University of Waterloo
Undergraduate Calendar
1977-1978
The Undergraduate Calendar

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

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

The Calendar is arranged in chapters which fall into four divisions. The first division contains general information about the University. The second division outlines the undergraduate programmes and the third division describes the courses offered in these programmes. The last division of the Calendar describes the general administrative structure of the University.

The information in this Calendar applies to the 1977-78 academic session which commences in September 1977. The University also publishes:

- a Graduate Studies Calendar
- an Admissions Brochure

Enquiries and formal applications for admission should be directed to the:

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

Telephone 885-1211 (Area Code 519)
The Registrar's Office is located on the second floor of the 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
Waterloo, Ontario
N2L 3G3
(519) 884-8110

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

All courses listed may not be offered in the current session; therefore, students are advised to consult the University course offerings list prior to arranging their programmes.

The Senate and Board of Governors of the University of Waterloo reserve the right to invoke changes in this Calendar without prior notice.
Undergraduate Calendar 1976-77

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Glossary of Terms

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

**Credit**
A unit of an academic programme earned toward a degree. A credit weight of 1.0 is normally assigned to a 26 week (2 term) course; a credit weight of .5 is normally assigned to a 13 week (1 term) course. These credit weights are used in the calculation of averages for academic standing.

**Note**
Most courses have credit weights of .5 or 1.0, but some have other weights such as .25, .75, 2.0.

**Programme**
A series of courses, a number of which may be mandatory and of a specialized nature, which lead toward a degree. Details of the several types of programmes offered such as Honours, General, Pass, Pre-Professional, Professional are given in the Calendar.

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

**Minor**
A group of approved courses taken by an honours student in a subject outside his/her "major" area.

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

**Pre-requisite**
A course required to be taken prior to registration in another course which lists it as a prerequisite. (“Consent of Instructor” is sometimes listed as an alternative to or in addition to a prerequisite).

**Co-requisite**
A course required to be taken concurrently with another course which lists it as a co-requisite.

**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.

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

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

**Pre-registration**
The process of selecting courses and having them approved by a faculty advisor prior to registration.

**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.

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

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

**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.
## Academic Calendar

<table>
<thead>
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<th>Event</th>
<th>Date</th>
<th>Day</th>
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<tbody>
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<td><strong>1977</strong></td>
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<tr>
<td>Meeting—Senate Executive Committee</td>
<td>March 7</td>
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<td>Supplemental Examinations Begin—Co-operative Programmes</td>
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<td>Good Friday—University Closed</td>
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<td>Meeting—Senate Executive Committee</td>
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<tr>
<td>Meeting—Board of Governors, 10:00 a.m.</td>
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<td>Examinations End – Spring Term</td>
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<td>Labour Day – University Closed</td>
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<tr>
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<td>Meeting – Senate Executive Committee</td>
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<tr>
<td>Registration – Graduate Studies – Fall Term</td>
<td>September 9</td>
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<tr>
<td>Registration Ends – Undergraduate Regular and Co-operative Programmes</td>
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<td>September 19</td>
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<td>October 4</td>
<td>Tuesday</td>
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<tr>
<td>Thanksgiving Day – University Closed</td>
<td>October 10</td>
<td>Monday</td>
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<tr>
<td>Meeting – University Senate, 7:30 p.m.</td>
<td>October 17</td>
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<td>October 21</td>
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<td>October 31</td>
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<tr>
<td>Meeting – Senate Executive Committee</td>
<td>November 7</td>
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<tr>
<td>Pre-registration Begins – On-Campus Co-operative Students for Spring Term 1977</td>
<td>November 9</td>
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<tr>
<td>Pre-registration Ends – On-Campus Co-operative Students for Spring Term 1977</td>
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<td>Meeting – University Senate, 7:30 p.m.</td>
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<td>December 26</td>
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<tr>
<td>Christmas Holidays – University Closed</td>
<td>December 26</td>
<td>Monday</td>
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<td>to December 30</td>
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<tr>
<td>Final Examination Results Due</td>
<td>December 30</td>
<td>Friday</td>
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</table>
Erratum
The chart showing Year 1 Science Programmes (P. 177) is referred to throughout Chapter 13 as being
on Page 179. Please note that all page references in
Chapter 13 should be reduced by 2 pages and the
page reference listed as Page 00 on Page 191 should
read Page 177.

Calendars are in limited supply. All University of
Waterloo students, including applicants who have
confirmed their intention to register, are entitled to one
copy of the current academic calendar.
Reference copies are available in the libraries and
Registrar's Office.

Course Descriptions
Beginning with the 1977-78 calendar the format of the
course descriptions has been adjusted to show
standardized information about each course.
Each course description now begins with a line of
coding as shown in the sample below. The previous
asterisk symbol * which indicated a term course has
been replaced by the designation of "credit weight" of
each course. For details see page 212.

The calendar is not a preregistration document.
Students should consult the Course Offerings List and
the Timetable Enrollment Report when preregistering.

Sample Course Description

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Term(s) Offered</th>
<th>Type of instruction and Number of hours/week</th>
<th>Credit weight</th>
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<tbody>
<tr>
<td>Fr 131</td>
<td>F, S, A</td>
<td>4C, 1L</td>
<td>.5</td>
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</table>

Course Name: Basic French

Course Description: An elementary course designed to give the
student a solid beginning in oral expression of the French language, as well as an
understanding of the basics of French sentence structure.

Extra information about course requirements: Prereq: Consent of Department

Terminology

Terms Offered
F fall term
S spring term
W winter term
J summer, first half, July
A summer, second half, August
M summer, both terms, July, August
Y September - April - 8 month session

Type of Instruction
C Lecturer
L Laboratory
T Tutorial
S Seminar
D Discussion
R Reading course
std workshop
wkshp workshop
std studio
stdlab fieldlab
prereq prerequisite
coreq corequisite
P Practicum
### 1978

<table>
<thead>
<tr>
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<td>January 3</td>
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<td>August 7</td>
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<td>August 10</td>
<td>Thursday</td>
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<td>August 10</td>
<td>Thursday</td>
</tr>
<tr>
<td>Examinations Begin—Summer Session</td>
<td>August 11</td>
<td>Friday</td>
</tr>
<tr>
<td>Examinations End—Summer Session</td>
<td>August 12</td>
<td>Saturday</td>
</tr>
<tr>
<td>Final Examination Results Due</td>
<td>August 17</td>
<td>Thursday</td>
</tr>
<tr>
<td>Spring Work Term Ends—Co-operative Programmes</td>
<td>August 25</td>
<td>Friday</td>
</tr>
<tr>
<td>Fall Work Term Begins—Co-operative Programmes</td>
<td>August 26</td>
<td>Monday</td>
</tr>
<tr>
<td>Year</td>
<td>January</td>
<td>April</td>
</tr>
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</tr>
<tr>
<td>1977</td>
<td><img src="calendar1977.png" alt="Calendar Image" /></td>
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<tr>
<td>1978</td>
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<td>1979</td>
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</tbody>
</table>
Campus Guide

Information Kiosks
After hours please enquire at Security Office, Building No. 15.

Parking Lots
Visitor pay parking D (.50c per hr.) 8:00 a.m. - 6:00 p.m. weekdays, .50c per entry evenings, weekends and holidays; N, M (.50c); Visitor lot Optometry adjacent to O (.50c); B & H evenings and weekends (25c); Student pay parking in C (25c); Reserved parking in all other lots; Free parking in Lot E.

Academic Faculties

Arts
9 Arts Lecture Hall
5 Modern Languages
   includes Theatre of the Arts; Art Gallery; coffee shop
24 J. G. Hagey Hall of Humanities
   includes Humanities Theatre
8 Dana Porter Arts Library
30 Psychology

Engineering
1 Engineering 1
2 Engineering 2 (Audio Visual Library)
3 Engineering 3
29 Engineering 4
11 Engineering Lecture Hall

Environmental Studies
10 Isaiah Bowman Environmental Studies Building,
   E.S. Library (maps)
109 Architecture

Human Kinetics and Leisure Studies
17 Offices in Mathematics and Computer Building
18 Physical Activities Complex
   includes Department of Athletics
90 Seagram Stadium
91 Seagram Gymnasium
109 Dept. of Recreation (Philip St.)

Integrated Studies Programme
30 Offices in Psychology Building

Mathematics
17 Mathematics and Computer
   includes computing centre; data processing;
   administrative offices for Human Kinetics and Leisure Studies; EMS Library (4th Floor)

Science
4 Physics
6 Chemistry 1
28 Chemistry 2

7 Biology 1
   includes Biology and Earth Sciences museum
13 Biology 2
33 Optometry
   includes Optometry clinic

Church Colleges
84 Conrad Grebel College
82 Renison College
81 St. Jerome's College
80 Notre Dame Women's Residence
140 Resurrection College
83 St. Paul's College

Residences
20 Student Village 1
25 Student Village 2
21 Tutors' Apartments
23 Minota Hagey Graduate Residence
26 Married Students' Apartments
149 Hammarskjold House (co-op)
150 Phillip St. Residence (co-op)

Administration
32 Administrative Services
   includes office of Vice-President, Finance and Operations; Administrative Services; Bookings;
   Financial Services; Operations Analysis and Internal Audit; Personnel (including the
   Secretarial and Clerical Overload Service); Physical Resources Group; Purchasing; Safety.
31 Needles Hall
   includes office of President, office of
   Vice-President, Academic; Academic Services;
   Alumni; Career Information Centre; Chaplain's
   office; Co-ordination and Placement;
   Counselling Services; Development; Graduate
   Studies; Information Services; Office of
   Research Administration; Registrar; Student
   Housing; University Secretariat; Word
   Processing Centre.

University Services
16 South Campus Hall
   includes Book Store; Festival Room,
   Laurel Room
19 Campus Centre
   includes student organizations; various
   commercial services; snack bar
27 Faculty Club
12 Central Services
14 Maintenance Stores
   includes Graphic Services; Mail Services
15 Commissary; Security
40 Grounds Maintenance
   includes Radio Waterloo; warehouse
104 Graduate Club
   includes Graduate Student Union
22 Health Services
Laurel Creek separates the residences from the main campus.
The Undergraduate Calendar

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

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

The Calendar is arranged in chapters which fall into four divisions. The first division contains general information about the University. The second division outlines the undergraduate programmes and the third division describes the courses offered in these programmes. The last division of the Calendar describes the general administrative structure of the University.

The information in this calendar applies to the 1977-78 academic session which commences in September 1977. The University also publishes:

- a Graduate Studies Calendar
- an Admissions Brochure
- a Summer Session Brochure

Enquiries and formal applications for admission should be directed to:

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

Telephone 885-1211 (Area Code 519)
The Registrar's Office is located on the second floor of the Ira G. Needles Hall.
Office hours are from 8:30 a.m. to 4:30 p.m. Monday through Friday. The office is not open weekends.

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
Waterloo, Ontario
N2L 3G3
(519) 884-8110

All courses listed may not be offered in the current session; therefore, students are advised to consult the University course offerings list prior to arranging their programmes. This calendar should not be used as a preregistration document.

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

The University

Classes at the University of Waterloo commenced in July, 1957, with the introduction of the Co-operative Engineering Programme. 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. Programmes are offered in Architecture, Arts, Engineering, Environmental Studies, Integrated Studies, Mathematics, Optometry, Human Kinetics and Leisure Studies, Science and Urban and Regional Planning. The University is a member of The Association of Universities and Colleges of Canada and the Association of Commonwealth Universities.

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 175,000 people.

Since the opening of the first permanent structure on campus in 1956, the University has expanded steadily. The thirty teaching and service buildings presently on campus include a Computing Centre, a Physical Activities Complex, a stadium, extensive library facilities, two theatres, four residential Church Colleges, and a variety of modern residential accommodation.

University Colours and Coat of Arms

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

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

Motto
Concordia Cum Veritate—In Harmony with Truth
The University Mace
The symbolic theme may be described as follows:

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

The design of the mace interprets this theme in the idiom of the life process: From the seeds at the base of the 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 a University’s functions.

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

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

Full time enrolment for each Faculty including church colleges and off campus students (as of September 28, 1976)

<table>
<thead>
<tr>
<th>Faculty of Arts</th>
<th>2,787</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty of Engineering</td>
<td>2,835</td>
</tr>
<tr>
<td>Faculty of Environmental Studies</td>
<td>1,368</td>
</tr>
<tr>
<td>Faculty of Human Kinetics and Leisure Studies</td>
<td>1,130</td>
</tr>
<tr>
<td>Integrated Studies Programme</td>
<td>54</td>
</tr>
<tr>
<td>Faculty of Mathematics</td>
<td>3,228</td>
</tr>
<tr>
<td>Faculty of Science</td>
<td>1,916</td>
</tr>
</tbody>
</table>

Total Undergraduate Enrolment (Full-Time) 13,318
Graduate Student Enrolment (Full-Time) 1,325

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

University of St. Jerome’s College
The University of St. Jerome’s College is a liberal arts college which had been affiliated with the University of Ottawa before entering into federation with the University of Waterloo in July, 1960. It offers a complete range of undergraduate courses in the Faculty of Arts and registers students in regular Mathematics programmes. Students registered at St. Jerome’s College freely supplement their programmes with courses offered at the University and students registered at the University complement their programmes with courses offered uniquely at St. Jerome’s. In the Calendar, St. Jerome’s faculty members and courses are indicated by a J suffix. Graduates of the college receive University of Waterloo degrees in accordance with the terms of the federation agreement. A continuous building programme since 1962 finds St. Jerome’s presently with a teaching and administration building, a library, a men’s residence accommodating 110 and a women’s residence, Notre Dame College, operated by the School Sisters of Notre Dame, which has room for 122 students. The University of St. Jerome’s College is conducted by the Congregation of the Resurrection.

Renison College
Renison College was founded by a group of Anglicans committed to the principle of a small residence-teaching community which could emphasize the virtues of intimacy, creativity, and innovation with regard to both teaching and residential life.

Academic offerings at Renison include courses in two areas:

a) Social Development Studies Programme, and
b) General Arts.
The former is an integrated programme of courses in the areas of Social Work, Psychology, Sociology and Interdisciplinary Social Science, with emphasis on both classroom study and community involvement. Within General Arts are courses in English, French, Geography, Psychology, Religious Studies, and Sociology. Renison College faculty members and courses are indicated by an R suffix.

The college has two residences accommodating 100 men and 82 women.

**Conrad Grebel College**

Conrad Grebel College is a Mennonite school with residential, teaching, research, and community programmes. Its courses are open to all students on campus. In the Calendar, Conrad Grebel College courses have a G suffix, and they can be found under Arts, History, Music (Fine Arts), Religion and Sociology. Special emphases include peace studies in the various disciplines. The academic programme in music at the University is administered by Conrad Grebel College. There are several choirs, choral, and instrumental ensembles.

An addition which includes classrooms, offices, a library and an auditorium opened in September, 1976.

**St. Paul's College**

St. Paul's United College is a teaching and residential community of 150 men and women. It offers a limited number of courses in Religious studies which are available for academic credit to any student enrolled in the University. St. Paul's College faculty members and courses are indicated by a P suffix. Resident life in the College provides a valuable contribution to university experience beyond that which comes from courses taken for credit. Through a programme of athletics, community dinners, a congregation and interest groups engaged in various projects and issues relating to the University, the Church, personal life and society, members of the College and associates participate in a vital and enriching community.

**Degrees Offered**

The University of Waterloo offers the following undergraduate degrees:

- Bachelor of Architecture (B.Arch.)
- Bachelor of Arts (B.A.)
- Bachelor of Applied Science (B.A.Sc.)
- Bachelor of Environmental Studies (B.E.S.)
- Bachelor of Independent Studies (B.I.S.)
- Bachelor of Mathematics (B.Math.)
- Bachelor of Science (B.Sc.)
- Doctor of Optometry (O.D.)

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

The University of Waterloo offers the following graduate degrees:

- Master of Arts (M.A.)
- Master of Applied Science (M.A.Sc.)
- Master of Mathematics (M.Math.)
- Master of Philosophy (M.Phil.)
- Master of Science (M.Sc.)
- Doctor of Philosophy (Ph.D.)

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

**Honorary Degrees**

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

- Doctor of Engineering (D.Eng.)
- Doctor of Environmental Studies (D.E.S.)
- Doctor of Laws (L.L.D.)
- Doctor of Letters (D.Litt.)
- Doctor of Mathematics (D.Math.)
- Doctor of Science (D.Sc.)

**Systems of Study**

The University offers its students two different systems of study, the Regular System and the Co-operative System. Some programmes are offered under one system only, while others are offered under either system. Each of the programme sections in this calendar contains information concerning the System of Study that can be followed for the programme 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 spend alternating terms of four months duration on the campus for academic studies, and with business, industry, or government for off-campus practical training. Further information about the Co-operative System can be found in Chapter 5.

**Part-time Studies**

Opportunities for part-time studies are available primarily through the Faculty of Arts, and to a limited extent through other faculties. Some degrees may be completed entirely through part-time study. Students wishing to pursue studies on a part-time basis may enrol in regularly scheduled day courses as well as evening or Saturday classes. The University offers a six week summer programme through the Faculty of Arts and courses through the Correspondence Programme (see below).
There is no distinction between part-time and full-time students as to admission requirements, grading practices and promotion policies. Normally, part-time students may take no more than 2 full courses per academic session.

In regard to admission, individuals of mature age who do not possess the minimum admission requirements may apply under the adult student clause. Information regarding the availability of courses and assistance regarding admission and registration procedures can be obtained from the Part-time Studies Office, Needles Hall.

**Correspondence Courses**

The University of Waterloo offers degree credit courses by correspondence in Biology, Chemistry, Classical Civilization, Earth Sciences, Economics, Engineering, English, French, German, Greek, History, Latin, Mathematics, Philosophy, Physics, Political Science, Psychology and Sociology. Other Arts courses are contemplated. Lectures are recorded on magnetic tape and are accompanied by supplementary material.

The Correspondence Programme was originally designed to assist elementary and secondary school teachers in upgrading their teaching qualifications. However, the courses may be taken by anyone with a suitable academic background and can be used for credit towards a degree at the University of Waterloo. Degree programmes in Arts, Mathematics and Science may be taken entirely on a part-time basis by any combination of correspondence, regular or summer courses which will fulfill the degree requirements of the faculty. Further information can be obtained from:

The Director,

Correspondence Programme.

**Continuing Education**

Through a number of channels the University recognizes its responsibility for the continuing education of adults.

A number of academic departments sponsor special lecture series of interest to all persons in the community. Information regarding these series can be obtained from the department concerned or from the Part-Time Studies 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 sections for a complete breakdown of the appropriate grading system.

<table>
<thead>
<tr>
<th>Assigned Common</th>
<th>Assigned Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Letter</td>
<td>Weighting Factors*</td>
</tr>
<tr>
<td>Grades</td>
<td></td>
</tr>
<tr>
<td>A+</td>
<td>95</td>
</tr>
<tr>
<td>A</td>
<td>89</td>
</tr>
<tr>
<td>A-</td>
<td>83</td>
</tr>
<tr>
<td>B+</td>
<td>78</td>
</tr>
<tr>
<td>B</td>
<td>75</td>
</tr>
<tr>
<td>B-</td>
<td>72</td>
</tr>
<tr>
<td>C+</td>
<td>68</td>
</tr>
<tr>
<td>C</td>
<td>65</td>
</tr>
<tr>
<td>C-</td>
<td>62</td>
</tr>
<tr>
<td>D+</td>
<td>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>

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

**Interpretation of Averages**

<table>
<thead>
<tr>
<th>Honours</th>
<th>General</th>
</tr>
</thead>
<tbody>
<tr>
<td>80-100</td>
<td>Excellent</td>
</tr>
<tr>
<td>70-79.99</td>
<td>Very Good</td>
</tr>
<tr>
<td>60-69.99</td>
<td>Good</td>
</tr>
<tr>
<td>50-59.99</td>
<td>Passing</td>
</tr>
<tr>
<td>0-49</td>
<td>Failure</td>
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</tbody>
</table>

**Non-Graded Standings**

<table>
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<tr>
<th>CR</th>
<th>Credit Granted</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEG</td>
<td>Aegrotat, credit granted due to illness</td>
</tr>
<tr>
<td>NCR</td>
<td>No credit granted</td>
</tr>
<tr>
<td>INC</td>
<td>Incomplete course work, no credit granted</td>
</tr>
<tr>
<td>DNW</td>
<td>Did not write examination, no credit granted</td>
</tr>
<tr>
<td>AUD</td>
<td>Audit only, no credit granted</td>
</tr>
<tr>
<td>NMR</td>
<td>No mark reported</td>
</tr>
</tbody>
</table>

**Cross-Registration with Wilfrid Laurier University**

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

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

Students must pay all fees at their home University regardless of the number of courses taken by Cross-Registration. The basic academic regulations, prerequisites for courses, grading systems etc., will be applicable where the student is taking the course.

Grades are reported to the student's home University
based on the grading system of the host University and are combined with the results of the student's other courses to complete the examination report. A student's overall academic standing is determined solely by the home University.

Regulations concerning the dates for adding or dropping a course as well as petitions for cross-registered courses are governed by the student's home institution.

For further details, contact the Registrar's office.

**Academic Offenses**

Disciplinary jurisdiction with respect to all students is vested in the Board of Governors which may delegate its authority in any particular case to the President. The President normally delegates to the Faculty Deans his authority to deal with academic offenses, except that he may not delegate his authority to expel a student from the University.

The following is a condensed version of the Report of the Senate Committee on Academic Regulations and Discipline (approved by Senate December 18, 1970).

Any act by a student which is in violation of any academic regulation of the University shall be considered an academic offense. The following list of examples of academic offenses is not necessarily all-inclusive:

- cheating on examinations or tests;
- being impersonated by or impersonation of another student;
- plagiarism; theft of examination papers, their distribution or use;
- falsification of academic records.

When an academic offense has allegedly occurred, the individual is presumed innocent until the contrary is established. In all cases reasonable effort should be made to settle any disciplinary issue, including alleged academic offenses, by means of informal discussions between the student(s) involved and the faculty member(s) concerned.

For academic offenses that cannot be resolved by discussion, formal procedures involving an Advisory Committee on Academic Discipline established to advise the Dean of the faculty may be invoked. The membership of the Committee is as follows: a non-voting chairman, who shall be the Associate Dean, one faculty member from each department within the faculty, and two students appointed by the student society of the faculty.

Full details of the procedures are contained in the Report.

For a student found guilty of an academic offense one of three disciplinary actions may be recommended to the Dean:

1) **Probation**, for a stated period of time;
2) **Suspension**, for a stated period of time;
3) **Expulsion**, which shall be permanent.

If the recommendation is for expulsion, the final decision shall rest with the President.

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**Student and Administrative Services**

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

**Federation of Students**

- **Campus Centre**

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

**Objects**

The principal "Objects" of the Federation are:

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

**The Student's Council**

Twenty-nine elected members plus officers make up the Student's Council. Members representing all faculties, societies and colleges are included.

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

**The Executive Board**

The Executive Board is composed of the principal officers including the President, Vice-President, Treasurer, and all Board Chairmen. The Board controls day-to-day administration, finance, and recommends policy to the Students' Council. It also co-ordinates programmes of all other Boards and provides liaison between them.
The Creative Arts Board
The Creative Arts Board provides activities in music, drama and dance.

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

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

The Board of Entertainment
The Board of Entertainment co-ordinates and supervises campus-wide special programmes, including, Freshman Orientation, "pubs", and concerts.

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

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

Persons wishing more information on any aspect of Federation activities are advised to write:

The Federation of Students

Athletics
Physical Activities Complex
The Department of Athletics offers a complete programme of intercollegiate and intramural activities for the enjoyment of the university community.

Book Store
South Campus Hall
Text books, general interest books and supplies are available at the University Book Store.

Career Information Centre
Needles Hall
The Centre contains material which will assist students in their vocational and educational planning. Information related to personal development and work or travel abroad is also available.

Centre for the Arts
Room 254, Modern Languages Building
The Centre administers the two theatres and the Art Gallery. It sponsors a series of professional attractions and, in conjunction with the Federation of Students, it provides participating activities in music, drama and dance.

The Computing Centre
Mathematics and Computer Building
The Computing Centre located on the first two floors of the Mathematics and Computer Centre building, provides computing facilities for faculty, staff, graduate and undergraduate students. Such facilities include keypunch rooms and programme-preparation areas, programme submission areas for several batch-computing services, a number of typewriter-terminals for inter-active computing services, an incremental plotting facility, an experimental control service capable of performing various functions in laboratory experiments on campus, and a variety of computing hardware and software chosen to handle the wide range of computing applications in a university community. Faculty, academic staff, graduate and undergraduate students use the computing facilities to aid them in their research; in addition, many academic courses require the use of the computer in course assignments. Administration and staff also use the computer in applications such as student records, course timetables, examination results, library circulation control, and payroll processing.

Most students, particularly at first and second year levels, gain access to the computer through the DEBUG Service. This is a cafeteria-style batch processing service in which users line up to submit jobs through a card reader and retrieve their output from a high speed printer further up the line. This service, including the necessary software to make it fast enough, was developed at the University of Waterloo several years ago. More recently, an experimental program to make the DEBUG Service "interactive" has been introduced. In this version, students submit their jobs and receive output via cathode-ray tube key driven terminals, but still have access to the student-oriented software.

More advanced users also use the Debug Service for much of their preliminary work. However, more advanced work is usually processed in a more general BATCH environment, or using the time-sharing facilities provided by VM/370 CMS. With CMS, it is possible to develop and execute programs in an interactive manner, thus increasing human productivity, particularly during program development. The virtual memory capabilities of VM/370 also make it possible to service users with applications requiring large blocks of memory.

In addition to operating the computing equipment and maintaining the computing software, the Computing Centre provides many "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 Centre to help make using the computer an easier
and more efficient process for all members of the
University community.

Counselling Services
Needles Hall
Trained counsellors are available to assist the student
with his or her vocational, personal and emotional
development on a confidential, individual or small group
basis.

Dean of Women
Room 224, Modern Languages Building
This office serves as a general academic information and
advisory centre for all students.

Health Services
Health Services Building
Staffed by medical doctors, registered nurses, a
counsellor and other trained personnel, Health Services
is open to all students. The doctors’ services are covered
by OHIP so the student should be sure he or she is
insured.

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

Office of Research Administration
(Incorporating Waterloo Research Institute)
The Office of Research Administration (ORA), now
located on the third floor of Ira Needles Hall, is
responsible for faculty grant applications and contract
research, as well as the distribution of grant information
and regulations.

Among the functions of the ORA are the following: to
ensure that university policies and agency/sponsor
requirements are met; to provide faculty with information
and application forms; to forward applications and
proposals to appropriate agencies; to act as a centre of
communications between granting agencies and faculty;
and to assist faculty in obtaining grants and contracts for
undertaking research.

The ORA also administers the university’s patent
assistance programme.

Contract Research: In this regard the ORA 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
ORA 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:

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

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

Residences
Residence accommodation is available at the University
for approximately 4,000 students in the University
Residences, Federated and Affiliated Colleges and the
Student Co-operative Residences. Apartments for
married students and their families are available on
campus in the Married Students’ Apartment Complex. An
off-campus housing information service is also provided.

Students who wish to apply for residence should write
to the Director of Housing or directly to the College of
their choice for a brochure and the Residence
Information sheet which includes the fee schedule.

International Student Office
This office is located on the second floor of Needles Hall
and is available to assist any International Students who
require information, e.g., Immigration laws, etc.
Admissions

Student Rally
General Information

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

Candidates may apply for admission to the programmes 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 correspondences should be directed to the Assistant Registrar for the Faculty to which the candidate is applying.

More detailed information regarding admission requirements is available from the Assistant Registrar (indicate Faculty desired).

Applicants are advised to outline thoroughly their educational background in order to facilitate the admission process. The admission information and requirements set forth in the Calendar are applicable for admission beginning in September 1977.

Authority to Admit

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

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

The University reserves the right to withdraw the offer of admission made to an Ontario secondary school student if the Applicant fails to complete Year 5 satisfactorily.

St. Jerome’s College

Applicants may apply for Programmes in Arts, and Mathematics (regular programme only) through St. Jerome's College. All applicants should indicate clearly “St. Jerome's College” on their application form. All transcripts and documents should be sent directly to the College.

Inquiries and correspondence should be directed to: The Registrar, St. Jerome's College.

Admissions

General Admission Requirements

Renison College

Applicants may apply for the Social Development Studies Programme and for other programmes in Arts through Renison College. Renison College applicants should indicate “Renison College” clearly on the application form.

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 Year 5 curriculum.

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

Applicants educated outside of Ontario must submit evidence of having obtained a level of education equivalent to Ontario Year 5 (see page 00) as well as meeting the subject prerequisites and satisfying any special average requirements.

The designation of a limited enrolment programme means that in the past, the number of qualified applicants exceeded the number of places available. It is expected that for 1977 the following programmes will be designated as limited enrolment programmes:

- Architecture
- Engineering
- Geography
- Kinesiology
- Man Environment Studies
- Mathematics
- Optometry
- Recreation
- Urban and Regional Planning

Applicants – Ontario Year 5 (Grade 13)

For all programmes, the University normally requires completion of an Ontario Year 5 (Grade 13) programme, comprising at least 6 Year 5 credits, leading towards the Secondary School Honour Graduation Diploma. A minimum average of 66% is normally required for admission. The following criteria are used in selecting applicants for admission: Year 5 interim or final standing; Year 4 final standing; Principal’s recommendation.

The 1977-78 Admission Requirements for applicants from Ontario Year 5 Programmes (Grade 13) are shown in the accompanying chart.
### Specific Faculty Program Recommendations and Requirements

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Specific Year 5 Requirements</th>
<th>Minimum Averages in Specific Requirements</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Arts</strong></td>
<td></td>
<td></td>
<td>Applicants should include Year 5 courses such as English, History, Languages (other than English) in their Year 5 programme. Level 5 English courses, particularly those that stress writing skills, are especially recommended.</td>
</tr>
<tr>
<td><strong>Engineering</strong></td>
<td>Relations and Functions</td>
<td>To be considered for admission, a minimum average of 60% is required in these courses. (There are more applicants than places available and the competition results in an average of greater than 60% required for admission.)</td>
<td>Students with high overall standing who are missing one or two of the five specific Year 5 requirements are encouraged to contact the Admissions Officer no later than January (for September admission). Applicants will be evaluated and advised on possible courses of action required to meet our specific requirements. Since Engineering requires considerable writing of reports and reviews, as well as the reading of books, articles and journals, the sixth credit for admission should be a subject requiring literary and writing performance such as English, History, Geography, etc. The University reserves the right to withdraw offers of early admission to Engineering for students receiving final marks below 60% in any of their six credits.</td>
</tr>
<tr>
<td><strong>Environmental Studies</strong></td>
<td></td>
<td></td>
<td>Because of the increasing use of statistics and quantitative methods in environmental research, students should present at least one Year 5 Mathematics course for admission to all programmes in Environmental Studies.</td>
</tr>
<tr>
<td><strong>Architecture (pre-professional programme)</strong></td>
<td>Relations and Functions</td>
<td>Normally a 60% overall average is required in these courses.</td>
<td>Selected applicants are normally required to come to the University for an interview as part of the admission process.</td>
</tr>
<tr>
<td><strong>Geography</strong></td>
<td></td>
<td></td>
<td>Applicants should include Geography in their Year 5 programme.</td>
</tr>
<tr>
<td><strong>Man-Environment Studies</strong></td>
<td></td>
<td></td>
<td>Applicants may find at least one Year 5 Mathematics course helpful.</td>
</tr>
<tr>
<td><strong>Urban and Regional Planning</strong></td>
<td></td>
<td></td>
<td>Selected applicants are normally required to come to the University for an interview as part of the admission process.</td>
</tr>
<tr>
<td><strong>Human Kinetics and Leisure Studies</strong></td>
<td></td>
<td></td>
<td>Applicants should include one or more Year 5 courses such as Calculus, Biology, Chemistry, Physics in their Year 5 programme.</td>
</tr>
<tr>
<td><strong>Dance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Kinesiology</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Recreation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Integrated Studies</strong></td>
<td></td>
<td></td>
<td>Each applicant to Integrated Studies is considered on the basis of a personal interview with a committee composed of students, resource persons and staff. Those who show an aptitude for self-direction and independent study and the ability to flourish in an unstructured academic setting will be given preference.</td>
</tr>
<tr>
<td><strong>Mathematics</strong></td>
<td>Relations and Functions</td>
<td>The Regular Programme requires a 60% overall average in specific requirements. The Co-operative Programme requires a 66% overall average in special requirements.</td>
<td>Applicants lacking Algebra but who have high overall Year 5 standing will be considered for admission.</td>
</tr>
<tr>
<td><strong>Science</strong></td>
<td>2 Science courses, one of which must be Physics or Chemistry, Calculus and one of Relations &amp; Functions or Algebra, preferably Relations &amp; Functions.</td>
<td>60% overall average in specific requirements. 70% in Chemistry and Physics for the Co-op Applied Physics Programme.</td>
<td>Applicants should select both Year 5 Chemistry and Physics courses.</td>
</tr>
</tbody>
</table>
Applicants – Other Than Ontario Year 5 (Grade 13)

Applicants who are not currently registered in Ontario Year 5 are considered under the following broad categories. These categories serve to identify general areas of academic preparation.

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

Applicants applying as adult students are advised to contact the Assistant Registrar of the desired faculty to discuss admissibility and appropriate qualifying work. Generally, it is recommended that applicants who are applying to enter the University as adult students attempt to obtain standing in at least one Ontario Year 5 level subject or its equivalent. This preparation should relate to the programme the applicant wishes to study at the University. Applicants to programmes requiring specific Ontario Year 5 level prerequisites normally must have standing in these required subjects to be considered for admission. Mature students not meeting the requirements for degree candidacy may in certain cases be admitted to degree studies on a part-time probationary basis. Each application is considered on its own merit by the Admissions Committee.

Mature students who are uninterested in pursuing a degree at this time, may apply on a non-degree basis. Courses taken under this provision will count toward a degree if the student is admitted later as a degree candidate.

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

Transfer Credit
Transfer credit will depend upon the programme applied to, the relevancy of the previous programme studied, and approval from the appropriate department that such courses are to be credited to the student's programme. As the specific transfer credit policies vary with each faculty, students are advised to refer to the faculty sections in the calendar for detailed regulations.

Applicants from Ontario Colleges of Applied Arts and Technology
As a general policy, applicants who have achieved first class honours or high second class honours in each of the three years of a programme at an Ontario College of Applied Arts and Technology are considered for admission to Year Two of a relevant programme at the University of Waterloo.

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

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

Certificates Equivalent to the Ontario Secondary School Honour Graduation Diploma
All applicants are required to hold the specific subject requirements indicated on page 00 in addition to the equivalent level of education.

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

A) Applicants from Other Canadian Provinces

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

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

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

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

Europe
Maturity or Matriculation Certificate

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

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

Countries using French System
Baccalaureate Passable

United States of America
Secondary School Graduation plus an additional year of
formal study in subjects comparable to Ontario Year 5.

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

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

English Proficiency Test
Applicants whose native language is not English are
advised to take the "Test of English as a Foreign
Language" (TOEFL). Normally, a score of 600 is required
to satisfy the Admissions Committee that the applicant's
knowledge of the English language is adequate to pursue
university studies successfully. In addition, applicants to
Co-operative programees must satisfy the Admissions
Committee that they can perform satisfactorily in their
work terms. The expenses involved in administering the
test must be borne by the applicant.

Landed Immigrant Status
Because of the nature of the co-operative programmes 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 Landed
Immigrant Status in Canada before applying for
admission to a co-operative programme. Exceptions can
be made on an individual basis at the request of a
government agency or other employer. Until such proof is
received, applicants will be considered for a comparable
programme, if available, offered under the regular
system of study. In the case of the Co-operative
Engineering Programmes, immigrants must have one
year's residency, with suitable work experience, in
Canada before applying for admission.

Application Procedures

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

   a) Applicants presently enrolled in an Ontario
      Secondary School as a full time day student must
      complete OUAC form 101 available from the secondary
      school guidance departments.

   b) All other applicants (e.g. mature applicants,
      applicants from outside Ontario) must complete OUAC
      form 105. These forms may be obtained from the
      Registrar's Office.

2) Applicants requesting part-time, non degree or
   correspondence courses should contact the University
   for the appropriate application forms. Do not apply
   through the Application Centre.

Note
When requesting an application form from the University
candidates should outline their academic background
and indicate the exact programme 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, documents required etc. 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 it cannot guarantee consideration of any application that is received.

<table>
<thead>
<tr>
<th>Session/Term starting</th>
<th>Last date for application</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 2, 1977</td>
<td>March 1, 1977</td>
</tr>
<tr>
<td>July 4, 1977</td>
<td>June 1, 1977</td>
</tr>
<tr>
<td>September 6, 1977</td>
<td>July 1, 1977</td>
</tr>
<tr>
<td>January 3, 1978</td>
<td>November 1, 1977</td>
</tr>
</tbody>
</table>

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

Processing of an Application

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

All Ontario Year 5 applicants will be notified on or after June 3, 1977, of the status of their application for admission. Year 5 applicants who do not receive an offer of admission at this time will have their applications deferred until their final Year 5 marks are received by the University. When these marks have been received, qualified applicants will be admitted until the remaining places are filled.

Ontario Year 5 applicants who receive an early offer of admission are encouraged to confirm as soon as possible, but are not required to respond before June 17, 1977.

Applicants who are not currently enrolled in an Ontario Year 5 programme can expect to wait several weeks before receiving a decision on their application. Some programmes require applicants to come to the University for an admission interview and a decision cannot be made in such programmes 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

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

Note
Pre-registration is the process of choosing courses and having them approved by the appropriate advisor prior to the beginning of classes.
Registration is completed when courses have been approved, fees paid, and a receipt issued.

A schedule of fees is outlined in Chapter 3, page 30 of this calendar.
Fees and Registration

Orientation 'Tug-o-War' – near Laurel Creek
Fees and Registration

Introduction
All students are required to pre-register for courses to be taken in the subsequent session/term, during:

a) March, for regular students
b) The preceding on-campus term for co-operative students
c) The summer months for first year students

Pre-registration, the process of choosing courses and having them approved by the appropriate advisor prior to the beginning of lectures will produce the Student Schedule-Fee Statement. Registration is completed when courses have been approved, fees have been paid or arranged, and the Fee Statement receipted by Financial Services.

Assessment of Fees
(Student Visa Students—See Note 4)
Fees are assessed to students as follows:

A) Per Term (on-campus co-operative students; regular students registered in the Winter or Spring term.)
1) Students taking one or two term courses are assessed for each term course at the unit course fee of $77.50.
2) Students (except those in 4. below) taking more than two term courses and less than five term courses are assessed:
   (i) each term course at the unit course fee of $77.50,
   (ii) full incidental fees as shown in the Schedule of Fees,
   (iii) the co-operative fee, for co-operative students only.
3) Students taking five or more term courses are assessed:
   (i) the Basic Fee as shown in the Schedule of Fees,
   (ii) full incidental fees as shown in the Schedule of Fees,
   (iii) the co-operative fee for co-operative students only.
4) Students in the Faculty of Engineering, the Integrated Studies Programme, the Architecture Programme, the Optometry Programme, who are taking:
   a) More than two full courses are assessed on a programme basis:
      (i) the Basic Fee as shown in the Schedule of Fees,
      (ii) full incidental fees as shown in the Schedule of Fees,
   b) Two full courses or less are assessed for each course at the unit course fee of $155.00 per full course and $77.50 per half course.

