, BSc, BE (Mysore), MS (Illinois), PhD (Michigan State), PEng

P.H.O.N. Roe, BASc (Toronto), MASc, PhD (Waterloo), PEng
S.S. Sengupta, MA, DPhil (Calcutta)
G.N. Souliu, 5 BASc (Toronto), PEng
T.E. Unry, BE (Madras), MTECH (Kharagpur), Dr Ing (Dresden), PEng
D.A. Winter, 6 BSc, MSc (Queen's), PhD (Dalhousie), PEng
A.K.C. Wong, BSc, MSc (Hong Kong), PhD (Cambridge), PEng

Associate Professors
M.L. Constant, BSc (Toronto), (Retired)
C.K.G. Hahn, MASc (Waterloo)
G.F. Rabideau, BA, MA (Wisconsin), PhD (Purdue), (Retired)
G.J. Savage, BASc, MASc, PhD (Waterloo), PEng

Assistant Professors
P.H. Cilamai, BASc, MASc, PhD (Waterloo)
G.L. Greig, BSc (Queen's), MASc (Wascana), PhD (Toronto), PEng
G.R. Hepple, BASc, MASc, PhD (Toronto), PEng
M. Kamel, BSc (Alexandria), MSc (McMaster), PhD (Toronto), PEng
J.J. Kay, 6 BASc (McGill), MSc, PhD (Waterloo)
J.A. Robinson, BSc (Durham), MSc, PhD (Essex)
H.C. Shen, BMSc (Waterloo), MSc (Toronto), PhD (Waterloo)
D.W. Stashuk, BASc (Waterloo), MEng, PhD (McMaster), PEng

Adjunct Faculty
D.M. Kilgour, 7 BASc, MSc, PhD (Toronto)
T.K. Lim, BSc (Nanyang), MASc (Waterloo), PhD (McMaster)
G.P. Madhavan, BSc, (calicut), MS (Indian Institute of Technology, Madras), PhD (McMaster)
N. Okada, BSc, MASc, DEng (Kyoto)
K. Singhal, BTech (Indian Institute of Technology, Kharagpur), MS, EngScD (Columbia), PEng

Faculty Members of Systems Design Engineering holding cross appointments to:
1Environment and Resource Studies
2Statistics and Actuarial Sciences

Faculty Members holding cross appointments to Systems Design Engineering from:
3Optometry
4Psychology
5Management Sciences
6Kinesiology
7Wilfrid Laurier University
8Environment and Resource Studies

Also has Adjunct appointment
Course Descriptions

Introductory Notes

1. The numbering of Systems Design Engineering courses is as follows:
   a. If the course is given in the "A" term, the number in the units place is odd; otherwise, it is even.
   b. The number in the 10's place refers to the field of the subject matter of the course, according to the following codes:
      1. topics in applied mathematics
      2. computer systems
      3. socio-economic systems
      4. human systems
      5. physical systems
      6. the design of engineering systems
      7. communication and information systems
      8. engineering sciences
      9. laboratories
   c. The number in the 100's place refers to the year in the program in which the student will encounter the course.

2. The majority of Systems Design courses are given on the basis of 3 formal lectures and 1 tutorial hour each week. The department 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
Tutorial
Systems Design first year students will meet with a faculty member designated as their class professor. Performance in assignments, conceptual difficulties with course, interrelation of coursework, later work and engineering practice will be discussed. Non-credit courses.

SY DE 111 F 3C,1T 0.5
Calculus 1

SY DE 112 S 3C,1T 0.5
Calculus 2

SY DE 113 F 3C,1T 0.5
Linear Algebra

SY DE 121 F 3C,1T 0.5
Digital Computation
Introduction to electronic digital computers; hardware and software organization, basic features of Pascal and/or Fortran, examples of efficient algorithms for engineering computation.

SY DE 122 S 3C,1T 0.5
Introduction to Computer Systems
Binary variables and basic logic circuits; computer architecture and machine instructions for small computers; assembly language programming; interfacing with peripheral equipment; current engineering applications of microcomputers.

SY DE 131 F 3C,1T 0.5
Engineering Economics
Cost-benefit analysis, critical path methods, interest, project economics, decision making, utility theory, project organizational theory.

SY DE 142 S 2C,2T 0.5
Introduction to 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 151 F 3C,3L 0.5
Introduction to Systems Design Engineering
Introduction to the ideas and techniques of systems analysis and design. Fundamentals of graphic techniques. The use of graphics as an aid to idea generation in design. Principles of planning, innovation, creation of design solutions, feasibility analysis, solution evaluation and selection. The systems approach to value and utility.

SY DE 161 F 3C,1T 0.5
Statics

SY DE 162 S 3C,1T 0.5
Dynamics

SY DE 164 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, interrelation of coursework, later work and engineering practice will be discussed. Non-credit courses.

SY DE 211 W 3C,1T 0.5
Differential Equations
First-order differential equations, integrating factor, higher order differential equations. Complex variables, forced and free solutions to differential equations, transient and steady-state solutions, applications. Laplace transforms and applications.

SY DE 212 F 3C,1T 0.5
Applied Mathematics for Linear Systems
Models and analysis of linear systems. Discrete time systems, continuous time systems; difference and differential equations; impulse and frequency response. Complex frequency, functions of complex variables, transform domain techniques: Z transform; Fourier analysis, Laplace transform. Transfer functions and frequency response, frequency-domain analysis of linear systems; sampling theory, stability, and linear filters.

SY DE 213 W 3C,1T 0.5
Theory and Applications of Probability

SY DE 214 F 3C,1T 0.5
Theory and Applications of Statistics

SY DE 252 F 3C,1T 0.5
Physical Systems I
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 semi-conductors and terminal characteristics of passive and active components; Kirchhoff's laws; step response of first and second order networks; sinusoidal steady-state analysis using phasors. Applications.