B) Per Session (all regular students registered in the Fall term.)
1) Students taking up to two full courses are assessed for each course at the unit course fee of $155.00 per full course and $77.50 per half course.
2) Students (except those in 4. below) taking more than two full courses but less than five full courses are assessed:
   (i) at the unit course fee of $155.00 per full course or $77.50 per half course,
   (ii) full incidental fees as shown in the Schedule of Fees.
3) Students taking five or more full courses are assessed:
   (i) the Basic Fee as shown in the Schedule of Fees,
   (ii) full incidental fees as shown in the Schedule of Fees.

C) Summer School (students registered for the July-August summer school)
1) Students are assessed for each course at the unit course fee as shown in the Schedule of Fees.

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

(i) for students assessed the Total fee as shown in the Schedule of Fees, two equal instalments.
(ii) for students assessed at less than the Total fee, the first instalment will be for the value of the courses taken in the Fall term up to a maximum of 50% of the Total fee. The second instalment will be for the balance.

Students who receive their fee statement by mail are normally expected to make payment by mail. Detailed instructions outlining the payment procedures will be included with the fee statement.

For students who cannot register by mail, a registration period is held on campus prior to the beginning of
lectures for each term. The dates of registration and beginning of lectures are listed on pages 5 to 8 of the calendar.

Students who have received a Notice of Assessment under the Ontario Student Awards Programme and are relying upon this source of funds for the payment of their fees may make arrangements by mail to direct payment to the University up to the value of the award. Where Notice of Assessment has not yet been received, consideration will be extended toward arrangement of fees at the on-campus registration centre provided an Application for Award has been filed with the Awards Office on or before the following dates:

**Session Students**
- 15 July 1977 for the 1977/78 Session

**Term Students**
- 11 March 1977 for the Spring 1977 term
- 15 July 1977 for the Fall 1977 term
- 11 November 1977 for the Winter 1978 term
- 15 March 1978 for the Spring 1978 term

Fees should be paid by money order or cheque payable to "University of Waterloo". For the 1977/78 year, for undergraduates only, the University will accept post dated cheques only as an arrangement for the payment of fees. Students choosing this method of payment must postdate the cheque as follows:

**Session/ Term Starting**

<table>
<thead>
<tr>
<th>Term Starting</th>
<th>Cheque Must be Dated</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 1977</td>
<td>30 August 1977</td>
</tr>
<tr>
<td>January 1978</td>
<td>23 December 1977</td>
</tr>
<tr>
<td>May 1978</td>
<td>23 April 1978</td>
</tr>
</tbody>
</table>

Cheques returned by the bank for any reason will be assessed a handling charge of $15.00 plus late registration penalty as applicable.

Students registering through Renison or St. Jerome's must pay their fees directly to the appropriate college.

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

Fee payments by scholarships, bursaries or methods other than those outlined above must be authorized by the University Credit Manager.

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

Students who register after the first day of lectures will be assessed a late fee penalty as follows:

| First Day | $10.00 |
| Second Day | $15.00 |
| Third Day | $20.00 |
| Fourth Day | $25.00 |
| Thereafter | $25.00 plus a 1% per month service charge applied to the balance outstanding and calculated from the due date. |

Students will not be allowed to register after the following dates:

<table>
<thead>
<tr>
<th>Session/Term</th>
<th>Last Date to Register</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starting May 1977</td>
<td>10 June 1977</td>
</tr>
<tr>
<td>July 1977</td>
<td>15 July 1977</td>
</tr>
<tr>
<td>September 1977</td>
<td>14 October 1977</td>
</tr>
<tr>
<td>January 1978</td>
<td>20 January 1978</td>
</tr>
<tr>
<td>May 1978</td>
<td>12 June 1978</td>
</tr>
</tbody>
</table>

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.

Students must register before the start of lectures whether or not a final class schedule has been received. Students who subsequently change programmes must register with the new fee statement within five days if the fees assessed have changed. No refunds will be processed unless this registration is completed.

Withdrawals
A student who finds it necessary to withdraw from attendance is required to obtain a Notice of Withdrawal from the Registrar. This Notice, when signed by both the Dean and the Registrar, or their delegates, may entitle the student to a refund of fees at the discretion of the University.

Schedule of Fees
The fee schedule is the one proposed for the 1977/78 year, and at the time of printing, is still subject to review and possible change. If a fee change is made, a notice will be issued with a new fee schedule; however, the University does not undertake or accept responsibility to so notify all recipients of this calendar. The Board of Governors reserves the right to make changes in the published schedule of fees without notice.
## Schedule of Fees – Undergraduate Programmes Tuition & Incidentals for All Years

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Session/ Term (See Note 1)</th>
<th>Basic Fee $</th>
<th>Co-op Fee (See Note 2) $</th>
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### Incidental Fees

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<tr>
<td>Sanford Fleming Foundation (See Note 7)</td>
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**Note 1 - Session/Term**

Session refers to the eight month September - April period of study. Term refers to the four month period of study for students registered in a) Co-operative programmes, and b) the Winter or Spring terms of regular programmes.

**Note 2 - Co-operative Fee**

Additional tuition fee assessed to all co-operative programme students registered in more than two term course equivalents per term.

**Note 3 - Unit Course Fee**

The fee assessed at $155.00 for each full course at a weight of 1.0; at $77.50 for each half or term course at a...
Note 4 - Student Visa Students
The Ontario Government has announced an increased schedule of fees for students on student visas.

Effective January 1, 1977, tuition will be substantially higher for international students studying in Canada on student visas. The fee increase applies only to students beginning a programme for the first time. Tuition fees for visa holders presently enrolled in a programme will remain the same as those for Canadian students until completion of their programme or the Winter Term, 1980 whichever occurs earlier. The following categories of students will be exempted from fee increases:

1) Canadian citizens within the meaning of The Canadian Citizenship Act;
2) Landed immigrants within the meaning of The Immigration Act;
3) Dependents of persons admitted to Canada under Section 7(1)(a) of The Immigration Act (diplomatic, consular and other representatives of foreign countries, the U.N. and other international agencies, their dependents and suites);
4) Dependents of persons admitted under Section 7(1)(h) of The Immigration Act for the temporary exercise of their profession, trade or occupation;
5) Students sponsored and financially assisted by the International Development Research Centre;
6) Foreign students in Canada on Canadian International Development Agency grants;
7) Persons studying in an institution under a cultural exchange agreement between the Government of Canada and the Government of another country provided that under such an agreement the number of places made available in Ontario universities normally equals the number of places made available to Ontario residents in the other country.
8) Foreign students in Canada on student visas who began their current programme before January 1, 1977.

Note 5 - Society Fees
The following schedule of fees applies:

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<td>Human Kinetics and Leisure Studies</td>
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<tr>
<td>Mathematics</td>
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<tr>
<td>Environmental Studies</td>
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</tr>
<tr>
<td>Science (including Optometry)</td>
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</table>

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 5 to 8 of this Calendar.

Note 7 - Sandford Fleming Foundation (S.F.F.)
In February 1976 the Engineering Undergraduate Student Societies, jointly with the Federation of Students, petitioned the Board of Governors to assess each Engineering Undergraduate Student $2.50 per term as a contribution to the Sandford Fleming Foundation. This fee 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 as indicated on pages 5 to 8 of this Calendar.

Miscellaneous Fees
- Examination Supplemental each paper: $10.00
- Presiding Fee (at outside centre each half day): $7.00
- Returned Cheques - Handling charge of $15.00 plus late registration penalty as applicable.
- Duplicate Fee Statement or tax receipt: $2.00
- Transcript of Record (per request): $2.00
- Replacement of lost Identification Card: $5.00

Residence Fees
Residence fees are payable by term and are due in full on or before the day of residence registration. Students who have received Notice of Assistance under any awards programme 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 for the period 1 May 1977 to 30 April 1978 will be mailed on 1 March 1978 to the home address on record.

Enquiries
Enquiries concerning payment of fees should be directed to Student Accounts, Financial Services.
4

Scholarships, Bursaries, Prizes and Financial Aid

University of Waterloo Sailing Club
Scholarships, Bursaries, Prizes and Financial Aid

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

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

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

Regulations Governing University of Waterloo Undergraduate Scholarships

1) The first charge against any scholarship payment will be for tuition and fees.
2) If no qualified applicant is found for a particular award in any year, the University reserves the right to withhold the award.
3) Awards based on donations from outside sources cannot be guaranteed by the University and can be forwarded only after the funds have been received by the donor.

Undergraduate Scholarships

University of Waterloo Entrance Scholarships

The University awards a number of Entrance Scholarships to entering students on the basis of outstanding performance in secondary school. In some faculties and departments, these Scholarships are also based on the results of the following competitions:

- The Chem 13 NEWS Exam;
- The Sir Isaac Newton Physics Test;
- Descartes Mathematics Competition.

Details regarding these Scholarships are listed on the following pages.

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

The Alberta Optometric Association Scholarships

The Alberta Optometric Association presents two scholarships in the amount of $250 to each of two students admitted to Year 2 (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.

The Allen-Bradley Canada Limited Award

The Allen-Bradley Canada Limited is making available three awards, each for $100, to second, third and fourth year electrical engineering students. These awards are given for the work term reports judged best for clarity, grammar and other communication skills. The technical content of the report is important but not a qualifying requirement. The award is made each term and the winner will be determined by the Department of Co-ordination in consultation with the Department of Electrical Engineering. Reports considered confidential are not eligible.

Allied Chemical Canada Limited Scholarship

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

The AOCCO Canada Limited Scholarship

AOCCO Canada Limited presents annually a scholarship to a Canadian student admitted to Year 2 (the First Professional Year) of the School of Optometry. This award is made on the basis of academic achievement. The value is $600.

Arts Faculty Scholarships

The Faculty of Arts is offering several entrance and upper year scholarships in order to recognize academic excellence. Entrance scholarships will be in the amount of $900 and will be awarded on the basis of secondary school performance and recommendations. Upper year scholarships, valued at $500, will be awarded on the basis of previous years' standing and will require the recommendation of the candidate's department. Other awards, in lesser amounts, may be available to both freshmen and upper year students. The amount awarded and the selection of successful candidates will be left to the discretion of the faculty.

Association of Professional Engineers Entrance Award

The Association of Professional Engineers of the Province of Ontario provides a $500 Entrance Award to the student who has the highest academic standing in Year 5 examinations and who is entering an accredited engineering programme at the University of Waterloo.

Association of Professional Engineers Undergraduate Scholarship

The Association of Professional Engineers of the Province of Ontario offers three annual scholarships of $250, one to the student in each of the first, second and third years in an accredited engineering programme who has the highest average in the examinations for his year.
Babcock & Wilcox Canada Limited Award
The Babcock & Wilcox Canada Limited is making available three awards, each for $100, to second, third and fourth year mechanical engineering students. These awards are given for the work term reports judged best for clarity, grammar and other communication skills. The technical content of the report is important but not a qualifying requirement. The award is made each term and the winner will be determined by the Department of Co-ordination in consultation with the Department of Mechanical Engineering. Reports considered confidential are not eligible.

The Bausch and Lomb Optical Company Limited Award for Clinical Proficiency
Bausch and Lomb Optical Company offers a prize to the student in the fifth professional year judged demonstrating the highest levels of proficiency in clinical activities. The prize is a Greens Refractor or equivalent ophthalmic instrumentation to the approximate value of $1675.

The Bausch and Lomb, Soflens Division Outstanding Achievement Awards
Total value of these awards is $1,000. These awards are in recognition of ability and effort in the pursuit and application of knowledge in the contact lens field while a final year student.

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 programme. To be eligible for one of these scholarships a student must obtain an average of 75% in the previous term's or year's examinations.

Borden Chemical Company Canada Limited Award
Borden Chemical Company Canada Limited is making available three awards, each for $100, to second, third and fourth year Applied Chemistry students. These awards are given for the work term reports judged best for clarity, grammar and other communication skills. The technical content of the report is important but not a qualifying requirement. The award is made each term and the winner will be determined by the Department of Co-ordination in consultation with the Faculty of Science. Reports considered confidential are not eligible. No application is necessary.

The British Columbia Optometric Association Scholarships
The British Columbia Optometric Association presents two scholarships in the amount of $250 to each of two students admitted to Year 2 (the first Professional Year) of the School of Optometry. These awards are made to students who are residents of British Columbia. They are awarded on the basis of academic achievement.

Canada Packers Awards
Canada Packers Limited is making available two $200 awards to fourth year Chemical Engineering students and two awards to fourth year Mechanical Engineering students having attained high academic achievement in third year. One award will be made in each of stream 'A' and stream 'B' in each department. Other determining factors include personal characteristics.

Canadian Information Processing Society – Grand Valley Chapter Scholarship
C.I.P.S. is making available one scholarship in the amount of $200 to a third year Math student with Computer Science and Business options. Selection will be based entirely on second year marks as recorded by the faculty.

Centennial Optical Scholarships
The Centennial Optical Company offers two scholarships in the amount of $250 to each of two students admitted to Year 2 (the First Professional Year) of the School of Optometry. These awards are made on the basis of academic achievement. Recommendation for these awards is made by the Scholarship Committee of the School of Optometry.

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

Chemistry Scholarships
The Department of Chemistry awards Year 1 Chemistry Scholarships annually. Selection is mainly on the basis of a CHEM 13 NEWS/Exam written in Ontario secondary schools. Values are $2,000 and $1,500 for one year. Chemistry Scholarships of $500, $400, $300 and $200 are also awarded to the top four students entering Years 2, 3 and 4 in Honours Chemistry, (regular or co-op). These scholarships may be subject to the condition that no other awards be held concurrently.
The above scholarship will be awarded subject to the availability of funds and the attainment of a minimum academic standard by candidates.

Candidates for Year 1 awards must write the CHEM 13 NEWS/Exam. No application is necessary for awards for Years 2, 3 and 4.

Cominco Scholarships
To assist in ensuring a continuing supply of qualified graduates in fields vital to industry in Canada, Cominco Ltd. has established a programme of twenty-four scholarships at specified Universities in Canada. One of these scholarships will be awarded annually in the form of a two-year award of $600 per year at the University of Waterloo. It is open to students who, in the Fall, will enter the penultimate undergraduate year of a course leading to a degree in Chemical Engineering, and Earth Sciences. Students must apply to the University of Waterloo by November 1st on forms obtainable from the Awards Officer, University of Waterloo, Waterloo, Ontario. Renewals for the second year will be subject to attainment of academic standards satisfactory to the Scholarship Committee of the University.

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

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

Datacrown Computer Science Scholarship
Value: $300. To the outstanding student entering fourth year Computer Science (Co-op) who has demonstrated both academic excellence and outstanding leadership.

Rene Descartes Scholarships, Fellowships, and Bursaries
Awards in varying amounts are offered through the Faculty of Mathematics to first year students enrolled in that Faculty and showing the University of Waterloo as their first choice on the application for admission to the university. In order to be eligible, a student must write the Descartes Mathematics Competition and submit an application form. These may be obtained from the Associate Dean, Faculty of Mathematics.

Claude Neon Limited Scholarship
Claude Neon Limited is offering an annual scholarship of $250 to be awarded to a third or fourth year student registered in the Honours Urban and Regional Planning programme. The student must have attained high academic standing and indicate an interest in planning. Application should be made to the Awards Officer.

Dow Chemical of Canada Scholarship in Chemical Engineering
$750 to the student and a grant-in-aid of $250 to the department. 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.

Earth Sciences Scholarships
The Department of Earth Sciences awards a number of scholarships valued at approximately $300 each to students in the Earth Sciences Department. The scholarships will be awarded to students in each academic year based on academic standing in the previous year. These scholarships may be subject to the condition that no other scholarships are held concurrently.

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

The Sandford Fleming Work Term Report Awards
The Sandford Fleming Foundation makes available awards of $100 each to second, third, and fourth year students in all departments of engineering. Awards are for the work term reports judged best for clarity, grammar, and other communication skills, and which are based upon actual work term experience. Awards are available each term to each class following 2A, in each undergraduate department, for those classes in which industrially sponsored prizes have not yet been established.
Freure Homes Scholarship
The Freure Homes Scholarship, valued at $200, is awarded annually to a student entering Year 3 (regular programmes) of either Geography or Urban and Regional Planning. Candidates must have an 80% average or above in Year 1 and 2 and it is desirable but not essential that they have a strong interest in urban problems.

The award will alternate annually between Geography and Urban and Regional Planning and the selection of the candidate will be made by the Chairman of the Department of Geography and the Director of the School of Urban and Regional Planning.

General Motors Scholarships
Two awards of $1,000 each to students in the final or penultimate year of Engineering, Economics or Mathematics-Business Option. The recipients must be Canadian citizens who look forward to careers in industry. General Motors will make summer or work-term work assignments an integral part of the scholarship.

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

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

Huron County Scholarship
Huron County Council is offering two $100 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.

Inco Limited Award
Inco Limited is making available three awards, each for $100 to second, third and fourth year Systems Design students. These awards are given for the work term reports judged best for clarity, grammar and other communication skills. The technical content of the report is important but not a qualifying requirement. The award is made each term and the winner will be determined by the Department of Co-ordination in consultation with the Department of Chemical Engineering. Reports considered confidential are not eligible.

K-W Optical Company Limited Awards
These awards are made to the two students in each of the second, third and fourth professional years who have shown significant improvement in clinical and academic performance in the preceding year. In the fourth professional year the awards are for $225. In the other years the awards are for $175.

James F. MacLaren Limited Award
James F. MacLaren Limited is making available three awards, each for $100, to second, third, and fourth year Civil Engineering students. These awards are given for the work term reports judged best for clarity, grammar and other communication skills. The technical content of the report is important but not a qualifying requirement. The award is made each term and the winner will be determined by the Department of Co-ordination in consultation with the Department of Civil Engineering. Reports considered confidential are not eligible.

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

Sir Isaac Newton Assistantships
The Department of Physics offers Sir Isaac Newton (SIN) Assistantships to recognize and encourage academic excellence in students proceeding towards an Honours Physics degree. The awards are normally made to freshmen, and are valued at $2,600, payable $650 per year. Renewal is based on satisfactory academic standing. About ten new awards are given each year, based mainly on the results of the SIN test mentioned above. Recipients of this award are required to undertake a minor academic or research project within the Department.
Ford S. Kumpf Scholarship
Through a bequest of the late Ford S. Kumpf of Waterloo, three or four scholarships will be offered each year to entering students who graduated from a secondary school in the Regional Municipality of Waterloo. The scholarships are $750 each in Year 1, and will be renewed for an additional $750 in Year 2 with the attainment of a first class honour standing.

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

Optometry Scholarships
The School of Optometry awards scholarships annually to students admitted to the School of Optometry from Year 1 Regular Science at the University of Waterloo. These awards will be made chiefly on the basis of scholastic achievement and as funds permit in Year 2 Optometry, Year 3 Optometry, Year 4 Optometry and Year 5 Optometry.

The Percy Hermant Centennial Bursary Scholarships
These awards are the gift of Sydney Hermant. The Bursary Scholarships are awarded on the basis of financial need and academic achievement in first year General Science at any Canadian University to a student who is proceeding into Year 2, School of Optometry. Six scholarships are available, each of a total possible value of $1,200, being $300 per year over the four professional years (Years 2, 3, 4 and 5) provided a satisfactory standing is maintained. One scholarship is awarded to a student who is a resident of one of the Maritime provinces; two scholarships are awarded to students who are residents of Ontario; three scholarships are awarded to students who are residents of one of the Western provinces. The various Provincial Optometrical Associations are consulted in awarding these Bursary Scholarships.

Applications should be submitted to The Student Awards Office before August 31st of each year.

The Saskatchewan Optometric Association Scholarships
The Saskatchewan Optometric Association presents two scholarships in the amount of $250 to each of two students admitted to Year 2 (the First Professional Year) of the School of Optometry. These awards are made to students who are residents of Saskatchewan. They are awarded on the basis of academic achievement.

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

Science Society Scholarship
The Science Society, University of Waterloo, is offering four $50 scholarships to the undergraduate students attaining the highest mark in the Faculty of Science in any academic year. This award may not be held concurrently with other scholarships or merit awards.

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

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

University of Waterloo Engineering Scholarships
Entrance Scholarships, ranging in value from $1,000 to $1,500 for first year with some renewable in subsequent years to a total value of $3,300, are awarded to students on the basis of superior ability in mathematics and science and demonstrated potential for success in engineering. The following criteria will be used in allocating these awards:
- minimum overall average of 85% in Year 5;
- performance in the special Waterloo tests (Descartes Mathematics, Sir Isaac Newton Physics and CHEM 13 NCWG competitions);
- principal's recommendation and other supporting material.
Students must submit an application form which can be obtained from the Awards Office.

Upper Year Scholarships in varying amounts are available to students on the basis of outstanding academic performance after first year.

Michael Wright Memorial Award
Value: $300. To an outstanding student in course in Political Science. Established in 1975 in memory of Michael Wright by his Mother and Sister.
University of Mannheim Exchange Scholarship
Travel, accommodation and living allowance for a student of the “Waterloo in Germany Programme” for a year of study at the University of Mannheim.

University of Waterloo – Waterloo County Entrance Scholarships
Value: $500. Awarded to the top eligible student from each of the Waterloo County secondary schools for first-year study at the University. Decisions are based on recommendations from the secondary schools.

St. Jerome’s College Awards

Undergraduate Scholarships
Unless otherwise stated, no application form is necessary. Where an application is required, appropriate forms may be obtained from the office of the Dean, St. Jerome’s College, and must be submitted before August 1, 1976.

Year 1 Admission Scholarships

Faculty of Arts
St. Jerome’s College is offering entrance scholarships in order to recognize and encourage academic excellence. Entrance awards will be in the amount of $700. and will be awarded on the basis of Year 5 marks and secondary school recommendations. Assessment of these awards will be based on preliminary grades submitted to the Ontario Universities’ Application Centre by the candidates’ secondary schools in April and will be awarded in June along with the candidates’ offers of admission to St. Jerome’s College, University of Waterloo.

Faculty of Mathematics
Awards in varying amounts are offered by St. Jerome’s College to first year students enrolled in the Faculty of Mathematics and showing St. Jerome’s College as their first choice on the application for admission to the university. In order to be eligible a student must write the Descartes Competition. Applications for the Descartes Competition may be received through The Associate Dean, Faculty of Mathematics, University of Waterloo. Students who write the Descartes Competition and who have applied for admission to St. Jerome’s College are asked to request a scholarship application form.

St. Jerome’s College Scholarships to Students of St. Mary’s High School and St. Jerome’s High School, Kitchener
Two scholarships of $500 each are awarded annually to one student from St. Jerome’s High School, Kitchener and to one student from St. Mary’s High School, Kitchener, who demonstrate high academic achievement on six Year 5 level courses, but who are not eligible for an Admission Scholarship in their respective Faculty. Assessment of these awards will be based on preliminary grades submitted to the Ontario Universities’ Application Centre by the candidates’ secondary schools in April and will be awarded in June along with the candidates’ offers of admission to St. Jerome’s College, University of Waterloo.
Upper Year Scholarships

St. Jerome’s College Upper Year Scholarships
St. Jerome’s College is offering upper year scholarships in order to recognize and encourage academic excellence. Upper year scholarships will be in the amount of $600 and will be awarded on the basis of a student’s academic standing in the previous year and the recommendation of the College Faculty.

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

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

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

Undergraduate Awards

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

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

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

Note
Second class standing is normally required of applicants for bursary assistance. Students with student visas who have not been in Canada for more than one year will not normally be considered. Applications must be submitted to the Awards Office by the end of the first month of first term unless otherwise indicated. All bursaries are applied for on a common University of Waterloo application form unless otherwise stipulated.

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. The recipient is determined by the Senate Committee on Scholarships and Student Aid in conjunction with the Faculty of Mathematics.

ASHRAE, Ontario Chapter Bursaries (American Society of Heating, Refrigerating and Air-Conditioning Engineers, Ontario Chapter)
The American Society of Heating, Refrigeration & Air Conditioning Engineers, Ontario Chapter is making available annually a sum of money to be distributed in bursary form. Applicants must be normal residents of Metropolitan Toronto or adjacent municipalities, and be enrolling in second or third year Mechanical or Electrical Engineering. Recipients will be determined in conjunction with the related Department and subject to verification by the Senate Committee on Scholarships and Student Aid.

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

Atkinson Charitable Foundation Bursaries
The Atkinson Charitable Foundation has established a bursary programme 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.

Birks Family Foundation Bursary
The Birks Family Foundation has established a plan of annual contributions to the Student Aid Fund of recognized Canadian Universities for the creation of the Birks Family Foundation Bursaries. The Bursaries are awarded by the Foundation on the recommendation of the University Scholarship Committee and are not restricted to faculty or year and may be renewed. The number and amount of such awards may vary annually, depending upon the funds available for the purpose from the Foundation.

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

Roberta Golightly Bursary
A bursary, in the amount of $100 is offered annually by the Citizens’ Committee for Pollution Control, Burlington, Ontario. The bursary may be awarded to a student who is resident of the town of Burlington, who is enrolled in the Faculty of Environmental Studies and who has a good academic standing.

Huron County Bursaries
Huron County Council has established a bursary fund at the University of Waterloo for students who attended high school in Huron County and whose home is in the County. The bursaries, offered annually, will be for an amount of $100 and will be awarded to full-time undergraduate students in any faculty of the University who have good academic records and who are in need of financial assistance to enable them to continue their studies. Students should make application through their high school or direct inquiries to the Awards Office.

The Hydro-Electric Power Commission of Ontario Bursary
A bursary, of the value of $500 is offered annually by the Hydro-Electric Power Commission of Ontario to a student in second year in any of the following honours courses: Mathematics, Physics, Applied Science and Engineering. It is to be awarded to undergraduates with good academic standing who are in need of financial assistance. The bursary may be held concurrently with other awards where the need exists. Awards will be made by the Scholarship Committee.
IBM Canada Bursary Program
IBM Canada Limited makes an annual grant of $1,000 for bursaries to students registered in a full-time course at the university who have satisfactory standing and who demonstrate financial need. Application may be made through the Awards Office.

Interprovincial Pipe Line Company Bursary
The Interprovincial Pipe Line Company Bursary Fund, of a total value of $2,000, has been established by Interprovincial Pipe Line Company to benefit students beyond the first year who are in need of financial assistance. The company has stipulated that at least 50% of the funds granted must go to students in the applied sciences. Preference will also be given to students whose normal residence is Canada or the USA.

J. P. Bickell Foundation Bursaries
The Foundation is making available a sum of money to be used in providing bursary assistance to Chemical Engineering and Earth Science students of good academic standing who need financial assistance.

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

Canadian Federation of University Women—Kitchener-Waterloo
The Canadian Federation of University Women has established a bursary fund at the University of Waterloo to assist one or more women 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.

Lambton County Bursary
Lambton County Council offers two bursaries valued at $100 each to students from the county, excluding residents of the City of Sarnia.

Litton Systems Bursary
A bursary, to the value of $500, is offered annually by Litton Systems (Canada) Limited. The bursary may be awarded to students in the Faculty of Engineering with preference being given to those in the electronic or electromechanical fields. It is intended to provide financial assistance to undergraduates in need and may be held concurrently with other awards where the need exists.

P. L. Robertson Manufacturing Co. Ltd. Bursary
A bursary, to the value of $100, is offered annually by the P. L. Robertson Manufacturing Co. Ltd. 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. Where the need exists the bursary may be held in conjunction with other awards.

The Minnesota Mining and Manufacturing of Canada Limited Bursaries
Two bursaries, to the value of $500 each, are offered annually by the Minnesota Mining and Manufacturing of Canada Limited. The bursaries may be awarded to any full-time undergraduate student at the University who has a good academic record and is in need of financial assistance for continued studies.

Proctor and Gamble Student Bursary Fund
A number of bursaries are available to assist needy students in any year or faculty. The bursaries are awarded to residents of Canada on the basis of academic standing and financial need.

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

Uniroyal (1966) Ltd. Student Aid Plan
Beginning with the academic year 1961-62 Uniroyal has included the University of Waterloo in its programme of aid to education. Awards will be made by the Scholarship Committee. A candidate must have completed at least one academic year, should establish a need for financial assistance and be willing to assume a moral obligation to repay the university over a reasonable period at least twenty-five per cent of any funds received.
Prizes

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.

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 programme who, having received honours, has obtained the highest standing in the final examinations of the current academic year. Included with this award is a gift of technical books valued at approximately $50.

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

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

b) Three General Proficiency Prizes (value $150 each) awarded to the student in the School of Optometry standing second highest in General Proficiency in each of the second, third, and fourth years.

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

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

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

- Dominion Contact Lens Laboratory, New Toronto, Ontario
- Eastern Optical Laboratories Limited, Dartmouth, Nova Scotia
- Gordon Contact Lenses, Inc., Rochester, N.Y.
- Kahn Optical Company Limited, Toronto, Ontario
- Monarch Optical Co., Toronto, Ontario
- Omand Optical Co., Toronto, Ontario
- Perfect Optical Co., Toronto, Ontario
- Plastic Contact Lens Co., Toronto, Ontario
- Professional Optical Co., Willowdale, Ontario
- Superlite Optical Co., Toronto, Ontario

Classics Prize
The Classics Prize of $50 will be awarded annually to the student who attains the highest mark in either Latin 190 or Greek 200. To qualify for the prize the student must enroll in a further Latin or Greek course at the 200 level.

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

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

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

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

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

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

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

The Canadian Contact Lens Society Prize (value approximately $100)
The proceeds of a fund invested on behalf of the Canadian Contact Lens Society will be awarded to a final year student in the School of Optometry who shows the greatest proficiency in the theoretical and practical application of Contact Lenses.
The E. T. Davies Memorial Prizes
In memory of the late Professor E. T. Davies, his colleagues in the Applied Mathematics Department offer annually two prizes of the approximate value of $100 each: one prize is for the first year student, enrolled in the Faculty of Mathematics, who ranks first in the final examinations; the other is for the third year Applied Mathematics student who ranks first on the final examinations. In the initial year the value of the first year prize will be increased by an amount donated by Professor Davies' students.

No application is necessary.

The Sandford Fleming Academic Achievement Medal
The Sandford Fleming Foundation has established five medals for graduating students, one in each of the Engineering programmes: Chemical, Civil, Electrical, Mechanical and Systems Design, at the University of Waterloo. In each Department, the award is made to the student with the best academic record in the last six academic terms of his undergraduate course.

The Sandford Fleming Co-operative Programme Performance Medal
The Sandford Fleming Foundation has established five medals for graduating students, one in each of the Engineering programmes: Chemical, Civil, Electrical, Mechanical and Systems Design, at the University of Waterloo. This award is made for outstanding overall performance in both the work term industrial experience and the academic programme of co-operative engineering education. The nominees are selected jointly by the Academic Faculty and the Department of Co-ordination.

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

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

The Bobby Bauer Memorial Award
The Bobby Bauer Memorial Foundation will make one or more awards annually to students demonstrating outstanding proficiency in Hockey who qualify for admission to a full-time undergraduate programme at a Canadian university.

Application should be made prior to August 31 on forms provided by the Foundation. A letter of reference from a person actively involved in Hockey must accompany each application.

Inquiries and applications should be sent directly to:
Bobby Bauer Memorial Foundation,
60 Victoria Street North,
Kitchener, Ontario.

The Bruce Wyler Kelly Memorial Prizes
These book prizes were established in 1960 by relatives and friends in memory of the late Bruce Wyler Kelly, the first Dean of Science at the University of Waterloo, 1956-1960. These prizes are awarded in the General Science Programme at the end of the second year to two students, one registered with Biology as his major subject and one registered with Chemistry as his major subject. Qualifications are: (A) a clear pass standing and (B) highest standing in Biology with a minimum of B standing in Chemistry or highest standing courses taken with a minimum of B standing in the average of these courses.

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

The Chemical Institute of Canada Prize
Two awards, one each to a Chemistry and a Chemical Engineering student, are made annually by the Institute. The awards, consisting of an inscribed medal and a $25 gift, are given to the student standing at the top of the penultimate year of either course.

No application is necessary.

Ocular Pharmacology Prize
A cash prize to an outstanding Optometry student for performance in the Ocular Pharmacology course.
University Loan Funds

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

Alumni Association Student Assistance Plan
This Loan Fund has been instituted by the Alumni Association, University of Waterloo.

Loans up to $200 with repayment periods of up to 4 months are available to students in all faculties.

Arts Society Emergency Loans
Short-term, interest-free emergency loans are available to full-time undergraduates who are members of the Arts Society. Loans are to a maximum of $100 for a period of up to 60 days.

The Adelaide Detweiler Student Loan Fund
This loan fund has been established by Mr. J. R. Detweiler in memory of his mother, Adelaide Detweiler, to provide short-term loans, interest free, to students who may be confronted with unexpected expenses during their academic year.

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

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

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

Environmental Studies Society Loan Fund
Short term non-interest bearing loans are available to full-time undergraduate students enrolled in the Division 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.

Ginny Lee Memorial Fund
Students' Council has set aside a sum of money to be used in assisting students by providing interest free, short term loans. It is intended that this fund be used only when other avenues of obtaining assistance have been tried unsuccessfully.

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.

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.

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

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

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

Canada Student Loans Plan and Ontario Student Assistance Program

Full-time students may be eligible for a loan or a loan and grant to help pay for post-secondary studies and certain related costs. Loans are made available through the Federal Government's Canada Students Loans Plan and the loans are interest-free while the student is engaged in full-time study. Grants are provided by the Government of Ontario and do not normally have to be repaid.

The two main principles behind the programs are:
- you qualify for assistance on the basis of financial need, not on your level of academic achievement;
- assistance is to supplement, not replace, your own financial resources and those of your immediate family. You will be expected to contribute to the cost of your own education and, depending on your circumstances, your parents or your spouse may also be expected to contribute.

Further details and applications are available from the Awards Office.

Ontario Special Bursary Program for Part-Time Students

This program will provide bursary assistance based on financial need to students taking less than 60% of a normal full course load. The assistance is intended for individuals who are unemployed, receiving social assistance, or have a low family income.

Additional information and application forms are available from the Awards Office.

Loans for Part-Time Students

The Ontario Student Loans Plan provides loans of up to $700 per term to eligible part-time students who are taking less than 60% of a normal full-course load. These loans are made available on the basis of financial need and are normally interest-free for six months after the conclusion of the academic period for which the loan was provided, or six months after you withdraw from your course or courses, or three and one-half years after the start of the first term for which you receive an Ontario Student Loan.

Further details and application forms are available from the Awards Office.
The Department of Co-ordination and Placement

Winter Scene—Chemistry-Biology Link is visible in the background
Department of Co-ordination and Placement

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

Associate Directors
B. A. McCallum, BA (Western)
J. C. Wilson, BSc, CE (U. N. R.), PEng

Operations Analyst
J. R. Culley, BComm (McGill)

The Department of Co-ordination and Placement is responsible for the work terms in the co-operative programmes, and for assisting all students in career planning and obtaining employment on graduation. The staff includes professional personnel having extensive experience related to their fields of service in the Department.

Engineering
Programme Administrator
D. H. Copp, BASc (Toronto), PEng

Liaison Co-ordinator
J. F. Westlake, BASc, MAsc, PhD (Waterloo), PEng

Co-ordinators
D. G. S. Anderson, BASc (Toronto), PEng
G. P. Berthin, BSc (Manitoba), Eng
W. G. Cole, BASc (Toronto), PEng
G. P. Dobbin, BASc (Toronto), PEng
A. T. Girard, BASc (Toronto), PEng
R. A. Grant, BSc (Queen’s), PEng
D. S. Harris, BEng (McGill), PEng
W. C. Jorgeson, BS (Illinois), PEng
A. L. Lind, BSc (Queen’s), Eng
R. Mateyk, BASc (Toronto), PEng
R. McDowell, BSc (Saskatchewan), PEng
W. A. Runge, BSc (Queen’s), PEng
M. M. Smith, BSc (Queen’s), PEng

Applied Science
Programme Administrator
R. A. Pullin, BSA (Toronto)

Co-ordinators
L. R. Bricker, BSc, MSc (Waterloo)
W. J. Palmer, BSc (St. Francis Xavier), MSc (Dalhousie)

Mathematics
Programme Administrator
R. A. Klawitter, BA (Western)

Assistant to Programme Administrator
E. P. Whelan, BA (Waterloo)

Co-ordinators
D. J. Beaupre, BComm (Loyola), CA
J. T. Boniface, BSc (Waterloo)
A. P. Bradshaw, BA (McMaster)
M. O. Deschenes, BA, BEd (Queen’s)
E. M. Johnson, BA (Queen’s)
J. R. Pawley, BA (Carleton)
E. R. Pyatt, BA (Waterloo), CA
S. R. Stankus, BSc (RMC)
G. M. Subasic, BASc (Washington)

Environmental Studies – Architecture
Programme Administrator
J. W. Hoag, BArch (Toronto)

Co-ordinator
W. G. Dalby, BArch (Liverpool)

Environmental Studies – Geography
Co-ordinator
M. A. McMartin, BA (Western)

Human Kinetics, Health Studies and Leisure Studies
Programme Administrator
W. B. Fuller, BA (Western)

Co-ordinators
M. S. McLaughlin, BA (Waterloo)
P. J. Uptgrove, BSc (Waterloo)

Arts – Applied Economics
Co-ordinator
M. M. Scandiffio, BA (York), MA (Carleton)

Arts – English
Co-ordinator
M. M. Scandiffio, BA (York), MA (Carleton)

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

The Co-operative Plan
Co-operative education is based on the principle that during the undergraduate years an academic programme 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.
### How the Co-op System Works

<table>
<thead>
<tr>
<th>Programme (By Faculty)</th>
<th>Sept/Dec</th>
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<th>May/Aug</th>
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- Denotes work term where it appears on the chart.

Z Admission occurs at the time of selection of 2nd year courses. You cannot be admitted to co-op in 1st year.

Y Admission beyond 1A is possible only for the following terms: 1B - Jan. or May; 2A - Sept. or Jan.; 2B - May or Sept.; 3A - Jan.

X The Co-operative programme begins in 2A; however, admission is made to the programme at the time of the initial application.

† These work terms involve 6 months in a Secondary School & 2 months in the summer at Althouse College of Education, London.
The motivation, responsibility and opportunity for insight gained through co-operative education can be of inestimable value to the student’s future. The co-operative concept enables those with a career orientation to become full-time students of their subject, both during the academic terms and during the related work terms, and not in a random and uncertain manner, but within a structure of organized purpose and serious study.

Operation of the Plan
The necessary arrangements for the integration of the work terms, the securing of potential employers of the students, the arranging of interviews, and generally the management of the employment aspect are the responsibilities of the Department of Co-ordination and Placement. The Co-ordinators counsel the students, visit them on the job, assist them to adjust to work situations and encourage professional development.

The Work-Study Sequence
All Year 1 students enrol in September and spend the first term together at the University. As indicated on the chart, (p. 49) they rejoin as a class for the last term to complete their course work and graduate together. In some programmes such as Engineering, Mathematics and Science, the class is split into two approximately equal groups, one known as Stream 8, the other as Stream 4. Both groups receive the same total time on campus and at work. Stream 8 has a double academic term at the start of the course; Stream 4 has a double academic term at the end of the course. The final choice of group is made by students during interviews with Co-ordinators shortly after registration. Where Stream 8 or Stream 4 are both available, a student must choose one or the other in Year 1. All other programmes shown on the chart are single stream programmes where no choice is available in Year 1. Variations may be requested due to academic or work situations in upper years. Precise dates for the beginning and end of various terms are shown in the Academic Calendar.

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

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

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

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

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

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

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

Unsatisfactory Performance
Unsatisfactory performance by a student on a work term is investigated by the student’s Co-ordinator. As a result of this investigation, if benefits from further professional training are questionable, the student may be required to withdraw from the programme.

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.

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

On Own – Self-imposed:
This indicates a condition where an on-own term is granted to a student for personal reasons. It may also be used to indicate that a student was unable to obtain suitable employment through the normal placement processes. If the student subsequently finds suitable employment, the Co-operative Student Record will be changed to record this fact.

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

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

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

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

Standings and Appeals
Applicable to sections “Seeking Employment and Employer Interviews”, and “Work Terms”. The Department of Co-ordination and Placement which administers these Regulations and Procedures will first present any notation of “Failed Work Term,” “On Own – Imposed by Department,” or “Required to
Withdraw" (as a result of unsatisfactory work term performance) to the appropriate Faculty examinations, promotions or standings committee for a decision. 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. Where other than four are required by the University, this is stated in the calendar or in the individual student's file. However, employers may require additional reports from students as part of the job. Normally for a report to be considered as a satisfactory work report it must have been written during the work term and be related to or evoked by the work term activity.

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

Graduation Requirements for Co-operative Programmes

Work Terms
Quantity: As a general principle, a co-operative programme includes a number of work-term/months equal to, or greater than, half the number of academic-term/months in the programme, from the time the programme begins. In those Faculties which offer both regular and co-operative programmes, the minimum number of related work terms required for a co-operative degree is normally four. In those Faculties offering only the co-operative programme, the minimum number of work terms normally equals the number of work terms available and remaining to the student in the programme from his/her point of entry.

Performance Evaluation: In those programmes with a stated minimum number of work terms, this number is also the minimum number of satisfactory work terms. In programmes where there is no stated minimum, the number of satisfactory work terms can be one less than the number of work terms remaining in the programme 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 programmes the submission of work reports is a requisite for graduation and generally the minimum number is four, and these four must be graded as satisfactory or better. Provision is made for students to upgrade unsatisfactory reports or submit new reports. Also provided for are situations where there are less than four work terms available to the student, as well as other special conditions 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 programmes, students must be registered as full-time students in the programme in all terms from point of entry through to the final academic term. The only exception occurs in programmes on a credit system where a student may have enough credits to be able to register as a part-time student in the final term.

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

Co-operative Degree Designation

Since Architecture and Engineering are mandatory co-operative programmes, University of Waterloo graduates in these disciplines are known to have gone through the co-operative system. In Chemistry, Economics, English, Geography, Geology, Kinesiology, Mathematics, Physics, and Recreation, students may graduate from either the regular or the co-operative programme. In recognizing the difference for one of these disciplines where the choice is optional, graduates completing the co-operative plan requirements will receive a "co-operative" degree designation.

The foregoing has been written with the assistance of the Student Advisory Council to the Department of Co-ordination and Placement. The Council strongly recommends that applicants interested in co-operative education read a brochure designed to supplement the Calendar, entitled "Where it's at with Co-op Education", before deciding whether such a programme is designed to best further their academic interests. The brochure presents more details about co-op in areas solely relevant to students, and is available from high school guidance departments or from the Department of Co-ordination and Placement.
Industrial Advisory Council for Co-operative Engineering and Applied Science

The Industrial Advisory Council of the University of Waterloo was established in 1958 to bring guidance from industry to the University of Waterloo. The Council meets twice each year to discuss problems and make recommendations relative to the University's co-operative programmes in Engineering and Applied Science.

D. W. Roughley (Chairman)
Cope Group of Companies

R. A. Carlyle (Vice Chairman)
Inco Limited

D. McKenzie (Secretary)
Ford Motor Company Canada Limited

J. R. Adare
Canadian Blower and Forge Company Limited

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Dow Chemical of Canada Limited

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Columbus McKinnon Limited

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E. G. MacInnis
Department of National Defence

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General Foods Limited

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Bell Canada Limited

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The Giffels Group

S. W. Sheldon
Standard Brands Canada Limited

D. T. Stevenson
Babcock & Wilcox Canada Limited

W. D. Stover
Sheldons Engineering Limited
Organizations Employing Co-operative Architecture Students

Adamson Associates
Agnew Peckham Associates
Air Canada
Akitt & Swanson, Architects
Alistair M. Ross, Architect
Allen Brown Sherriff, Architects
Andres Kalm, B.L.A.
Andrew Volgyesi, Architect
Anthony Butler, Architect
Anthony L. Kemp, Architect
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Arnott MacPhail Johnstone & Associates Limited
Arthur Erickson, Architect
Ball Brothers Limited
Bank of Montreal
Bell Canada
Bittorf Holland Christianson
Blood & Houghton, Architects
Brant County Board of Education
Bregman & Hamann, Architects
Brewers Warehousing Company
Brian E. Pye, Architect
Brook Carruthers & Shaw, Architects
Built Environment Co-ordinators Limited
Campeau Corporation Limited
Canadian Imperial Bank of Commerce
Canadian Penitentiary Services
Central Mortgage & Housing Corporation
City of Cambridge
City of Guelph
Clifford, Lawrie, Bolton, Ritchie, Architects
Cliff & Cluff, Architects
Dale Chandler Kennedy, Architects
David Boulva Cleve, Architects
Dawson & Szymanski, Architects
A. J. Diamond, Architect
Dominik Thompson Laframboise Mallette, Architects
Don Hancock, Landscape Architect
Donald N. Chapman, Architect
Donald E. Skinner, Architect
Dunlop Farrow Aitken, Architects & Consulting Engineers
Ferdinand Wagner, Architect
Fraser & Macie, Architects
Frick Bellinger Associates
Gail E. Lamb, Architect
Gios Architects, Engineers & Planners
Gore & Storrie Limited
Govan Kaminker Keeneleyeside Melick Devonshire Wilson, Architects
Government of Canada
Government of North West Territories
Government of Ontario
Grand River Conservation Authority
Harley Little Associates Limited
Harold Freure Limited

Co-ordination and Placement
Organizations Employing Co-operative Architecture Students

Harry Smith, Architect
Henriquez & Todd, Architects
Henry Fliess, Architect
Horton Ball Walter Fedy McCargar Hachborn
Humber College
IBI Group
Imperial Oil Limited
Jackson Ypes & Associates
John Andrews, Architect
Kapelle Wright & MacLeod Limited
Kirbourn Engineering Limited
Killick Metz Field Associates
Kyles Kyles & Garrett, Architects
Lebensold Affleck Nichol Hughes, Architects
Lingwood & Robertson, Architect-Engineer
Lipson Dashkin, Architects
Litwick Lambert Sim & Johnston & Moy, Architects
MacDonald & Zuberec, Architects
Mark Musselman McIntyre Combe, Architects
Matthers & Haidenby, Architects
Matsui Baer Vanstone, Architects
McNab Barkley Young
Meek Klausen Servage Walker, Architects & Engineers
Meno S. Martin Contractor Limited
Merrett Stahl Elliott, Architects
Michael Torsney, Architect
Moffat Moffatt & Kinoshita, Architects
Moffat & Duncan, Architects
Moshe Safdie, Architect
Multi-Service Systems
National Research Council
The Niagara Parks Commission
A. Norman McRoberts, Architect
Ontario Housing Corporation
Otonabee Conservation Authority
Page & Steele, Architects
Parkin Architects, Engineers & Planners
Paul Rust, Architect
M. Paul Wiegand, Architect
Prack Partners, Architects
Y & R Properties
Ranta & Tett, Architects
Irving Rayman, Architects
Robert L. Langlois, Architect
Robinson & Heinrichs, Architects
Ryan & Lee, Architect & Engineer
Salter & Allison, Architects
Schoeller Heaton Harvor Menendez, Architects
Sheldon D. Rosen, Architect
Shore Tilhe Henschel Irwin, Architects & Engineers
Snider Huget & March, Architects
Souter Lenz Scott & Taylor
Somerville McMurrich & Oxley, Architects
Stafford Haensli, Architects
Stan H. Butcher, Architect & Town Planner
Stark & Temporale, Architects
I. Stecura, Architect
R. Stewart Smith, Architect
Stone & Kohn, Architects
<table>
<thead>
<tr>
<th>Organizations Employing Co-operative Engineering, Applied Sciences &amp; Geography Students</th>
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<tr>
<td>Abex Corporations Ltd.</td>
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<tr>
<td>Abitibi Paper Company Limited</td>
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<td>Abitibi Provincial Paper Ltd.</td>
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<td>Acres Consulting Services Ltd.</td>
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<td>Adam Clarke Company Limited</td>
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<td>The Adams Mine</td>
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<td>Addiction Research Foundation</td>
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<td>Aerofall Mills Limited</td>
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<td>AES Data Limited</td>
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<td>Ainley and Associates Limited</td>
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<td>Air Canada</td>
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<td>Alberta Research Council/University of Alberta Campus</td>
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<td>Albery Pullerits Dickson &amp; Associates</td>
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<td>Alcan Wire &amp; Cable Limited</td>
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<td>The Algoma Steel Corporation Limited</td>
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<td>Allen-Bradley Canada Limited</td>
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<td>Allied Chemical Canada Ltd.</td>
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<td>Aluminum Company of Canada Limited</td>
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<td>AMF Canada Ltd./Potter Brumfield Div.</td>
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<td>American Can of Canada Limited</td>
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<td>Amoco Canada Petroleum Co. Limited</td>
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<td>Anatek Electronics Ltd.</td>
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<td>Angelstone Limited</td>
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<td>H. H. Angus &amp; Associates Ltd.</td>
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<td>Anthes Equipment Limited</td>
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<td>Aptec Engineering Limited</td>
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<td>Aquitaine Company of Canada Limited</td>
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<td>Armco Canada Limited</td>
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<td>Armstrong Cork Company</td>
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<td>Arthur G. McKee &amp; Co. Canada Limited</td>
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<td>Ashland Oil Canada Limited</td>
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<td>Atlas Steels Company</td>
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<td>Atomic Energy of Canada Limited</td>
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<td>Automotive Hardware Limited</td>
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<td>BAC M Limited</td>
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<td>Babook &amp; Wilcox Canada Ltd.</td>
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<td>Bacon Engineering Limited</td>
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<td>Barton Tubes Limited</td>
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<td>Bell Canada</td>
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<td>Bell Northern Research</td>
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<td>Bennett &amp; Wright Eastern Ltd.</td>
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<td>Benson &amp; Hedges Tobacco Co.</td>
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<td>Bennett Paving &amp; Materials Limited</td>
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<td>Black &amp; Decker Manufacturing Company Limited</td>
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<td>Black &amp; McDonald Limited</td>
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<td>Bondar-Clegg of Canada Limited</td>
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<td>Borden Chemical Company (Canada) Limited</td>
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<td>Borg-Warner (Canada) Ltd.</td>
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<td>Borough of East York</td>
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Co-ordination and Placement
Organizations Employing Co-operative Engineering, Applied Sciences & Geography Students

Borough of Etobicoke
Borough of Scarborough
Bowmar Canada Limited
Boyle-Midway (Canada) Limited
Brant County Board of Education
Brighton Valve Limited
T. G. Bright & Company Limited
Brinkerhoff Drilling Canada Limited
Bristol-Myers Canada Limited
Bruce S. Evans Limited
B.P. Refinery Canada Limited
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Building Products of Canada Limited
R. J. Burnside & Associates
Burroughs Business Machines Limited
Butler Manufacturing Company (Canada) Ltd.
Canada Alloy Castings Limited
Canada Cement Lafarge Limited
Canada Colors & Chemicals Limited
Canada Giebe Company Limited
Canada Machinery Corporation Limited
Canada Packers Limited
Canada Sand Papers Limited
Canada Starch Company Limited
Canadian Advanced Production Consultants
Canadian Association of Oilwell Drilling Contractors
The Canadian Blower & Forge Co. Ltd.
Canadian Brass Limited
Canadian Broadcasting Corporation
Canadian Canners Limited
Canadian Carbonization Research Association
Canadian Fram Limited
Canadian General Electric Company Limited
Canadian General Tower Limited
Canadian Gypsum Co. Ltd.
Canadian Heat Treaters Limited
Canadian Industries Limited
Canadian Ingersoll Rand Co. Limited
Canadian Iron Ore Committee
Canadian Johns-Manville Company Limited
Canadian Liquid Air Limited
Canadian National Railways
Canadian National Telecommunications
Canadian Pacific
Canadian Pittsburgh Industries Ltd.
Canadian Refractories Division
Canadian Standards Association
Canadian Tire Corporation Limited
Campbell Smith Engineering Limited
Camston Limited
Canatom Limited
Canhar Wood Tank Company
Canefco Limited
Canron Limited
Catalytic Enterprises Limited
CFTO-Channel 9
Chemetics International Ltd.
Chevron Standard Limited
Chipman Chemicals Limited
Chrysler Canada Limited/National Parts Depot
CIBA-GEIGY Canada Ltd.
Cimco Ltd
City of Brampton
City of Branford
City of Burlington
City of Cambridge
City of Chatham
City of Guelph
City of Hamilton
City of Kitchener
City of London
City of Mississauga
City of Niagara Falls
City of Peterborough
City of Port Colborne
City of St. Catharines
City of Sault Ste. Marie
City of St. Thomas
City of Sudbury
City of Thunder Bay
City of Toronto
City of Welland
City of Windsor
City of Waterloo
Club House Foods Ltd.
Columbus McKinnon Limited
Cominco Ltd.
Commutron Limited
Computing Devices of Canada Limited
Cometstock International Ltd.
Conestoga Engineering Limited
Consolidated-Bathurst Ltd.
Consolidated Canadian Faraday Limited
Control Data Canada Limited
Conwest Exploration Company Limited
County of Brant
Conspec Controls Limited
The Consumer’s Gas Company
Consumers Glass Co. Ltd.
Continental Can Company of Canada Limited
V. B. Cook Company Ltd.
Cooper-Bessemer of Canada Limited
A. Cope & Sons Limited
Corrosion Service Co. Ltd.
Cosmos Chemlac Limited
Coulter Copper & Brass Limited
County Contracting of Wheatley Inc.
County of Perth Planning Office
Cox Construction Limited
R. L. Crain Limited
Crane Canada Ltd.
Crane Packing Company Ltd.
Crouse-Hinds of Canada Ltd.
Cumming-Cockburn & Associates
Dagmar Construction Limited
DeLeuw Cather Canada Limited
Delta-Benco Cascade
Deutz Diesel (Canada) Limited
Denison Mines Limited
Diamond Canapower Ltd.
Diamond Clay Products Company Limited
Diesel Equipment Ltd.
Digital Equipment of Canada Ltd.
Digital Video Laboratories Inc.
M. M. Dillon Limited
Dixon Red Devil
Dome Petroleum Limited
Dominion Aluminium Fabricating Ltd.
Dominion Bridge Company Limited
Dominion Foundries & Steel Limited
Dominion Glass Co. Ltd.
Dominion Soil Investigations Ltd.
Dominion Textile Limited
Domtar Chemicals Limited
Domtar Construction Materials Ltd.
Domtar Packaging Limited
Dow Corning of Canada Limited
Dresser Industries Products Limited
Dufferin Construction Co.
Dupli-Color Canada Limited
Dupont of Canada Ltd.
Dylox Limited
E & B Cowan Consulting Engineers
East Gwillimbury Township
Eaton Yale Ltd.
Eastern Steel Products
Ebascos Services of Canada Ltd.
Eco-Research Limited
Ecodyne Limited
Eddy Forest Products Limited
Eldorado Nuclear Limited
Electronics Corporation of America (Canada) Limited
Eli-Lilly & Company (Canada) Limited
Ellis-Don Ltd.
Engelhard Industries of Canada Limited
Engineering Interface Limited
Epitex Electronics Limited
Erco Industries Ltd.
Erie Technological Products of Canada Ltd.
Ernst Leitz (Canada) Ltd.
Esso Chemical Canada
The Falk Corporation of Canada Limited
Federal Pioneer Ltd.
Fermar Paving Ltd.
Ferranti-Packard Limited
Ferrara-Resco Limited
Fiberglas Canada Limited
Firestone Tire & Rubber Co. of Canada Ltd.
Fischback & Moore of Canada Ltd.
Fisher Gage Limited
Flecto Coatings Limited
Forano Limited
Ford Motor Company Canada
Foseco Canada Ltd.
Foster-Wheeler Limited
Foundation of Canada Engineering Corp. Ltd.
Fowler Construction Company Limited
E. S. Fox Ltd.
Foxboro Company Limited
Francis Hankin & Company Limited
Frankel Structural Steel Limited
Freure Homes Limited
Galt-Brantford Malleable Iron Ltd.
Galt Metal Industries Limited
Gandalf Data Communications Ltd.
Garrett Manufacturing Limited
Gaspe Copper Mines Limited
General Foods Limited
General Instrument of Canada Limited
General Motors of Canada Ltd.
Geocon Limited
Geophysical Engineering Limited
George W. W. Canada Limited
Geosearch Consultants Limited
The Giffels Group
Glaxo Canada Ltd.
H. Q. Golder & Associates Limited
B. F. Goodrich Canada Limited
Goodyear Canada Incorporated
Gore & Storrie Limited
Gould Manufacturing of Canada Ltd.
Government of Northwest Territories
Government of Canada
Government of Ontario
Grand River Conservation Authority
Grandview Industries Ltd.
Grayco Limited
The Great Lakes Paper Company Limited
Great West Steel Industries Ltd.
Greb Industries Ltd.
A. P. Green Refractories Canada
Greenfield Construction Co. Inc.
Griffith Mine
GTE Automatic Electric (Canada) Limited
Guelph Hydro
Gulf Oil Canada Limited
Haessler & Deway Ltd.
Halliday Homes Limited
Hamilton Harbour Commission
Hart Chemicals Ltd.
Hart & Cooley Mfg. Company of Canada Limited
Harth Industries Ltd.
Hatch Associates Ltd.
Hawker Siddley Canada Ltd.
Hayes-Dana Limited
Hi Tower Drilling
R. R. Higgins & Associates Limited
Hospital for Sick Children
Hostess Foods Products Ltd.
Hovey & Associates Ltd.
Hover-Jak Ltd.
A CA Howe International Limited
Hudson Bay Oil & Gas Limited
Hudson Bay Exploration & Dev. Co. Ltd.
Co-ordination and Placement
Organizations Employing Co-operative
Engineering, Applied Sciences & Geography Students

Hudson Bay Mining & Smelting Co. Limited
Hydraulic Machinery Co. Ltd.
Hydro Mississauga
IB Group
IBM Canada Limited
ICN-Empire
Imperial Oil Ltd.
Imperial Oil Enterprises Limited
Imperial Tobacco Products Limited
Inco Limited
Industrial Grain Products Ltd.
Inglis Co. Ltd.
Inspec-Sol Ltd.
International Minerals & Chemical Corp (Canada) Ltd.
International Systems Ltd.
Interprovincial Corrosion Control Co. Ltd.
Interroyal Corporation Limited
Interteel Consultants Ltd.
Iron Ore Company of Canada
IST Incorporated
ITT Canada Limited
ITT Grinnell Co. of Canada Ltd.
James F. MacLaren Limited
Jarvis Clark Company
Jerrold—A Division of General Instrument of Canada Limited
Jervis B. Webb Company of Canada Ltd.
John Deere Welland Works
John T. Hepburn Co. Ltd.
Johnson Controls Limited
Joy Manufacturing Company (Canada) Ltd.
Kanmet Limited
Kappele Wright & MacLeod Limited
Kaufman Footwear Limited
Kearney-National (Canada) Ltd.
Keeprite Products Limited
Kellogg's Saalada
W. E. Kelly & Associates Limited
Kerr Addison Mines Ltd.
Kilborn Engineering Ltd.
Kimberly-Clark of Canada Limited
Kimberly-Clark Pulp & Paper Co. Ltd.
Kindred Industries Limited
King Hydraulic Power Limited
R. S. Kirkup & Son
Kitchener-Waterloo Hospital
The Kleinfieldt Group Ltd.
Knox Martin Kretch Ltd.
Korlin Limited
Labatt Breweries of Canada Limited
Lackie Bros. Ltd.
Lear-Siegler Industries Ltd.
J. D. Lee Engineering Limited
Leigh Instruments Limited
Lely Limited
Lindsay Speciality Products Limited
Lingwood Robertson Architects/Engineers
Litton Systems (Canada) Limited
W. P. London & Associates Ltd.
Long Manufacturing Division
Long Spruce Constructors
Looby Construction Limited
The Lummus Company Canada Limited
3M Canada Limited
M & T Products of Canada Ltd.
Magnum Coll Limited
Malcolm Condensing Company Limited
Manitoba Forestry Resources Ltd.
Manitoba Hydro Limited
Marshall Macklin Monaghan Limited
Massey-Ferguson Industries Limited
Mattabi Mines Limited
McAlpine Robert Limited
McAsphalt Engineering Services
McCormick Rankin & Associates Limited
McGeorge & Barry Limited
McGuinness Distillers Limited
McGurk Strapp & Associates
McNamara Marine Limited
Metex Corporation Limited
Mickelson Associates
Miles Laboratories Limited
Millhaven Fibres Limited
Mobil Paint Company
Molson's Brewery (Ontario) Limited
Molson's Brewery (Quebec) Limited
Monsanto Canada Limited
Monteith & Sutherland Ltd.
Montgomery Elevator Limited
Montreal Engineering Company Limited
Motorola Electronics Sales Limited
Mould Tek Industries Limited
MTD Products Canada
Municipality of Metro Toronto
The National Cash Register Co. of Canada Ltd.
National Research Council
National Sewer Pipe Ltd.
New Jersey Zinc Exploration Co. (Canada) Ltd.
Niagara Paint & Chemical Co. Ltd.
Nisbet Letham Limited
Nixon Plasti Vans Limited
Noranda Exploration Company Limited
Noranda Research Centre
Northern Electric Company Limited
Northern Engineering Services Co. Ltd.
Northern Telecom Company Limited
North York Hydro Office
Nuodex Canada Limited
O & W Electronics Limited
The Ontario Cancer Institute
Ontario Education Communications Authority
Ontario Housing Corp.
Ontario Hydro
The Ontario-Minnesota Pulp & Paper Co. Ltd.
Co-ordination and Placement
Organizations Employing Co-operative Engineering, Applied Sciences & Geography Students

The Ontario Paper Company Limited
Ontario Research Foundation
Orangeville Hydro Commission
Ottawa Hydro
Outboard Marine Corporation of Canada Limited
Oxford Regional Centre
Pamour Porcupine Mines Ltd.
Papeterie Reed Limited
C. C. Parker & Associates Limited
Paul Theil Associates
Peter F. McGaw & Associates
Petrosar Recruiting
Phillips-Laul Products Limited
Phillips Electronics Industries Ltd.
Phillips Cables Limited
Picker X-Ray Mfg. Ltd.
Piggott Construction Company Limited
Pilkington Brothers Canada Limited
Pitts Engineering & Construction Ltd.
Planistics Incorporated
Plastoflex Industries
Plax Canada Limited
Polyasar Plastics Limited
Pratt & Whitney Aircraft of Canada Ltd.
Preston Metal & Roofing Products Limited
Preston Sand & Gravel Co. Ltd.
Prince George Pulp & Paper Limited
Pro-Eco Limited
The Proctor & Gamble Company of Canada Ltd.
The Proctor Redfern Group
Provincial Crane Division of Dominion Bridge Co. Ltd.
Public Utilities Commission of Brantford
Public Utilities Commission of Ingersoll
Public Utilities Commission of Woodstock
Purolator Limited
The Quaker Oats Co. of Canada Ltd.
Raytheon Canada Limited
Reed Voorhees & Associates Ltd.
Reed Paper Company Limited
Regional Municipality of Durham
Regional Municipality of Halton
Regional Municipality of Hamilton-Wentworth
Regional Municipality of Niagara
Regional Municipality of Peel
Regional Municipality of Sudbury
Reuter-Stokes Canada Ltd.
J. L. Richards & Associates Limited
Rio Algom Mines Limited
The Robert Mitchell Company Limited
Romm Construction Company Limited
B. M. Ross & Associates Limited
P. S. Ross & Partners
Roxton Furniture Limited
Sandwell & Company Limited
L. H. Scwindt & Co. Limited
Scintrex Surveys Limited
Seaway/Midwest Limited
Selectone Paints Limited
Semco Industries Co. Ltd.
G. M. Sernas & Associates
Shaw Pipe Industries Ltd.
Sheldons Engineering Limited
Shell Canada Limited
Silverwood Dairies Limited
A. G. Simpson Company Limited
Simpsons-Sears Limited
Skega Canada Limited
Sonoco Limited
Southam Printing Company Limited
Spar Aerospace Products Limited
Spliers Industrial Construction Inc.
Spruce Falls Power & Paper Company Limited
St. Anne-Nackawic Pulp & Paper Ltd.
St. Joseph's Hospital
St. Lawrence Cement Co. Ltd.
St. Mary's Cement Co.
Stanton Pipes (Canada) Limited
Steed & Evans Limited
The Steel Company of Canada Limited
Steele's Wire Springs Limited
Steeple Rock Iron Mines Limited
Steffler Metal Products Limited
Stephens-Adamson Division of Allis Chalmers Can. Ltd.
Sterling Varnish Co. (Canada) Ltd.
Stevenson & Kellogg Ltd.
Sullivan Strong Scott Limited
Sunnybrook Hospital
Sun Oil Company Limited
Sutcliffe Company
Switzer Engineering Services Ltd.
Syncrude Canada Limited
Taylor Engineering Ontario Limited
Taylor Instrument Companies of Canada Ltd.
Technical Coatings Co. Ltd.
Teklogix Limited
Telesat Canada
Tembec Forest Products Inc.
Temprite Industries Limited
Texaco Canada Limited
Texasgulf Canada Limited
J. E. Thomas Specialties Limited
The Timberland Ellicott Limited
Toronto-Hydro Electric System
Toronto Malton Implementation Team
Toronto Transit Commission
Tottem Sims Hubicki (Canada) Ltd.
Town of Halton Hills
Town of Markham
Town of Oakville
Township of Elliot Lake
Toyota Limited
TransCanada Pipelines Limited
Transportation Canada
Trecan Ltd.
Trench Electric Limited
Underwood McLellan & Associates Ltd.
Union Carbide Canada Ltd.
Union Drawn Steel Company Limited
Co-ordination and Placement
Organizations Employing Co-operative
Human Kinetics & Leisure Studies Students

Union Gas Company of Canada Limited
Union Miniere Explorations & Mining Corp. Ltd.
Uniroyal Chemical—Division of Uniroyal Ltd.
Uniroyal Limited
Unit Rig & Equipment Co. (Canada) Ltd.
United Co-operatives of Ontario
United Tire & Rubber Company Limited
Universities & Colleges
  McMaster University Medical Centre
  Memorial University of Newfoundland
  Royal Military College of Canada
  Sheridan College of Applied Arts & Technology
  St. Clair College of Applied Arts & Technology
  University of Alberta
  University of Western Ontario
Upper Canada Resources Ltd.
Velan Construction Company
Varian Associates of Canada Ltd.
Velan Engineering Ltd.
VME Associates Ltd.
Vicat Canusa Company of Canada Limited
Volkswagen Associates Limited
Wabush Mines
Walbar Machine Products of Canada Ltd.
Walter Fedy McCargar-Hachborn Consulting Engineers
Westeel-Rosco Limited
Western Controls Incorporated
Western Foundry Limited
Westinghouse Canada Limited
Weston Research Centre
Weyerhaeuser Canada Ltd.
White-Cockshutt Farm Equipment
Whiting Equipment Limited
William Trow & Associates Limited
Willroy Mines Limited
Wm. Roberts Electric & Mechanical Limited
The W. C. Wood Company Limited
Worthington (Canada) Ltd.
Xerox of Canada Ltd.
M. S. Yolkes Associates Ltd.
York Steel Construction Ltd.

Organizations Employing Co-operative
Human Kinetics & Leisure Studies Students

Adult Occupational Centre, Edgar
Alcoholism & Drug Addiction Research Foundation
Arc Northpeel Enterprises
Ausable-Bayfield Conservation Authority
Boards of Education
  Brant
  Durham
  Muskoka
  North York Borough
  Ottawa
  Peel
  Sudbury
  Timmins
  Waterloo County
  Wellington County
Borough of Etobicoke
Borough of Scarborough
Boyne River Natural Science School
Brock Creek Provincial Park
Camp Tawingo
Carol Curier Residence
Cawthra Park Secondary School
Cedar Glen
City of Brampton
City of Brantford
City of Burlington
City of Kitchener
City of Nanticoke
City of North Bay
City of Sudbury
City of Thunder Bay
City of Waterloo
County of Oxford
C. P. R. I. Childrens Psychiatric Research
Creative Child (The)
Defence & Civil Institute Environmental Medicine
Dr. MacKinnon Phillips Hospital
Erindale Secondary School
Government of Ontario
Hamilton Psychiatric Hospital
C. M. Hincks Treatment Centre
Homewood Sanitarium
Huronia Regional Centre
Kitchener-Waterloo Hospital
Lakeshore Psychiatric Hospital
Lutherwood
Lynwood Hall Children's Centre
Maitland Valley Conservation Authority
Markham Fitness & Racquets Club
Meadowvale Recreation Centre
Midwestern Regional Centre
Minto Management Recreation Department
Mississauga Racquets Club
Muskoka Centre
Nepean Parks & Recreation
Ontario Society for Crippled Children Camp
Oxford Regional Centre
OW Sports Limited
Parks Canada
Participation House
L. S. Penrose Centre
Pine Ridge
Queen Street Mental Health Centre
Recreation Department, Exeter
Recreation Facilities Research Project
Rideau Regional Hospital School
Royal Ottawa Hospital
Sacred Heart Children's Village
 Salvation Army Children's Home
Sheldon Valley Field Studies Centre
Southwestern Regional Centre
St. Clair Region Conservation Authority
St. Peter's Centre
St. Thomas Psychiatric Hospital
Sunbeam Home
Sunset Home for the Aged
Timmins High & Vocational School
Toronto Squash Club (The)
Town of Arnprior
Town of Hanover
Town of Milton
Town of West Lorne
Universities & Colleges
  Cambrian College
  Centennial College
  Humber College
  Loyalist College
  Ontario Police College
  Sault Ste. Marie College
  Seneca College
Valleymere Home for the Aged
Victoria Woods Development Corporation
West Scarborough Boys' Club
Whitby Psychiatric Hospital
Woolwich Recreation Department
YMCA
  Kitchener-Waterloo
  Metropolitan Toronto
  Orillia
YM-YWCA
  Brantford
  Guelph
  Peel

Organizations Employing Co-operative Mathematics Students

AGT Data Systems Limited, DCF Systems Limited
The Algoma Steel Corporation Limited
Allen, Miles, Fox & Johnston
Alphatext Systems Limited
Aluminum Company of Canada Limited
Aluminum Goods
A. E. Ames & Company Limited
R. Angus Computer Services
Anton Jenset & Company
Atmospheric Environment Services
Atomic Energy of Canada Limited
Automatic Electric Canada Limited
Bank of Canada
Bank of Montreal
Bank of Nova Scotia
Bata Limited
The Bay
Beallor, Beallor & Burns
Beaver Engineering Limited
The Becker Milk Company Limited
Bell Canada
Bell Northern Research
Boards of Education
  Brant County
  Carleton County
  The Cochrane-Iroquois Falls
  Essex County
  Etobicoke
  Frontenac County
  Hamilton
  Hastings County
  Lincoln County
  North York Borough
  Ottawa
  Peel County
  Renfrew County
  Sault Ste. Marie
  Scarborough
  Sudbury
  Timmins
  Waterloo County
  Wellington County
  York Borough
  York County
Bouris, Wilson, Scott & Proctor
Bowmar Canada Limited
Brunton, Browning, Day & Partners
Burns Foods Limited
Burroughs Business Machines Limited
Campbell, Lawless & Punchard
Campbell, Sharp, Nash & Field
Canada Permanent Trust Company
Canada Systems Group (EST) Limited
Canadian Imperial Bank of Commerce
Canadian Industries Limited
Canadian National Telecommunications
Co-ordination and Placement
Organizations Employing Co-operative Mathematics Students

Canadian Pacific
Canadian Reinsurance Company
Canadian Tire Corporation Limited
Carling O'Keefe Limited
CCH Canadian Limited
C. C. M.
Charles Kench & Associates Limited
Chrysler, Shillington & Company
City of Sault Ste. Marie
City of Sudbury
City of Toronto
Clarke, Starke, & Diegel
Clarkson, Gordon & Company
Co-operators Insurance Association
Cole, Rubin, Finkelstein & Green
Collins Barrow
Columbia Records of Canada Limited
Combined Insurance Company of America
Comtech Group Limited
Confederation Life Insurance Company
Consolidated Bathurst
Consolidated Computer Limited
Consumers Gas Company Limited
Control Data Canada Limited
Control Data Institute
The Cooper Tool Group Limited
Coopees & Lybrand
Corporate Benefit Plans Incorporated
Cossar, Hector, Payne & Company
Coutu's Hallmark Cards
Cox, Hyatt & Company
The Crown Life Insurance Company
Dacik & Tinsdale
L & W Data Systems Limited
Data Crown Limited
Deloitte, Haskins & Sells
Desmarais, Arseneault & Company
DMR & Associates
Dominion Foundries & Steel Limited
Donald Hill & Partners
Dow Chemical of Canada Limited
D. A. Dunlop & Company
Dun & Bradstreet
Dunwood & Company
Dylex Limited
Ellis-Don Limited
Enns, Graham & Company
Erickson, Lee, MacDonald, McNeil
Esso Chemical
Facelle Company Limited
Falconbridge Nickel Mines Limited
Felk Corporation of Canada
Fiberglas Canada Limited
Financial Post
Ford, Keast, Giles, Smith & Phillips
Ford Motor Company of Canada Limited
Fox, Glicksman & Company
Gardner, McDonald & Company
Gaviller & Company
GEAC Computer Corporation Limited
Geilman, Hayward & Partners Limited
General Foods Limited
General Motors Canada Limited
George Deeth
George A. Welch & Company
Geoterrex Limited
The Globe and Mail Limited
Goebelle & Wagner
Goodyear Canada Incorporated
Gore Mutual Insurance Company
Government of Canada
Government of Ontario
Grand & Toy Limited
Greer, Fleming, Roland & Company
Guaranty Trust Company of Canada
Gulf Oil Canada Limited
Hans Graf
Harbinson, Glover & Company
Harding Carpets Limited
M. A. Hassal
Heaton & McKeon
Hewlett-Packard (Canada) Limited
Hilborn & Company
Hiram Walker & Sons Limited
Hobbs, McRae, Poupore & Kendall
Home Hardware Stores Limited
Honeywell Limited
Hyde-Houghton & Company
IBM Canada Limited
Imperial Life Assurance Company Limited
Imperial Oil Limited
Imperial Tobacco Limited
Inco Limited
The Independent Order of Foresters
Informetrica Limited
Integrated Mini Systems Limited
International Harvester Company of Canada Limited
Jarrett, Goold, Elliot & Company
Johnson, Rickard & Company
Joscelyn, Laughlin, Harper, Tory & Associates
Kimberly Clark of Canada Limited
Kim & Company
Kodak Canada Limited
Mr. H. Kreeft
Langlois, Hauck & Company
Litton Systems (Canada) Limited
Loftus A. Allen & Company
London Life Insurance Company
Lough Lewis & Associates
MacGillivray & Company
Mack Trucks Limited
MacKillican & Associates
A. F. MacLaren & Company
The Manufacturers Life Insurance Company
Massey-Ferguson Industries Limited
McCarney, Swinarton, Newland & Company
Co-ordination and Placement
Organizations Employing Co-operative Mathematics Students

McCay, Duff & Company
McColl, Turner & Company
McMahon, Millard, Graham & Kentner
McNeil Crosson & Magwood
McPherson, Scott & Cragg
The Merchantile & General Reinsurance Company
Microm Data Systems Limited
Millard, Rouse & Rosebrugh
Minicomputer Business Systems
Model Management Systems
The Molson Companies
Morris, Burk, Friedman & Luborsky
Municipality of Metropolitan Toronto
The Mutual Life Assurance Company of Canada
National Cash Register Company of Canada
National Drug & Chemical Company of Canada Limited
The National Life Assurance Company of Canada
National Trust Company
New Brunswick Telephone Company
Noranda Mines Limited
North American Life Assurance Company
Northern & Central Gas Corporation Limited
O. F. Osborne
The Ontario Institute for Studies in Education
Ontario Hydro
Ortho Pharmaceutical (Canada) Limited
Outboard Marine Corporation of Canada Limited
Partridge, Skene & Company
Peat, Marwick, Mitchell & Company
Perrin, Shore, Wilkinson & Rogers
Peters Brown & Company
A. L. Pettit
Phillips Data Systems
Polysar Limited
Powell Jones & Company
Price-Waterhouse & Company
Procter & Gamble Company of Canada Limited
P. S. Ross & Partners
Quasar Systems Limited
Reed Paper Limited
Ross, Pope & Company
Roth & Hymers
Rothesay Collegiate School
Rowntree Company Limited
The Royal Bank of Canada
Royal Insurance Group
Ryerson Polytechnical Institute
Saddington, Greenfield & Company
Satellite Computer & Communication Systems Limited
J. M. Schneider Limited
S. D. I. Associates
Secker & Ross
Selby, Madgett, Boler & Company
I. P. Sharp Associates Limited
Shell Canada Limited
Simpsons Sears Limited
Smith, Klymas, Selks & Company
Smith, Nixon & Company
Springer Chapman & Company
The Steel Company of Canada Limited
Steep Rock Mines
Stille & Sutton
Sudbury Hydro
Sun Oil Company Limited
Systemhouse Limited
Systems Dimensions Limited
Tax Time Services
Telesat Canada
Tessier, Smith & Partners
Texaco Canada Limited
Texasgulf Canada Limited
Thorne Riddell & Company
Tomenson Alexander Limited
The Toronto Dominion Bank
Toronto Hydro – Electric System
The Toronto Mutual Life Insurance Company
Toronto Transit Commission
Touche, Ross & Company
Towers, Perrin, Forster, Crosby (Canada) Limited
Transcanada Pipelines Limited
Travelers Life Insurance Company of Canada
Uniroyal Research Labs
United Co-operatives of Ontario
Universities & Colleges
Albert College
Ashbury College
Carleton University
Laurentian University
Loyalist College
McMaster University
St. Andrews College
St. Clair College
Sheridan College of Applied Arts & Technology
University of Alaska
Wilfrid Laurier University
York University
G. H. Ward & Partners
Warner Blackstein Rose & Co.
Warren Bitulithic Company
Weish & Brooks
Wilkinson & Company
William M. Mercer Ltd.
Wilson, Masin & McLaren
Winspear, Higgins, Stevenson & Company
Woods, Gordon & Company
Workmen's Compensation Board
Xerox of Canada Limited
York Ryerson Computing Centre
The University Libraries

Dana Porter Arts Library
The University Libraries

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A. Dunnett, BBA (UNB)

Administrative Assistant to the University Librarian
Vacant

Business Administrator
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Systems Development Librarian
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Rare Books Librarian
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Associate Librarian for Support Services
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E. Waterman, BA (McMaster), BLS (Toronto)

Cataloguing Department Head
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Assistant Head
P. Stoksik, BA, BLS (Toronto)

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C. Hagstrom, BA (Lakehead), MA (Western), MLS (Western)
R. Ho, BA (Wisconsin-Madison), MSLS (Case Western)
Vacant
M. Wan, BSSc (Hong Kong), MA, MLS (Western)

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

Cataloguer
Vacant

Reader Services

Associate Librarian for Reader Services
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Circulation Department Head
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Government Publications
Department Head
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Librarian
J. Boettger, BA (Waterloo), BLS (British Columbia)

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Divisional Library

Assistant Librarian for the Engineering, Mathematics and Science Divisional Library
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Circulation Department Head
V. Mixer, AB (Hanover)

Reference Department Head
S. Beuttenmiller, BSc (Waterloo), BLS (Toronto)

Reference Librarians
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W. MacPherson, BSc, MLS (Dalhousie)
D. Morlon, BSc (Western), MLS (Western)
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I. Rodin, BSc (McGill), MLS (Western)
B. Toth, BA (Queen's), MLS (McGill)

Environmental Studies Library
Head
P. Brown, BA (Queen's), MLS (Toronto)
The University Libraries are central to the academic programmes going on throughout the University. Their function is to provide books, journals, and other library materials to support those programmes. The Library staff, aided by the university community in many important ways, works to make the library system an excellent base for teaching, study and research.