SY DE 284 F 3C,1T 0.5
Fluid Mechanics

SY DE 292 F 2C,3L 0.5
Digital Circuits and Systems Laboratory
Digital systems design, an introduction to digital logic with emphasis on the use and characteristics of integrated circuits. Design of logic systems involving gates, counters, registers, 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 3C,1T 0.5
Introduction to Optimization
Deterministic operations research models. Topics will include: mathematical techniques of unconstrained and constrained optimization, followed by the construction, evaluation and applicability of various models in allocation, inventory, replacement, sequencing and related problems.

SY DE 321 S 3C,1T 0.5
Numerical Analysis and Computer Methods
Introduction to numerical techniques for engineering problems. Topics covered include: source of computational error; solutions to linear and non-linear equations; matrix factorization; eigensystems; numerical interpolation and approximation, numerical integration solution of ordinary and partial differential equations. Introduction to data structures and their application.

SY DE 322 W 3C,1T 0.5
Computer Simulation of Systems
System modelling, simulation techniques for continuous and discrete systems; special purpose computer languages for systems simulation; examples and applications in a variety of areas.

SY DE 332 W 3C,1T 0.5
Mathematical Programming
Theory and algorithms for non-linear constrained optimization problems: convex set, convex functions, convex programming, Kuhn-Tucker conditions, duality, quadratic programming, quasi-Newton methods, geometric programming, dynamic programming.

SY DE 333 S 3C 0.5
Applied Statistics
Multiple regression analysis. Assumptions, use of indicator variables, variable selection techniques, analysis of variance. Introduction to experimental design, including block designs, factorial arrangements of treatments.
SY DE 341  S 2C,1L  0.5
Introduction to Occupational Hygiene
History and development of occupational hygiene. Review of organic chemical terminology. Recognition, evaluation, and control of, and human response to, hazardous chemical and physical agents in the environment.

SY DE 351  S 3C,1T  0.5
Physical Systems 2
The subject matter is similar to SY DE 252 except that the development is based on other physical systems such as mechanical and hydraulic systems. Mixed nodal, state formulation and solution. Relationship to classical approaches to modelling of systems from other physical systems.

SY DE 352  W 3C  0.5
Fundamentals of Data Structures and Algorithms
Data structure techniques and their role in the design of algorithms; arrays, lists, trees and graphs, sorting and searching algorithms, evaluation and analysis of algorithms, application to engineering problems.

SY DE 353  S 3C,1T  0.5
Introduction to Linear Control Systems
A continuation of SY DE 311, with emphasis on stochastic operations. Application of systems theory to the problems of control. The course integrates this study with an exposition of classical control theory.

SY DE 362  W 1C,3L  0.5
Systems Design Workshop 3
A continuation of the Systems Design Workshop sequence for third year students.

SY DE 364  W 3C,1T  0.5
Manufacturing Science

SY DE 366  W 2C,1T  0.5
Aesthetic and Perceptual Aspects of Design
Presentation and discussion of appropriate and possible methods for the designing of systems or artifacts in which aesthetic characteristics and visual form are primary requirements of the design.

SY DE 372  W 3C,1T  0.5
Introduction to Pattern Recognition
Pattern recognition as a process of data analysis. Pattern features as components in a random vector representation. Classification techniques; distance measures in feature space, probabilistic (Bayesian) decision theory, linear discriminants. Clustering and feature extraction. Applications: optical character recognition, speech recognition, industrial robot vision, medical diagnosis, remote sensing and satellite image analysis, fault detection and diagnosis in complex systems such as nuclear reactors.

SY DE 381  S 3C,1T  0.5
Thermodynamics
An introductory course in engineering thermodynamics structured for students in Systems Design. Classical thermodynamics is presented as the systematic study of energy; its use, degradation, and waste. Applications focus on problems of energy and environment. The concepts of statistical thermodynamics are introduced briefly and their connections with information theory are described.

SY DE 384  W 3C,1T,2L  0.5
Materials Engineering
An introduction to the understanding of the properties and applications of engineering materials. Atomic bonding and packing; crystal defects and microstructure; elasticity, plasticity, strength and fracture; strengthening methods and transformations; fast fracture, toughness, fatigue and creep; oxidation and corrosion; case studies of materials in design.

SY DE 391  S 2C,3L  0.5
Analog Circuits and Systems Laboratory
Analog systems design, signal conditioning systems; attenuation; amplification, oscillation, modulation and detection; linear filters. Input-output relationships, transfer functions and frequency response of linear systems. Application to measurement instrumentation.

SY DE 392  W 2C,3L  0.5
Control Systems Laboratory
This course serves as a focus for the complete lab program sequence. The emphasis is on major experiments which are themselves complete systems requiring the application of previous acquired knowledge in areas of sensing, synthesis, control, measurement and evaluation. Experiments are drawn from the digital control or computer control environment and from the analog control environment.

SY DE 401/402  F,W 1C  0.0
Tutorial
Systems Design fourth year students will meet with a faculty member designated as their class professor. Conceptual difficulties, the interrelation of course work and engineering practice will be discussed. Non-credit courses.

SY DE 411  F 3C,1T  0.5
Probabilistic Modelling
A continuation of SY DE 311, with 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 422  W 3C,1T  0.5
Machine Intelligence
The objective of this course is to introduce the students to current intelligent system concepts. Artificial intelligence systems in areas such as natural language understanding, speech understanding, machine vision and learning will be discussed. Methods and tools for building expert systems will be introduced.