The Dana Porter Arts Library, situated in the centre of the campus and rising to a height of ten storeys, is the focal point of the University. The lower floors house the main public service departments and the behind-the-scenes technical services. Public services located on the first floor include a large reserve reading room with seating for 160 readers, a rare book room, a listening room with facilities for both phonodiscs and audio cassettes and eight typing cubicles. From just inside the main entrance on the second floor the public catalogue, the circulation counter and the reference desk are all immediately visible and close at hand. The periodical and journal collections, and microforms, are located on the third floor. Government publications are located on the fifth floor. The upper floors house the main circulating collections and seats for readers. In all there are more than fourteen hundred places for readers.

The Arts Library collections number 890,000 items, including books and periodicals in the Humanities and Social Sciences, pamphlets, theses, microforms, documents, reports, sound recordings, and other materials. The library grows by 3,000 volumes each month. An important element is the collection of journals and periodicals, back files and current issues. The library subscribes to 3,615 periodicals.

The Engineering, Mathematics and Science Library occupies the fourth floor of the Mathematics and Computer Science Building. Again, the three principal public services—the catalogue, the circulation counter, and the reference desk—are just inside the entrance to the library. Space is provided for 740 readers.

The E.M.S. Library collections number 250,000 items, including books, journals, and many kinds of special materials, which include technical reports, microforms, documents and maps. The library has 2,720 subscriptions to current periodicals; 1,800 volumes of books and periodicals are added per month.

The Environmental Studies Library is housed on the main floor of the Social Sciences Building. The core of the library collection consists of 40,000 maps, supported by 4,000 books and reports, together with atlases, periodicals, aerial photographs and films. Like the Arts and E.M.S. libraries, its resources are available to all members of the University.

The staff of the library system, 200 persons, both professional and supporting, is engaged in obtaining material, in processing it for the collections, and in bringing it to the attention of users. During the day and evening hours reference and circulation staff are on duty to assist in making use of the collections and facilities. Week nights the Arts and E.M.S. libraries are open for use, under the custodianship of library attendants.

Handbooks are available to explain the use of the libraries: the classification system, the card catalogues, the serial lists, and in general the rules and procedures. Also available are other publications, such as bibliographies and lists of reference materials.

For a more detailed and up-to-date description of the University Libraries, see the current Library Handbook.
Faculty of Arts

Students at work in Fine Arts Studio
The Faculty of Arts

The graduate in Arts is generally and liberally educated and has not been trained for a specific task in a specific profession. The holder of the Honours B.A. is usually qualified to enter professional programmes to begin professional training. To be liberally educated is no mean accomplishment; the world has increasing need of men and women so educated. The goal of a liberal education—acquaintance with some of the major ideas and forces that shape our civilization and the ability to think clearly, critically, and creatively—is important and desirable in itself.

Qualified women and men are both encouraged to apply.

Degrees
The Degree of Bachelor of Arts (B.A.) is awarded by the University in the following undergraduate programmes:

A) General Programmes

B) Honour Programmes
The Faculty of Arts offers Honours degrees in the following major disciplines: Anthropology, Classical Studies, Economics, English, Drama and Theatre Arts, Fine Arts (Art), French, Geography, German, History, Latin, Medieval Studies, Philosophy, Political Science, Psychology, Religious Studies, Russian, Sociology, Spanish and Social Development Studies. Descriptions of the single honours programmes and each discipline's requirements in joint honours programmes are outlined on pages 75 through 97. Students interested in programmes and courses emphasizing Canadian material should examine the Canadian Studies Programme on page 76 and the Canadian Studies section of the Calendar, in Chapter 14. Co-operative programmes are now available in Honours Economics and Honours English.

Type A Teaching Certification
Admission to the Type A Certification programme at the Ontario Colleges of Education requires the completion of a programme of at least twenty full-year University courses, including one or two specialist fields in which the student has obtained at least second class (honours) or equivalent standing. A programme of twenty courses and one specialist field must include at least nine full courses in the field. A programme of twenty courses and two specialist fields must include fourteen full-year courses in the two combined fields, with at least six in each field. Information regarding approved specialized fields can be obtained from the Ontario Ministry of Education.

Admission

Adult Students
Individuals who have been away from formal education for at least two years who do not meet the published minimum academic requirements may apply as adult students. At the time of application applicants must satisfy the Admissions Committee that they possess the academic ability necessary to undertake successfully a university programme.

To discuss admissibility applicants are advised to communicate with the Assistant Registrar for the Faculty of Arts.

Transfer Credit
Generally transfer credit is given for courses in which a grade of 60% or better was obtained. Students transferring from other institutions may have their transferred courses count toward the University of Waterloo degree; however, 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 the cumulative average or transferring all relevant courses passed and including all courses passed and failed in the cumulative average.

Examinations and Standings
The following regulations govern final examinations and standings in the Faculty of Arts. These regulations also apply to part-time students and special programmes.

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 passed fewer than five courses will be considered Year 1 students; those who have passed at least five courses but fewer than ten will be considered Year 2 students; those with at least ten but fewer than fifteen, Year 3, and those with 15 or more, Year 4.

1 Final Examinations

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

b) 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 his instructor.

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

d) No instructor shall be permitted to administer—and no student shall be required to sit—final examinations in the formal lecture period.

2 Grading System

a) Normally all courses should be completed within the term in which they are offered. Letter grades are used to signify evaluation in individual courses.

b) For the purpose of striking averages, the following weights will be assigned to grades received in individual courses:

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

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

Note

When a failed 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.

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

In satisfaction of the minimum degree requirements students in general programmes may present up to three full course equivalents with a grade of Credit (Cr) in courses outside their major. Students in Honours Programmes may present up to four full course equivalents with a grade of Credit (Cr) in courses outside their Honours Area.

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

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

Note

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.

3 Course Load

Regular full-time students in the General Arts programme normally enrol, in each academic term, in five or six half-courses equivalents. Full-time students in the General Arts programme may enrol in more than six half-course equivalents per academic term only with the consent of the Examinations and Standings Committee.

Regular full-time students in the Honours Arts programmes normally enrol, in each academic term, in five or six half-course equivalents. (See departmental Honours Programmes for specifications and exceptions.) Students in Honours Programmes may not enrol in more than one-half course equivalent per academic term in excess of the number specified for their programme except with the permission of the Examinations and Standings Committee.

4 Reduced Programmes

Students may be enrolled for reduced programmes and may take fewer than five courses. Such programmes must be elected at pre-registration or during the official drop-add periods and must be consistent with the drop-add regulations outlined on page 73. After these times reduced programmes require the approval of the appropriate Undergraduate Office, and of the Examinations and Standings Committee, and they must be consistent with the drop-add regulations.

5 Part-time Studies

Students may pursue degree studies (in both General and Honours Programmes) on a part-time basis by enrolling in regularly scheduled day courses as well as evening or Saturday courses. In addition, courses may be taken in the six week summer programme or by correspondence. There is no distinction between part-time and full-time students as to admission requirements, grading practices, or promotion policies.
6 Standing

a) To be considered in good standing in the General programme, a student must maintain a cumulative overall average of at least 60 as well as an average of at least 65 in the field of specialization. If at any time a student's overall average falls between 50 and 60 or the average in the student's field of specialization below 65, the student will be granted conditional status for one year, during which period the student must make reasonable progress toward obtaining good standing or will be withdrawn from the Faculty of Arts.

b) To be considered in good standing in an Honours Programme, a student must maintain a cumulative overall average of at least 60%. In addition, a student must maintain a cumulative 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 Programme must maintain a cumulative average of at least 75% in all the courses taken in the two honours disciplines unless the departments specify a higher average.

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

Note
The requirements specified in (a) and (b) are minimum academic requirements and do not guarantee admission to all programmes. Individual departments may specify requirements beyond those listed here.

c) Even while otherwise in good standing, a student who fails two or more full courses in any academic year may be required to withdraw if the Faculty council considers that the student will not profit by further study.

d) A student who has been withdrawn for academic reasons is eligible to apply for readmission after one year's absence. If re-admitted, such a student has a cleared average.

7 Grade Appeal Procedures

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

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

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

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

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

In order to earn a B.A., a student must complete, with the necessary cumulative averages, the necessary-number of prescribed and elective courses for either the General or the Honours Programme. 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 Council.

English Language Proficiency Requirement

All students whose initial registration in degree programmes in the Faculty of Arts is Fall 1977, or thereafter, are required to pass an English Language Proficiency Examination in order to qualify for a B.A. degree. Students must write this examination in their first year; those who fail are required to attend a special non-credit writing clinic before sitting the examination again.

Group A and Group B Requirements

All Arts students in all Arts Major and Honours Programmes (see below for requirements for non-majors) 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:

<table>
<thead>
<tr>
<th>Group A (i)</th>
<th>Group A (ii)</th>
<th>Group A (iii)</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>English, History, Philosophy</td>
<td>French, German, Greek, Italian, Latin, Polish, Russian, Spanish, Ukrainian (See Note)</td>
<td>Classical Civilization, Drama, Fine Arts, Religious Studies</td>
<td>Anthropology, Economics, Geography, Political Science, Psychology, Sociology</td>
</tr>
</tbody>
</table>

Before being admitted to the degree an Arts student must complete with passing marks a minimum of three full course equivalents from Group A and a minimum of two full course equivalents, not both in the same subject in Group B. The student should note that Group A is further subdivided into Group A (i), Group A (ii) and Group A (iii). Of the three full course equivalents required of each student in Group A, a student must complete with passing marks:

- a minimum of one full course equivalent from Group A (i)
- a minimum of one full course equivalent from Group A (ii)

Note 1

Other foreign languages may be used to meet the Group A (ii) requirement. This includes such courses as Religious Studies 105J Elementary Hebrew, Religious Studies 106P, New Testament Greek, Arts 190/191 or 192/193 Introductory Chinese, Arts 290/291 or 292/293 Intermediate Chinese.

Note 2

English students should note that they may elect to meet the Group A (ii) requirement in their second or subsequent year by completing with passing marks one of the following courses:

- French 291/291;
- German 271/272;
- Russian 271/272;
- Spanish 210;
- Classical Civilization 201/202 or Italian 230J.

These courses are not open to first year Arts Students. These courses are the only approved alternative to the A (ii) requirements.

Selection of Year 1 Programmes

All Year 1 students are officially classified as being in the General Arts Programme. Students are not identified with a specific major or honours programme until their second year. The great majority of students are relieved to discover that they do not have to choose a General or Honours Programme for the first year. The first year is a broad exploratory year, and the student should select a programme of courses that keeps as many options as possible open for advanced work.

The Faculty of Arts recommends that its students take at least one course in mathematics or the natural sciences.

Note 1

Space limitations, from time to time, imply that students admitted to the University or otherwise in good standing, are not guaranteed course and programme selections of their choice.

Note 2

Each student's programme must be approved on or before registration date by a faculty advisor from the Faculty of Arts.

Note 3

In Year 1, a student must normally complete the introductory course in the department in which he will major in later years.

Note 4

"Courses" refers to courses which extend for one full academic year (September through April). Two half-year (term) courses are the equivalent of one full course.

Course and Programme Changes

a) Changes in courses or programmes must be submitted for approval to the appropriate Undergraduate Officer.

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

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

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

e) A course that has not been dropped officially (i.e.
recorded in the Registrar's Office) will receive a grade
and be counted in the student's average.

It is important that students settle down in their
schedule of courses just as quickly as possible.

Students usually find that courses
they
add
late in the
second or third week of classes poses special problems
in catching up with the work already covered.

Year 1
The General Programme
Students in Year 1 normally choose five courses (two and
a half each term) for a total of five credits for the year. The
usual pattern of courses is two from Group A and two
from Group B, with one or two as electives.
Students usually find that courses they add late in the
second or third week of classes pose special problems
in catching up with the work already covered.

Year 2
Students in Year 2 of the General Programme choose at
least five courses in consultation with their departmental
advisor:

a) a minimum of two further courses in the major subject
(See notes);
b) three other courses (See notes).

Year 3
Students in Year 3 must choose five courses in
consultation with their departmental advisor:

a) a minimum of two further courses in the major
subject;
b) three other courses.

Note 1
The programme of every student in the General
Programme must include either

a) a minimum of eight courses beyond the 100 level, or
b) courses from no more than seven subject fields.

Note 2
Before graduation each student in the General
Programme must have completed a minimum of fifteen
credits with passing mark in each and an overall
cumulative average of at least 60%, and a cumulative
average in his major of 65%.

Non-Major General Arts Programme

a) A student in the Arts Faculty may graduate with a
general Arts degree (non-major) upon completion of
15 courses with a passing mark in each, including:

a minimum of 7.5 courses, above the first year level;
a minimum of 7.5 courses in the Faculty of Arts;
a minimum of two courses, not both in the same subject
from among Drama, English, History, Philosophy, Fine
Arts, Religious Studies, and languages other than
English; a minimum of two courses, not both in the same
subject. from among Anthropology, Economics,
Geography, Political Science, Psychology and Sociology.

b) A cumulative average of 65% is required for
graduation.
Note
Any normal first year Arts programme will satisfy the needs for a student contemplating a General Arts (non-major) programme. The programmes of Non-Major General Arts students must be arranged through the Arts Faculty Undergraduate Office.

Minor Programmes
Students enrolled in Honours Programmes in Arts or other faculties may elect a minor in an Arts discipline. All minor programmes in Arts require successful completion of at least five credits in the minor discipline with an overall cumulative average of 65% in those credits.

Minor in Asian Studies
To meet requirements for a minor in Asian Studies, a student must complete 5 credits from the following list of courses with a cumulative average of 65%. At least 3 of the credits must be from 3 different discipline areas of Anthropology, Sociology, Philosophy, Political Science, History, Religious Studies, and Chinese language and literature courses under the Arts listing. Courses in the minor cannot also count in the honours discipline.

Anthropology 236J Social and Cultural Change in South East Asia
Arts 190/191 Introductory Chinese, or Arts 192/193
    Introductory Chinese
Arts 220R/221R Chinese Thought and Culture
Arts 290/291 Intermediate Chinese, or Arts 292/293
    Intermediate Chinese
Arts 320R/321R Special Topics in Chinese Thought and Culture
Arts 361/392 Classical Chinese, or Arts 393/394 Taoism
Arts 395/396 Confucianism
History 103/104 The Emergence of the Third World
History 269R History of Modern Revolution
History 282 East Asian History
History 351A Mao and the Chinese Revolution
History 375 History of China
History 440 Senior Seminar on Far East Asian History
Philosophy 365/366 Oriental Philosophy
Political Science 102 Imperialism in International Relations (section taught by A. Kapur)
Political Science 261/282 International Politics 1 and 2 (section taught by A. Kapur)
Religious Studies 110 Religions of Mankind
Religious Studies 211 Religion in Japan
Religious Studies 213 Hinduism
Religious Studies 214 Buddhism in India, China, and Japan
Religious Studies 215A Chinese Religion 1
Religious Studies 215B Chinese Religion 2
Religious Studies 269 Myths and Symbols of the Religions of India
Religious Studies 313 Modern Religious Movements in India

The General Arts Degree (Canadian Studies)
A student takes fifteen courses with at least five of them in his major. The student would also take six courses in Canadian Studies (or seven if the French course is taken in Year one). Students would take CdSt201/202 and 300 as part of the Canadian Studies package.

A Minor in Canadian Studies
The Minor consists of five courses, two of which would be CdSt201/202 and CdSt300, with the other three being selected from three different disciplines but all from designated Canadian Studies courses. A French language course is strongly recommended.

Honours Programmes
In Year 1 a student must normally complete the introductory course in the subject in which such student will major in later years. Before graduation each student must have completed twenty to twenty-four courses, (as specified in a Departmental Honours Programme) with a passing mark in each.

Students are requested to refer to the detailed programmes following this page for the other departmental requirements. Joint Honours Programmes not found in this section may be arranged by consultation between the student and the departments concerned.

Departmental Programmes
General B.A. in Anthropology
The student must pass five credits in anthropology. Four of these anthropology credits must be in 200-level courses or above. One half credit must be taken in an advanced (200-level or above) course in each of the four sub-disciplines within anthropology (socio-cultural anthropology, archaeology, linguistics and physical anthropology). Anth. 103 or Anth. 104 may fill the linguistics portion of this last requirement.

Honours Anthropology
The student must pass ten credits in anthropology. Nine of these anthropology credits must be in 200-level courses or above. One credit must be taken in advanced (200-level or above) courses in each of the four sub-disciplines within anthropology (socio-cultural anthropology, archaeology, linguistics, and physical anthropology). Anth. 103 and/or Anth. 104 may be used to fill all or part of this linguistics requirement. The honours student’s programme must also include a credit in anthropological theory (400-level theory oriented courses). The anthropology honours student needs 20 credits to graduate.
Anthropology Joint Honours Programmes

The recommended anthropology programme for joint honours includes seven credits in anthropology. Six anthropology credits must be in 200-level courses or above, one half credit must be taken in an advanced (200-level or above) course in each of the four sub-disciplines within anthropology (socio-cultural anthropology, archaeology, linguistics, and physical anthropology). Anth. 103 or Anth. 104 may serve to meet the linguistics portion of this requirement. The joint honours student’s programme must also include a credit in anthropological theory (400-level theory oriented courses).

The student should consult the recommended programmes of other departments to determine their requirements. The joint honours student completes 22 credits before graduation.

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

Note 1
Joint Honours students with Anthropology and Geography or Anthropology and Man-Environment Studies must fulfill the requirements of the Faculty of Arts for the B.A. degree or of the Faculty of Environmental Studies for the B.E.S. Geography Requirements will be found under Geography Joint Honours Programmes.

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

Note 3
Students are advised to consult the undergraduate officers of both Departments before formulating their programme of study.

Honours Programmes in Canadian Studies

Recommended Programme

Year 1
A) 2 courses
  English 101
  History 123

B) 2 courses
  Economics 101/102
  Geography 101/102
  Political Science 101/102
  Sociology 120R/121R

C) 1 course
A course given in French such as 101/102, 131/132, or 151/152. (A course in French language is strongly recommended. In rare circumstances, however, a student unable to fulfil this recommendation may be allowed to substitute a third course from the group B social sciences list above).

Year 2
Canadian Studies 201/202
The equivalent of three full courses in the student’s major subject one of which should specifically deal with Canada (see note 2)
The equivalent of one other full course chosen from among those specifically recommended for students concentrating their programme in Canadian Studies (see note 3)

Year 3
Canadian Studies 300
The equivalent of three full courses in the student’s major subject, one of which should specifically deal with Canada (see note 2)
The equivalent of one other full course chosen from among those specifically recommended for students concentrating their programme in Canadian Studies (see note 3)

Year 4
Canadian Studies 400
The equivalent of three full courses in the student’s major subject, one of which should specifically deal with Canada (see note 2)
The equivalent of one other full course chosen from among those specifically recommended for students concentrating their programmes in Canadian Studies (see note 3)

Note 1
Students may choose straight or double honours in History, Economics, Political Science, Geography, Urban and Regional Planning, Sociology, French, English or Anthropology. The student is granted, upon successful completion of the 22-course programme, an Honours B.A. in his major subject with the subtitle of Canadian Studies.

Note 2
Students following a double honours programme will normally take the equivalent of two full courses in each of their major departments, one of which in each case should be the principal Canadian course at the 200, 300, or 400 level.
Note 3
Each of the participating departments has designated its principal Canadian course at the 200, 300 and 400 levels but students may choose from among any of the Canadian content courses listed in Chapter 14 of the Calendar. Many 300 and 400 level courses have specific prerequisites and it is often desirable to use the electives to pursue work in a particular discipline. Students following double honours programmes should reduce the number of electives at each level by one.

Honours Classical Studies
Recommended Programme

Year 1
Greek 100, Latin 100 or Latin 150
C. Civ. 101/102
Three other courses.

Year 2
Greek 200, Latin 150 or one full course at 200 level
C. Civ. 251/252, 265/266
Two other courses.

Year 3
Senior Greek or Latin course.
C. Civ. 270, 351/352
Two other courses.

Year 4
Two other C. Civ. courses
Three other courses.

Note 1
In the single honours programmes in Classical Studies, three courses out of ten must be from either Greek or Latin or both.

Joint Honours Programme in Classical Studies
Recommended Programme

Year 1
Greek 100, Latin 100, or Latin 150
C. Civ. 101/102
Three other courses.

Year 2
Greek 200, Latin 150 or one full course at 200 level
C. Civ. 251/252, 265/266
Two other courses.

Year 3
C. Civ. 270, 351/352
Three other courses.

Year 4
One C. Civ. course
Five other courses.

Note 2
Students are advised that History 340 is acceptable for Classics credit.

Drama and Theatre Arts Group General Programme
1) A total of fifteen courses (30 half courses) including Faculty of Arts Group A and B courses required with an overall cumulative average of at least C- and a cumulative major average of C.
2) At least six (twelve half courses) of the student's courses must be in Drama and Theatre Arts.
3) Drama 101 is the required pre-requisite for most Drama and Theatre Arts courses.
4) In addition students must satisfy the following requirements.
   A) Drama 102
   B) Drama 243 or Drama 244
   C) Three of Drama 251, 252, 253, 254, 255, Engl. 362, 363, 190 (see note).
   D) Drama 371 or Drama 372
   E) Drama 409
   F) Any four other Drama courses or other approved courses in related departments.

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

Minor Programme
Drama 101 and Drama 102, plus eight other half courses of which two must be in dramatic literature.

Honours Drama and Theatre Arts
1) A total of twenty courses (forty half courses) including Faculty of Arts Group A and B requirements with an overall cumulative major average of B.
2) At least ten of the students courses (twenty half courses) must be in Drama and Theatre Arts.
3) Drama 101 is the required pre-requisite for most Drama and Theatre Arts courses.
4) In addition students must satisfy the following requirements:
   A) Drama 102
   B) Drama 243 or Drama 244
   D) Drama 371 and Drama 372
   F) Drama 409.
   G) Drama 499 (See Note 3).
   H) Any four other Drama courses or other approved courses in related departments.
Note 1
See Faculty of Arts requirements for other required classes.

Note 2
The Honours B.A. programme in Drama will enable the student to proceed towards the Ontario College of Education Type A Certificate provided at least two full courses in another teaching subject are acquired (see current calendar requirements).

Note 3
For a description of Drama 499 see Course Description.

Joint Honours Programmes, Drama and Theatre Arts
1) Seven and a half of the student's courses (fifteen half courses) must be in Drama and Theatre Arts.
2) Drama 101 is the required pre-requisite for most Drama and Theatre Arts courses.
3) In addition students must satisfy the following requirements:
   A) Drama 102.
   B) Drama 243 or Drama 244.
   C) Drama 371 and Drama 372.
   D) Three of Drama 251, 252, 253, 254, 255, English 362, 363.
   E) Drama 409.
   F) Drama 499. This is a full year course. Also see note 4 below.
   G) Four other half courses.

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

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

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

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

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

Economics
The Department of Economics allows a student to earn an economics degree in two ways. A student may qualify for the degree in the traditional manner by attending University during the Fall and Winter terms of each year. The department also provides a co-operative option. This option provides a mix of academic work and on-the-job experience. An honours student may study on a co-operative basis specializing in economic theory and policy or managerial accounting. Students specializing in managerial accounting can qualify for twelve R.I.A. exam exemptions, with an opportunity, while still enrolled at University, to write three R.I.A. Uniform National Examinations.

Prerequisite
It is desirable, but not mandatory, that students planning to enter Honours Economics should offer a minimum of one Ontario Year 5 credit in Mathematics or the equivalent.

Regular Honours Programmes
Honours Economics
Twenty full-course credits are required for the degree. Of these, a minimum of nine full credits must be in Economics. The required Economics courses are Economics 101, 102, 201, 202, 211, 221, 231, 301, 302, 401, 402. In addition students must select one of Economics 191, 241 and 263 and an additional half course in Economics from courses numbered above 300.

Note
It is recommended that students in Year 1 adopt the following program.
Economics 101, 102
Political Science 101, 102
English 109 or 150
Philosophy 140
Two electives*

*Students without Ontario Year 5 Mathematics or equivalent should select Mathematics 101/102 as an elective.

Honours Economics with Chartered Accountancy Option
At the end of this programme the student will have completed all of the formal university training required by the Canadian Institute of Chartered Accountants. The other principal requirements for the C.A. certificate are a minimum of two years of work for a public accounting firm and successful completion of the Provincial Institute's examinations. Twenty-two courses are required in order to receive the degree of Honours Economics with the C.A. option. The following are the required Economics courses.
Analytical Economics: Economics 101, 102, 201, 202, 211, 221, 231, 301, 302, 341.

Note
Students in this option are also required to take Business 216 (W.L.U.) and one additional half course in Economics at the 300 level.

It is recommended that students in Year 1 adopt the following programme.
Economics 101, 102, 191, 192, 193, 194
Computer Science 112 and 115 or 180 and 150
English 109 or 150
One elective

Co-operative Programmes in Economics
Twenty-two full course credits are required in the co-operative programme. It is recommended that all Year 1 students who are considering co-operative Economics include the courses listed below in their first year course selections.
Economics 101, 102, 191, 192
Computer Science 112 and 115 or 180 and 150
English 109 or 150
Students without Ontario Year 5 Mathematics or equivalent should also select Mathematics 101, 102.

Honours Applied Economics
The required Economics courses are:
Economics 101, 102, 191, 192, 201, 202, 211, 221, 231, 241, 263, 301, 302, 303, 321, 401, 402, 421, 422
In addition students are required to do one additional half course numbered above 300.

Note
Students in this programme will be required to do a minimum of one full credit in Mathematics above the level of Mathematics 101, 102 plus Statistics 500.

Honours Economics R.I.A. Option
The following are the required courses in Economics and Accounting.
Analytical Economics: Economics 101, 102, 201, 202, 211, 221, 231, 301, 302 plus two half courses numbered above 300.
In addition students will be required to take two half courses at W.L.U., Business 388 and 398.

Economics Joint Honours Programmes
The core courses in economics for any joint honours programme normally are: Economics 101, 102, 201, 202, 211, 221, 231, 301, 302, 401, 402. At least one and a half other Economics course (three half courses)
In addition, students must meet the requirements of the other department, as well as the Faculty of Arts Group A and Group B requirements. Selection of courses will be made with the assistance of the appropriate undergraduate officers. For Joint Honours Programmes, 22 courses are required.

Joint Honours programmes have been approved with Geography, Political Science, Sociology and Mathematics. The following notes pertain:

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

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

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

Note 4
Economics and Mathematics
Substitute Economics 311, 321 for Economics 211, 221 Economics 421, 422 to be included in the above core courses. Students in Years 1 and 2 may take this programme 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 programme must then be approved by the Economics Department or by an appropriate department of the Faculty of Mathematics.

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

Economics Minor for Honours Students in other Faculties
Economics 101, 102, 201, 202, 231, either 211 or 221, plus two additional courses in Economics (four half courses).
General Economics
Students proceeding to a General Arts degree with a major in Economics are required to take as part of their programme Economics 101, 102, 201, 202, 231 plus either 211 or 221 and at least four half courses in Economics at the 300 level or above.

Advanced Standing Examinations
Early in the Fall term the Department of Economics administers a test in Economics 101/102 for students who have completed Economics in Year 5 and also Economics 191/192 for students who have completed Accounting in Year 5. Any student who scores at least 70 per cent in either these tests will be exempted from Economics 101/102 and/or Economics 191/192 respectively and may register for Economics 201/202 and/or Economics 291/292.

English General Programme
To fulfill the requirements for a general degree in English, a student must take six courses in English consisting of:
- 101 or equivalent;
- 251;
- one full course equivalent from 310, 350, 362, 363;
- one full course equivalent from 305, 330, 373, 375, 410, 430, 451;
- two other approved English credits.

Honours English
English Requirements
Although either English 101 or 102 is recommended, first year students may take any other approved English course.

English 251
One full course equivalent in each of the following categories:
1) Language and Early Literature (305, 373, 375)
2) Historical Periods of British Literature (330, 410, 430, 451)
3) Major figures in British Literature prior to the Twentieth Century (310, 350, 362, 363)
4) Genres and Themes, (202, 203/204, 206, 211/212, 230/231, 232/233)
Three approved English full course equivalents.

Note
Students must take at least 6 full course equivalents in English courses numbered 300 or above.

Other Requirements
One full course equivalent in either a language other than English or a foreign culture.
Two full course equivalents from Group B.
Seven other full course equivalents.

Recommended Courses
Classical Civilization 265/266

Note 1
An English Honours Student will take a minimum of 20 courses before graduation, including a minimum of 10 approved English courses. These latter normally will be divided 1-3-3-3 among the four years.

Note 2
The heart of this curriculum will reside in the conferences between student and advisor. The department will expect all students to have a rational programme designed to fit their needs and plans. Students, for example, who plan to do graduate work would be wise to choose the following English courses:
101, 251; 362/363; 373; 305 or 310; two of 410, 430, 451, 460; one pair from among 211/212, 230/231, 232/233; 290 and one of 313/314/315/316; 330 or 350. These students might also choose to take 400; or two more courses from 305, 310, 330, 350, 410, 430, 451, 460; or one of the above and two of 291, 345/346/347. Students, on the other hand, who plan to teach high school are advised to take: 101, 251; 373 or 375; 362/363; one of 330, 410, 430, 451; one pair from among 211/212, 230/231, 232/233, 290/291; two of 313/314/315/316; 415, 451; one more from 305, 310, 330, 350, 373, 375, 410, 430, 451, 460.

English Joint Honours Programmes
Although either English 101 or 102 is recommended, first year students may take any other approved English course.

English 251
One full course equivalent from each of three of the following categories:
1) Language and Early Literature (305, 373, 375)
2) Historical Periods of British Literature (330, 410, 430, 451)
3) Major figures in British Literature prior to the Twentieth Century (310, 350, 362, 363)
4) Genres and Themes (202, 203/204, 206, 211/212, 230/231, 232/233)
Three other approved English full course equivalents. Twenty-two credits must be taken overall.

Note
Students in an English Joint Honours Programme must maintain a minimum average of 70% (with no more than three half course equivalent grades below B-) in the English component of their programmes together with a combined 75% average in both areas of specialization (that is, English and the other discipline). Students must take at least 4 full course equivalents in English courses numbered 300 or above.
Co-operative Programme in Honours English
The programme leading to the Degree of Bachelor of Arts in Honours English (co-operative programme) 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 programme after completion of their first two academic terms at the University of Waterloo and will proceed through the Honours English B.A. Programme consisting of six further terms of study on campus and five paid work terms with participating employers in the media, business, government, and industry.

The academic requirements of the co-operative programme will be identical with those of the regular Waterloo Honours B.A. in English.

Students who complete the programme will have had a total of twenty months of practical and relevant work experience for which they will have received payment. They will have become involved in areas of employment in which they wish to pursue their chosen careers. They will have had the opportunity to choose appropriate elective courses or groups of courses in areas relevant to their careers. Finally, they will have qualified for a University of Waterloo B.A. Degree in Honours English.

English Minor for Honours Students in Other Faculties
101 or equivalent
Either 150/151 or 251
One full course equivalent from 305, 310, 330, 350, 362/363
Two other English full course equivalents.

Fine Arts

General Programme
15 credits
A & B requirements 5 credits
120/121 & additional 2 half studio courses 2 credits
110/111 & additional 2 half art history courses 2 credits
4 half courses at 3rd year level of which 2 half courses are studio and 2 half courses are art history 2 credits
electives 4 credits

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

Honours Programme (Studio Option)
20 credits
A & B requirements 5 credits
120/121, 224/225, 324 plus 3 half courses in drawing 4 credits
110/111, & 6 additional half courses in art history or film history (only those film courses offered by the Fine Arts department) 4 credits
6 half courses in major area of printmaking, painting, sculpture or additional drawing including 490/491 3 credits
electives 4 credits

Note
4th year courses cannot be taken without departmental permission.

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

Honours Programme (Art History Option)
20 credits
A & B requirements 5 credits
110/111, 470, 471 2 credits
120/121 & 4 additional studio half courses 3 credits
10 half courses in art history and film history (only those film courses offered by the Fine Arts Dept.) 5 credits
490/491 1 credit
electives 4 credits

Note
4th year courses cannot be taken without departmental permission.

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

Requirements for Fine Arts General Programme in Music
To fulfill the requirements for a general degree in Fine Arts in Music, students must take an equivalent of 14 half courses in Music including 150G/151G, 250G/251G, 254G/255G, and 351G/352G. Besides, students must demonstrate competence on one instrument (including voice) equal to Grade 10 standing at the Toronto Conservatory of Music. The remaining music courses must be selected in consultation with the Music Faculty.

A minor program in Music requires 10 half courses in Music including 150G/151G, 2 of 254G, 255G, 351G or 352G plus any 6 other half courses including the option of Music Studio in voice, piano, woodwind, etc. Science 313 and/or Science 313, Physics of Music, are applicable as music credits in a major or minor music programme.

Students from any faculty may take courses in Music on an elective basis.

Fine Arts Joint Honours Programmes
Programmes of this nature are possible in art history and film history only. All students must take Fine Arts 110 and 111, both of which must be taken prior to the fourth year, and 120/121. Students majoring in art history must take 390a in the third year; in addition, 472, 473, 490, and 491 must be taken in the fourth year. Students majoring in film history must take 470, 471, 490, and 491 in the fourth year. Fine Arts courses other than those mentioned above are required for this degree but, since programmes will vary, these other courses must be chosen with the help of a faculty advisor from the Department of Fine Arts.
Honours French

Recommended Programme

Year 1
French 191
Four more courses

Year 2
A minimum of three full courses or equivalent in French
Two more courses

Year 3
A minimum of three full courses or equivalent in French
Two more courses

Year 4
A minimum of three full courses or equivalent in French
Two more courses.

Note 1
Before graduation, the student must complete a minimum of ten full courses (or equivalent) in French. If the student intends to enter the teaching profession, French 250, 300 and 401/402 should be completed.

Note 2
To establish a Minor in a sister discipline, the student must complete five full courses (or equivalent) in that discipline.

Note 3
With the permission of the department, the student may spend the third year enrolled in an acceptable university in France or in the Province of Quebec.

Note 4
A total of 20 courses must be successfully completed before graduation.

Note 5
Students in year 4 must have the permission of the Department to enrol in French courses on the 100 or 200 level.

French in Joint Honours Programmes

The Department of Classics and Romance Languages recognizes combined honours programmes in French and the following disciplines:

Classical Studies
English
German
History
Latin
Mathematics

Philosophy
Political Science
Psychology
Russian
Sociology
Spanish

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

Recommended Programme (French)

Year 1
French 191

Year 2
Three full courses in French or equivalent. (1)

Year 3
Two full courses in French or equivalent.

Year 4
Two full courses in French or equivalent.
1) Two full courses in French when in combination with Political Science.

Note 1
Before graduation, students in combined honours programmes must complete a minimum of eight full courses (or equivalent) in French. (Seven when combined with Political Science).

Note 2
Those planning to enter the teaching profession should complete French 250, 300, 401/402.

Note 3
A total of 22 courses must be successfully completed before graduation.

Note 4
Students in year 4 must have the permission of the Department to enrol in French courses on the 100 or 200 level.

Note 5
The degree requirements of the Faculty of Arts (see page 73) must be met for the B.A. Degree.

Honours Geography

Admission to the programmes in Geography in the Faculty of Arts is gained in second year. Those interested should ensure that they take the appropriate Geography courses in first year. Admission to the Geography programmes in the Faculty of Arts is competitive and will be limited to 25 per year. Participants in Geography programmes will not normally be permitted to switch faculties after they have entered second year.
Year 1
Geography 102 Introduction to Physical Geography
and one of but no more than three of
Geog. 101 Introduction to Human Geography
Env. St. 195 Introduction to Environmental Problems
Geog. 110 Tutorial in Human Geography
Geog. 152R Introduction to the Developing World
Geog. 126R The Emerging "Third World"
Geog. 127 Regional Problems of Europe

Plus additional credits chosen after consultation with the department so that the student has 6 full credits. (Note that all of these courses (except Geog. 110) are available to any student in the University. Geography students, however, cannot take more than four first year geography half credits.)

Year 2
Env St 200 Field Ecology
Geog. 201 Some basic Topics of Climatology and Geomorphology
Geog. 202 Some Basic Topics of Economics and Urban Geography
Geog. 260 Introduction to Cartography and Map Analysis
Geog. 275 Introductory Air Photo Analysis and Remote Sensing
Geog. 271 Introduction to Quantitative Research Methods

and one of
Geog. 203 Some Basic Topics of Cultural and Regional Geography
Geog. 204 Soviet Union
Geog. 205 Africa
Geog. 220 World Regional Geography

and additional credits so that a student should have completed by end of the second year, 11 full credits.

Year 3
Geog. 381 The Nature of Geography
Geog. 391 Field Research

and one of
Geog. 316 Multivariate Statistics
Geog. 317 Nonparametric Statistics or Geog. 318 Spatial Analysis

Two full credits of Geography electives.
Two credits chosen after consultation with the Department.

Year 4
Geog. 490 Seniors Honours Essay
and additional credits so that a student should have a minimum of 21 full credits.
For additional information see Notes on p 74.

Geography Joint Honours Programmes
The Department of Geography offers Joint Honours Programmes in conjunction with a number of other departments across the campus. The Bachelor of Arts degree with joint honours will be awarded to students registered in the Faculty of Arts who meet the general requirements of that faculty in addition to the specific requirements of the Joint Honours Programmes approved by the Department of Geography and the Departments of Anthropology, Economics, English, History, Germanic and Slavic Languages, and Political Science. The Bachelor of Environmental Studies degree will be awarded to students registered in the Faculty of Environmental Studies who pursue a similar course of study and who meet the general requirements of that Faculty.

The Department of Geography is prepared to work out other programmes for keenly interested students who otherwise meet Honours standards.

Students enrolled in Joint Honours Programmes are required to obtain at least seven course credits in Geography: students intending to qualify for the Type A Certificate for teaching secondary school require a minimum of nine credits in Geography.

Course requirements for the Joint Honours Programme are identical with those of the Geography Honours programme above with the exception that where both Departments participating in the programme require courses of similar content, a student shall meet that requirement in one Department only. This might be expected to apply in the case of technique courses, field research and the Senior Honours Essay: students should obtain clarification from the Undergraduate Officers of the respective departments before registration.

Completion of this programme will lead to the Bachelor's degree of the Faculty in which the student is registered and students should ensure that they meet all other requirements of that Faculty.

Honours German

Year 1
German 101/102, 121/122 or 151/152
Four additional full courses

Year 2
Three full courses in German
Two additional full courses

Year 3
Three full courses in German
Two additional full courses
Year 4
Two full courses in German
Three additional full courses

Note 1
Before graduation students must complete the Group A (i) and B requirements listed on page 73.

Note 2
A minimum of 20 full courses must be successfully completed before graduation.

Note 3
With the permission of the department the student may spend one of the senior years at a university of a German-speaking country, preferably at the University of Mannheim in the Departmental Programme.

German Joint Honours Programmes
English and German
Economics and German
French and German
German and Drama
German and Environmental Studies
German and History
German and Mathematics
German and Political Science
German and Russian
Philosophy and Literature (German)
German and Geography

Other joint honours programmes may be arranged by consultation between the student and the departments concerned.