Prereq: SY DE 352 or equivalent

SY DE 423  F 3C,1T  0.5
Computer Algorithm Design and Analysis
Design of efficient algorithms and methods for their analysis, mathematical algorithms, string processing algorithms, geometrical algorithms, exhaustive search and traversal techniques, introduction to a lower bound theory and NP-completeness, examples from engineering problems.

Prereq: SY DE 352 or equivalent
Course Descriptions
Systems Design Engineering

SY DE 432 W 3C,1T 0.5
Analysis of Large Systems
Topics include macroscopic modelling of large scale resource and societal systems, decomposition techniques, graph-theoretic and computer based methods of analysis, decision and control problems, other problems concerned with complexity, largeness and aggregation.

SY DE 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 3C,0.5
Time Domain Models for Physical Systems
State equations for two-terminal component systems; time varying and non-linear components; analytical solutions for state models; numerical and analog methods for solution.

SY DE 461 F 1C,3L 0.5
Systems Design Workshop 4
A continuation of the Systems Design Workshop Sequence for fourth-year students.

SY DE 462 W 1C,3L 0.5
Systems Design Workshop 5
A continuation of the Systems Design Workshop sequence for fourth-year students.

SY DE 466 W 3C 0.5
Technological Innovation and Its Management
Factors influencing technological innovation. The environment for technological innovation in Canada. Technological innovation in the corporations. The role of governments and universities. International comparisons.

SY DE 468 W 3C,1T 0.5
Structures and Design
Structural forms. Structural requirements. Statically determinate and indeterminate structures. Basic theorems of linear elastic structures. Methods of analysis: slope-deflection, moment distribution, etc. Applications of Graph Theory to the analysis of structural systems.

SY DE 513 F 3C,1T 0.5
Linear Graph Theory and Applications
Important concepts in graph theory, their properties, relationships among them and useful graph algorithms are given in the context of various applications. Applications include but not restricted to the number of variables for electrical network equations, graph theoretic solutions to electrical network equations, sparse matrix techniques, graph models for fault diagnosis, optimum distribution of traffic through network and other network flow problems.

SY DE 521 F 3C,1T 0.5
Computer Aided Design
Issues and direction in computer-aided design (CAD); fundamental principles and concepts required in actual design and building of CAD systems; state-of-the-art of CAD systems on the market; criteria upon which to evaluate CAD systems. Additional topics such as computer-aided manufacturing, flexible manufacturing and expert systems may be included.

SY DE 533 F 3C 0.5
Conflict Analysis
Techniques from game theory for assessing the social and political influences in engineering decision making. Topics include metagame analysis, games with mistaken information, sensitivity analysis, dynamic games, probabilistic considerations, bargaining and real-world applications of all the foregoing concepts.

SY DE 543 F 3C,1T 0.5:
Engineering Psychology and Human Performance
The purpose of this course is to provide a comprehensive survey of human mental capabilities with applications to computer-human machine interfaces. Topics covered include: signal detection and absolute judgement, decision making, perception of verbal material, non-verbal perception, memory, attention and perception, mental workload, selection of action, reaction time and human error, continuous manual control, process control and automation, learning and skill acquisition.

SY DE 548 W 3C,1T 0.5
Design of Human-Machine Systems
This course will present the fundamental principles of design of human-machine interfaces, with applications to the design of cockpits, control rooms and computer interfaces. The first part of the course will be devoted to display and perception: measurement and specification of light, colour and sound; properties of the visual and auditory systems; signs, symbols and language; auditory and visual display of information. The second part of the course will apply these concepts to design: human limitations on perception, attention, memory and decision making, and the design of displays and intelligent machines to supplement them; allocation of function between human and machine.

SY DE 554 W 3C,1T 0.5
Modelling of Continuum Systems
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.

SY DE 558 W 3C,1T 0.5
Information-Theoretic System Analysis
Maximum Entropy Principle (MEP). Jaynes' formalism, applications to thermo-dynamics, 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.
Women's Studies

Assistant Professor, Director
L. Dorney, BA, MA (Louisville)

Members of the Women's Studies Advisory Board

Professors
P. Forsyth, AR (Mount Holyoke), MA, PhD (Toronto), Recipient of the Distinguished Teacher Award
N.L. Patterson, BA (Washington)
S.M. Weaver, BA, MA, PhD (Toronto)
A. Wipper, BA, MA (McGill), PhD (California-Berkeley)

Associate Professors
J.A. Legault, BSc, MSc (Ottawa), PhD (OKlahoma), Chairperson of the Advisory Board
P.E. Bowers, BA (Queen's), MA, PhD (Illinois)
G. Brude-Finnau, Staatssexamen (Berlin), PhD (Yale)
C.M. Fernandez, Lic en Arq (Madrid), MA (Tulane), D Lit et Phil (Madrid)
V.F. Golini, BA (McMaster), MA (Colorado), PhD (California-Berkeley)
M.C. Howard, BA, MA (Lancaster), PhD (Leicester)
B. Hyma, BS, MS (Madras), MA (Sheffield), PhD (Pittsburgh)
J. Miller, BA, BLS (McGill), MA, MPhil (Waterloo), PhD (York)
A.C. Minas, BA (Radcliffe), MA, PhD (Harvard)
N. Theberge, BA (Massachusetts), MA (Boston), PhD (Massachusetts)
A.F. Thompson, BA (Toronto), BTh (Huron), MA (Western Ontario), STM, PhD (McGill)

Assistant Professors
C.D. Cutler, BSc (Winnipeg), MSc, PhD (Carleton)
S.P. Gunz, BA, LLB, MA (Sydney), MBA (Manchester)
G. Losier, DA, MA (Ottawa), PhD (Paris)
A. Lubiw, BSc (Toronto), MMath (Waterloo), PhD (Toronto)
K.J. MacHardy, BA, MA (Western Ontario), PhD (Berkeley)
G.O. Michalenko, BA, PhD (Saskatchewan)
W.B. Moul, BA, MA, PhD (British Columbia)
J.Z. Segal, BA (McGill), MA, PhD (British Columbia)
M. van Dijik, BA, MA (Wellington), PhD (Toronto)
S. Vethamany-Globus, BSc, MA, MSc (Madras), PhD (Toronto)
C.A. Weaver, BMus, MMus, DMus (Indiana)

Research Associate and Lecturer
R.L. Walker, BSc, MSc (Western Ontario)

Instructor
J. Lowe, BSc (Carleton), Recipient of the Distinguished Teacher Award

Library
S. Bellingham, BA (Waterloo Lutheran), MLS (Western Ontario)

Independent Studies
A. Dagg, BA, MA (Toronto), PhD (Waterloo), Academic Director

University of Waterloo

Since WS 200, the core course of the Joint Option, is an interdisciplinary introductory course to Women's Studies; this course is a team-taught effort. The participating lecturers from other disciplines of Art, Sociology, Psychology, Philosophy, Religious Studies, Economics, Political Science and English may vary each term.

Wilfrid Laurier University

Associate Professor
J. Clarke, BA, MA, PhD (Waterloo)

Independent Studies

IS 101A F.W.S. 1.5 Introductory Independent Research
Each half credit will involve one seminar a week devoted to the philosophy, methodology and practicality of carrying out independent study. Emphasis will be placed upon such different forms of independent study as self-directed learning, problem posing, and critical thinking. In addition, each student enrolled in the course will spend at least seven hours a week of independent research supervised by an IS faculty member or by a consenting supervisor from any of the other academic units on campus.

Prereq: IS students must be in good standing. Non-IS students must be in good standing in an Honours program. Consent of instructor

IS 101B 1.0 Same as above

IS 101C 1.5 Same as above

IS 101D 2.0 Same as above
IS 101E 2.5
Same as above

IS 102A,B,C,D,E F,W,S 1S 0.5 to 2.5
Introductory Independent Research
Continued
Criteria as above.
Prereq: IS 101 and consent of instructor

IS 301A,B,C,D,E F,W,S 1S 0.5 to 2.5
Advanced Independent Research
Each half credit will involve one seminar a week devoted to the philosophy, methodology and practicality of carrying out independent study. Emphasis will be placed upon such different forms of independent study as self-directed learning, problem posing, and critical thinking. In addition, each student enrolled in the course will spend at least seven hours a week of independent research supervised by an IS faculty member or by a consenting supervisor from any of the other academic units on campus.
Prereq: IS 101 or 102 or evidence of ability to undertake advanced individual research and consent of instructor

IS 302A,B,C,D,E F,W,S 1S 0.5 to 2.5
Advanced Independent Research
Continued
Criteria as above
Prereq: IS 301 and consent of instructor
Governing Bodies and University Offices
The Board of Governors

The Board of Governors acts as the governing body of the University and as such has the power to control UW's property and revenues, and the conduct of its business and affairs. Planning and implementation of the physical and operational development of the University, establishment and enforcement of rules and regulations with respect to University property, and designation of University funds are included under the jurisdiction of the Board of Governors.

The membership of the Board of Governors consists of representatives from the University faculty, staff and student bodies, and the community-at-large, as well as appointees from the Lieutenant-Governor-in-Council, and a number of ex officio members.

Officers
Chairman, J.E. Sinclair
Vice-Chairman, D.P. Allison
Secretary, J.W. Brown

Ex Officio
Chancellor, J.P.R. Wadsworth
President, D.T. Wright
Mayor of the City of Waterloo, W.B. Turnbull
Mayor of the City of Kitchener, D.V.P. Cardillo
Regional Chairman, K. Seiling

From the Community-at-Large
D.P. Allison, Kitchener
K. Copeland, Toronto
J.T. Eyton, Toronto
M.F. Garvey, Toronto
J.D. MacDonald, Toronto
D.G. MacLeod, Cambridge
P.D. Mitchell, Waterloo
J.E. Sinclair, Toronto
M. Volker, Waterloo
vacancy

Appointed by the Lieutenant-Governor-in-Council
F.C. Ansley, Toronto
S.C. Basset-Klauber, Toronto
D.H. Haberstroh, Kitchener
A.L. Reitzel, Waterloo
A. Sarlos, Toronto
P.H. Sims, Kitchener
H.W. Sloan, Jr., Waterloo

Staff
R. Grant (Electrical Engineering)
H. Hahn (Biology)

Senate

Senate establishes educational policies of the University including admission standards, policies concerning the qualifications of faculty members, curricula of all courses of instruction, and co-ordination of long-range academic planning.

In order to exercise these powers effectively, a number of Councils and Committees have been created which report to Senate directly. These include Senate Undergraduate Council, Senate Scholarships and Student Aid Committee and Senate Long Range Planning Committee.