Note 1
A student in a Joint Honours Programme will take a minimum of 22 full courses before graduation, including seven in German.

Honours History

Year 1
Any first year programme that fulfills the general Faculty of Arts requirements is acceptable. A Level 1 programme course in History is recommended. Political Science 101 is also recommended to students intending to major in History.

Year 2
Three Honours History courses, preferably including History 250 (see note 1)
Three other courses (see note 2)

Year 3
Three Honours History courses (see note 1)
Two other courses (see note 2)

Year 4
Two Senior Seminars
One other Honours History course.
One other approved course.

Note 1
All Honours History candidates must complete 10 full History courses with a B average, as follows: normally one Introductory History course, plus at least eight Honours History (or programme) courses, and one other History course (which may be either a programme or non-programme course). History 250 is highly recommended. The Honours History courses must be selected to ensure development and breadth. To ensure development they must include at least four courses in the 300 and 400 range, at least two of which must be Senior Seminars. To ensure breadth they must include at least one full course from each of the columns as follows:

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Note 2
In addition to the departmental requirements for history courses, candidates must also have completed, preferably by the end of 3rd year, the Faculty of Arts A and B requirements with the following variation: one non-history course in humanities (A) must be above the 1st year level. The foreign language substitute (culture course) is considered to be at 1st year level. Also, students who plan to enter graduate school are strongly advised to develop facility in a language other than English.

Note 3
Graduation in this programme qualifies a student for admission to the Type A course in History at a College of Education in Ontario.
Note 4 – Minor

It is possible for Honours students from another faculty or Arts discipline to take a minor in History. A minor consists of 5 History courses of which one must be a Level 2 programme course and not more than one may be at the 100 level.

History Joint Honours Programmes

1) An introductory History Course (preferably a Level 1 programme course).

2) Four Honours History courses selected from the 200 or 300 range in consultation with a department advisor. These courses must be selected from at least two of the ABCD columns (see above, "Honours History, Note 1"), and at least one of them must be in the 300 range.

3) Two Senior Seminars (History 400-455).

4) A minimum of 22 courses are required for all joint honours programmes with History. The A and B requirements of the Faculty of Arts must be fulfilled.

Combined programmes presently exist with Philosophy, Geography, German, Russian, English, Political Science, Sociology, Anthropology, Religious Studies, Classics, Fine Arts, Psychology, and French. The History Department is prepared to consider others for keenly interested students who otherwise meet Honours standards.

Not all joint Honours programmes fulfill the Ministry of Education's requirements for a Type A certificate. Students should consult with the departmental advisor.

Honours Latin

Recommended Programme

Year 1
One Latin course
One Classical Civilization course
Three more courses

Year 2
A minimum of two full courses or equivalent in Latin
One Classical Civilization course
Two more courses

Year 3
A minimum of two full courses or equivalent in Latin
One Classical Civilization course
Two more courses

Year 4
A minimum of two full courses or equivalent in Latin
Three more courses

Note 1

Before graduation, it is recommended that students complete Latin 251/352.

Note 2

Students intending to obtain a Type A certificate for teaching in Ontario Secondary Schools must take a Minor in addition to their Latin programme. In Greek as a minor subject, three courses (nine hours) are required. In French or English, five courses (fifteen hours) are required. The electives each year provide room for these requirements.

Note 3

A total of 20 courses must be successfully completed before graduation.

Note 4

The degree requirements of the Faculty of Arts (see page 73) must be met for the B.A. degree

Note 5

Before graduation students must complete a minimum of ten courses in Latin, or equivalent. Not more than three Classical Civilization courses should normally be taken as part of these ten courses.

Latin Joint Honours Programmes

The Department of Classics and Romance Languages recognizes combined honours programmes in Latin and the following disciplines:

- English
- French
- Spanish

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

Recommended Programme (Latin)

Year 1
One Latin course

Year 2
Three full courses in Latin or equivalent
Year 3
Two full courses in Latin or equivalent

Year 4
Two full courses in Latin or equivalent

Note 1
Before graduation, the student must complete a minimum of eight full courses (or equivalent) in Latin.

Note 2
Latin 251/352 are recommended before graduation.

Note 3
A total of 22 courses must be successfully completed before graduation.

The degree requirements of the Faculty of Arts (see page 73) must be met for the B.A. degree.

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

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

The Honours Programme
For the core of the Medieval Studies Programme, each student must take eight courses from the list given, and at least one course from each of five of the eight subject fields specified.


The General Programme
For the core of a Medieval Studies Programme, each student must take seven courses from the above, at least one course from each of four of the eight subject fields specified.

General Philosophy Programme

Note to General Philosophy Students
Five full course equivalents in Philosophy are required for the General Degree in Philosophy, including at least one of 140, 240, 241 or 340, 221 and one full-course equivalent from 280/281, 282/283, 390/391. (St. Jerome's students: see p. 383 for further information.)

Minor
A minor in Philosophy consists of any five full courses (or equivalent) in Philosophy.

Departmental Recommendation
The Department of Philosophy recommends that its Honours and Majors take at least one course in Mathematics or Science.

A student may register through St. Jerome's College in the General Programme in Philosophy.

Honours Philosophy
Twenty full course equivalents Ten in Philosophy, including 221/222, one of 240, 241 or 340, 260/281, 282/283, 499 (tutorial) Ten others, including Group A and B requirements (see page 73.) St. Jerome's students (See chapter 14, Department of Philosophy course descriptions information).

A student may register through St. Jerome's College in the Honours Programme in Philosophy.

Honours Programme: Phil 218J or 221, 222, 240, 280-1, 282-3, 499J or 499, plus 5 other philosophy electives. College students are expected to take 450J.

Philosophy Joint Honours Programmes
Students interested in Joint Honours Programmes other than those listed here should consult with the undergraduate officer in Philosophy.

A student may register through St. Jerome's College in the Joint Honours Programme in Philosophy.

Students in joint Honours Programmes, one half of which is Philosophy, may substitute the same St. Jerome's College courses in those programmes as others may substitute in the single Honours Programme.

Honours Philosophy and Economics
Overall Requirements
Seven full-course equivalents in Economics (taken in consultation with the Economics Department) Seven electives
Seven Philosophy courses
One senior Honours tutorial in Philosophy or Economics

Arts
Honours Programmes
**Philosophy Requirements**

Seven full-course equivalents in Philosophy, including one of 140, 241 or 340.  
One full-course equivalent from 280/281, 282/283  
One half-course in Social and Political Philosophy (e.g. 125, 225, or 325)  
One half-course in Ethics (e.g. 221 or 222)  
Philosophy 243 and 362)  

**Honours Philosophy and English**

**Philosophy Requirements**  
Seven full-course equivalents in Philosophy, including 221/222, one of 140, 240, 241 or 340, 280/281, 282/283, Philosophy 331.  

**English Requirements** (See English Joint Honours Requirements)  

**Other Requirements**  
One full course equivalent in a foreign language  
Two full course equivalents from Group B  
Four other full course equivalents  

**Note**  
English 495, Senior Honours Essay, may be chosen as one of these courses.  

**Honours Philosophy and History**

**Philosophy Requirements**  
The equivalent of at least seven full courses in Philosophy which must include one of 140, 240, 241 or 340, 221/222, 260/281, 282/283, 446.  

**History Requirements** (See History Joint Honours Requirements)  

**Other Requirements**  
Eight full course equivalents, including A and B requirements (page 73).  

**Honours Philosophy and Literature**

**Recommended Programme**

**Year 1**  
French 191 (or German 121/122)  
English 101  
A Social Science  
two of  
A Natural Science  
Mathematics  
History  
Another Language  
Another Social Science  

**Year 2**  
One of Philosophy 221/222 or 280/281  
Philosophy 282/283 and one other Philosophy course  
French: Minimum of two full courses or equivalent (see note)  
(or German 281/282 and one of German 241/242, 251/252, 271/272)  
One elective (Social Science, if requirement not met in first year)  

**Year 3**  
Philosophy 331, 399 (tutorial), and  
One of Philosophy 221/222, or 280/281  
French: Minimum of two full courses or equivalent (see note)  
(or German 341/342, 351/352, 361/362, 371/372  
One elective  

**Year 4**  
Two full course equivalents in Philosophy  
French: Minimum of two full courses or equivalent (see note 2)  
(or German 451/452, 461/462, 471/472, 481/482)  
Senior Essay  

**Note 1**  
In certain special cases, where the student can prove a high degree of familiarity with English literature the student may substitute French 191 or German 121/122, whichever has not already been chosen. Those taking French option should normally take Latin 190.  

**Note 2**  
Before graduation students must complete a minimum of eight courses (or equivalent) in French. Students intending to teach French should complete French 250, 300, 401/402.  

**Joint Philosophy – Mathematics Programme**

**Choice of Degree**  
Students in Years 1 and 2 may take this programme in either faculty, but at the end of the second year, they will decide whether to continue toward a degree in Arts or a degree in Mathematics. The programme must then be approved by the Philosophy Department or by an appropriate department of the Faculty of Mathematics respectively.  

**Requirements for all students**  
(Other requirements will depend on which degree is taken: the student will have to add to these to meet the requirements of his faculty)  

Philosophy 340, 258/359, 280/281, 282/283,  
Three others, one of which is in a value area mathematics 129, 130, 229 or 237 and one of 228, 233, 234, 239, 240  
Two others
Further requirements for the degree B.Math. (Mathematics and Philosophy) see Chapter 14
Further requirements for the degree B.A. (Philosophy and Mathematics)
Six more courses, including A and B requirements for an Arts Degree

Honours Philosophy and Political Science

Philosophy Requirements
The equivalent of at least seven full courses in Philosophy which must include 221/222, one of 140, 240, 241 or 340, 280/281, 282/283, 327, 362

Political Science Requirements (See Political Science Joint Honours Requirements)

Other Requirements
Either Philosophy 325/326, or Political Science 221/222 or 225/226
The equivalent of seven full courses, one of which must satisfy the Faculty's foreign language requirement and one of which should be in a social science other than Political Science.

Honours Philosophy and Psychology

Philosophy Requirements
Seven full-course equivalents in Philosophy, including 221/222, 280/281, 282/283, one of 240, 241 or 340 and 362

Psychology Requirements (See Psychology Joint Honours Requirements)

Other Requirements
Either Philosophy or Psychology 499
Seven full courses equivalents, including A and B requirements (see page 73)

Honours Philosophy and Religious Studies

Philosophy Requirements
Seven full-course equivalents in Philosophy, including one of 140, 240, 241 or 340, 221/222, one full course equivalent in the history of Philosophy, and 335

Religious Studies Requirements (See Religious Studies Joint Honours Requirements)

Other Requirements
Eight full course equivalents to make a total of 22 full course equivalents, including either Philosophy or Religious Studies 499, and A and B requirements (see page 73)

Honours Philosophy and Sociology

Philosophy Requirements
Seven full-course equivalents in Philosophy, including 221/222, one of 140, 240, 241 or 340, 280/281, 282/283, and 362

Sociology Requirements (See Sociology Joint Honours Requirements)

Other Requirements
Either Philosophy or Sociology 499
Seven full course equivalents, including A and B requirements (see page 73)

Note
The following courses are recommended as electives for students with special interests: Sociology 603, 631, and 632

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

Political Science 101/102
Economics 101/102
Sociology 101/205
History—the equivalent of one full-year course
One other course, chosen from Group A

By no means should the above recommendations be considered mandatory: while these courses constitute, on the whole, the best overall background for the study of politics, students who wish to pursue interests in other disciplines are free to do so.

The Department of Political Science offers a series of undergraduate programmes designed to meet the needs of students with varying interests. Requirements for each programme are restricted to the completion of a specified number of courses in different fields of the discipline before graduation. For these purposes Political Science courses above the 100 level are numbered according to the field within which they fall. The key to this scheme is the second digit of the course number as follows:

1—methodology
2—normative theory
3—public administration, public law, and public policy
4—local and regional politics
5—comparative politics (more than one country)
6—comparative politics (specific countries)
7—the political process
8—international politics
with the number 9 reserved for special courses which are not regarded as dealing with a particular field of the discipline.
1 General Programme
Students choosing a three-year General programme in Political Science (see the University’s requirements for the General Programme in Chapter 7) will normally complete, before graduation, the equivalent of five full courses in Political Science beyond the 100 level, of which there must be at least one-half course from each of four different fields of the discipline as defined above.

2 Honours Programme
Students choosing an Honours programme in Political Science (see Chapter 7) must complete, before graduation, the equivalent of nine full courses in Political Science beyond the 100 level, of which four must be different fields of the discipline as defined above. Honours students may elect to pursue a series of connected courses as a minor programme in a related discipline such as Anthropology, Economics, Geography, History, Philosophy, or Sociology in consultation with the departments involved.

3 Joint Honours Programme
Students who wish to combine a study of Political Sciences 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 programme.

It is possible to combine the Political Science joint honours requirements (see Chapter 7) with the requirements made by Anthropology, Economics, English, French Geography, History, Man-Environment, Philosophy, Psychology or Sociology. In a joint honours programme involving a Department in another Faculty, as in the Political Science and Man-Environment programme, students will fulfill the degree requirements of the Faculty in which they are registered. For a joint honours programme in any other discipline, please consult the Political Science Department and the other department concerned.

Students choosing a joint Honours programme involving Political Science must complete, before graduation, the equivalent of six full courses in Political Science beyond the 100 level of which there must be at least one-half course from each of four different fields of the discipline as defined above.

4 Minor Programme
The Department will be glad to recommend a connected series of courses in Political Science beyond the 100 level for students majoring in other disciplines such as Sociology, History or Economics. Students in programmes in other Faculties, such as Planning, may follow a series of courses to obtain a minor designation in Political Science in their degree. Please consult the Department for assistance in planning such a programme. In addition, it is now possible for students in co-op studies in Arts, Math, Science, Engineering or Recreation to add a wide range of Political Science courses to their programmes.

Note
Students who have completed no fewer than six full courses in Political Science in a joint honours programme or 9 full courses in Political Science in an honours Political Science programme are now eligible to enter studies leading to an Ontario secondary school ‘Type A’ teaching certificate in Political Science.

Graduate Programme
The Department of Political Science offers a programme leading to the degree of Master of Arts. The programme consists of the equivalent of two full courses and a thesis, or the equivalent of three full courses and a cognate essay. Highly personalized, flexible instruction is also offered in the form of reading courses. For more information, please consult the Graduate Calendar or the Political Science Department.
Honours Political Science

Recommended Programme

Year 1
Political Science 101/102
The equivalent of four other full courses

Year 2
The equivalent of three full courses in Political Science
(see note)
The equivalent of two other full courses

Year 3
The equivalent of three full courses in Political Science
(see note)
The equivalent of two other full courses

Year 4
The equivalent of three full courses in Political Science at
least two of which must be at the 400 level (see note)
The equivalent of one other full course

Note
Among the six Political Science courses above the 100
level, students must select at least one-half course in
each of four different fields of the discipline. For further
information on this please consult the Department.

Honours Political Science
(Administrative Studies Option)

This programme consists of the successful completion of
a programme of courses which would ordinarily lead to
an Honours or Joint Honours degree in Political Science,
and the following core courses.
1) Economics 101/102
2) Business 227-30 (WLU)
3) Business 247-30 (WLU)
4) Psychology 333 or
   Management Science 404 or
   Sociology 339
5) English 210

An Honours Programme in addition to the core courses
must include:
1) The equivalent of at least three full courses in Political
   Science beyond the 100 level, selected from courses
   which have been designated as Administrative
   Studies courses by the Department; and
2) The equivalent of at least two full courses beyond the
   100 level not in Political Science, selected from
   courses which have been designated as
   Administrative Studies courses by the Department.

A Joint Honours Programme in addition to the core
courses must include:
1) The equivalent of at least three full courses beyond
   the 100 level in each of the student's major subjects
   selected from courses in those subjects which have
   been designated as Administrative Studies courses
   by the Department; and
2) The equivalent of at least two full courses beyond the
   100 level not in either of the student's major subjects
   selected from courses which have been designated
   as Administrative Studies courses by the Department.
Various Continuations of the Administrative Studies Programme after the First Year

| Year 2 | 1/2 course | Business 227-30 (WLU) |
|        | 1/2 course | English 210          |
|        | 3 courses  | from the major subject, one of these must be in a designated Administrative Studies course electives |
|        | 2 courses  | Total 6 courses      |
| Year 3 | 1/2 course | Business 247-30 (WLU) |
|        | 1/2 course | Psychology 333 or Sociology 339 (unless Management Science 404 is to be taken in Year 4) |
|        | 4 courses  | from the major subject, one of these must be in a designated Administrative Studies course elective, chosen from designated Administrative Studies courses not in the major subjects |
|        | 1 course   | Total 6 courses      |
| Year 4 | 1/2 course | Management Science 404 (unless Psychology 333 or Sociology 339 was taken in Year 3) |
|        | 4 courses  | from the major subject, one of these must be in a designated Administrative Studies course elective, chosen from designated Administrative Studies courses not in the major subjects |
|        | 1 1/2 or 2 courses | Total 6 courses      |
| Total courses in programme: 23 |

Note

Students interested in the Administrative Studies Option must consult with the Department's Undergraduate Officer. Each year the Department prepares a list of courses which are designated as Administrative Studies courses; this list will be available in the Department at the time of pre-registration.

Note

Successful completion of either the Honours or Joint Honours programme permits the student to add the title of Administrative Studies to the name of the degree earned.

General Programme in Psychology

Students choosing a three-year General programme in Psychology must complete Psychology 101, 102, 275, a minimum of three additional Psychology credits, and of the remaining ten credits a minimum of eight credits in Departments other than Psychology (see also the Arts Faculty General Programme requirements).
Honours Psychology

Students choosing the Honours programme in Psychology must complete, before graduation, the equivalent of nine credits in Psychology. Before entering the fourth year of the programme, all students must complete Psychology 283, 284, 285 and one research half credit from each of the following groups:

Group 1: 293, 295, 297
Group 2: 393, 395, 397

In the fourth year, all students must complete Psychology 496 or 499. A recommended programme is outlined below.

Recommended Programme

Year 1
Psychology 101/102
The equivalent of four additional credits.

Year 2
Psychology 283/284
The equivalent of one credit in Psychology (see note 1)
The equivalent of three additional credits

Year 3
Psychology 285
The equivalent of two and one half additional credits in Psychology (see note 1)
The equivalent of two additional credits

Year 4
Psychology 498 or 499
The equivalent of two additional credits in Psychology (see note 2)
The equivalent of two additional credits

Note 1
Honours students are required to complete one research half credit from each of the following groups before entering the fourth year of the programme.

Group 1: 293, 295, 297
Group 2: 393, 395, 397

Note 2
Honours students should include at least two fourth-year seminars in their programme.

Psychology Joint Honours Programmes

Students choosing the Honours Psychology Programme with Early Childhood Education and Care Option fulfill all the requirements listed under the Honours Programme above. In addition, students must be accepted into the option at the beginning of the third year and must have completed the following courses prior to the fourth year:

Psychology 101, 203 or 207, 211, 241, 242, 283, 284, 285, 293 or 295, 311, 321, 341, 393, Health Studies 140, and Recreation 200. In the fourth year students must complete Psychology 421, 453, 498 or 499, Dance 364, Health Studies 345 and Sociology 216. Before graduation each student must complete a minimum of twenty-two credits. Of these twenty-two credits a minimum of nine credits must be in Psychology with letter grades (Psychology 321 and 421 are offered on a Credit-Fail basis only).

At the end of this programme the student will have completed all of the formal university training required by the Association of Early Childhood Education (Ontario) and the Ministry of Community and Social Services for working in a preschool and day care setting. The other principal requirement for the Early Childhood Education Certificate is one year of full-time teaching experience in the Ontario preschool setting.

Recommended Programme

Year 1
Psychology 101/102
The equivalent of four additional credits

Year 2
Psychology 211/203 or 207
Psychology 241/242, 283/284
Health Studies 140
The equivalent of two and one half additional credits

Year 3
Psychology 285, 311/341, 321
Psychology 393/293 or 295
Recreation 200
The equivalent of two additional credits

Year 4
Psychology 421
Psychology 498 or 499
Psychology 453/Dance 364
Health Studies 345
Sociology 216
The equivalent of one additional credit

Note
Students must obtain a minimum of 9 Psychology credits with letter grades to meet the requirements for the honours degree. Psychology 321 and Psychology 421 are offered on a Credit-Fail basis only.
Psychology 283, 284, 285 and one research half credit from each of the following groups:

Group 1: 293, 295, 297
Group 2: 393, 395, 397

In the fourth year, all students must complete Psychology 498 or 499, or the Honours Thesis course in the related discipline.

Joint Honours programmes other than those already approved may be arranged by consultation with the Psychology Department and the Department concerned. Approved joint honours programmes presently exist with Psychology and Classical Studies, Drama, French, Geography, German, History, Man and Environment, Math, Philosophy, Political Science, Russian, Sociology, and Statistics.

Honours Psychology with a B.Sc. Degree
An Honours Psychology degree programme is also available in the Faculty of Science. See Chapter 73.

Minor Programme
The Department offers a minor programme in Psychology. Any student interested in planning a sequence of five credits to complement his/her major field of study is encouraged to consult the Undergraduate Officer. All minor programmes must be approved by the Department.

Religious Studies
Purpose of the Programme in Religious Studies:

a) to expose the student to the issues and problems involved in, and to the nature of the questions raised by, the study of religious phenomena and ideas;
b) to enable him to approach, in a methodical way, the study of the major religious traditions living today for the purpose of encountering and understanding the life and the expression of religion through the various religions of the world;
c) to introduce him to the distinctive features of one or more religious traditions and to the methods for their systematic study.

A) Honours Religious Studies

Year 1
Any five first-year courses that meet the general requirements of the Faculty of Arts and include one of the following full-course equivalents in R.S.:
103/104, 110/111, 130/131, or 160/161

Years 2, 3 and 4
Nine full R.S. courses (or the equivalent) and six electives.

The R.S. courses are to include:
a) Two full courses (or the equivalent) from either one of the following groups and one from the other:

<table>
<thead>
<tr>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hinduism</td>
<td>Judaism</td>
</tr>
<tr>
<td>Buddhism</td>
<td>Christianity</td>
</tr>
<tr>
<td>Chinese Traditions</td>
<td>Islam</td>
</tr>
</tbody>
</table>
b) Three full-courses (or the equivalent) at the 300-level or above
c) At least one Senior Seminar.

Note
Total number of courses for the degree, twenty.

Religious Studies Joint Honours Programmes
The Religious Studies requirements in Joint Honours Programmes are the same as the Honours Programme except for the overall number of R.S. courses; Honours requires 10, Joint Honours 7.

Religious Studies has Joint Honours Programmes with Classics, English, History, Philosophy, Psychology, Social Development Studies, and Sociology.

B) General in Religious Studies
Students majoring in Religious Studies must have their programmes approved by the undergraduate officer. Each student is required to take any 100-level R.S. course in the first year and two R.S. courses in each of the two subsequent years. At least three of the five required R.S. courses should be above the 100-level. These courses should be selected from at least two of the following four main categories of approaches to religious phenomena (the decade grouping of the numbering scheme will guide the student in making this selection): Course Categories and Numbering Scheme

1) Studies in Religious Texts 00-69
2) Studies in the History of Religions 10-19A) History of Religions
   20-29B) History of the Christian Church
3) Theological-Philosophical Studies 30-39A) Theological
   40-49B) Philosophical
   50-59C) Ethics
4) Cultural Studies 60-69A) Religion and Culture
   70-79B) Religion and the Social Sciences

C) Minor in Religious Studies
The requirements for a Minor in Religious Studies are as follows:
1) successful completion of a minimum of five R.S. courses with a cumulative average of at least 65% (as provided for in Faculty regulations),
2) selection of these five courses from at least two of the categories outlined in the requirements for the General Degree,
3) taking of three of the required five courses above the 100-level.
Note
Students at the University of Waterloo and Wilfrid Laurier University may, with the permission of their advisor, take courses in Religious Studies at either University. For details regarding registration procedures and courses available at Wilfrid Laurier University, consult the Undergraduate Officer, Religious Studies.

Honours Russian

Year 1
Russian 101/102 or equivalent
Four additional full courses

Year 2
Two full courses in Russian
Three additional full courses

Year 3
Three full courses in Russian
Two additional full courses

Year 4
Three full courses in Russian
Two additional full courses

Note 1
A minimum of 20 full courses must be successfully completed before graduation.

Note 2
Before graduation students must complete the group A(i) and B requirements listed on page 73.

Russian Joint Honours Programmes
Drama and Russian
English and Russian
Economics and Russian
Environmental Studies and Russian
French and Russian
German and Russian
History and Russian
Mathematics and Russian
Political Science and Russian
Geography and Russian
Philosophy and Russian

Other Joint Honours programmes may be arranged by consultation between the student and the departments concerned.

Note 1
A student in a Joint Honours Programme will take a minimum of 22 full courses before graduation, including seven in Russian.

Social Development Studies
The Social Development Studies Programme at Renison College currently offers an interdisciplinary curriculum leading either to an honours or a general B.A.

Courses in sociology, psychology, social work and interdisciplinary concerns are offered by faculty in each of these core areas as well as by supportive faculty from other disciplines. Human growth and social issues are examined in the context of institutional arrangements that affect life, as well as safeguards and systems that must be created to enhance collective human welfare.

The programme realizes its applied emphasis through the development and operation of projects within and outside the university community to balance and test theory and practice against each other. With a commitment to confronting contemporary social problems, the Social Development Studies Programme is designed for students interested in employment or graduate studies in human service areas such as community organizing, journalism, law, social work, communications, international service programmes, theology, etc.

The General Programme
The general programme consists of 6 academic terms in a period of 3 years. Courses are normally offered in the fall or winter terms. The programme requirements are listed below.

1) A minimum of 15 full courses in total;
2) The normal "Group A and B" requirements of the Faculty of Arts;
3) A minimum of 7 full courses from the core area courses listed below with the following stipulations:
   a) In the first year a student must register in the fall term for the introductory course (120 level) in sociology, psychology and social work. In the winter term which follows, the student completes follow-up courses (121 level) in at least two areas and also enrols in an introductory interdisciplinary social science course (i.e., ISS 120R). In the second year all students are required to take a full credit in social research (i.e., ISS 250R/251R). A student is required to complete a minimum of 2 full courses from the list in each year that he/she is registered in the three-year programme.
   b) The 7 courses must be distributed over at least 3 of the 4 core areas with a maximum of 3 courses within a single area counting towards the requirement.
4) After meeting these minimum requirements, the student may elect his/her remaining courses from the general arts offerings of Renison or any Department of the University.
5) Transfer students from other programmes, faculties or universities must comply with all requirements as set out above. In special cases they may petition for equivalent credit for courses taken elsewhere which are similar to core area courses. Petitions should be directed in writing to the registrar.
6) For further information consult the Registrar, Renison College, Waterloo, Ontario N2L 3G4.

Core Area Courses

<table>
<thead>
<tr>
<th>Interdisciplinary Social Science</th>
<th>Social Work</th>
<th>Sociology</th>
<th>Psychology</th>
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</thead>
<tbody>
<tr>
<td>ISS 120R</td>
<td>Soc 120R/</td>
<td>120R</td>
<td>120R/</td>
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<tr>
<td></td>
<td>Soc 121R</td>
<td>121R</td>
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<tr>
<td>ISS 220R</td>
<td>Soc 220R</td>
<td>220R</td>
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<tr>
<td>ISS 221R</td>
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<tr>
<td>ISS 250R/251R</td>
<td>Soc 225R</td>
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<td>Soc 226R</td>
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<td>Soc 227R</td>
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<td>Soc 325R</td>
<td>325R</td>
<td></td>
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<tr>
<td>ISS 398R/399R</td>
<td>Soc 398R</td>
<td>398R</td>
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<td></td>
<td>Soc 399R</td>
<td>399R</td>
<td></td>
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</tbody>
</table>

The Honours Programme

The honours programme consists of eight academic terms in a period of four years. Requirements for the honours programme are:

1) a minimum of 21 full credits in total while maintaining an overall average of at least C- and a cumulative average of B in the core area courses of the programme;

2) the normal “Group A and B” requirements of the Faculty of Arts, University of Waterloo;

3) a minimum of 9 full credits within the core areas of the programme;

4) a minimum of four full credits related to one of the multidisciplinary theme areas. (see note 1)

Year 1

Interdisciplinary Social Science 120R, Social Work 120R, Sociology 120R, Psychology 120R
At least two half courses from among: Social Work 121R, Sociology 121R, Psychology 121R.

The equivalent of two additional credits

Year 2

Interdisciplinary Social Science 250R/251R
At least two half courses from among:
Interdisciplinary Social Science 220R, 221R
Social Work 220R, 221R, 222R
Sociology 220R, 221R, 205(R)
The equivalent of two credits from chosen theme area (see note 1)
The equivalent of 1.5 additional credits.

Year 3

Interdisciplinary Social Science 320R, Social Work 326R
At least two half courses from among:
Social Work 320R, 321R, 322R
Sociology 325R/326R, 327R/328R
Psychology 322R, 323R

The equivalent of two credits from chosen theme area (see note 1)
The equivalent of 1.5 additional credits.

Year 4

Interdisciplinary Social Science 469R, 499R
The equivalent of three additional credits

Note 1

Students in the Honours Social Development Studies Programme are required to complete four full credits from a theme area of study which has been selected in consideration of the students own needs and plans. The suggested theme areas are: “Home and School”, “Work”, “Community”, “Mental Health”.

In consultation with Renison’s Undergraduate Officer, courses are chosen in such a manner as to explore the theme area in depth, looking at the historical, institutional, and cross-cultural aspects, and examining value systems and patterns of change.

Social Development Studies Joint Honours Programme

Social Development Studies requirements

1) Four introductory half courses in the core area:
   ISS 120R, Psych 120R, Soc 120R, SocWk 120R;
2) Methodology: ISS 250R/251R;
3) ISS 320R, plus 2.5 credits at the 200 level or above;
4) A Senior Seminar, ISS 469R, or a Senior Honours Essay, ISS 499R.

Note

The student will be expected to develop an elective theme area of three full course equivalents.
There is a joint honours programme with Religious Studies.
Honours Sociology
Recommended Programmes

Year 1
Sociology 101
One other half course in Sociology at 200 level
Four elective full year courses (or equivalent half courses)

Year 2
Sociology 202
Two full year courses in sociology (or equivalent half courses)
Two and one half elective full year courses (or equivalent half courses)

Year 3
Sociology 321/322
Two full year courses in sociology (or equivalent half courses)
Two elective full year courses (or equivalent half courses)

Year 4
Sociology 425/426
Sociology 499
One full or two half courses in Sociology
Two elective full year courses (or equivalent half courses)

Note 1
Students may elect Honours Sociology (Canadian Studies) by fulfilling the Honours requirements in Sociology and the requirements listed under Canadian Studies in this Calendar.

Sociology Joint Honours Programmes
Sociology has joint honours programmes with the following: Anthropology, Classics and Romance Languages, Economics, English, History, Philosophy, Political Science, Psychology, Mathematics and Recreation. The usual recommended programme in Sociology for joint honours is seven and one half full course equivalents distributed as follows: a half course in introductory sociology (101); a half course in statistics (202); two half courses in research methods (321/322); two half courses in sociological theory to be chosen from 331, 402, 425; the equivalent of three and one-half full courses of electives in Sociology; and an honours thesis course (499) or the equivalent in the related department.

Note 1
For requirements in joint honours with History, Philosophy, Psychology and Mathematics see the Department Undergraduate Officer.

Note 2
In the joint honours programme with French (Classics and Romance Languages) Soc 202 may be replaced by an elective in Sociology.

Honours Spanish
Recommended Programme

Year 1
Spanish 191/192 (students with little or no Spanish will take Spanish 101/102 in the first year and Spanish 191/192 and 255/256 in the second year).
Four more courses

Year 2
A minimum of three full courses or equivalent in Spanish including 255/256.
Two more courses

Year 3
A minimum of three full courses or equivalent in Spanish including 318.
Two more courses

Year 4
A minimum of three full courses or equivalent in Spanish including 444 and 498.
Two more courses

Note 1
Before graduation, the student must complete a minimum of ten full courses or equivalent in Spanish of which the following courses are obligatory: 255/256, 318, 444, 498. If the student intends to enter the teaching profession, 191/192, 251/252, and 351/352 must be completed.

Note 2
To establish a Minor in a sister discipline, the student must complete five courses (fifteen hours) in that discipline. Students registering in Honours Spanish are strongly advised to minor in French.

Note 3
With the permission of the Division, the student may spend the third year enrolled in an acceptable university in Spain or in Mexico.

Note 4
A total of 20 courses must be successfully completed before graduation.

Note 5
The degree requirements of the Faculty of Arts (see page 73) must be met for the B.A. degree.

Note 6
Students in year 4 must have the permission of the Division to enrol in Spanish courses on the 100 or 200 level.
Spanish Joint Honours
The Department of Classics and Romance Languages recognizes combined honours programmes in Spanish and the following disciplines:
Classical Studies
English
French
German
History
Latin
Sociology

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

Recommended Programme (Spanish)

Year 1
Spanish 191/192 (students with no high school Spanish will take Spanish 101/102 in the first year and Spanish 191/192 in the second year).

Year 2
Three full courses or equivalent in Spanish including 255/256.

Year 3
Two full courses or equivalent in Spanish including 318.

Year 4
Two full courses or equivalent in Spanish including 444 and 498.

Note 1
Before graduation, students in combined honours programmes must complete a minimum of eight full courses (or equivalent) in Spanish of which the following courses are obligatory: 255/256, 318, 444, 498.

Note 2
Those planning to enter the teaching profession are expected to complete 191/192, 251/252, and 351/352.

Note 3
A total of 22 courses must be successfully completed before graduation.

Note 4
The degree requirements of the Faculty of Arts (see page 73) must be met for the B.A. degree.

Note 5
Students in year 4 must have the permission of the Division to enrol in Spanish courses on the 100 or 200 level.
Faculty of Engineering

Biomedical Lab in Mechanical Engineering
The Co-operative Engineering Programme

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 programme 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 programme covers almost five calendar years, comprising eight terms each of about four months’ duration of university work on the campus which are pursued alternatively 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.”

While co-operative programmes have been offered in many other countries, and the inherent advantages are well recognized, the co-operative Engineering programme at the University of Waterloo is unique in Ontario and was, until recently, unique in Canada. The engineering curricula at the University of Waterloo provide a sound basis in Mathematics and Pure Science and in Engineering Science and Design. The first year of the programme is common for all programmes except Chemical Engineering and Systems Design. A substantial part of the work of the first and second years is common to all programmes. Starting with the second year (first year for Chemical Engineering and Systems Design) students elect one of the five principal divisions of engineering. The curriculum for each of the five basic programmes combines required “core” subjects essential to the field, and “elective” subjects permitting considerable diversity in individual programmes 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 programme 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 (B.A.Sc.) is awarded by the University in the following undergraduate programmes:

- Chemical Engineering
- Civil Engineering
- Electrical Engineering
- Mechanical Engineering
- Systems Design Engineering

All programmes entail 4-2/3 calendar years of undergraduate study on the co-operative system.

The Degrees of Master of Applied Science (M.A.Sc.) and Doctor of Philosophy (Ph.D.) are also awarded in Engineering. For further details, consult the Graduate Studies Calendar and the list of the particular courses in graduate work in the various departments.

Admission

All Year 1 students enrol in September. These Year 1 students spend the Fall term together at the University, after which they are divided into two groups. They also complete the last term of the programme and graduate together. Both groups, of course, have the same total time on campus and in industry, one group having a double academic term at the start of the programme and the other having a double academic term at the end of the programme. The division at the end of the first term of study is based upon student preferences, financial consideration of students, etc. Precise dates for the beginning and end of the various terms are shown in the academic calendar on page 5-8.

The programme in Systems Design is not divided into two groups. All students in this programme start with four months of school before going out on the first work term in the Winter.

Admission

The admission requirements and procedures for all programmes 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 Year 5

Applicants must present the following Mathematics courses—Relations and Functions, Calculus, Algebra, as well as Chemistry and Physics in their overall Year 5 programme. Students with high overall standing who are missing one or two of the five specific Year 5 requirements are encouraged to contact the Admissions Officer no later than January (for September admission). Applicants will be evaluated and advised on possible courses of action required to meet our specific requirements.

Admission as An Adult Student

It is recommended that applicants attempt to obtain standing in Ontario Year 5 Mathematics and Science courses or their equivalent. The University has developed special pre-university mathematics and science courses which can be taken by correspondence and which are recommended for adult students. To discuss accessibility and appropriate qualifying work applicants are advised to contact the Admissions Officer for the Faculty of Engineering.
Admission to Advanced Standing

Because of the co-operative nature of the Engineering programme, no student will be admitted above Year 3, term A level. Any student thus admitted will be required to register in the January term and to complete a minimum of three satisfactory work terms. The level of advanced admission is determined by an examination of the applicant's academic and work experience.

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

Examinations and Promotions

The Faculty constitutes the examining body for all examinations and is responsible for all decisions on grades, promotions, failures, deferred examinations, appeals and the preparation or recommendations for the granting of degrees. Students are examined and marks are set for individual subjects on completion of the work for that subject. With few exceptions beyond first year, subjects are one term in length, and promotion decisions are made at the end of each term.

For the purposes of promotion the two terms of first year are considered as a unit and promotion decisions are made at the conclusion of the second term only. However, a first year student's progress is reviewed at the end of the first term and the Engineering Faculty Council may recommend or require a student to withdraw if, in the opinion of the Council, the student is unlikely to benefit from further study.

The procedures through which promotion decisions are made are as follows:

1) At the end of each term examining faculty members submit marks to the Engineering Examinations and Promotions Committee which makes promotion decisions which may be reviewed by the Engineering Faculty Council. The decisions are reported to the students through the Registrar's Office. All recommendations to award degrees must be approved by senate.

2) Promotion decisions are made at the end of each term except the first term. The decision for each student is based on a weighted average computed from his marks in individual subjects following the weighting scheme for his department. For promotion a student must achieve an average of 60% or higher, except in special cases where, at the discretion of the Faculty, promotion may be granted with an average below 60%.

There is no "passing" or "failing" of individual subjects. Promotion is based on the weighted overall average and a minimum grade is not normally required in any one subject, although individual departments may designate minimum grade requirements in certain courses. Also, there are individual department rules regarding the grading and averaging of non-technical elective courses. There are no supplemental examinations except in the last term of the programme.

3) All promoted students will be shown as having obtained First, Second or Third Class Honours according to the following table:

<table>
<thead>
<tr>
<th>Average</th>
<th>Honours</th>
</tr>
</thead>
<tbody>
<tr>
<td>80.0 to 100%</td>
<td>First Class</td>
</tr>
<tr>
<td>70.0 to 79.9%</td>
<td>Second Class</td>
</tr>
<tr>
<td>60.0 to 69.9%</td>
<td>Third Class</td>
</tr>
</tbody>
</table>

The exception to this will be those special cases where a student has less than 60% but who has been given a "Promotion Granted" decision.

Students will be ranked in order of overall averages. A student's class standing will be shown on his report. Failing students will be given their failing average.

4) Students who are not promoted at the end of the first year will be required normally to repeat all of the second term, except that re-admission will be denied if, in the opinion of the faculty, a student is deemed unlikely to profit from further study.

5) Students who are not promoted at the end of the third or subsequent terms will normally be required to repeat all of the work of the term failed.

Where timetables permit, repeating students may be excused from repeating individual courses in which good marks have been obtained, and permitted to register in other appropriate courses, at the discretion of the student's department.