Officers
Chairman, D.T. Wright, BASc, MS, PhD, DEng, LL, DSc, LHD, PEng, FCAE
Vice-Chairman, J.A. George, BSc, MSc, PhD
Secretary, J.W. Brown, BA

Ex Officio Members
Chancellor, J.P.R. Wadsworth, LL,D
Chairman, Board of Governors, J.E. Sinclair, BA
President, D.T. Wright, BASc, MS, PhD, DEng, LL,D, DSc, LHD, PEng, FCAE
Vice-President, Academic and Provost, J.A. George, BSc, MSc, PhD
Vice-President, University Services, D.P. Robertson, BComm
Treasurer, D.P. Robertson, BComm
Librarian, M.C. Shepherd, BEd, MA(LS)
Registrar, C.T. Boyes, BA
President, Faculty Association, L.T. Guelke, BSc, MA, PhD
President, Federation of Students, A. Chamberlain, BES
President, Graduate Student Association, K. Morris, BSc, MMath
The Principal or President of each Federated or Affiliated College
I.L. Campbell, BA, MSc (Principal, Renison)
N.L. Choate, CR, BA, MA (President, to June 30, 1989. President-Elect, D.R. Letson, BA, MA, PhD, effective July 1, 1989, St. Jerome’s)
F.C. Gérard, MA, BD, STM, PhD (Principal, St. Paul’s)
R. Lebold, BA, BD, MTh, DMin (President, to June 30, 1989. President-Elect, R.J. Sawatsky, BA, MA, MA, PhD, effective July 1, 1989, Conrad Grebel)

The Dean of each Faculty
R.K. Banks, BA, MA, PhD, Arts
W.C. Lennox, BASc, MSc, PhD, PEng (Engineering)
J.H. Bater, BA, MA, PhD (Environmental Studies)
R.G. Marteniuk, BPE, MA, EdD (Human Kinetics and Leisure Studies)
J.G. Kalbfleisch, BSc, MA, PhD (Mathematics)
D.E. Brodie, BSc, MSc, PhD (Science)

The Dean of Graduate Studies
J.S. Gardner, BSc, MSc, PhD

The Dean of Research
L.A.K. Watt, BSc, MS, PhD (Acting)

Elected Members

Faculty Representatives
To 1989
R.A. George, MA, PhD (Arts)
S.N. Kaira, BSc, MS, PhD, PEng (Engineering)
A.G. Mcellen, BSc, PhD (Environmental Studies)
S.L.J. Smith, BA, MA, PhD (Human Kinetics and Leisure Studies)
D.L. McLeish, BSc, MSc, PhD (Mathematics)
J.A. Legault, BSc, MSc, PhD (Science)
M.W. Higgins, BA, BEd, MA, PhD (St. Jerome’s)
W.R. Maust, BS, BM, MM, PhD, CGC (Conrad Grebel)
M.A. Bennett, BA, FSA, FCIA (At large)
H.K. Ellenton, BSc, MA (At large)
W.R. MacNaughton, BA, MA, PhD (At large)
A. Roberts, BA, MA (At large)

To 1990
D.A. Wilton, BComm, PhD (Arts)
W.A. McLaughlin, BSc, MSc, PhD, PEng (Engineering)
E. Bunting, BA, MA, PhD (Environmental Studies)
P.J. Bishop, BSc, BPE, MSc, PhD (Human Kinetics and Leisure Studies)
C.L. Stewart, BSc, MSc, PhD (Mathematics)
T.B. McMahon, BSc, PhD (Science)
V.F. Golini, BA, MA, PhD (St. Jerome’s)
J. Majoris, BA, MA, MSW, PhD (Renison)
I.F. Blake, BSc, MSc, MA, PhD, PEng (At large)
R.R. Kerton, BComm, MA, PhD (At large)
P.Y. Forsyth, AB, MA, PhD (At large)
G.A. Griffin, BA, MA, PhD (At large)

G.N. Soulis, BASc, PEng (At large)
F.R. McCourt, BSc, PhD (At large)
D.A. Brisbin, BSc, PhD (At large)

To 1991
H.M. Lefcourt, BA, MA, PhD (Arts)
J.D. Apelvich, BE, PhD, PEng (Engineering)
A. Banerji, BA, MArch (Environmental Studies)
I.D. Williams, MS, PhD (Human Kinetics and Leisure Studies)

Student Representatives

Undergraduate
M.K. Lippert (Engineering)
J. Kalfieh (Human Kinetics and Leisure Studies)
B.S. Capstick (Mathematics)
P.D. Obeda (At large)

Graduate
A. Karagiozis, BSc, MSc (At large)
G. Kotturi, BSc (At large)

To 1990
T.J. Jackson (Arts)
S.P. Markan (Environmental Studies/Independent Studies)
B.D. Hamilton (Science)
J.K. Herbert (At large)

Graduate
G. Wang, BASc, MASc (At large)
B.A. Kuntz, BSc (At large)

Alumni Representatives

To 1989
W. Schneider, BASc
S. Wells, BA
R. Whent, BA

To 1991
P. Howe, BA

Board of Governors Representatives

To 1989
vacancy
Note:
More information regarding the Senate and the Board of Governors, their Councils and Committees, may be obtained from the University Secretariat.
Most meetings are open to the University community and are normally announced in the Gazette the week prior to the scheduled meeting date. Senate meets the third Monday of every month, except July and August. Board of Governors meets the first Tuesday of October, February, April and June.

University Offices

Chancellor
J.P.R. Wadsworth, LLD

Chairman, Board of Governors
J.E. Sinclair, BA

President and Vice-Chancellor
D.T. Wright, BASc, MS, PhD, DEng, LLD, DSc, LHD, PEng, FCAE

University Secretary
J.W. Brown, BA

Secretariat
E.M. Barnes
Associate University Secretary
R.J. Bullen, BMath
Associate University Secretary
R.G. Atwater-Hallatt, BA
Assistant University Secretary
D.P. Scheifele
Assistant University Secretary

Internal Audit
J.E. Buochert, BA, CMA
Director

Security
A.L. MacKenzie, BA
Director

Vice-President, Academic and Provost
J.A. George, BSc, MSc, PhD

Advisors to the Vice-President, Academic and Provost
T.E. Bunting, BA, MA, PhD
Advisor on Interdisciplinary Programs
Faculty of Mathematics
J.G. Kalbfleisch, BSc, MA, PhD
Dean of Mathematics
V.A. Dyck, BMath, MMath
Associate Dean, Undergraduate Studies
M.E. Thompson, BSc, MSc, PhD
Associate Dean, Graduate Studies
J.W. Wong, BS, MS, PhD
Associate Dean, Computing;
Director, Mathematics Faculty Computing Facility
R.G. Dunkley, BA
Assistant Dean – External Programs
P.C. Brillinger, BA, MA
Director of Undergraduate Affairs
L. Williams, BA
Executive Assistant to the Dean