Previous marks in exempted courses will not be included in the average of the repeated term.

6) Students who are not promoted at the end of any term are required to stay out 8 months before they can repeat their term.

7) A student may not repeat a given term more than once. The Examinations and Promotions Committee decisions "Failed, May Repeat" and "Promotion Granted" are to be considered equivalent in that the maximum number of such decisions a student may accumulate is two.

8) The Engineering Faculty Council will recommend or require a student to withdraw at any time if, in the opinion of the Council, the student is unlikely to profit from further participation in the co-operative programme.
9) A student who withdraws from the programme less than four weeks before the commencement of the final examination period in the programme, shall normally be deemed to have failed the year or term in which he was enrolled at the time of withdrawal. This does not apply to the 1A term.

10) Courses taken by students that are in addition to the degree requirements will not be included in a student’s average. Marks obtained in extra courses will be reported on a student’s transcript.

11) Courses taken by students during work terms will not be included in a student’s average for any term. The marks of courses taken at the University of Waterloo, however, will be reported on a student’s transcript. Normally students will be expected to register for the minimum number of courses specified by the calendar for the appropriate term.

12) In special cases other symbols may be substituted for marks and the following list summarizes these symbols and their meanings:

- **AEG** - Student was ill as per medical evidence.
- **CR** - Performance was **Satisfactory**, student is given a **Pass** with no specific mark or grade assigned.
- **NCR** - Performance was **Unsatisfactory**.
- **INC** - Student obtained permission not to write because of illness or death in family, etc. The exam is **Deferred** to a later date. Also, the course and project cannot be completed until the next term. Thus mark is **Postponed** in meantime. Course work is **Incomplete**.
- **NMR** - No mark reported.
- **DNW** - Student **Did Not Write** the exam and did not officially drop the course.

13) Students who feel that assigned grades or the promotion decision do not reflect a just evaluation of their achievement, or who have done poorly because of sickness or unavoidable absence, may appeal faculty decisions. All appeals should be addressed to the Chairman of the Engineering Examinations and Promotions Committee, Registrar’s Office, University of Waterloo. Reasons in support of the appeal must be provided. Doctor’s certificates and similar supporting documents where appropriate should be included with the student’s statement. It is to the student's advantage to file his appeal as early as possible, preferably before the Examinations and Promotions Committee meets to discuss the grades affected. Appeals must normally be submitted no later than three weeks after the promotion decisions are mailed by the Registrar’s Office.

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

### 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) Each Engineering student is required to submit a minimum of four satisfactory work reports prior to graduation. For those students admitted to advanced standing into 2B or 3A with only 3 work terms remaining, only 3 satisfactory work reports would be required.

2) All work reports shall be submitted to the Department of Co-ordination on the first day of lectures for the academic term following the work term and subsequently distributed to departments within 1 week. Failure to comply with the deadline will result in no work report credit for that term.

3) Work reports shall be compulsory for all students in their first work term and these reports shall be assessed by the Department of Co-ordination. The reports and evaluation forms shall be returned to the students and copies of the evaluation forms shall be placed in the students’ files in the Department of Co-ordination.

4) Three additional work reports shall be submitted for the remaining five work terms. Students are encouraged to reserve a report for their final work term. If students wish, they may submit the additional reports and the evaluations of these reports will be added to their work term record. Students may be required to submit work reports to employers.

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 re-written and re-submitted during the academic term. Students with unsatisfactory work reports may be required to take formal instruction in technical report writing.
Continued registration in later academic terms depends on satisfactory work-terms performance and/or reports. Students with an "NCR" designation on any work report will not be promoted until they have cleared this condition. (see booklet on Regulations & Procedures for co-operative programmes).

Academic Programmes

The core programmes for each of the five major divisions of engineering provide the foundation for professional activity in any field of engineering interest. A wide variety of elective courses are available in Engineering, Science, Mathematics, the Humanities, and Social Sciences, from which optional programmes may be developed under the guidance of faculty advisors.

For further enlargement of the programmes, refer to the booklet entitled Admissions Information '77.

Year 1 Engineering Programmes

All students enrolling in Year 1 are required to choose one of the following three programmes:

a) General Engineering  
b) Chemical Engineering  
c) Systems Design

Students enrolling in Chemical Engineering register for the same courses as above except in the 1A term they take Ch E 100 (see course description on page 237) in lieu of Gen E 115. and Ch E 101 in the 1B term.

Students enrolling in Systems Design should refer to page 116 for the Systems Design course listings.

At the completion of the first year, students in the General Engineering programme are required to select one of the following major divisions of engineering for the second year of study:

Civil Engineering  
Electrical Engineering  
Mechanical Engineering

Students in Chemical Engineering and Systems Design may transfer to Civil, Electrical or Mechanical Engineering (see booklet entitled Admissions Information '77 for conditions of transfer and make-up requirements).

Note

Detailed course descriptions commence in Chapter 14. Courses beginning with Gen E (General Engineering) can be found on page 303.
Chemical Engineering

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

Biochemical and Food Engineering

This option deals with the processing of systems where biochemical phenomena are important. It is concerned with waste treatment, food processing and fermentation operations which manufacture microbial products such as alcoholic beverages, yeasts, antibiotics, vitamins, and enzymes. The usefulness of these studies is obvious in a world with increasing food and health problems, and for the Canadian economy in which agricultural products play a significant role.

Extractive and Process Metallurgy

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

Pollution Control Engineering

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

Polymer Science and Engineering

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

Transport Processes

This option is a further development of a core area of chemical engineering. Within it, aspects of fluid flow, heat transfer, mass transfer and reaction kinetics, which are important in most chemical and allied industries, are studied.

Mathematical Analysis and Control

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

Guide to Undergraduate Chemical Engineering Course Numbers

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

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

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

Third digit (0-9): term
Even numbers: first term
Uneven numbers: second term
### A) Core Courses

<table>
<thead>
<tr>
<th>(Beyond Year 1)</th>
<th>Lectures (hr/wk)</th>
<th>Labs/Problems (hr/wk)</th>
<th>Tutorials (hr/wk)</th>
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<tbody>
<tr>
<td>ChE 220</td>
<td>Applied Mathematics 1</td>
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<td>ChE 230</td>
<td>Physical Chemistry 1</td>
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<tr>
<td>ChE 232</td>
<td>Inorganic Chemistry 1</td>
<td>3</td>
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<tr>
<td>Chem 26</td>
<td>Organic Chemistry 1</td>
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<td>Math 210</td>
<td>Calculus 2 (For Chemical Engineers)</td>
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<td>ChE 211</td>
<td>Transport Processes 1 (Fluid Mechanics)</td>
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<td>1</td>
</tr>
<tr>
<td>ChE 231</td>
<td>Physical Chemistry 2</td>
<td>3</td>
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<tr>
<td>ChE 233</td>
<td>Physical Chemistry Laboratory</td>
<td>3</td>
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<tr>
<td>Chem 36</td>
<td>Organic Chemistry 2</td>
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<td>Math 216</td>
<td>Differential Equations</td>
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<td>ChE 312</td>
<td>Transport Processes 2 (Heat Transfer)</td>
<td>3</td>
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<td>ChE 320</td>
<td>Applied Mathematics 2</td>
<td>3</td>
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<td>ChE 330</td>
<td>Chemical Engineering Thermodynamics</td>
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<td>ChE 332</td>
<td>Inorganic Chemistry 2</td>
<td>3</td>
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<td>ChE 334</td>
<td>Instrumental Methods of Chemical Analysis</td>
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<td>ChE 313</td>
<td>Transport Processes 3 (Mass Transfer)</td>
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<td>ChE 315</td>
<td>Chemical Engineering Laboratory</td>
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<td>2</td>
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<tr>
<td>ChE 331</td>
<td>Chemical Reaction Engineering</td>
<td>3</td>
<td></td>
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<tr>
<td>ChE 420</td>
<td>Process Dynamics and Control 1</td>
<td>3</td>
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<tr>
<td>ChE 422</td>
<td>Engineering Economics</td>
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<tr>
<td>ChE 482</td>
<td>Technical Seminar and Process Design</td>
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<tr>
<td>ChE 280, 281</td>
<td>General Awareness Seminar</td>
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<td>380, 381</td>
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<td>480, 481</td>
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<tr>
<td>ChE 007</td>
<td>General Awareness Seminar</td>
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</table>

### B) Elective Courses

In addition to the core courses listed above, a minimum of 13 elective courses must be taken. The usual sequence of technical (T) and non-technical (NT) electives is as follows:

<table>
<thead>
<tr>
<th>NT</th>
<th>T or NT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2A</td>
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<tr>
<td>2B</td>
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<tr>
<td>3A</td>
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<tr>
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<td>(ii) 2</td>
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</table>

Four to six of these courses may be chosen from non-technical electives, (one required in each of the terms 2A, 2B, 3A, and 3B, and one open elective in each of the terms 4A and 4B). Four non-technical elective courses must be successfully completed beyond year 1B. Marks for these courses are not included in the term averages from 2A to 3B inclusive.

The remaining seven to nine courses must be technical electives of which at least three are to be selected from one of the first seven option groups listed below. An elective course is normally based on three lecture hours per week for one term unless otherwise specified in the detailed course description. The other technical electives may be chosen from other Chemical Engineering courses or from other science or engineering courses according to interest, but the choice must be approved by the Associate Chairman (Undergraduate Studies).

The three technical electives for each of the seven Chemical Engineering option groups are identified below. Within each option group, the first course is normally taken in the 4A term and the other two courses in the 4B term.
1) Transport Processes
   Ch E 510  Prediction of Physico-Chemical Properties
   Ch E 515  Two-Phase Flow Operations
   Ch E 517  Performance of Separation Processes

2) Mathematical Analysis and Control
   Ch E 520  Chemical Engineering Analysis
   Ch E 521  Process Dynamics and Control 2
   Ch E 523  Process Control Laboratory

3) Polymer Science and Engineering
   Ch E 540  Introduction to Polymer Science
   Ch E 541  Physical Chemistry of Polymers
   Ch E 543  Polymer Laboratory

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

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

6) Pollution Control Engineering
   Ch E 470  Air Pollution
   Ch E 560  Introduction to Biochemical Engineering
   Ch E 571  Water Pollution

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

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

A student may acquire a B.A.Sc. in Chemical Engineering with an option in Management Sciences by taking eight M Sc courses (see p. 00) as electives. Two of the courses in this option are to be replaced by two Ch E courses: Ch E 220 is in lieu of M Sc 421 and Ch E 477 is in lieu of M Sc 23. The six other courses comprise 6 of the minimum 13 elective courses (3 NT and 3 T). Marks for these courses will be included in the term averages.
Civil Engineering

Civil Engineers plan, design, and supervise the construction of such facilities as bridges, buildings, railways, highways, dams, water supply streams, and waste disposal systems. The curriculum provides a modern approach to the subject based on a thorough grounding in mathematics, natural sciences, and socio-economic concepts.

Although complete professional specialization can be achieved only in postgraduate study and in engineering practice, the student can find opportunity to pursue advanced undergraduate study in a variety of areas. For example:

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

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

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

d) Geotechnical Engineering – is designed to provide the student with the understanding of the engineering properties of soils and enable him to appreciate the methods behind the design of foundations of structures, earth retaining structures, earth dams, and highway pavements.

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

f) Hydraulic Engineering – is intended for the student interested in the planning, design and operation of water supply and water resources management.

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

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

A) Core Programme

Civil Engineering Core Courses
Civ E 200 Civil Engineering Project 1
Civ E 203 Statics
Civ E 204 Dynamics
Civ E 205 Mechanics of Deformable Solids 1
Civ E 206 Mechanics of Deformable Solids 2
Civ E 221 Calculus
Civ E 222 Differential Equations
Civ E 224 Probability and Statistics
Civ E 285 Structure and Properties of Materials
Civ E 286 Fluid Mechanics
Civ E 291 Survey Camp†
Civ E 292 Socio-Economic Aspects of Civil Engineering
Civ E 296 Seminar
Civ E 299 Seminar
Civ E 300 Civil Engineering Project 2
Civ E 303 Structural Analysis 1
Civ E 304 Structural Analysis 2
Civ E 315 Structural Design 1
Civ E 342 Urban Transport Planning 1
Civ E 353 Geology and Soil Mechanics
Civ E 354 Soil Mechanics and Foundations
Civ E 375 Sanitary Engineering
Civ E 381 Hydraulics
Civ E 393 Environmental Engineering
Civ E 398 Seminar
Civ E 399 Seminar
Civ E 400 Civil Engineering Project 3
Civ E 498 Seminar
Civ E 499 Seminar

B) Elective Courses

The electives may be selected from the list below in consultation with a Civil Engineering faculty advisor:
Civ E 343 Urban Transport Planning 2
Civ E 413 Structural Steel Design
Civ E 414 Structural Concrete Design
Civ E 415 Structural Design 2
Civ E 441 Transportation Economics
Civ E 454 Foundation Engineering
Civ E 481 Engineering Law
Civ E 493 Engineering in the Canadian North
Civ E 500 Special Project
Civ E 501 Approximate Analysis of Structures
Civ E 504 Structural Analysis 3
Civ E 506 Project Management
Civ E 508 Structural Dynamics and Stability
Civ E 518 Plates and Shells
Civ E 520 Advanced Computer Programming for Engineers
Civil Engineering

Engineering Analysis
Civil Engineering

Civ E 522  Engineering Analysis
Civ E 524  Probability, Statistics and Decision Theory
Civ E 525  Introduction to Finite Element Methods
Civ E 526  Continuum Mechanics
Civ E 534  Model Analysis of Engineering Structures
Civ E 536  Model-Aided Design of Engineering Structures
Civ E 540  Highway Design
Civ E 541  Traffic
Civ E 542  Pavement Structural Design
Civ E 543  Land Use Models
Civ E 544  Systems Analysis
Civ E 545  Transportation Planning Practice
Civ E 551  Engineering Terrain Analysis
Civ E 558  Soil Engineering (Case Histories)
Civ E 560  Mechanical Behaviour of Materials
Civ E 572  Topics in Wastewater Treatment
Civ E 573  Pollution in the Aquatic Environment
Civ E 580  Elements of Water Resources Management
Civ E 583  Water Distribution and Collection Systems
Civ E 584  Technological Forecasting and Long-Range Planning
Civ E 586  Hydrology
Civ E 589  Open Channel Flow

Appropriate courses offered in other Departments are also available as electives upon the consent of the instructor.

† Dagger indicates the offering of these courses is contingent on sufficient demand and/or available teaching resources.

C) Other Courses
These courses are not intended for Civil Engineering students at any level:

Civ E 110  Urban Transport Problems and Prospects
Civ E 190  Technology in Urban and Regional Planning

Academic Programme for Each Term

Year 1B (Winter and Spring terms)
Civ E 116  Engineering Concepts 2

Year 2A (Fall and Winter terms)
Civ E 203, Civ E 205, Civ E 221, Civ E 224, Civ E 265,
Civ E 291†, Civ E 292, Civ E 298

Year 2B (Spring and Fall terms)
Civ E 200, Civ E 204, Civ E 206, Civ E 222, Civ E 280,
Civ E 291†, Civ E 299

Year 3A (Winter and Spring terms)
Civ E 303, Civ E 342, Civ E 353, Civ E 381, Civ E 393,
Civ E 398

Year 3B (Fall and Winter terms)
Civ E 300, Civ E 304, Civ E 315, Civ E 354, Civ E 375,
Civ E 399, Elective

Year 4A (Spring and Fall terms)
Civ E 498, Five Electives

Year 4B (Winter term)
Civ E 400, Civ E 499, Four Electives

† Civ E 291 Survey Camp is taken at the commencement of the Fall Term preceding either year 2A or 2B.
Electrical Engineering

The curriculum in Electrical Engineering is designed to teach those fundamental physical and engineering sciences which form the basis of the work of electrical engineers. After the common first year programme in Engineering, the programme in Electrical Engineering consists of twenty-four core courses and a minimum of nine technical electives (taken during the last two terms); these technical electives include the possibility of working on a design or research project. In addition, students are required to take one non-technical elective course in each of the 2B and 3A terms and a general elective course in each of the last three terms. A general elective may be either technical or non-technical. During each term they also attend one general seminar course. The department uses a broad interpretation of what constitutes a "non-technical elective".

The normal recommended programme shown below involves a course load (excluding seminars) of five or six courses per term; however, students are allowed to depart from this normal load within the framework of the following rules and within the constraints of the timetable.

The technical programme will consist of a minimum of all twenty-four core courses and nine technical electives, normally chosen from the listing below (including the possibility of one or two final year project electives). Laboratory exercises are compulsory where they form part of the course.

The non-technical electives must be successfully completed; however the mark is not included in the term average. General electives in the last three terms are included in the term average.

The normal rules of the co-operative programme 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 his first year)—unless he is a student admitted to advanced standing, as defined in the Calendar (see page 100).

The student must register his course load at the start of each term. Departmental permission at the time of registration will be required for departures from the normal load in any one term.

Permission to carry more than the normal load in any one term will normally be given only if the student holds an A average in the previous term.

The promotion criteria will be as laid down in the Faculty rules, (see page 101) and the student will be examined on the course for which he is registered at the time of examination.

Electrical Engineering, with an Option in Management Sciences

A student may acquire a B.A.Sc. in Electrical Engineering with an Option in Management Sciences by taking eight MSci courses (see p. 112) as electives. Credit for MSci 21 is equivalent to Credit for EIE 316, requiring the student to pass seven MSci courses as electives and to obtain a pass standing in EIE 316.

Academic Programme (1977-1978)

Note 1
Students may depart from this programme only within the framework of the rules given above.

Note 2
With the approval of the department in terms 4A and 4B, students may take technical courses offered by other departments.

Note 3
The laboratory hours shown are approximate indications of the average time per week the student will spend in the laboratory.
## Term 2A, Fall and Winter

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Lect</th>
<th>Lab</th>
<th>Tut</th>
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<tbody>
<tr>
<td>EIE 201</td>
<td>Seminar</td>
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<tr>
<td>EIE 205</td>
<td>(Math 211) Calculus 2 (for Electrical Engineers)</td>
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<td>2</td>
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<tr>
<td>EIE 221</td>
<td>Principles of Digital Circuits &amp; Systems</td>
<td>3</td>
<td>2</td>
<td>1</td>
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<td>EIE 233</td>
<td>Physical Electronics</td>
<td>3</td>
<td>0</td>
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<td>EIE 241</td>
<td>Electric Networks 1</td>
<td>3</td>
<td>0</td>
<td>2</td>
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<tr>
<td>EIE 293</td>
<td>Instrumentation &amp; Measurement 1</td>
<td>1</td>
<td>9</td>
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<tr>
<td>MSci 23</td>
<td>Engineering &amp; Managerial Economics</td>
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## Term 2B, Fall and Spring

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<td>EIE 206</td>
<td>Advanced Calculus for Electrical Engineers</td>
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<td>EIE 261</td>
<td>Energy Processing &amp; Conversion</td>
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<td>EIE 271</td>
<td>Electric &amp; Magnetic Fields</td>
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<td>EIE 294</td>
<td>Instrumentation &amp; Measurement 2</td>
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<td>ME 50</td>
<td>Thermodynamics</td>
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Non-technical elective

## Term 3A, Winter and Spring

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<td>EIE 301</td>
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<tr>
<td>EIE 316</td>
<td>Probability &amp; Statistics</td>
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<td>EIE 317</td>
<td>Signal Analysis Methods</td>
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<td>EIE 342</td>
<td>Electric Networks 2</td>
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<td>EIE 351</td>
<td>Electronic Devices</td>
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<td>EIE 362</td>
<td>Dynamic Energy Conversion</td>
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Non-technical elective

## Term 3B, Fall and Winter

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<tr>
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<td>Introduction to Digital Computers</td>
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<td>EIE 352</td>
<td>Electronic Circuits</td>
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<td>3</td>
<td>1</td>
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<td>EIE 372</td>
<td>Transmission Lines &amp; Electromagnetic Fields</td>
<td>2</td>
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<td>EIE 380</td>
<td>Introduction to Systems &amp; Control</td>
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General Elective†
## Term 4A, Fall and Spring

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<td>Seminar</td>
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General Elective†

Five Technical Electives from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Lect.</th>
<th>Lab.</th>
<th>Tut</th>
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<tbody>
<tr>
<td>EIE 418</td>
<td>Signal Analysis and Frequency-Domain Methods</td>
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<td>EIE 425</td>
<td>Systems Simulation</td>
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<td>EIE 427</td>
<td>Digital Hardware Engineering</td>
<td>3</td>
<td>3</td>
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<tr>
<td>EIE 435</td>
<td>Semiconductor Devices 1</td>
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<td>EIE 446</td>
<td>Linear Systems</td>
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<td>EIE 454</td>
<td>Nonlinear Electronic Circuits</td>
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<td>EIE 463</td>
<td>Power Electronics</td>
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<td>EIE 473</td>
<td>Microwave Engineering</td>
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<td>3</td>
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<tr>
<td>EIE 481</td>
<td>Control Systems 1</td>
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<tr>
<td>EIE 499A</td>
<td>Project</td>
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## Term 4B, Winter

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General Elective†

Four technical electives from the following:

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Service Courses

ME 2A: EIE 14 Electrical Engineering 1
ME 3A: EIE 32 Electrical Engineering 2

* Indicates laboratory work every second week.

† The general elective can be any course that is not a repeat of course material.
Department of Management Sciences

Activities and Scope
The Department of Management Sciences, Faculty of Engineering, was established in 1969, as a graduate department and has subsequently extended its activities to undergraduate programmes.

The present activities of the department are: (1) the pursuit of advanced research in selected fields of the management sciences, (2) the provision of postgraduate courses of instruction for people who want to achieve high professional qualifications, and (3) the provision of undergraduate courses in the management sciences for students registered in the Faculty of Engineering.

Active faculty engagement in advanced research as well as experience in professional practice is considered essential to the development of adequate courses of instruction. The boundaries between pure research, applied research and professional practice become indistinct when the aim is to discover imaginative new ways to solve complex management problems. The research activities of the faculty members fall into three major categories: operations research, applied economics, and organizational behaviour. A major aim of the Department is to strengthen and develop these fields of study.

Undergraduate Programmes
At the present time the Department is involved in two major activities in undergraduate teaching: i) Option in Management Sciences; ii) Production/Industrial Engineering Option (jointly with the Department of Mechanical Engineering). Students completing courses in either of these options will be eligible for admission, with advanced standing to the Department's M.A.Sc. programme.

Option in Management Sciences
The Department of Management Sciences offers an Option programme in Management Sciences for the following Departments.

Chemical Engineering
Civil Engineering
Electrical Engineering
Systems Design

The Option in Management Sciences is structured to provide an understanding of the issues, concepts and techniques related to managerial problems. It aims to impart a training that will be useful for problem-solving capability in the long run; also, it lets the student acquire certain skills which should help widen the scope of his immediate employment.

The Option consists of eight courses (see course descriptions in Chapter 14), two in each of the following areas:

a) Statistics
   1. MSci 21 Applied Probability & Statistics
   2. MSci 31 Industrial Statistics & Design of Experiments

b) Economics
   1. MSci 405 Managerial Economics
      or
      MSci 23
   2. MSci 43 Economics of Enterprise & Benefit/Cost Analysis

c) Operations Research
   1. MSci 406 Managerial Decision Making
      or
      MSci 46
   2. MSci 407 Managerial Decision Making
      or
      MSci 47

d) Decision Analysis
   1. MSci 404 Organizational Behavior
      or
      MSci 44
   2. MSci 53 Decision Theory & Organization

The designation of an Option in Management Sciences will be shown on the student's transcript when he: 1) takes and passes all eight courses (see above) or their equivalents as specified by the Department of Management Sciences, and 2) obtains an average of 60% or more in these courses.

A student may take any number of courses in the Option as electives, provided that the appropriate prerequisites* are satisfied. However, the designation of an Option in Management Sciences will not be shown on the transcript of a student who does not take all the eight courses specified above.

Students taking the Option may advance to the M.A.Sc. in Management Sciences within three academic terms following the completion of the B.A.Sc.

In order to facilitate the taking of all eight courses in the Option the student should start in 2A and proceed according to the following schedule:

* MSci 21, MSci 23/MSci 405, MSci 46/MSci 406 and MSci 44/MSci 404 are prerequisites for: MSci 31, MSci 43, MSci 47/MSci 407 and MSci 53, respectively.
## Option in Management Science

<table>
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<th>2A Winter</th>
<th>2B Spring</th>
<th>2B Fall</th>
<th>3A Winter</th>
<th>3A Spring</th>
<th>3B Fall</th>
<th>3B Winter</th>
<th>4A Spring</th>
<th>4A Fall</th>
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<td>or MSci 21</td>
<td>or</td>
<td>or</td>
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<td>SyDe 333</td>
<td>MSci 43</td>
<td>or</td>
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</table>

† Part of Production & Industrial Engineering option
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 a variety of industries throughout Canada. Mechanical Engineers are required in the field of power generation where they could deal with steam, diesel or other internal combustion engines, and with hydraulic or gas turbines; in the field of heating, ventilating and refrigeration; in the design and manufacture of environmental research equipment, safety equipment, material handling equipment, automobiles, locomotives, aircraft, rockets, marine vessels, furnaces, boilers, pressure vessels, heat exchangers, motors, generators and machine tools. They are employed in industries such as steel production, mining, transportation, communications, oil refining, chemicals manufacture, paper, sugar, textiles, the government, and construction. In the last few years additional demands have been imposed by the requirement that Mechanical Engineers understand and lead in the development of new methods of energy conversion and other technologies of the space age. The undergraduate programme in Mechanical Engineering is designed to provide the student with a firm grasp of the basic fundamentals in the mathematical, physical, chemical and engineering sciences, and also provides an opportunity (on a limited scale) for specialization in the later years. The degree of B.A.Sc. in Mechanical Engineering permits registration as a Professional Engineer in the Association of Professional Engineers of the Province of Ontario upon satisfaction of the work experience requirement and carries exemption from parts 1 and 2 of the Institution of Mechanical Engineers (London) Examination.

Organization of the Mechanical Engineering undergraduate programme is founded on a core of subjects that must be taken by all students. The first year is common with Civil and Electrical Engineering. The second year provides elementary courses in Mechanical Engineering and certain subjects in Electrical Engineering together with further development in mathematics and physics. Opportunities for specialization occur during the third and fourth years, there being a choice of elective subjects available to permit pursuit of individual interests. A coherent set of electives in a particular technical area is termed an Option. Examples of such Options are the following:

a) The Thermodynamics-Fluid Mechanics Option: The courses in this option deal with a broad range of applications of the principles of thermodynamics and fluid mechanics, with emphasis on topics of industrial significance.

Students can structure curricula for specialization in combustion and energy conversion, internal flows with heat and mass transfer, turbomachinery and fluid control systems or for a broader exposure to these and other areas.

b) Solid Body Mechanics and Mechanical Design Option: The courses offered in this option range from those which provide the mathematical and physical basis of the subject matter through to those which are largely applied. Subjects treated are: mechanics (including vibrations); theories of elasticity, plasticity and fracture; choice of working stress, mechanical design and design optimization. Students taking this option will be prepared for careers in design and development.

c) Production/Industrial Option: Is designed to provide the student with an understanding of industry from the viewpoint of its organization, its processes, economics and the application of mathematics to its operation. It is suggested for those students primarily interested in industrial and manufacturing aspects of mechanical engineering.


e) Geophysical (Environmental) Fluid Dynamics Option: For students interested in the control of air and water pollution and noise abatement, or who wish to embark later on a research career in meteorology, oceanography, ocean engineering, weather modification, pollution problems or related fields.

f) General Mechanical Engineering Option: The General Mechanical Engineering Option is designed to give the student a general background rather than specialize in any particular option. The course material has been carefully chosen to equip the student for a broad range of Mechanical Engineering practice.

A) Core Programme

a) Credit courses

<table>
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<tr>
<th>Course Code</th>
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<tr>
<td>EIE 14</td>
<td>Electrical Engineering 1</td>
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<td>EIE 32</td>
<td>Electrical Engineering 2</td>
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<tr>
<td>ME 1</td>
<td>Advanced Calculus</td>
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<tr>
<td>ME 3</td>
<td>Ordinary Differential Equations</td>
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<td>ME 4</td>
<td>Numerical Analysis</td>
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<td>ME 5</td>
<td>Partial Differential Equations</td>
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<tr>
<td>ME 12</td>
<td>Dynamics</td>
</tr>
<tr>
<td>ME 15</td>
<td>Structure and Properties of Matter 1</td>
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<td>ME 19</td>
<td>Mechanics of Deformable Solids 1</td>
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<tr>
<td>ME 20</td>
<td>Mechanics of Deformable Solids 2</td>
</tr>
<tr>
<td>ME 21</td>
<td>Kinematics and Dynamics of Machines</td>
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<tr>
<td>ME 30</td>
<td>Structure and Properties of Matter 2</td>
</tr>
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<td>ME 40</td>
<td>Manufacturing Processes</td>
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<td>ME 44</td>
<td>Production Engineering</td>
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<td>ME 50</td>
<td>Thermodynamics</td>
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B) Elective Courses

a) Non-technical Electives: Students entering the programme will take three non-technical electives. The marks obtained in these courses will not enter the calculation of term averages. However, for graduation the minimum average mark for three non-technical electives is 60%.

b) Technical Electives. Nine elective courses are required in addition to the core courses listed above to fulfill the requirements of the Mechanical Engineering programme. Also each student will complete a two-term Mechanical Engineering Project (ME 82). Electives should be chosen largely from a single option and the choice must be approved by a designated faculty member. The offering of certain elective courses will be contingent on demand and/or availability of teaching resources.

a) Thermodynamics – Fluid Mechanics Option

ME 52 Air Conditioning
ME 54 Thermodynamics 2
ME 56 Heat Transfer 2
ME 58 Internal Combustion Engines
ME 59 Energy Conversion
ME 555 Thermodynamics 3
ME 557 Combustion 1
ME 561 Fluid Control Systems
ME 563 Turbomachines
ME 565 Gas Dynamics 1
ME 566 Fluid Mechanics 3
ME 568 Noise Analysis and Control
ME 569 Industrial Fluid Mechanics

b) Solid Body Mechanics and Mechanical Design Option

ME 22 Mechanical Design 1
ME 63 Tribology (Friction, Lubrication and Wear)
ME 523 Mechanical Design
ME 525 Mechanical Vibrations
ME 527 Mechanics of Deformable Solids 3
ME 528 Experimental Mechanics
ME 562 Introduction to Automation
ME 626 Creep, Fatigue and Brittle Fracture
SyDe 543 Human Factors Engineering
SyDe 544 Ergonomics

c) Production/Industrial Option

ME 46 Polymer Processing
ME 48 Analysis and Design of Manufacturing Systems 2
ME 63 Tribology (Friction, Lubrication and Wear)
ME 541 Deformation Processes
ME 542 Mechanics of Machining Processes
ME 543 Metal Casting Processes
ME 544 Welding Processes
ME 548 Numerical Control of Machine Tools 1
MSci 31 Industrial Statistics and Design of Experiments
MSci 43 Economics of Enterprise and Benefit/Cost Analysis
MSci 44 Industrial Psychology
MSci 46 Optimization Models for Policy Analysis
MSci 47 Stochastic Models of Industrial Operations
ME 22 Mechanical Design 1
ME 35 Industrial Metallurgy
ME 534 Properties of Polymers
ME 562 Introduction to Automation

d) Engineering Materials Option

ME 32 Physical Metallurgy 2
ME 33 Experimental Materials Science
ME 35 Industrial Metallurgy
ME 531 Physical Metallurgy 1
ME 534 Properties of Polymers
ME 537 Ceramics

Suggested electives from other options and departments

ME 22 Mechanical Design 1
ME 541 Deformation Processes
ME 543 Metal Casting Processes
ME 527 Mechanics of Deformable Solids 3
ME 544 Welding Processes
CivE 560 Mechanical Behaviour of Materials

e) Geophysical (Environmental) Fluid Dynamics Options

ME 69 Introduction to the Environment Studies
ME 566 Fluid Mechanics 3
ME 568 Noise Analysis and Control
ME 570 Geophysical Fluid Dynamics 1
ME 571 Air Pollution 1

Graduate courses in this field may also be available to selected undergraduate students.

f) General Mechanical Engineering Option Programme should include all of the following courses:

ME 22 Mechanical Design 1
ME 35 Industrial Metallurgy
ME 541 Deformation Processes
ME 54 Thermodynamics 2
ME 63 Tribology (Friction, Lubrication and Wear)
ME 528 Experimental Mechanics
ME 563 Turbomachines
Academic Programmes for Each Term (1977-78)

Year 2A, Fall 1977, and Winter 1977  
ME 1, MSci 21, ME 15, ME 19, ME 12, ME 200, EIE 14

Year 2B, Spring 1977 and Fall 1977  
ME 3, ME 4, MSci 23, ME 20, ME 30, ME 50

Year 3A, Spring 1978 and Winter 1978  
ME 5, ME 21, ME 40, ME 51, ME 60, ME 300,  
1 Non-technical elective

Year 3B, Fall 1977 and Winter 1978  
ME 53, ME 62, EIE 32, ME 44, 2 technical electives

Year 4A, Spring 1977 and Fall 1977  
ME 82, ME 400, ME 560, 3 technical electives  
1 Non-technical elective

Year 4B, Winter 1978  
ME 82, 4 technical electives, 1 Non-technical elective

Systems Design

The Department of Systems Design was formed at Waterloo in 1965. Since that time it has received international recognition for its graduate programmes, research activities and design projects.

Within the last decade it has become increasingly apparent that effective solutions to problems involving both society and technology must be based on a broad systems point of view. Not only must the overall technical factors of these problems be carefully considered, but the economic, social, human and political parameters must be given equally careful attention. When large scale problems are under study, few people can be knowledgeable in the complete span of factors and parameters which must be considered. For these cases, solutions must be arrived at by interdisciplinary teams where each member contributes his 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 undergraduate programme in Systems Design Engineering at Waterloo is a study of those basic skills required for system analysis, simulation, optimization and design. Numerous examples may be cited where these systems design fundamentals may be applied: transportation, engineering design, computer applications, production, planning and scheduling, environmental pollution, education, etc. 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.

Type of Student

The Systems Design Engineering programme is specifically oriented towards developing graduates who can solve problems lying at the interface of technology and the human environment. It is therefore attractive to those students who are technically oriented and also have a strong parallel interest in social and human problems.

The tools for systems problem solving are becoming more powerful and sophisticated; thus larger and more complex systems may be successfully investigated. Recent developments include an increasing awareness of the theories of communication, progress in the areas of Systems Theory, Human Systems Engineering and Socio-Economic Systems, developments in the theories and Design and Planning and, of course, the tremendous impact of electronic computing systems.
The Systems Design Engineering Programme
The undergraduate programme 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 programme are intended to provide each student with a broad background and capability in the areas of:

- applied mathematics
- engineering systems and systems theory
- socio-economics systems
- human systems engineering and,
- computer systems and applications

Throughout these three years the student's ability to grasp real engineering problems is enhanced by an early course in Engineering Design and an intensive experience in the Systems Design Workshop. It is here that a focus is given to the whole curriculum and the student learns to apply lecture material, to develop skills in solving problems that cut across the traditional disciplines, and to develop design, planning and organizational abilities.

The beginning three years of the programme are followed by one year in which the problem-solving capabilities of the student may be applied with emphasis in one particular area of technology, as chosen by the student. This prepares the student for a further year of advanced study to the M.A.Sc. degree if desired, or for a meaningful career in industry or government with the Bachelor's degree.

The general core curriculum of the first three years is given flexibility through two means. Firstly, in each term of the 2nd and 3rd years the student may elect one course freely from any of the offerings of the University, provided only that these courses do not duplicate the core programme. Secondly, in the third year, the student is provided with two additional technical elective courses which serve as precursors to the technical option areas selected for study in the fourth year.

General Description of the Technical Options
The Systems Design Department is offering three well-defined technical options to its students. The technical disciplines encompassed by these options are in areas in which individual faculty members of the department are involved by a procedure for devising special options outside of these areas as outlined below. There is considerable overlap among the disciplines encountered in the various options; indeed, this overlap extends to the objectives of the options in terms of engineering problem solving and design.

In general, it is possible to define technical options for engineering students either through the specific engineering disciplines to which they are oriented or through the special problem-solving skills to which they are directed. The Systems Design options are characterized by an amalgamation of these two points of view. This is emphasized by the continuation of the Systems Design Workshop through the fourth year. At this time each individual student will be required to attack a major problem taken from his technical option area, but with strong involvement in other disciplines. In addition, each student is encouraged to structure the technical elective courses so that studies include not only the major technical option area but also a "minor" study from a second technological discipline.

Nonetheless, the technical options are named in terms of the major engineering disciplines that they encompass. This has the advantage of identifying the general problem areas which are to be studied in the options, and gives a specific professional identity to the students who choose them.

If a student wishes to select an area not included in the general Systems Design programme, the student may structure a special option with the advice and approval of his/her supervisor. A special option will include a core of four Systems Design courses taken from within any Systems Design option series with an additional four courses which may be taken from well structured options offered outside of the Systems Design department, e.g. water resources, transportation, etc.

Structure of the Options
Each technical option is characterized by a series of options core subjects, and an additional set of technical elective courses. When a student has chosen a particular option he must take all of the associated option core courses. His remaining courses are chosen with the advice of his faculty advisor, in such a way as to strengthen his knowledge of particular facets of the option discipline and to provide for an integrated minor study of a second area. The third and fourth year curriculum is structured as follows:

3A
4 courses Systems Design general core programme
Systems Design Workshop
1 free elective course
1 technical option course, from the option core

3B
4 courses Systems Design general core programme
Systems Design Workshop
1 free elective course
1 technical option course, from the option core

4A
2 Systems Design mandatory courses
Systems Design Workshop
1 free elective course
2 elective courses, from the option core

4B
Systems Design Workshop
1 free elective course
4 technical option courses, at least two from the option core
Design and Human Systems Option
The Design and Human Systems option embraces in whole or in part a wide spectrum of "professional" areas known as human factors engineering, human engineering, ergonomics, engineering ecology, 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 programme 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 safety in industry, transportation, etc.
- medical design problems involving engineering technology
- design involving human engineering
- design of consumer products used in recreation and normal living
- human aspects of engineering ecology
- design of human "micro-environments"
- problems of ergonomics and industrial hygiene

Option Core Courses
3A Sy De 341 Problems of Man in the Operational Environment
3B Sy De 366 Aesthetic and Perceptual Aspects of Design
4A Sy De 445 Measurement Methods in Human Engineering
   Sy De 463 Structures and Design
4B Two courses from:
   Sy De 542 Human Engineering and Systems Development
   Sy De 564 Methodological Processes in Design
   Sy De 472 Man-Machine Communications
   Sy De 522 Computer-Aided Design 2
   Sy De 442 Occupational and Environmental Systems Safety
   Sy De 464 Theory and Applications of Photographic Methods to Measurement and Design

Socio-Economic Systems Option
Many large scale design projects have important socio-economic consequences. Also social and political forces may affect the design process. Under this option a student can study the various interactions between a project and its social environment; in particular the aim of this option is to equip the student to attack problems associated with the design of large-scale non-corporate systems.

In the option core, techniques are taught for analyzing this interaction by the use of statistics, operations research, game theory and the social sciences. Through his electives a student may pursue further various topics in the social sciences and operations research.

Option Core Courses
3A Sy De 333 Experimental Design
3B Sy De 332 Mathematical Programming
4A Sy De 411 Systems Operations 2
   Sy De 433 Conflict Analysis
4B Sy De 412 Topics in Operations Research
   Sy De 432 Analysis of Large Systems

Systems Theory and Computer Option
In this option the student is given the opportunity either to study in some depth Physical Systems Theory as it has evolved as a discipline over the last decade or to gain additional background and expertise in the application of electronic computers to the analysis, simulation and design systems.