Data Processing
J.D. Walker, BA, MASc
Director

Graphic Services
M.J. Rowe
Director

Operations Analysis
R.D. Truman, BMath
Director

Office of Research
L.A.K. Watt, BSc, MS, PhD
Acting Dean of Research
A.H. Headlam, MBA, FCA
Director, Research Services and Development
D.H. Copp, BASc, PEng
Contracts Manager
R.B. Hayward
Contracts Manager
M.J. Hadley
Research Grants Officer
V.E. Leavoy
International Programs Officer
J.P. Sprung, BA, MBA
Manager, Software Co-ordination
B.C. Scott, BMath, MASc, CGA
Manager, Research Financial Services
S. Jacobs, DVM
Co-ordinator, Animal Care
S.E. Sykes, BA, MASc, PhD
Co-ordinator, Human Research
E. Davison, BSc, PhD, PEng
NRC Technical Advisor
R.B. Nally, BSc, MSc, PEng
Commercial Development Officer

Independent Studies Program
R.H. Holmes, BA, MA, PhD
Chairman, Academic Board
A.I. Dagg, BA, MA, PhD
Academic Director

Space Utilization and Campus Planning
A.E. Lappin, BSc, PEng
Director

Teaching Resources and Continuing Education
C.K. Knapper, BA, PhD
Director and Teaching Resource Officer
W. Shalinsky, BA, BSW, MSc, DSW
Senior Associate
S.B.P. Haag, BA, MA, MPhil
Distance Education Advisor
B.A. Lumsden, BA
Associate Director for Distance Education
J.H. Willment, BA, MA
Advisor on Teaching and Learning
W. Macintosh, BA
  Administrative Assistant

Vice-President, University Development

To be announced

Development and Alumni Affairs
DEVELOPMENT
D. Livingston, BBA
  Director
M.P. Gavin
  Associate Director, Office Services
E. Cadell, BA
  Associate Director, Development Programs
L. Kieswetter, BSc, BEd
  Foundations Co-ordinator

ALUMNI AFFAIRS
J.S. Roberts, BA, MA
  Director

Information and Public Affairs
M. Van Nierop, BA
  Director

COMMUNITY RELATIONS
M. Miles
  Co-ordinator

INTERNAL COMMUNICATIONS
C.A. Redmond, BA, MA
  Director

NEWS BUREAU
R.W. Whitton, BA
  Director

Vice-President, University Services and Treasurer

D.P. Robertson, BComm

Audio-Visual Centre
G. Downie
  Director
R.G. Russell, BAA
  Production Co-ordinator
J.H. Hilhorst
  Technologist
W.M. Ritchie
  Media Librarian

Co-operative Education and Career Services
J.C. Wilson, BScCE, PEng
  Director

University Offices

Financial and Business Services
D.J. Battae
  Director
W.P. McNamara, CMA
  Associate Director
J.S. Phillips, MCI
  Manager, Accounts Receivable and Credit
V. McCormick
  Director, Bookstore
C.A. Lawrence
  Director, Central Stores and Mail Services
D.A. Gardener
  Director, Purchasing
J. Staines
  Manager, University Club

Library
M.C. Shepherd, BEd, MA (LS)
  University Librarian
B. MacNeil, BSc, MLS
  Associate Librarian, Public Services
C.D. Emery, BA, ALA
  Associate Librarian, Collections
C. Presser, AB, MLS
  Associate Librarian, Planning and Systems
L. Claxton, BA, BLS, MLS
  Co-ordinator, Information Services
S. Bellingham, BA, MLS
  Special Collections Librarian
L. Beattie, BA, MA, PhD
  Co-ordinator, Library Administrative Services

Office of the Registrar
J. Manson, CA
  Director

C.T. Boyes, BA
  Registrar
B.A. Lumsden, BA
  Associate Registrar, Part-Time Studies
J.T. Boniface, BSc
  Associate Registrar, Records
N.S. Walker, BA
  Director of Admissions and Student Awards
S.J. Little, BA
  Director of Secondary School Liaison
P.F. Burroughs, BA, MSc
  Assistant Registrar, Arts, Environmental Studies, Independent Studies
G.L. Buckley
  Assistant Registrar, Engineering, Human Kinetics and Leisure Studies
K.A. Lavigne, BA
  Assistant Registrar, Mathematics, Science
D.L. Kasta, BA, MA
  Manager, Continuing Education Liaison Services
B.K. LeDrew, BMath
  Assistant Registrar, Scheduling
University Offices

G.V. Ambrose  
Manager, Correspondence Student Services

J. O'Rourke, BA, BEd, MEd  
Manager, Course Development Services

Personnel
R.J. Elliott, BA  
Director

Plant Operations
J.W.G. Sloan, BSc, MICE, CEng, PEng  
Director

Dean of Students
E.S. Lucy, BA  
Dean

Athletics
C.A.W. Totzke, BA  
Director

W. Delahey, BA  
Co-ordinator, Men's Interuniversity Program

P. Davis, BPHE, MEd  
Co-ordinator, Women's Interuniversity Program

P. Hopkins, BA, BPE, MA  
Co-ordinator, Campus Recreation

Bookings
Z. Whittington  
Bookings Agent

Campus Centre
Ann Woodruff, BA  
Manager

Counselling Services
J.L. Williams, BA, MA, PhD  
Director

Counsellors
W.W. Dick, BA, BD, MA, PhD
L. Kellar, BA, MASc
L. Thom, MA
R.J. Walsh, BA, MASc
J.J. Wine, AB, MSc, PhD