Those students who study Systems Theory are expected to be able to apply this theory to problems involving electrical, mechanical and hydraulic systems and their combinations. They may also apply the concepts of Systems Theory to wide varieties of other systems, involving both engineering and non-engineering disciplines.

For those students concerned with the applications of electronic computers the option provides access to information concerned with computer hardware (the physical structures of digital, analog and hybrid computers), computer software (procedural, simulation and problem-oriented languages), and application techniques (particularly in computer-aided design).

Option Core Courses
3A Sy De 353 Time Domain Models for Physical Systems
3B either Sy De 324 Principles of Digital Computers or
   Sy De 352 Algorithms for Computer-Aided Systems Analysis
4A Sy De 521 Analog and Hybrid Computing Systems
   Sy De 451 Multi-Terminal Representations and Piecewise Analysis of Physical Systems
   Sy De 463 Structures and Design
4B Two courses from:
   Sy De 522 Computer-Aided Design 2
   Sy De 452 Introduction to Linear Control Systems
   Sy De 454 Hydraulic Systems
   Sy De 456 Power Systems

Free Electives and Technical Electives
In each term of the second, third and fourth years the Department of Systems Design requires each student to study one course outside of the core programme. The intent of this free elective programme is to allow the student to broaden his own education in the manner most
suitable to his own needs. It is required, however, that at least four of these free electives are from humanities and social sciences (CAB requirement).

In the third and fourth years a student in Systems Design has, in addition, a total of eight technical elective courses. Most of these form the core of the student's chosen option area while the remainder are chosen by the student to provide insight into particular applications of the option discipline.

In all cases elective course selections are subject to approval by the department. A student is promoted on the basis of a final average which includes all elective courses.

**1A**
(Fall Term)
- Sy De 111 Calculus 1
- Sy De 113 Linear Algebra
- Sy De 121 Digital Computation
- Sy De 131 Engineering Economics
- Sy De 161 Systems Behaviour
- Sy De 181 Statics
- Sy De 183 Graphics and Design

**1B**
(Spring Term)
- Sy De 112 Calculus 2
- Sy De 114 Theory and Applications of Probability
- Sy De 142 Introduction to Ergonomics
- Sy De 162 Systems Design Methodology
- Sy De 182 Dynamics
- Sy De 184 Electricity and Magnetism

**2A**
(Winter Term)
- Sy De 211 Applicable Mathematics for Systems Design 1
- Sy De 213 Theory and Applications for Statistics
- Sy De 221 Numerical Analysis and Computation
- Sy De 261 Systems Design Workshop 1
- Sy De 281 Mechanics of Deformable Solids
- Sy De 291 Systems Design Laboratory 1
- 1 free elective

**2B**
(Fall Term)
- Sy De 212 Applicable Mathematics for Systems Design 2
- Sy De 252 Physical Systems 1
- Sy De 262 Systems Design Workshop 2
- Sy De 292 Systems Design Laboratory 2
- Sy De 282 Thermodynamics
- Sy De 284 Fluid Mechanics
- 1 free elective
  - or
  - Sy De 242 Human Function

**3A**
(Spring Term)
- Sy De 311 Systems Operation 1
- Sy De 351 Physical Systems 2
- Sy De 361 Systems Design Workshop 3
- Sy De 381 Materials Engineering
- Sy De 383 Introduction to Biochemical and Polymer Systems
- 1 technical elective
- 1 free elective

**3B**
(Winter Term)
- Sy De 322 Computer Simulation of Systems
- Sy De 362 Systems Design Workshop 4
- Sy De 364 Manufacturing Science
- Sy De 382 Applied Electronics
- Sy De 392 Systems Design Laboratory 3
- 1 technical elective
- 1 free elective

**4A**
(Fall Term)
- Sy De 421 Computer-Aided Design 1
- Sy De 431 Economics of Engineering Design
- Sy De 461 Systems Design Workshop 5
- 3 technical electives or 2 technical electives and 1 free elective

**4B**
(Winter Term)
- Sy De 462 Systems Design Workshop 6
- 4 technical electives
- 1 free elective

**Technical Electives**
The technical electives should be chosen in consultation with the Associate Chairman in light of the preceding discussion on the structuring of options.

**3A**
- Sy De 341 Ergonomics of Special Environments
- Sy De 333 Experimental Design
- Sy De 353 Time Domain Models for Physical Systems

**3B**
- Sy De 366 Aesthetic and Perceptual Aspects for Design
- Sy De 332 Mathematical Programming
- Sy De 324 Principles of Digital Computers
- Sy De 352 Algorithms for Computer-Aided Systems Analysis
4A  
Sy De 445  Measurement Methods in Human Engineering  
Sy De 483  Structures and Design  
Sy De 411  Systems Operations 2  
Sy De 433  Conflict Analysis  
Sy De 521  Analog and Hybrid Computing Systems  
Sy De 451  Multi-Terminal Representations and Piecewise Analysis of Physical Systems  

4B  
Sy De 542  Human Engineering and Systems Development  
Sy De 564  Methodological Processes in Design  
Sy De 472  Man-Machine Communications  
Sy De 522  Computer-Aided Design 2  
Sy De 464  Theory and Applications of Photographic Methods to Measurement and Design  
Sy De 412  Topics in Operations Research  
Sy De 432  Analysis of Large Systems  
Sy De 452  Introduction to Linear Control Systems  
Sy De 454  Hydraulic Systems  
Sy De 456  Power Systems  
Sy De 442  Occupational and Environmental Systems Safety  

Notes  
The numbering of Systems Design 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 mathematics required for Systems Design  
2  computer systems  
3  socio-economic systems  
4  human systems  
5  physical systems  
6  the design of engineering systems  
7  human communication systems  
8  engineering sciences  
9  laboratories  

c)  The number in the 100’s place refers to the year in the programme in which the student will encounter the course. The only exception is that courses in the 500 series are available to fourth year students.  

The majority of Systems Design courses are given on the basis of three formal lectures and one tutorial hour each week. The department endeavours to ensure that the formal course schedule remains below 25 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 55 and 65 hours per week on his studies.
Faculty of Environmental Studies

Architecture Students examine stress problems
Faculty of Environmental Studies

Introduction
The Faculty of Environmental Studies is equivalent in organization to any regular faculty, such as Arts, Science, and Engineering but is unique in its outlook. It concentrates on using diverse sources of knowledge from different disciplines needed to understand one particular problem area: man and his environment. Since many of the issues are contemporary, the faculty has attempted to utilize the best of traditional teaching approaches combined with newer and innovative techniques derived from a broad range of disciplines.

The Faculty of Environmental Studies has within it two types of academic groups — the professional Schools, and the academic Departments.

Schools and Departments
School of Architecture
Department of Geography
Department of Man-Environment Studies
School of Urban and Regional Planning

The professional schools are specialized, vocation oriented but they are not narrow. Through the Faculty of Environmental Studies, they are integrated into the mainstream of the University’s concern with man and his environment, through the two main thrusts of research and practical applications.

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

One of the innovative aspects of the Faculty of Environmental Studies is the high degree of interaction among its four units. Faculty members in each School or Department participate in the programmes of the other units, and it is an objective of the Faculty to make all its members available to students in any of its four units. Interaction with other parts of the University is also fostered, and joint appointments of faculty members with other Faculties and Schools have been made. Students are not only free to, but are encouraged to choose from across the whole University.

Degrees
The Faculty of Environmental Studies offers two undergraduate degrees: a Bachelor of Environmental Studies (B.E.S.), and a Bachelor of Architecture (B.Arch.). At the graduate level a Master of Arts (M.A.) and a Ph.D. Degree may be obtained in both Geography, and Regional Planning and Resource Development. In addition, the Geography and Man-Environment Studies Departments offer joint honours programmes with many other departments in the University (see programmes for other details).

Degrees may be obtained in the following programme areas:
B.E.S. — Pre-Professional Architecture (3 years), on rotating work/study co-operative scheme.
B.Arch. — Professional Architecture (2 years, with co-operative work terms following completion of B.E.S. Pre-professional Architecture).
B.E.S. — Honours Geography (4 years).
B.E.S. — Major in Geography (3 years).
B.E.S. — Honours Man-Environment Studies (4 years).
B.E.S. — Honours Urban and Regional Planning (4 years).
M.A. — Geography
M.A. — Regional Planning and Resource Development
Ph.D. — Geography
Ph.D. — Regional Planning and Resource Development.

The student should choose 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 programme. Ease of transferring between the units of the Faculty of Environmental Studies varies. Transfer to the School of Architecture is not normally permitted above Year 1, except where the applicant has done acceptable work at another approved School of Architecture. Transfer to the School of Urban and Regional Planning is not normally permitted above Year 2.

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

Because of the increasing use of statistics and quantitative methods in environmental research it is recommended, but not required, that students present at least one Year 5 Mathematics course for admission to programmes in Environmental Studies. Year 5 Geography is similarly recommended for those applying to the Geography Departments. For applicants to the School of Architecture, Functions and Relations, Calculus, Physics, and English at the Year 5 level are required.

Interviews
Students being seriously considered for admission to the Schools of Architecture and Urban and Regional Planning are normally required to participate in an interview as part of the admissions process. For Architecture, a test will be conducted by the School during interviews to establish ability to comprehend the various thematic areas.
Transfer Credit
Generally transfer credit is given for courses in which a grade of 60% or better was obtained. Students transferring from other institutions may have their transferred courses count toward the University of Waterloo degree; however, 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 the 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 Faculty and students are advised to refer to the Faculty sections in the calendar for detailed regulations.

Examinations and Standings

The following regulations govern the practice of the Faculty of Environmental Studies in regard to final examinations, standing, and make-up examinations. These regulations also apply to part-time students and special programmes. Students should note that the Faculty of Environmental Studies operates under a “course system” in which student progress is measured by courses successfully completed rather than by years. Students who passed fewer than five courses will be considered Year 1 students; those who have passed at least five courses but fewer than ten will be considered Year 2 students; those with at least ten but fewer than sixteen, Year 3, and those with sixteen or more, Year 4.

1) Final Examinations

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

b) Failure to write an examination is ordinarily considered a failure to pass. A student who defaults a final examination, except for a properly certified reason, shall have no make-up examination privileges and may be required to repeat the work in class. If a student fails to write, for medical reasons, a Doctor's certificate covering the precise period of absence must be filed in the Registrar's Office within one week of the set examination date.

c) A student will be eligible for make-up examinations only when failure to pass is attributable to extraordinary circumstances. In addition, students 1) must have attended a reasonable number of lectures in the course in which they propose to write, and must have satisfied all term work requirements; 2) must have secured the permission of the professor concerned.

d) Appeals against faculty decisions made under these regulations may be made in writing to the Undergraduate Affairs Committee of the Faculty through the appropriate Undergraduate Affairs Officer. Forms of examination are at the discretion of the individual faculty member. Where final written examinations are required they are held in December, April, or August. Oral examinations may be required at the discretion of individual departments. The normal duration for written examinations is three hours.

2) Standing

a) Standing in an individual subject is determined by combining the marks assigned for term work with those obtained in the final examination. For the purpose of grading, the University Grading System described on page 17 will be used.

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

c) Students receiving an Incomplete standing in any course will be allowed 4 months from the completion date of the course to clear the Incomplete. Any Incomplete standing not cleared within this period will automatically be converted to a grade of F-.

d) To be considered in good standing in the Honours programmes, a student must maintain a cumulative overall average of at least B- (70.0) as well as an average of at least B (73.0) in the chosen field of specialization (unless otherwise specified in a departmental Honours programme). If an Honours programme candidate's average falls below the prescribed minimum, the individual can be given conditional standing if in the opinion of the School or Departmental Promotions Committee the person can
attain Honours standing before graduation. If not, the student, upon request, will be considered a candidate for a degree in the General Geography Programme and the regulations in (e) below will apply.

e) To be considered in good standing in the General Geography programme, a student must maintain a cumulative overall average of at least C- (60.0) as well as an average of at least C (63.0) in the chosen field of specialization. If at any time a student's average falls below C- (60.0) or the average in the field of specialization below C (63.0), the individual will be granted conditional status for one year, during which period he/she must make reasonable progress toward obtaining good standing or he/she will be asked to withdraw. A student whose cumulative overall average falls below D (53.0) may continue only with the permission of the Undergraduate Affairs Committee.

f) The only general programme in the faculty is the General Geography Programme. The B.E.S. programme in the School of Architecture is a pre-professional programme. A regular (full-time) student in the General Geography Programme must in each academic year enrol in at least five courses, but in not more than six. A regular student in the Honours programmes must each year enrol in at least six courses (unless otherwise specified in a departmental Honours programme), but in not more than seven. Students may be enrolled for reduced programmes after obtaining the approval of the appropriate Undergraduate Affairs Officer.

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

h) A student who has been required to withdraw for academic reasons may be eligible to apply for re-admission after one year's absence.

3) Additional Regulations, School of Architecture

Examinations and Promotions

To pass from one term to the next in the B.E.S. and B.Arch. programmes it is necessary for the student to:

a) obtain an overall cumulative average of (65.0). (Term promotion from 2A through to 3B will require an overall cumulative average of 70.0 each term).

b) pass the studio course. If any studio course (Arch. 192, 193, 292, 293, 392, 393, 492, 493, 592, 593) is failed, the student may not proceed to the studio course of the next term, until the studio course is passed.

c) fail not more than two half courses in any single term; a minimum passing grade in any course is D-.

Normally students of the school are permitted to take only one more or one fewer half-courses (academic weight 0.50) than that prescribed for the particular year and term registered in. Any further addition or reduction to the student's programme must be approved by the Undergraduate Officer of the School of Architecture.

The following procedures have been set out for those students who have not met the above conditions.

Supplemental Examinations

A student failing any Architecture course with an F- standing has supplemental examination privileges and may take such an examination as arranged in accordance with University policy.

Appeals

Appeals against School decisions concerning grades and promotions made under these regulations may be submitted in writing to the Chairperson of the Appeals Committee of the School. The Appeals Committee sits once each term, and the student is advised to contact the School as soon as possible to determine the next sitting of the Appeals Committee.

Academic Programmes

A student who has not determined in what field or subject he/she wishes to concentrate should study the Calendar carefully. After examining the suggested departmental programme, the student should read the descriptions of individual courses in order to have a more comprehensive idea of what the content of any programme would include. The student should consult his/her High School Guidance Officer, Chairperson or Undergraduate Officer of any University department, or the Registrar, by letter or in person for additional clarification and information.

Course and Programme Changes

a) Students may add and drop half courses during the first three weeks of the Fall, Winter and Spring terms upon having the appropriate change form completed.

b) Students may add and drop full-year courses during the first three weeks of the Fall term upon having the appropriate change form completed.

c) After these periods, students will be allowed to add courses only with the permission of the instructor and the appropriate undergraduate officer and upon completing the appropriate change form.
d) After these periods, students enrolled in more courses than their programmes require may, upon having the appropriate change form completed, with the signature of the appropriate undergraduate officer, drop the courses to reduce their programmes to the specified minimum up to but not later than four weeks prior to the end of lectures in the courses being dropped.

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

f) A course that has not been dropped officially (i.e. recorded in the Registrar's Office) prior to the last four weeks of lectures in that course will receive a grade and be counted in the student's average.

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

Caution - Environmental Studies students wishing to take high enrolment courses, such as M Env 357, should study their scheduling carefully to ensure that the courses can be fitted, at some time, into their undergraduate programme.

The following statement outlines the objectives and nature of the four programmes in the Faculty of Environmental Studies.

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**Courses in the Natural Resources - Ecology Theme**

The following courses provide a possibility for students to orient their programmes to stress natural resources and ecology. Students are encouraged to see the Chairman of the Natural Resources - Ecology Committee (Dean's Office).

**Ecology-Biology**

- EnvSt200 Ecology
- Geog/Plan 357 Conservation and Resource Management
- Arch 385 Resources & Design
- Biol 130 Biosphere (non lab)
- Biol 131 Biosphere (lab)
- Biol 236 Biosphere Natural
- EnvSt417 Land Use History and Landscape Change 1
- EnvSt418 Land Use History and Landscape Change 2

**Physical**

- Geog 102 Physical Geography
- Geog 201 Physical Geography
- Geog 300 Geomorphology of Southern Ontario
- Geog 301 Climatology
- Geog 302 Geomorphology
- Geog 303 Water
- MEnv 356 Canadian Non-Renewable Resources
- Geog 408 Hazards
- Geog 460 Land Dereliction
- Earth 130 Lithosphere - products and processes
- Earth 438 Lithosphere - geology and engineering

**Human**

(Economic, Social, Policy)

- MEnv 357 Resource Use
- MEnv 331 International Environment
- Geog356 Resource Management
- Geog 410 Recreation
- Geog 411 Investment & Resources
- MEnv 445 Technology and Policy
- Geog 413 Behavioural
- Geog 414 Resource Management
- MEnv 410 Environmental Assessment
- EnvSt417 Land Use History and Landscape Change 1
- EnvSt418 Land Use History and Landscape Change 2

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

Nature of the Programme
Architecture, traditionally, is the art, science and technique of modifying the physical environment to satisfy the needs and aspirations of people. The School, therefore, endeavours to engender in the student of architecture an awareness of the need to understand the diverse, dynamic and, often, contradictory demands of a society and its individuals.

Equally stressed, is the need to comprehend the implications of those demands in relation to the existing environment. That is, the School also endeavours to foster in the student of architecture an acceptance of responsibility for the influence of his/her action upon the environment he/she modifies and the realization that, in so doing, the student requires consultation and collaboration with others of a variety of disciplines involved in the study of human ecology.

The intention of the programme of study is to impart to the student of architecture an understanding of a process of responsible environmental modification for man's use and to enable the student, as an architect, to contribute to that process. This requires a broad base for architectural studies and promotes an interdisciplinary approach to studies in the University and especially, within the Faculty of Environmental Studies. The full, five-year programme in Architecture is intended to prepare the student to become an architect capable of practice within contemporary professional constraints and capable, too, of adaptation to a changing profession and society it serves.

The School of Architecture offers two undergraduate programmes: a pre-professional, three-year Bachelor of Environmental Studies programme and a two-year professional programme of study for the Bachelor of Architecture degree. Both programmes are on the co-operative system which consists of alternating periods of academic study and practical work experience.

Degrees
The pre-professional architecture programme comprises six academic terms of study and three, four-month co-operative work terms* leading to the degree, Bachelor of Environmental Studies (B.E.S.). This degree indicates appropriate preparation for four subsequent academic terms of study and two co-operative work terms*, one of four months and one of eight months, leading to the degree, Bachelor of Architecture (B.Arch.).

*See section in this chapter on co-operative programme.

Non-Architecture Students
Students not enrolled in the School of Architecture may take any architectural course listed in the recommended core programme 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) Programme
The purpose of the pre-professional B.E.S. programme 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 a historical process. The programme helps the student to predict the effect of science, technology and man’s creations on the environment, and to understand that continuing studies will help the future architect to become sensitive to the needs of mankind in a never-ending cycle of change. The programme is founded on four broad study themes:

1) the design studio, theories and methods, and a workshop for application and experimentation of theories
2) studies of systems and measures including computer, physical and material sciences
3) cultural history in the human environment
4) environmental studies, including natural and human ecology.

See Recommended Core Programme for course arrangement, page 128. See Chapter 14 for course descriptions.

Bachelor of Architecture Programme
The purpose of the Bachelor of Architecture programme is to permit a student who has successfully completed the Environmental Studies (Pre-professional Architecture) degree or equivalent to pursue, in parallel with a prescribed design studio programme, courses of study selected by the student and appropriate to his/her capabilities and interests. The final two terms of the programme are normally devoted to the undertaking of a studio project problem selected and programmed by the student. Students’ presence is required at studio courses.

*See section in this chapter on co-operative programme.
Note
Students are expected to defray costs of materials in connection with studio projects.

See Recommended Core Programme for course arrangement, page 129. See Chapter 14 for course descriptions.

Co-operative Programmes
The Bachelor of Environmental Studies programme includes six terms of study, three four-month co-operative work terms and one "off-term". The subsequent Bachelor of Architecture programme consists of four terms of academic study and two co-operative work terms, of eight months each.

Note
The "off-term" in the Bachelor of Environmental Studies pre-professional programme follows the first two terms of study (from September to April) in Year 1. A student may use the "off-term" as a vacation period or he/she may seek temporary employment. Any employment arrangements made for the "off-term" are the student's own responsibility.

The terms are arranged as indicated on the following charts.

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 practising 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 buildings, sufficient ability and adequate mature judgement to assume responsibility for any medium sized building project.
# Programme for the Degree of Bachelor of Environmental Studies

(Pre-Professional Architecture)

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<th>Year/Term</th>
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<th>Culture Theme Area</th>
<th>Design Theme Area</th>
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<tr>
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<td>Env St 195</td>
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<tr>
<td>Sept-Dec</td>
<td>Arch 112, Computer Science</td>
<td>Introduction to Environmental Problems</td>
<td>Iconography 1</td>
<td>Design Fundamentals (1 credit)</td>
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<tr>
<td>1-B</td>
<td>Arch 103, Statistics</td>
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<td>Winter</td>
<td>Arch 113, Computer Science</td>
<td>Iconography 2</td>
<td>Design Fundamentals and Studio</td>
<td>(1½ credits)</td>
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<td>Employment for students in this term. (see section on co-operative programme).</td>
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<td>Navt-tern</td>
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<tr>
<td>May-Aug</td>
<td>Arch 103, Statistics</td>
<td>Arch 143</td>
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<td>Arch 113, Computer Science</td>
<td>Iconography 2</td>
<td>Design Fundamentals and Studio</td>
<td>(1½ credits)</td>
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<td>Arch 163, Statics</td>
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<tr>
<td>2-A</td>
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<tr>
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<td>Arch 213, Computer Generated Design or FE</td>
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<tr>
<td>Sept-Dec</td>
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<tr>
<td>Winter</td>
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<td>F.E.*</td>
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<tr>
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<td>Arch 313* Computer Generated Design or FE</td>
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<td>Fall</td>
<td>Arch 246</td>
<td>Arch 292</td>
<td>Arch 393</td>
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<tr>
<td>Sept-Dec</td>
<td>Arch 363</td>
<td>Theory of Structures 2</td>
<td>Design Concepts and Studio (2 credits)</td>
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<tr>
<td>3-B</td>
<td>Arch 303*</td>
<td>Arch 313* Computer Generated Design or FE</td>
<td>Arch 393</td>
<td>Design Concepts and Studio (2 credits)</td>
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<tr>
<td>Fall</td>
<td>Arch 363</td>
<td>Theory of Structures 2</td>
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<tr>
<td>Sept-Dec</td>
<td>Arch 363</td>
<td>Theory of Structures 2</td>
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## Programme for the Degree of Bachelor of Architecture

### Systems and Measures Theme Area

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<td>Arch 472 Mechanical Systems 2</td>
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<tr>
<td>4-A Fall Sept-Dec</td>
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<td></td>
<td>Arch 462 Structural Synthesis 1</td>
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<td></td>
<td>Arch 472 Mechanical Systems 2</td>
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<tr>
<td>4-B Winter Jan-Apr</td>
<td>Arch 455 Management and Estimating or FE</td>
<td>Arch 423 Urban Planning or TE</td>
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<td></td>
<td>Arch 463 Structural Synthesis 2</td>
<td>Arch 493 Design Studio (2 credits)</td>
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<td>Co-op Work Terms</td>
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<td>6 &amp; 7 Spring and Fall</td>
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<td>Arch 555 Architectural Practice</td>
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**Notes:**

- The course may be replaced by a 'free elective'
- The course may be replaced by a 'theme elective'

FE (Free Elective) constitutes any course in any Faculty at the University of Waterloo.

TE (Theme Elective) constitutes a recommended course in the Faculty of Environmental Studies.

**Note:** Department approval of electives is mandatory.
## Class Terms Chart

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Department of Geography

Nature of the Programme

Geography is concerned with both the natural and man-made environment, studying how man has shaped it according to the 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 (B.E.S.) programme in Honours Geography provides students with almost unlimited freedom to choose supporting electives from across the whole University. Thus, in consultation with professors, every student will be able to have a tailor-made programme to suit his/her particular needs, whether he/she is primarily interested in physical or human geography, regional or systematic topics, or a combination of these. The Department has Joint Honours programmes with a number of other departments on campus.

The Honours Geography programme provides a sound, well-rounded foundation in the discipline, and prepares the student for specialization at the graduate level in almost any aspect of Geography. The programme includes a group of mandatory core courses that provides a balance of content and technique. The content courses include a series of integrated courses in both physical and human geography, using a systems approach. The technique courses include field methods, remote sensing, cartography, statistical analysis, and computer use. The fourth year includes a seminar on the philosophy and research frontiers of Geography and a research project known as the Senior Honours Essay.

In the programme there is emphasis on both the development of theory and methodology and on practical application of geographical concepts to the economic, social and political problems of Canada and other parts of the world. The "applied" geography aspects of the programme are enhanced by the availability in the faculty of elective courses in Urban and Regional Planning and Man-Environment Studies given by the faculty with academic and practical experience in urban and regional planning, resource management, conservation, and environmental design.

Many graduates of the geography programme proceed to further graduate work or jobs in education, in government, industry and planning agencies.

Although the programme is broad in scope, it permits a student to specialize in one of four major aspects of the discipline: applied physical, economic-urban, resources or cultural-regional geography. Advanced elective courses are available in each of these four streams, and further concentration is possible by careful selection of courses from related fields in other parts of the University.

The programme is liberal in that the only requirement other than the core of Geography courses is that five of the elective courses be taken outside the Faculty of Environmental Studies. These may be taken all in one discipline or in a variety of disciplines.

The Department of Geography also offers an Honours co-operative programme. Students will be admitted to the co-operative programme after spending their first year in one of the other Geography programmes on the basis of academic standing and interviews. The co-op programme involves alternative terms of practical work experience and academic study. Co-op Geography students will enter their first work term in the Winter of the second year. Students anticipating entry to the Honours Co-operative Programme should be aware that a number of specific courses are required in the first year. The minimum number of work terms required for a Co-operative degree is normally four. Inquiries for additional information regarding Co-operative studies should be directed to the Department Chairman.

Students taking the geography programme in the Faculty of Arts will receive a B.A. (Bachelor of Arts) degree and those in the Faculty of Environmental Studies will receive a B.E.S. (Bachelor of Environmental Studies) degree. The Co-op Geography Programme is not available in the Faculty of Arts.

The Department of Geography has both Master's (M.A.) and Ph.D. graduate programmes. At the graduate level the course work and research is concentrated on some specific subfield of Geography. The Department's areas of research specialization include applied physical geography, air photo interpretation and remote sensing, urban and economic geography, agricultural geography and rural development, regional planning and development, resources management and Europe.

Bachelor of Environmental Studies
(Honours Geography Programme)

Undergraduate Geography Courses

Note 1

All courses are open to any student from any Faculty or School of this University whenever prerequisites are met and space permits.

Note 2

The Department of Geography offers General and Honours programmes both in the Faculty of Arts (B.A.) and the Faculty of Environmental Studies (B.E.S.). Joint honours programmes with most subjects in the University may be arranged subject to approval. Some examples of such programmes may be seen under the Faculty of Arts programme section earlier in the calendar.

Note 3

The letter R designates courses given through Renison College.
Note 4
Geog 101 and Geog 102 are given in both fall and winter terms. It is immaterial which of these courses is taken first as neither is sequential to the other.

Honours Geography

Year 1
Geog 102 Introduction to Physical Geography

and one but no more than three of:

Geog 101 Introduction to Human Geography
EnvSt 195 Introduction to Environmental Problems
Geog 110 Tutorial in Geography
Geog 125R Introduction to the Developing World
Geog 126R The Emerging "Third World"
Geog 127 Regional Problems of Europe

Plus additional credits chosen after consultation with the department so that the student has 6 full course credits. Note that all of these courses (except Geography 110) are available to any student in the University.

Year 2
EnvSt 200 Field Ecology
Geog 201 Some Basic Topics of Physical Geography
Geog 202 Some Basic Topics of Economic and Urban Geography
Geog 260 Introduction to Cartography and Map Analysis
Geog 275 Introductory Air Photo Analysis and Remote Sensing
Geog 271 Introduction to Quantitative Research Methods

Note that it is not necessary for all three techniques courses to be taken during the second year.

and one of:

Geog 203 Some Basic Topics of Cultural and Regional Geography
Geog 204 Soviet Geography
Geog 205 Africa
Geog 220 World Regional Geography

and additional credits so that a student should have completed by the end of second year, 11 course credits.

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

and one of:

Geog 316 Multivariate Statistics
Geog 317 Nonparametric Statistics
Geog 318 Spatial Analysis
Two course credits of geography electives
Two course credits chosen after consultation with the Department

Environmental Studies

Geography

Year 4
Geog 490 Senior Honours Research Essay and additional course credits so that a student should have a minimum of 21 full course credits

Note 1
While twenty-one full course credits is the minimum required for the degree of Bachelor of Environmental Studies (Honours Geography) students may take an enriched programme of up to twenty-four course credits maximum.

Note 2
The minimum and maximum number of full course credits in geography courses in the programme are nine and thirteen of which seven must be designated as Geography courses. If a student takes an enriched programme the additional electives may all be in Geography.

Note 3
Students must take a minimum of five full course credits in Faculties other than the Faculty of Environmental Studies.

Note 4
To enter Year 2 of the Honours Geography programme, a student must achieve in Year 1 a minimum overall average of B− (70.0) and an average of B (73.0) in his Geography and Environmental Studies courses. In subsequent years, a student must continue to achieve an overall average of B− (70.0) and an average of B (73.0) in Geography and Environmental Studies courses.

Note 5
It is recommended that all honours students specialize at third and fourth year levels. The department offers specialized streams in (a) Applied Physical Geography (b) Economic Geography (industrial resources, rural, and urban aspects) (c) Comparative Regional Themes (d) Resources Management. Additional courses in areas of specialization can be obtained from other disciplines in the University.

Note 6
Since many departments doing graduate work in Geography demand proficiency in a foreign language, students intent on graduate work should consider taking a foreign language in their first year.

Note 7
Students intending to teach in Secondary Schools are advised to take at least two course credits (or equivalent) of Regional Geography courses.
### Geography

#### Note 8
This programme prepares students for graduate study in Geography or in Planning, for entry to Secondary School teaching, or for research positions in industry and government.

#### Note 9
All Geography students are encouraged to take summer employment which will provide experience useful to a geographer. Where possible, the Department will provide information and assistance in securing such summer employment. This note does not apply to the Co-op Geography students who will gain employment experiences as part of their degree requirements.

#### Note 10
For some courses, participating students may be expected to make a small financial contribution to defray heavy equipment/travel costs, e.g. Geog 391 (Field Camp), which is mandatory for all third year honours students.

#### Note 11
A maximum of 1½ reading courses may be taken in Geography.

### Honours Co-operative Programme

#### Year 1

**Fall Term Core Courses**
- Geog 102 Intro. to Physical Geography
- Geog 110 Tutorial in Geography
- Geog 260 Intro. to Cartography & Map Analysis
- Math 105 Math for Environmental Studies (if no Year 5 Math)

**Theme Courses**
one course in one of the following areas—
Business, Economics, Languages, Earth Sciences, Biology

**Electives**
one course if Year 5 Math not obtained, otherwise two courses

**Winter Term Core Courses**
- Geog 202 Intro. to Physical Geography
- Geog 205 Intro. to Cartography & Map Analysis
- Math 105 Math for Environmental Studies (if no Year 5 Math)

**Theme Courses**
one course in one of the following areas—
Business, Economics, Languages, Earth Sciences, Biology

**Electives**
two courses

### Year 2

**Fall Term 2A Core Courses**
- Geog 201 Some Basic Topics of Physical Geography
- Env St 200 Field Ecology
- Env St 271 Intro. to Quantitative Research Methods
- Engl 210 Report Writing

**Theme Courses**
one course

**Electives**
one course

**Winter Term**

**Work Term 1**

**Spring Term 2B Core Courses**
One of:
- Geog 203 Some Basic Topics in Cultural and Regional Geography
- Geog 204 Soviet Geography
- Geog 205 Africa
- Geog 220 World Regional Geography

**Theme Courses**

#### Year 3

**Winter Term 3A Core Courses**
- Geog 381 The Nature of Geography
- Env St 272 Computer Programming in Environmental Studies

**Theme Courses**
three courses of which two courses must be in the continuing theme

**Electives**
one course

**Spring Term**

**Work Term 3**

**Fall Term 3B Core Course**
- Geog 391 Field Research or equivalent
- Geog 390 Senior Honours Essay Research Project

**Theme Courses**
same as Winter Term 3A
Electives  none

Year 4
Winter Term
Work Term 4

Spring Term 4A Core Course
Geog 490  Senior Honours Research Essay

Theme Courses
at least two courses of which a maximum of one course is in the continuing theme

Electives
two courses

Fall Term
Work Term 5

Winter Term 4B Core Course
Geog 490  Senior Honours Research Essay

Theme Courses
same as 4A

Electives
same as 4A

Note
1) All courses are term courses except Geog 490 and Geog 220.
2) Effective in the Fall term 1977 all students in the honours geography programmes will be required to take one of the following courses to complete the geography requirements for graduation:

Geog 316  Multivariate Analysis
Geog 317  Nonparametric Statistics
Geog 318  Spatial Analysis

3) To satisfy Departmental requirements for graduation in the honours geography programmes, a student must have a minimum of nine full courses designated as Geography (Geog) and/or Environmental Studies (Env St) courses. A minimum of seven full courses must be in courses designated as Geography courses.

Joint Honours
Joint Honours programmes have been arranged between Geography and several other disciplines in the University. Detailed programmes have been worked out with Anthropology, Biology, Canadian Studies, Earth Sciences, Economics, English, German, History, Man-Environment Studies, Mathematics, Political Science and Russian. These programmes lead to the degrees of the Faculty in which the student is registered, providing always that in addition to the requirements of the specific programme the general requirements of the faculty have been met. For the programmes already approved, depending on the student's registration, the following degrees may be awarded:

B.E.S. or B.A.  Joint Geography with:
Anthropology,
Canadian Studies,
Economics, English,
German, History,
Political Science,
Man-Environment Studies,
Recreation,
Russian

B.E.S. or B.A.  Mathematics
or B.Math

B.E.S. or B.Sc.  Earth Sciences

The Department of Geography is prepared to work out other programmes for keenly interested students who meet Honours standards.

Students enrolled in these programmes are required to obtain at least seven course credits in Geography with the exception that five are required in the joint programme with Earth Sciences; those intending to qualify for Type "A" certificate for teaching secondary school require a minimum of nine course credits in Geography.

Geography course requirements in joint programmes are identical with those of the Geography Honours Programme above, with the exception that where both Departments participating in the programme require courses of similar content, a student shall meet that requirement in one Department only. This might be expected to apply in the cases of technique courses, field research and the Senior Honours Essay; students should obtain clarification from the Undergraduate Officers of the respective departments before registration.

Geography Minor for Honours Students in Other Faculties
The requirements are the same as those noted for the General Geography Programme.

General Geography Programme

Year 1
Geog 102  Introduction to Physical Geography
and one of, but not more than three of:

Geog 101  Introduction to Human Geography
Env St 195  Introduction to Environmental Problems
Environmental Studies
Man-Environment Studies

Geog 110 Tutorial in Geography
Geog 125R Introduction to the Developing World
Geog 126R The Emerging "Third World"
Geog 127 Regional Problems of Europe

Four course credits selected in consultation with the Department. (Note that all of these courses except Geog 110 are available to any student in the University.)

Year 2
EnvSt 200 Field Ecology
Geog 201 Some Basic Topics of Physical Geography
Geog 202 Some Basic Topics of Economic and Urban Geography

one of:

Geog 203 Some Basic Topics of Cultural and Regional Geography
Geog 204 Soviet Geography
Geog 205 Africa
Geog 220 World Regional Geography

and additional credits so that a student should have completed by the end of the second year 10 full course credits.

Year 3
Geog 381 The Nature of Geography
One and one-half courses of Geography electives
Three courses selected in consultation with the Department.

Note 1
Fifteen course credits is the minimum requirement for the degree of Bachelor of Environmental Studies (General Geography). However, an enriched programme of up to eighteen course credits may be arranged.

Note 2
A minimum of five course credits in Geography and Environmental Studies, of which four must be designated as Geography courses constitutes a Geography Major but up to eight geography course credits may be taken in this programme. Students taking an enriched programme may choose additional geography electives.

Note 3
Students must take a minimum of four course credits in Faculties other than the Faculty of Environmental Studies.

Note 4
Students must maintain an overall average of C− (60.0) with an average of C (63.0) in their geography courses.

Department of Man-Environment Studies

Nature of the Programme
Man-Environment Studies is a four year honours degree programme oriented towards study of the many dimensions of human interrelationships with various environments including natural and managed landscapes, buildings and cities, small groups, communities and whole societies. Through problem and issue oriented enquiry into such complex inter-relationships along with related study in the contributory academic disciplines, ample scope is provided for acquiring a broad-based education which recognizes to a degree the need for contemporary "relevance" in the approach and content of higher education.

More important is the educational process sought from a thematic programme such as man-environment studies, which is not artificially constrained by conventional boundaries of academic disciplines. This educational process derives from the recognition that many of the complex interrelated problems of the contemporary world and the future will require attention from people who not only have specialized technical abilities, but who also have the perspective, awareness and understanding necessary to exercise these abilities effectively in co-operation with others and take some measure of responsibility for the human, social and other implications of the results.

The Man-Environment Studies programme does not in itself concentrate on one technical or pre-professional field to meet specifications for particular jobs. However, by investigating a wide range of subjects and problems inherent in the theme of man-environment inter-relationships, students obtain a clearer understanding of the range of options open to them for specialized study and can thereby decide more knowledgeably how best to proceed. The programme offers a good base and considerable flexibility from which more specialized qualifications can be sought in a number of related areas through concurrent and, especially, through graduate study.

Graduates holding the B.E.S. degree in Man-Environment Studies have found employment in a range of government agencies in fields such as natural resources management, pollution control, social services planning, and urban affairs as well as with private corporation and consulting firms in the communications industry and environmental design; with other universities as full-time teaching or research assistants, and with community agencies in various social programmes and as community organizers. Others who have graduated from man-environment studies have gone on to post-graduate work in programmes such as urban and metropolitan studies, natural resources administration, regional planning, environmental engineering, law, systems design, teacher training, adult education, and communications studies.
The Department is unique in having a multi-disciplinary faculty whose formal education and experience range over a number of disciplines in the natural sciences, social sciences and the fine arts. They bring to the programme qualifications in fields such as anthropology, agriculture, biology, chemistry, chemical engineering, communications science, earth sciences, economics, fine arts, geography, mathematics, physics, planning, political science, psychology, sociology and social work, as well as a variety of experience in such diverse areas as the planning of education systems, ecological research, geological investigations, economic studies, urban affairs, technology assessment, and work with various international organizations.

For the approach used in Man-Environment Studies, considerable academic innovation has been necessary. Besides lectures and labs, the programme uses modular instruction units; student-selected projects and community work; field trips to environments other than lecture halls; team teaching; a regular flow of visitors from outside the University; and workshop instruction to help develop techniques and skills relevant to environmental studies. Although there are no formal arrangements for a co-operative programme in Man-Environment Studies, students are encouraged to relate aspects of their academic programme to summer and other employment or to involvement in community organizations in order to incorporate this experiential learning into a university-based educational process.

For many students a "theme" oriented programme of this kind offers a more satisfying undergraduate education than traditional alternatives.