Food Services
R.W. Mudie  
Director

Health and Safety
B. Schumacher, MD  
Medical Director

C. Hea, RN  
Supervisor

N. Ozaruk, CRSP  
Safety Director

A. Ledbetter, MSW  
Counsellor

J.B. Reis, BSc, DCS, MEd  
Counsellor

F. Thomlison, BA  
Co-ordinator, Disabled Services

Housing and Residence Operations
H.R.N. Eydt, MSc, PhD  
Warden of Residences and  
Director of Housing

UW Theatre Centre
A.G. Anderson  
Manager

Honorary Members of the University  
Date Conferred

Dorothea Walter**, BA, MA  
May 1972

Paul Meincke, BSc, PEng  
May 1985

Hildegard Marsden**, BA, MA  
October 1985

William G. Scott, BA, MA  
May 1986

C. Fred MacRae, BA, MA, PhD  
May 1988

Professors Emeritus  
Date Conferred

Paul Seligman**, BA, PhD  
Philosophy  
May 1975

H.B. Noel Hynes, BSc, PhD, DSc, ARCS, FRSC  
Biology  
May 1983

George R. Hibbard, BA, MA, DLitt  
English  
October 1985

William B. Pearson, DFC, MA, DSc, FRSC, FCIC  
Chemistry, Physics  
May 1986

William T. Tutte, BA, MA, PhD, DMath, FRS, FRSC  
Combinatorics and Optimization  
May 1986

Edward J. Fisher, BA, MA, DSc, FAAO  
Optometry  
May 1987

W.A.E. (Pete) McBryde, MA, PhD, FCIC  
Chemistry  
May 1987

Jerzy T. Pindera, MSc, PhD, DSc, PEng  
Civil Engineering  
May 1987

Horst H.E. Leipholz**, Dipl. Eng., Dr. Ing., Docent Habil, DEng, PEng, FRSc, Recipient of the Distinguished Teacher Award  
Civil Engineering  
October 1987

J. William Dyck, AB, MA, PhD  
Germanic and Slavic  
May 1988

Francis W. Karasek, BS, PhD, FCIC  
Chemistry  
October 1988

President Emeritus  
J.G. Hagey**, OC, BA, LLD  
October 1970

*Deceased
The President’s Committee

The President’s Committee was established in 1960 and is composed of friends of the University who annually contribute $1000 or more to the University of Waterloo. The President’s Committee members play an important role in the development of the University, not only directly through their contributions to UW, but indirectly through the example they set for Corporations and Foundations which are approached to support the University.

Life Members
G.R. Baksi, Kitchener
W.D. Beynon, Waterloo
M.A. Black, Kitchener
E.M. Bronfman, Toronto
P.F. Bronfman, Toronto
R.L. Brown, Waterloo
D.J. Coleman, Cambridge
* J.S. Dellandrea, Waterloo
K.R. Dey, Guelph
J.P. Duffy, Waterloo
J.W. Dyck, Waterloo
J.T. Eyton, Toronto
S.A. Feraday, Toronto
M.F. Garvey, Toronto
J.R. Hanna, Waterloo
C.B. Hilliker, Waterloo
* R.R. Hudgins, Waterloo
B.G. Hutchinson, Waterloo
R.G.R. Lawrence, Waterloo
F.J. Liut, St. Clair Beach
D.B. Livingston, Waterloo
J.P. Logan, Toronto
R.P. MacDonald, Waterloo
Hon. A.G. MacKinnon, New Westminster
D.B. MacKinnon, Vancouver
* B.C. Matthews, Waterloo
L. Matthews, Waterloo
W.C. McCutchan, Kitchener
D.D. McKay, Toronto
N.W. McLeod, Westhill
D.H. Moogk, Kitchener
M. Nanasi, Waterloo
J. Pavanal, Guelph
J.C. Pavanal, Waterloo
D.D. Roberts, Waterloo
J.E. Robinson, Toronto
P.R. Roeker, Waterloo
A. Sarlos, Toronto
R. Sexton, Hull
K. Shantz, Kitchener
W. Shantz, Kitchener
* T.D. Sharma, Waterloo
A.M. Shoultz, Qualicum Beach
P.H. Sims, Kitchener
L.W. Smith, Kitchener
G.R. Sullivan, Waterloo
M.C. Volker, Waterloo
S. Ward, Kitchener
J.D. Whiteside, Thornhill

Members 1987/88
T.S. Able, Kitchener
M.J. Abs, Barrie
J.D. Aczel, Waterloo
F.A. Allard, Waterloo
A. Anderson, Waterloo
F.J.R. Anrep, Toronto
J.E. Arbuckle, Kitchener
R.L. Archambault, Amherstburg
E.J. Ashworth, Waterloo
* E.M. Avedon, Waterloo
D.T. Ayer, Kitchener
R.R.O. Aytono, Schomberg
R.B. Baker, Port Perry
* R.K. Banks, Waterloo
W.S. Barnard, Toronto
J.R. Barnett, Willowdale
R.N. Barr, Oakville
S. Bata, Don Mills
T.J. Bata, Don Mills
J.H. Bater, Waterloo
* T.L. Batke, Richmond
P. Beam, Waterloo
R.E. Beam, Toronto
C.F.A. Beaumont, Waterloo
C. Beingsaner, Waterloo
U.A. Bender, Baden
M.S. Bird, Kitchener
G. Botzang, Waterloo
D.A. Brisbin, Kitchener
* D.E. Brodie, St. Agatha
P.J. Brooks, Sydney
J.M. Brown, Kitchener
* J.W. Brown, Waterloo
J.A. Brox, Kitchener
C.G. Brunk, Waterloo
M.P. Bryden, Waterloo
J.A. Brzozowski, Waterloo
R.J. Callahan, Lafayette
M.G.E. Callander, Waterloo
A.J.R. Cameron, Waterloo
D.G. Campbell, Toronto
G.T. Campbell, Waterloo
I.L. Campbell, Waterloo
J.B. Capindale, Waterloo
S. Carmichael, Waterloo
M.E. Carroll, Waterloo
A. Chamberlain, Waterloo
G.A. Chisholm, Ingersoll
* Rev. N.L. Choate, C.R., Waterloo
K. Christie, Toronto
E. Ciesluk, Waterloo
H.D. Clemens, St. Catharines
W.B. Clemens, St. Catharines
G.W. Cloake, Peace River
D.H. Coop, Elora
D.D. Cowan, Waterloo
D.G. Craig, Waterloo
E.B. Cross, Waterloo
D.P. Crowne, Waterloo
J. Cuenca, Waterloo
A.P. Cullen, Waterloo
S.G. Cunningham, Waterloo
I.R. Dagg, Waterloo
D.W. Dalman, Peterborough
D.A. Davies, Waterloo
M.L. Demers, Waterloo
D.L. Dennis, Toronto
J.H. Dick, Leamington
W.I. Dickie, Fergus
A.E. Dixon, Kitchener
D. Dixon, Kitchener
R. Dixon, Kitchener
<table>
<thead>
<tr>
<th>Name</th>
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<tbody>
<tr>
<td>R. A. Dominico</td>
<td>Caledon East</td>
<td>D. J. Houghan</td>
<td>Toronto</td>
<td>His Honour Judge</td>
<td>Joseph McDonald, Waterloo</td>
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<tr>
<td>R. J. Donelson</td>
<td>Waterloo</td>
<td>M. H. Hill</td>
<td>Kitchener</td>
<td>M. F. McDonald, Waterloo</td>
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<td>L. C. Dorney</td>
<td>Waterloo</td>
<td>S. Hoefert</td>
<td>Waterloo</td>
<td>I. J. McGee, Waterloo</td>
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<td>R. G. H. Downer</td>
<td>Waterloo</td>
<td>D. W. Hoffman</td>
<td>Guelph</td>
<td>W. L. McCaug, Oakville</td>
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<td>M. Dumancic</td>
<td>Waterloo</td>
<td>H. B. S. Hogg</td>
<td>Richmond Hill</td>
<td>B. D. McIntyre, Brantford</td>
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<tr>
<td>R. G. Dunkley</td>
<td>Kitchener</td>
<td>D. L. Hopkins</td>
<td>Milton</td>
<td>M. McLaughlin, Waterloo</td>
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<td>A. I. Dust</td>
<td>Waterloo</td>
<td>J. P. Huws</td>
<td>Toronto</td>
<td>H. G. McLeod, St. Catharines</td>
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<td>P. C. Eastman</td>
<td>Waterloo</td>
<td>R. Y. Huang</td>
<td>Waterloo</td>
<td>D. G. McWhirter, Toronto</td>
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<tr>
<td>D. Eby</td>
<td>West Montrose</td>
<td>S. Huculak</td>
<td>Barrhead</td>
<td>I. J. McNabb, Calgary</td>
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<tr>
<td>L. G. Eckel</td>
<td>Waterloo</td>
<td>N. C. Hultin</td>
<td>Waterloo</td>
<td>P. McNichol, Toronto</td>
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<tr>
<td>H. B. Ellis</td>
<td>Waterloo</td>
<td>B. F. Hunter</td>
<td>Summerside</td>
<td>K. I. McPhee, Kitchener</td>
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<tr>
<td>V. Erb</td>
<td>New Hamburg</td>
<td>B. I. Hyma</td>
<td>Waterloo</td>
<td>J. M. Miller, St. Paul</td>
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<tr>
<td>E. V. Eves</td>
<td>Burlington</td>
<td>D. E. Irish</td>
<td>Waterloo</td>
<td>J. W. Miller, Kitchener</td>
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<td>H. R. N. Eydt</td>
<td>Waterloo</td>
<td>H. W. Jasper</td>
<td>Kitchener</td>
<td>P. D. Mitchell, Guelph</td>
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<tr>
<td>* T. Z. Fahidy</td>
<td>Kitchener</td>
<td>D. John</td>
<td>Waterloo</td>
<td>* J. B. Moffat, Waterloo</td>
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<tr>
<td>K. J. Farlinger</td>
<td>Mississauga</td>
<td>L. S. Joyce</td>
<td>Mississauga</td>
<td>A. V. Morgan, Waterloo</td>
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<tr>
<td>R. N. Farvolden</td>
<td>Kitchener</td>
<td>J. D. Kalbfleisch</td>
<td>Waterloo</td>
<td>P. E. Morrison, Baden</td>
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<tr>
<td>P. M. Feder</td>
<td>Kitchener</td>
<td>* J. G. Kalbfleisch</td>
<td>Kitchener</td>
<td>D. R. Morrow, Smiths Falls</td>
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<tr>
<td>* J. E. Fisher</td>
<td>Waterloo</td>
<td>W. Korff</td>
<td>Mississauga</td>
<td>G. P. Moser, Kitchener</td>
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<tr>
<td>M. P. Fitzgerald</td>
<td>Waterloo</td>
<td>F. F. Karrow</td>
<td>Waterloo</td>
<td>P. J. Motz, Kitchener</td>
<td></td>
</tr>
<tr>
<td>I. B. Forbes</td>
<td>Waterloo</td>
<td>* J. Kates</td>
<td>Willowdale</td>
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