Man-Environment Studies started at Waterloo in 1969 and as an undergraduate degree programme it is unique in Canada although similar ones have become established in the United States, Europe and Australia.

Bachelor of Environmental Studies (Honours Man-Environment Studies)
About one half of the 22 courses required for the B.E.S. degree are designated as a core of required courses. The remainder are free electives chosen by each student to develop the mix of subjects and skills best suited for achieving individual educational or career preparation objectives.

Most required courses are taken in the first two years. The first year introductory courses examine major environmental themes from the viewpoints of the natural and social sciences. They also introduce techniques for investigating environmental questions and provide experience in conducting a systematic enquiry through the device of small group projects. In the second year, further work in natural ecology and social sciences helps to introduce other perspectives and themes running through man-environment studies such as a systems mode of understanding relationships and the "futures" implications of the problems considered. Additional course work on 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 one from among several honours seminars which provide the occasion for students to draw together much they have learned and direct it to one of the broad sub-areas within man-environment studies.

The stress given to project-oriented learning within the programme 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 practice 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 government 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 programme. Faculty will advise on this, but essentially there are four broad options as follows:

a) Students may combine Man-Environment Studies with one academic discipline to the extent that some form of a joint honours degree can be awarded. Arrangements to do this have been approved with seven other academic programmes in the university and more are being considered. Students interested in this type of option should make certain they consult with the Undergraduate Officer.

b) Students may concentrate study in an associated field to the extent it becomes a "minor" (5 full courses or equivalent) within honours Man-Environment Studies.

c) Students may develop a coherent sequence of courses from electives offered by the Department in combination with courses offered elsewhere to concentrate on one of several possible sub-areas emerging within man-environment studies, i.e. human and community studies, resource and environmental management, policy and decision-making at the interface of technology and society.
d) Students may choose instead to explore whatever range of subjects interest them in addition to Environmental Studies.

In each case students should give careful consideration to their choices in terms of the educational goals and possible careers they may wish to pursue after obtaining a B.E.S. degree. They would also do well to seek information and advice on the kind of undergraduate courses favoured by different graduate programmes either as absolute prerequisites for them or expressed preferences.

The Honours Programme requires a minimum of six full credits or the equivalent per semester for the first two years and five full credits or their equivalent per semester in the third and fourth years and five full credits or their equivalent per semester in the third and fourth years. Each student must have completed twenty-two full credits or the equivalent before graduation with a cumulative overall average of B- (70.0); a major average of B (73.0) must be maintained in the required courses.

The programme is as follows:

**Year 1**

M Env 120 (Y) Environmental Issues and the Natural Sciences
M Env 130 (Y) Environmental Issues and the Social Sciences
M Env 150 (Y) Environmental Issues: Methods and Techniques
M Env 190 (Y) Seminar-Workshops
Electives: Two full credits: Four half-year courses or equivalent

**Year 2**

Env St 200 Field Ecology
M Env 241 Social Change, or other half-year course in social sciences
Env St 271 Introduction to Quantitative Research Methods, or one other introductory methods course approved by the Department (see Undergraduate Officer)
M Env 290 (Y) Seminar-Workshop
Electives: Three and one-half full credits or equivalent (i.e. seven half-year courses)

**Year 3**

M Env 390 (Y) Seminar-Workshop (credit value can be increased to 2 by consent of Faculty)
Electives: Three or four full credits or equivalent (i.e. six or eight half-year courses)

**Year 4**

M Env 490 (Y) Senior Honours Assignment (credit value can be increased to 2 or 3 by consent of Faculty)
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<tr>
<th>Year</th>
<th>Required Planning Courses</th>
<th>Required Elective Courses</th>
<th>Elective Planning Courses</th>
<th>Other Electives</th>
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<td>Year 1</td>
<td>Plan 100 – Introduction to Urban Planning Concepts and Techniques</td>
<td>One-half credit from each of the eight categories in the list of Year 1 Required Elective Courses (see below)</td>
<td>Plan 159 – Graphics for Planning</td>
<td>Students may select other electives from any of the University Year 1 offerings – Required and Elective Courses together must total 6 credits</td>
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Select those courses which appear to be best suited to your interests and background. (N.B. There are no "best" courses). Before making a final selection in these courses, students should check that prerequisites have been covered for courses they might wish to take in year 2, 3 and 4.

### Year 1 Required Elective Courses

#### Theme Areas

**1 Ecology**
- Bio 131 Introduction to Biology
- Earth 130 Introductory Geology
- Geog 102 Introduction of Physical Geography
- Sci 100 Geological Foundations of the Environment

**2 Administration**
- P Sci 101 Introduction to Politics 1
- P Sci 102 Introduction to Politics 2

**3 Design**
- Arch 021 An Introduction to the Art of Urban Design
- Arch 095 An Introduction to Visual Design
- Arch 194 Visual Interdisciplinary Language
- Engl 108B Utopia and Anti-Utopia
- Fine 120 Fundamentals of Visual Art 1
- Fine 150G Introduction to Music 1
- Plan 159 Graphics for Planning

**4 Habitat**
- EnvSt 195 Introduction to Environmental Problems
- Geog 101 Introduction to Human Geography
- Rec 100 Introduction to the Study of Leisure and Recreation

**5 Methodology**
- Anth 103 Nature of Language
- Arch 112/113 Computer Science
- CS 116 Introduction to Computers
- CS 117 Applications and Implications of Computers
- Engl 109 Basic Writing Skills
- Engl 140 The Use of English 1
- Fr 101 Reading French
- Gen E 120 Engineering Synthesis
- Phil 140 Introduction to Formal Logic

**6 Sociology**
- Soc 101U Introduction to Sociology
  - If taught, otherwise Soc 101

**7 Economics**
- Econ 101 Introduction to Micro-Economics
- Econ 102 Introduction to Macro-Economics

**8 Philosophy**
- Arts 122G Quest for Meaning in the 20th Century
- Engl 108B Utopia and Anti-Utopia
- Engl 108H Isolation and Alienation
- Hist 102/R Major Themes of Western Civilization
- Hist 120 An Introduction to Western Intellectual History
- Phil 125 Fundamentals of Social and Political Philosophy
- Phil 150 Knowledge and Reality
## Environmental Studies
### School of Urban and Regional Planning

<table>
<thead>
<tr>
<th>Year</th>
<th>Required Planning Courses</th>
<th>Required Elective Courses</th>
<th>Elective Planning Courses</th>
<th>Other Electives</th>
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</table>
| Year 2 | Env St 200 – Field Ecology  
     Plan 256 – Principles of Environmental Design  
     Env St 271 – Introduction to Quantitative Research Methods | One full credit from list of Required Elective Courses (see following page) | Plan 222 – Canadian Regional Issues  
     Plan 230 – The Small Group in the Planning Process  
     Plan 258 – Readings and Research in Planning  
     Env St 272 – Computer Programming in Environmental Studies | Required and Elective Courses together to total 6 full credits  
     List of "Non-Planning Suggested Electives" obtainable from Undergraduate Officer |
|       | Plan 307 – Social Survey Techniques if taught, otherwise Soc 321U Research Methods | and at least 2 of:  
     Plan 255 – Planning Surveys and Analysis  
     Plan 358 – Regional Planning and Development  
     Plan 357 – Conservation and Resource Management | | |
| Year 3 | Plan 300 – Seminar/Workshop Project in Urban and Regional Planning  
     Plan 391 – Field Research Methods and Projects | Two full credits from list of Required Elective Courses (see following page) | Plan 301 – Planning Design  
     Plan 316 – Multivariate Statistics  
     Plan 317 – Nonparametric Statistics  
     Plan 318 – Spatial Analysis  
     Plan 319 – Regional Planning Techniques  
     Plan 330 – Urban Social Planning  
     Plan 332 – The Sociology of Regions  
     Plan 333 – The Sociology of Regional Planning  
     Plan 344 – Principles of Recreation Planning  
     Plan 360 – Technology in Urban and Regional Planning  
     Plan 370 – Land Development Planning | Required and Elective Courses together to total 6 full credits  
     List of "Non-Planning Suggested Electives" obtainable from Undergraduate Officer |
| Year 4 | Plan 456 – Political and Administrative Processes in Urban and Regional Planning  
     Plan 490 – Senior Honours Essay (2 full course credits) | One full credit from list of Required Elective Courses (see following page) | Env St 400 – Environmental Law  
     Plan 414 – Housing Policies  
     Plan 430 – Social Policy Planning  
     Plan 470 – Concepts and Ideas in Contemporary Urban Planning  
     Plan 475 – Projects, Problems and Readings in Planning  
     Plan 476 – Projects, Problems and Readings in Planning | Required and Elective Courses together to total 6 full credits  
     List of "Non-Planning Suggested Electives" obtainable from Undergraduate Officer |
### Year 2-4 Required Elective Courses

<table>
<thead>
<tr>
<th>Urban Theme</th>
<th>Regional Theme</th>
<th>Resource Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>These courses are subject to availability</td>
<td>These courses are subject to availability</td>
<td>These courses are subject to availability</td>
</tr>
</tbody>
</table>

#### Year 2

- **Plan 230** The Small Group in the Planning Process
- **Env St 272** Computer Programming in Environmental Studies
- **Anth 247** Urban Anthropology
- **Arch 245** Survey of Contemporary Architecture
- **Geog 201** Some Basic Topics of Physical Geography
- **Geog 202** Some Basic Topics of Economic and Urban Geography
- **Geog 251** Urban Areas in North America
- **Geog 260** Introduction to Cartography and Map Analysis
- **Hist 204C** Canadian Urban History
- **Hist 265B** Canadian History 2

#### Year 3

- **Plan 301** Planning Design
- **Plan 330** Urban Social Planning
- **Plan 360** Technology in Urban and Regional Planning
- **Plan 370** Land Development Planning
- **Civ E 342** Urban Transport Planning 1
- **Civ E 393** Environmental Engineering
- **Econ 343** Urban Economics
- **Econ 357** Environmental Economics
- **Geog 349** The City as a System 1
- **Geog 350** Regional Urban Systems 1
- **P Sci 343** Canadian Municipal Government
- **P Sci 344** The Politics of Local Government
- **Soc 301** Urban Sociology
- **Soc 360** Political Sociology

#### Year 4

- **Plan 414** Housing Policies
- **Plan 430** Social Policy Planning
- **Plan 470** Concepts and Ideas in Contemporary Urban Planning
- **Env St 400** Environmental Law
- **Geog 449** City as a System
- **Geog 450** Regional Urban Systems 2
- **Arch 554** Development and Financing
- **Civ E 543** Land Use Models

#### Year 3

- **Plan 301** Planning Design
- **Plan 316** Multivariate Statistics
- **Plan 317** Nonparametric Statistics
- **Plan 318** Spatial Analysis
- **Plan 319** Regional Planning Techniques
- **Plan 332** The Sociology of Regions
- **Plan 333** The Sociology of Regional Planning
- **Plan 344** Principles of Recreation Planning
- **Civ E 343** Urban Transport Planning
- **Econ 360** Technology in Urban and Regional Planning
- **Civ E 343** Transportation Engineering
- **Econ 356** Economic Development
- **Econ 357** Environmental Economics
- **Geog 350** Regional Urban Systems 1
- **Soc 360** Political Sociology

#### Year 4

- **Plan 430** Social Policy Planning
- **Env St 400** Environmental Law
- **Geog 412** Industrial Geography
- **Geog 422** Canada
- **Geog 450** Regional Urban Systems 2
- **Geog 452** Problems of Rural Land Use
- **P Sci 428** State and Economic Life
- **Civ E 543** Land Use Models

#### Year 4

- **Env St 400** Environmental Law
- **Geog 408** Special Topics in Climatology and Natural Hazards
- **Geog 410** Recreation Geography
- **Geog 411** Resource Studies
- **Geog 414** Resources Management Workshop
- **Geog 452** Problems of Rural Land Use
- **Geog 460** Land Dereliction and Rehabilitation
- **M Env 431** Comparative Approaches to Environmental Management
- **Rec 410** Planning of Recreation Facilities
- **Rec 434** Advanced Park Management
Environmental Studies  
School of Urban and Regional Planning

Additional Information
The four year Honours programme is recognized by the professional association of planners in Canada (the Canadian Institute of Planners) and an increasing number of employers as a satisfactory preparation for a wide range of careers.

Note 1
Students in the Planning School are required to participate fully in all four years of the programme. Students are normally expected to carry a load of six credits in each of those years. However, students interested in taking extra courses are free to take a seven credit load in any given year without approval from the School; preregistration for more than seven credits may only be done with the undergraduate officer's approval. If the student has accumulated more than the required minimum number of credits for proceeding into the next year of the programme (Year 2: six credits, Year 3: 12 credits, Year 4: 18 credits) he may elect to reduce his load and will be permitted to take a minimum of 5 credits in any given academic year through Year 4. All required courses should be taken in the year indicated.

Note 2
It is possible to gain admission to Year 2.
To enter Year 2 of the Honours Planning Programme, a student must obtain a minimum overall average of B- (70.0) and a B (73.0) in Planning and Environmental Studies courses and must obtain credit standing in 6 full courses. In subsequent years, a student must maintain a cumulative overall average of B- (70.0) as well as an average of B (73.0) in Planning and Environmental Studies courses.

Note 3
Planning 156 and Planning 342 and 343 are intended for students in the other disciplines and may not be taken for credit by Planning students.

Note 4
No more than 8 first year level credits will be allowed toward the 24 required to graduate. The number of electives from the required list in each of the 4 years apply not merely to each year in question. For example, a student in Year 4 can also pick from the required list in Year 2 and 3 so long as the total required electives in all 4 years at graduation meets the minimum number (and is within the 8 credit guideline for Year 1 level courses).

Note 5
Students in Year 1 and 2 should be aware of prerequisites in other departments, where Year 1 courses are needed in order to be able to take more advanced courses later.

Note 6
A student wishing to register for a readings and research course (Planning 258, 475 and 476) must first make arrangements with a faculty member to provide the necessary supervision and guidance.

Note 7
Plan 307 if available, otherwise Soc 321U may be taken in Year 2 or Year 3.

Note 8
Students selecting the Quantitative Methods elective in the fourth year are required to select Planning 319, and, if they wish, any of Planning 316, 317, 318.

Note 9
Not all the courses listed herein are offered each year. Students should consult the School prior to registration.

Note 10
The number of hours of lectures shown after the course description is an attempt to indicate the "normal"; each instructor determines how often his particular class will meet.

Note 11
For some courses, participating students may be expected to make a small financial contribution to defray materials/travel costs, e.g. Plan 159 (Graphics for Planning), Plan 300 (Seminar/Workshop Project in Urban and Regional Planning), Plan 357 (Conservation and Resource Management), Plan 391 (Field Research Methods and Projects).

Note 12
Where a student selects 2 of: 255, 358 and 357 and then picks up the third option—that third course will be considered as one of the additional elective planning courses required for either Year 2 or 3.

Note 13
Students who enter the Planning School under the pre-existing 4-year programme course outline, contained in the calendars of 1973-74 or 1974-75, may elect to meet the requirements of either the old or new programme of the School outlined in the 1975-76 calendar.

Note 14
Leave of absence may be negotiated with the approval of the undergraduate officer.

Note 15
A variety of items are covered in the Undergraduate Affairs Policy Manual available from the undergraduate officer. Policy areas covered include: Admission, Courses, Examinations, Records and Transfers, Registration, Appeals and Discipline, Academic Standing.
Faculty of Human Kinetics and Leisure Studies

Biomechanics Lab in Kinesiology
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 (1966-1967) and the School of Physical Education and Recreation (1968-72). Within this faculty, the Department of Kinesiology, the Department of Recreation, and the Dance Group offer academic programmes and conduct research, whereas the Department of Athletics conducts intercollegiate and intramural athletics and a service programme in physical activity for all students, faculty and staff.

The programmes of the Faculty have developed rapidly in response to student needs and interests and to the changing needs and demands of society. Five years ago a regular stream was added to the co-operative programme to enable students who wanted the programmes, but not the co-operative aspects, to attend the University of Waterloo. The regular programme has grown to the point where it equals the co-operative programme enrolment. At the same time elective courses were introduced into each department making it possible for students to pursue in some depth an area of Kinesiology, Dance, Health Studies or Recreation in which they had a special interest. The future promises even greater opportunities for specialized study by the individual students.

Kinesiology Programme

The Kinesiology programmes are multi-dimensional studies of human physical movement incorporating the biological, physical, and social sciences. Extensive laboratory facilities enable the students in the programme to be among the few undergraduate students in the world to examine first hand the problems adherent within human physical activity.

A General programme was added in 1973, as were two streams for concentration: Kinesiological Sciences, and Applied Kinesiology. Freshmen students need not concern themselves with these channels, as all first year students enrol in Honours Kinesiology.

A special Honours Programme in Health Studies courses. Graduates of this programme are capable of performing in such career areas as Public Health, Community Health Education, Private Health Agencies, Teaching and Research.

The Kinesiology programmes are designed to provide graduates with maximum flexibility in choosing a career. Graduates are already found in a variety of agencies ranging from teaching (the Honours programme meets all requirements for admission to the Type "A" Certificate courses in Physical and Health Education at the Colleges of Education in Ontario), to hospitals for the aged, infirm, retarded, and psychiatric populations, fitness institutes, sports equipment manufacturing outlets, YM-YWCA’s, youth centres, university teaching and/or graduate programmes, and related fields.

Recreation Programme

The academic programme in Recreation has been designed to give each graduate the body of knowledge necessary to prepare for a professional position in the field of Recreation. Students completing the Honours Degree programme can, in addition, complete course sequences resulting in a declared option in Recreation Administration, Therapeutic Recreation Services, Outdoor Recreation, or Leisure Studies. Joint Honours Programmes are available with Geography, Man-Environment Studies and Sociology. A Recreation-Business Option with Wilfrid Laurier University is also offered.

Graduates of the Recreation Degree Programme are found in diverse settings, including hospitals, municipalities, schools, national and provincial parks, youth agencies, and university graduate programmes. All are eligible to apply for the Municipal Recreation Directors’ Interim Type ‘A’ Certificate from the Ministry of Culture and Recreation.

Dance Programme

The honours programme in Dance offers students the unique opportunity of studying dance from the perspective of the humanities, the social sciences, and the biological sciences, as well as that of the performing arts. This orientation, which represents a marked departure from the strictly performance oriented approach which is taken in most programmes of dance at universities in Canada and the United States, allows the student a wider range of career choices than do the traditional programmes.

Degrees

Graduates of all Kinesiology programmes will receive either an Honours or General Bachelor of Science degree in Kinesiology. Recreation programme graduates are awarded an Honours Bachelor of Arts degree in Recreation. Those students who graduate from the Dance programme will receive an Honours Bachelor of Science Degree in Dance.

Graduates who have pursued their studies in a co-operative programme and who have successfully completed 4 work terms, 4 work reports, and who indeed do finish the co-operative programme, will have the words “Co-operative Programme” added to their University diploma.

Systems of Study

Co-operative System

The co-operative system is one whereby after the first eight month academic year the student spends alternate four month terms in academic study and related work experiences.

Arrangements for work assignments are made through the Department of Co-ordination 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 programme.

**Regular System**

In regular programmes students attend school for two consecutive four month terms each year for four years.

**Admission**

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

**Application from Ontario Year 5**

Applicants to any of the Kinesiology programmes are advised to select a Year 5 programme which includes one or more of the following courses: Calculus, Biology, Chemistry, Physics.

Applicants to the Recreation programme are advised to include Geography in their Year 5 programme.

**Advanced Standing**

It is not unusual for students transferring to H.K.L.S. programmes to be granted credit for courses taken elsewhere in which they have received a grade of C- or better. All transfer students will be required to complete at least the equivalent of two years of study at Waterloo (i.e. at least 11 full year courses) regardless of the number of courses that are presented for transfer.

One term of advanced work experience standing may be granted to students transferring into third year of co-operative programmes in HKLS. Details are available in the Department of Co-ordination.

**Examinations and Standings**

The Faculty of Human Kinetics and Leisure Studies currently operates under a “course system” in which student progress is measured by courses successfully completed rather than by years. Students who have passed fewer than 12 term courses will be considered Year 1; those who have passed at least 12 term courses but fewer than 22 will be considered Year 2; those with at least 22 but fewer than 32, Year 3; and those with 32 or more, Year 4.

1) **Final Examinations**

a) The faculty constitutes the examining body for all examinations. All examination results are considered by the Undergraduate Affairs Committee and subsequently by the Faculty Council. The results are issued to individual students by the Registrar.

Appeals against faculty decisions made under these regulations should be made in writing to the Chairman, Undergraduate Affairs Committee within one month of publication of the official mark reports.

b) 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 in 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.

c) Students defaulting 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 Chairman of the Undergraduate Affairs Committee within one week of the scheduled examination.

d) All examinations which receive a failing grade are automatically re-read.

2) **Standing**

a) The Faculty has endorsed the letter grade system outlined on page 17 of this calendar.

b) Overall standing will be determined at the end of each year for regular programmes and upon completion of the B term for co-operative programmes by the cumulative average of all courses taken at the University while enrolled in the faculty (whether passed or failed).

The following cumulative averages are required to proceed in the programmes of the Faculty:

<table>
<thead>
<tr>
<th>Programme</th>
<th>Overall</th>
<th>Major Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kinesiology Honours</td>
<td>C</td>
<td>C/+</td>
</tr>
<tr>
<td>(Health Studies Option)</td>
<td>C</td>
<td>C/+*</td>
</tr>
<tr>
<td>Kinesiology General</td>
<td>D</td>
<td>C/-</td>
</tr>
<tr>
<td>Recreation Honours</td>
<td>C-</td>
<td>B-</td>
</tr>
<tr>
<td>Dance Honours</td>
<td>C-</td>
<td>C-</td>
</tr>
</tbody>
</table>
*All courses designated Kinesiology or Health Studies will be included in the major average.

Kinesiology, Health Studies and Dance students who receive a grade report with one of F, INC, or DNW in any one academic year are placed on probation for the following academic year. Students who receive a grade report with two or more of any combination of the following F, INC or DNW in any one academic year are designated as "May not proceed in the Programme". (The designation F takes into account all failing grades, i.e., F-, F, and F+). If a student clears his/her F, INC and DNW grades prior to his/her next registration, the decision on his/her grade report may be changed.

Students who are required to withdraw may be eligible to apply for readmission only after a one year absence. It is recommended that during this absence students do some academic work (extension, correspondence, or community college study) in order to demonstrate that they should be readmitted.

Programme selection
Full-time students: All first year students must take a minimum of 12 term courses. In subsequent terms, a student will normally take at least 5 courses.

Part-time studies or reduced programmes: Except in exceptional circumstances, an Honours programme may not be taken on a completely part-time or reduced programme basis; at least seven academic terms must be taken on a full-time (full programme) basis and no student may spend more than 5 years of full-time study (10 terms) for an Honours degree. The Faculty of Human Kinetics and Leisure Studies does not encourage part-time studies but will allow the General degree to be pursued on a part-time or reduced-programme basis subject to approval by the Associate Dean (Undergraduate Affairs) and the Department concerned. Normally, no first year programme for a full-time student may be reduced below the 12 course minimum except in very exceptional circumstances.

Course and Programme Changes
a) Up to the end of the first three weeks of lectures, the initials of the faculty advisor (beside the course), plus the faculty advisor's signature are necessary to carry out a course drop on the registration form.

b) After the first three weeks of classes any course may be dropped provided the course instructor initials the drop, and the Associate Chairman for Undergraduate Affairs signs the registration form. This policy will permit course drops only up to the date which is 4 weeks prior to the last day of lectures.

Academic Programmes
Department of Kinesiology

Listed below are the course combinations leading to the Honours and General degrees in Kinesiology and the Honours Degrees in Health Studies. Students are encouraged to make full use of the advisory system of the Department in planning their programmes.

Degree Requirements Honours and General Programmes
a) Required Kinesiology courses: (14)
   Kinesiology 102, 103, 200, 222, 300, 317, 321, 330, 335, 365, 431, 432, 470 plus one of Kinesiology 353, 354, or 452.
   (Kinesiology 116 is required of all students not presenting Year 5 Chemistry for Admission).

b) Required courses from other departments: (7)
   Physics 103 or Physics 104 (see note), Biology 110, 203 and 204, Psychology 101, Sociology 101 and one other Sociology or Psychology.

Note
In the case of Physics 103, Physics 104 and Biology 110 students may elect to take full year courses in either subject in the appropriate department. Physics 103 is for students not presenting Year 5 for admission. Physics 104 is for students who have taken Year 5 Physics.

c) Kinesiology Electives: (10)
   Ten courses from those offered in the Department in addition to the required courses. These may include Health Studies courses.

d) Electives: (13)
   The remaining thirteen term courses required for the degree are to be elected as follows:

   1) Eight (8) term courses must be elected in departments outside the Faculty of Human Kinetics and Leisure Studies.

   2) The remaining five term courses may be taken in any department of the University including Kinesiology, Dance and Recreation.

Honours Programme
Each student in the Honours Programme must include in his/her programme at least seven (7) courses from one of the following two areas of concentration:

a) Kinesiological Sciences:
   Kinesiology 946, 352, 353, 354, 356, 401, 402, 410, 420, 425, 426, 452, 453

b) Applied Kinesiology:
General Programme
The ten (10) elective courses in Kinesiology may be made up of any combination of Kinesiology and/or Health Studies courses.

Course Sequence – Honours and General Programmes
Year 1
(Common to regular and co-operative programmes)

<table>
<thead>
<tr>
<th></th>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kin 102</td>
<td>Kin 103</td>
<td></td>
</tr>
<tr>
<td>Psych 101</td>
<td>Another Psych or Soc</td>
<td></td>
</tr>
<tr>
<td>Soc 101</td>
<td>Biol 110</td>
<td></td>
</tr>
<tr>
<td>Phys 103 or 104</td>
<td>Kin 116 (if no Year 5 Chemistry)</td>
<td>Two electives</td>
</tr>
<tr>
<td>Two electives</td>
<td>Two or three electives</td>
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</tr>
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</table>

Co-operative Programmes

<table>
<thead>
<tr>
<th>Term 2A</th>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kin 200, 222</td>
<td>Kin 321, 330, 335</td>
<td></td>
</tr>
<tr>
<td>Biol 203</td>
<td>Two electives</td>
<td></td>
</tr>
<tr>
<td>Two electives</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Term 3A</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kin 355</td>
<td>Kin 300, 317</td>
</tr>
<tr>
<td>Biol 204</td>
<td>Three electives</td>
</tr>
<tr>
<td>Three electives</td>
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</table>

<table>
<thead>
<tr>
<th>Term 4A</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kin 431</td>
<td>Kin 432, 470</td>
</tr>
<tr>
<td>Five electives</td>
<td>Four electives</td>
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</table>

Regular Programmes

<table>
<thead>
<tr>
<th>Year 2</th>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kin 200, 222</td>
<td>Kin 321, 335</td>
<td></td>
</tr>
<tr>
<td>Biol 203</td>
<td>Biol 204</td>
<td></td>
</tr>
<tr>
<td>Two electives</td>
<td>Two electives</td>
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</table>

<table>
<thead>
<tr>
<th>Year 3</th>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kin 300, 317, 330</td>
<td>Kin 355</td>
<td>Four electives</td>
</tr>
<tr>
<td>Two electives</td>
<td>Four electives</td>
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</table>

<table>
<thead>
<tr>
<th>Year 4</th>
<th>Fall</th>
<th>Winter</th>
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</thead>
<tbody>
<tr>
<td>Kin 431</td>
<td>Kin 432, 470</td>
<td>Four electives</td>
</tr>
<tr>
<td>Five electives</td>
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</tbody>
</table>

Honours Health Studies
Students may apply for admission directly into the Honours Health Studies Programme, co-op or regular.

44 Term courses

Degree Requirements
a) Required Health Studies courses: (13)

b) Required Kinesiology courses: (5)

c) Required courses from other departments: (9)
   Biology 131, 245, 246, 203, 204, Sociology 101, Psychology 101, 211.

d) Electives: Seventeen (17) term courses selected in consultation with the student's advisor.

Health Studies Year 1 Common

<table>
<thead>
<tr>
<th>Year 2</th>
<th>Fall</th>
<th>Winter</th>
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</thead>
<tbody>
<tr>
<td>Helth 140</td>
<td>Helth 141</td>
<td></td>
</tr>
<tr>
<td>Psych 101</td>
<td>Psych 211</td>
<td></td>
</tr>
<tr>
<td>Soc 101</td>
<td>Helth 116 (if necessary)</td>
<td></td>
</tr>
<tr>
<td>Biol 131</td>
<td>Biol 131</td>
<td></td>
</tr>
<tr>
<td>Two electives</td>
<td>Two or Three electives</td>
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</table>

Regular Programme Year 2

<table>
<thead>
<tr>
<th>Year 3</th>
<th>Fall</th>
<th>Winter</th>
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</thead>
<tbody>
<tr>
<td>Helth 240</td>
<td>Helth 241</td>
<td></td>
</tr>
<tr>
<td>Kin 200, 222</td>
<td>Biol 246</td>
<td>Three electives</td>
</tr>
<tr>
<td>Biol 245</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One elective</td>
<td></td>
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<table>
<thead>
<tr>
<th>Year 4</th>
<th>Fall</th>
<th>Winter</th>
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</thead>
<tbody>
<tr>
<td>Helth 349, 410</td>
<td>Helth 345, 346, 348</td>
<td></td>
</tr>
<tr>
<td>Kin 330, 317</td>
<td>Biol 204</td>
<td>One elective</td>
</tr>
<tr>
<td>Biol 203</td>
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</table>

<table>
<thead>
<tr>
<th>Year 5</th>
<th>Fall</th>
<th>Winter</th>
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<tbody>
<tr>
<td>Helth 431, 440</td>
<td>Helth 432, 445</td>
<td></td>
</tr>
<tr>
<td>Kin 300</td>
<td></td>
<td>Four electives</td>
</tr>
<tr>
<td>Three electives</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Co-operative Programme

Year 2

2A Fall
- Health 240
- Kin 200, 222
- Biol 245
- Biol 203

2B Spring
- Health 345, 348
- Kin 330
- Two electives

Year 3

3A Winter
- Health 241
- Biol 246
- Biol 204
- Two electives

3B Fall
- Health 410, 440
- Kin 300, 317
- One elective

Year 4

4A Spring
- Health 349, 346, 431
- Three electives

4B Winter
- Health 432, 445
- Four electives

It is recommended that students wishing to elect Drama 101 or Fine Arts 120 or Philosophy 100 consider taking these courses in first year.

Academic Programme

Honours Dance

Forty-four term courses are required for the honours degree in Dance.

Degree Requirements:

a) Required Dance Courses (10):

b) Required Kinesiology Courses (6):

c) Required Courses from Other Departments (10):
- Biol 110 or Kin 102, Phys 103, Psych 101, Soc 101, Phil 100 or two term courses in philosophy, Fine 150G, 151G, and two courses from Drama 101, 243, 381, Fine 110, 111, 120, 228B.

d) Six electives in Dance to be selected from:

e) Other Electives: The remaining 12 term courses must include at least 8 term courses outside the faculty of Human Kinetics and Leisure Studies. The remaining 4 term courses may be taken in any department of the University.

Course Sequence

Year 1

Fall
- Dance 162
- Kin 200D
- Music 150G
- Elective
- Elective

Winter
- Dance 163
- Psych 101
- Music 151G
- Elective
- Elective

It is recommended that students wishing to elect Drama 101 or Fine Arts 120 or Philosophy 100 consider taking these courses in first year.

Year 2

Fall
- Dance 262
- Dance 264
- Phys 103
- Elective

Winter
- Dance 362 or 363
- Dance elective
- Kin 321
- Elective

By the end of second year students must have completed at least one term course requirement in Drama or Fine Arts.
By the end of third year students must have completed two term courses in Philosophy plus any two term courses (as outlined) in Drama or Fine Arts.

Year 4
Dance 461
Dance 464
Dance elective
Elective

Note
Students should plan their programme with a faculty advisor so that courses are elected in the appropriate sequence and electives chosen to suit the student's needs and interests.

Academic Programmes
Department of Recreation

Fourty-four term courses are required for the Honours degree in Recreation. The student begins study in one of the four areas of concentration available in the second year of the programme. Double Honours programmes with other departments are being developed. For information about these programmes, please consult the Department of Recreation.

Degree Requirements
A) Recreation courses (22):

1) Required:

b) Each student normally must include in his programme the five (5) courses listed in one of the following areas of concentration (see note):

Therapeutic Recreation: Recreation 200, 252, 253, 254, 361.
Recreation Administration: Recreation 316, 320, 334, 410, 434.
Outdoor Recreation: Recreation 331, 332, 334, 432, 434, 435.

Note
In exceptional cases, with departmental advice and approval, other course combinations may be developed to meet specific educational goals.

2) Electives:
Each student must complete 3 or 4 additional recreation electives to meet the required total of 22.

B) Courses outside the Department of Recreation

1) Required: (8)
- Psychology 101 and Sociology 101
- Any two of English 109, 140, 141, 209, 210
- Any four of Business 121, Kinesiology 200, Economics 101, Geography 101/Environmental Studies 195, Planning 150 or a course in the Fine or Performing Arts.

2) Electives: (14)

C) Additional Requirements

Practical Experience. All students must complete a faculty approved work term, normally of at least three months duration, or successfully petition the Department for exemption on the basis of experience.
Honours Recreation and Sociology

The Joint Honours programme in Recreation and Sociology has the following requirements:

**Required Recreation Courses (13)**
- 100 Introduction to the Study of Leisure & Recreation
- 101 Introduction to Leisure Services
- 204 Leisure and Recreation in Historical Perspective
- 210 Organization and Administration of Recreation Services
- 220 Recreation in Programme Development
- 230 Introduction to Outdoor Recreation & Education
- 250 Introduction to Therapeutic Recreation Service
- 270 Statistical Techniques Applied to Leisure Studies
- 300 Philosophy of Leisure
- 371 Research Design Applied to Leisure Studies & Services
- 400 Seminar in Recreation & Leisure
- 470 Research Project
- 471 Research Project

**Required Sociology Courses (5):**
- Sociology 101 Introduction to Sociology
- 320 Research Methods 1
- 321 Research Methods 2
- 425 Sociological Theory
- 426 Sociological Theory

**Non-Departmental Required Courses (5):**
- Psychology 101 Introductory Psychology
- One of English 109, 140, 141, 209, 210
- Three of: Business 121
- Kinesiology 200
- Economics 101
- Geography 101/Environmental Studies 195
- Planning 156
- A course in Fine Arts or Performing Arts

**Recreation Electives (7):**
Students must elect any seven advanced courses in Recreation.

**Sociology Electives (9):**
Students must elect any nine advanced courses in Sociology.

**Non-Departmental Electives (5):**
Students must elect any five courses outside of Recreation or Sociology which relate to their major area of study.

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Course Sequence (co-operative and regular)

**Year 1**
- Recreation 100, 101, 220, 230, 250
- Psychology 101
- Sociology 101
- Two of:
  - English 109, 140, 141, 209, 210
  - Three of:
    - Business 121
    - Kinesiology 200
    - Economics 101
    - Geography 101/Environmental Studies 195
    - Planning 156
    - A course in Fine Arts

**Year 2**
- Recreation 204, 210, 270
- 2 Recreation electives
- 5 electives

**Year 3**
- Recreation 300, 371
- 5 Recreation electives
- 5 electives

**Year 4**
- Recreation 400, 470, 471
- 2 Recreation electives
- 5 electives
Honours Recreation and Business Option
In this special honours Recreation programme, students take business courses at Wilfrid Laurier University. The 44 term courses in this programme must include:

a) The 22 term courses required of all Recreation students.
b) The 8 outside courses required of all Recreation students.
c) Eight (8) Business/Economics Courses which must include Business 121, 212H, 383R, 398, 39B and 471R.
d) Six (6) Electives.

Honours Recreation and Man-Environment Studies
Students in the joint honours programme in Recreation and Man-Environment Studies must successfully complete 44 term courses and must maintain a minimum average of 70% in their recreation courses, 73% in their Man-Environment courses, and 70% overall.

Students must include the following in their programme:

Required Recreation Courses (10-13)
  100 Introduction to the Study of Leisure & Recreation
  101 Introduction to Leisure Services
  204 Leisure and Recreation in Historical Perspective
  210 Organization and Administration of Recreation Services
  220 Recreation Programme Development
  230 Introduction to Outdoor Recreation
  250 Introduction to Recreation for Special Populations
  T 270 Statistical Techniques Applied to Leisure Studies
  300 Philosophy of Leisure
  371 Research Design Applied to Leisure Studies & Services
  400 Seminar in Recreation & Leisure
T 470 Research Project
T 471 Research Project

Required Man/Environment Courses (14-17)
  120 (Y) Environmental Issues and the Natural Sciences
  130 (Y) Environmental Issues and the Social Sciences
  150 (Y) Environmental Issues: Methods and Techniques
  190 (Y) Seminar-Workshops
  200 Field Ecology
  241 Social Change, or other half-year course in social sciences (Sociology 101)
T 271 Introduction to Quantitative Research Methods, or one other introductory methods course approved by the Department
  290 (Y) Seminar Workshop
  390 (Y) Seminar Workshop
T 490 (Y) Senior Honours Assignment

T Note
A student may elect to take either Recreation 470-471 or Man Environment 490, and Recreation 270 or Man Environment 271.

Recreation Electives (8)
Students must elect eight advanced courses in recreation. Five of these courses should be from one of the following areas of concentration.
a) Therapeutic Recreation (200, 252, 253, 254, 361)
b) Leisure Studies (200, 301, 302, 306, 361)
c) Recreation Administration (316, 320, 334, 410, 434)
d) Outdoor Recreation (331, 332, 334, 432, 434, 435)

Man Environment Electives (2)
Students must elect one of the following honours seminars:
  410 (Y) Environmental Management
  445 (Y) Technology Assessment and Policy Analysis
  470 (Y) Environmental Teaching and Learning
  480 (Y) Special Topics Seminar

Non-Departmental Required Courses (7-8)
- Sociology 101† and Psychology 101
- Any two of English 108, 140, 141, 209, 210
- Any four of Business 121, Kinesiology 200, Economics 101, Geography 101/Environmental Studies 195, Planning 156, or a course in Fine or Performing Art.
† can be substituted for 241, Social Change

Honours Recreation and Geography
Students in the joint honours programme in Recreation and Geography must successfully complete 44 term courses and must maintain a minimum average of 70% in their recreation courses, 73% in their Geography courses and 70% overall.

Students must include the following in their programme:

Required Recreation Courses (10-13)
  100 Introduction to the Study of Leisure & Recreation
  101 Introduction to Leisure Services
  204 Leisure and Recreation in Historical Perspective
  210 Organization and Administration of Recreation Services
  220 Recreation Programme Development
  230 Introduction to Outdoor Recreation
  250 Introduction to Recreation for Special Populations
  T 270 Statistical Techniques Applied to Leisure Studies
  300 Philosophy of Leisure
  371 Research Design Applied to Leisure Studies & Services
  400 Seminar in Recreation & Leisure
T 470 Research Project
T 471 Research Project

Required Man/Environment Courses (14-17)
  120 (Y) Environmental Issues and the Natural Sciences
  130 (Y) Environmental Issues and the Social Sciences
  150 (Y) Environmental Issues: Methods and Techniques
  190 (Y) Seminar-Workshops
  200 Field Ecology
  241 Social Change, or other half-year course in social sciences (Sociology 101)
T 271 Introduction to Quantitative Research Methods, or one other introductory methods course approved by the Department
  290 (Y) Seminar Workshop
  390 (Y) Seminar Workshop
T 490 (Y) Senior Honours Assignment
**Required Geography Courses (10-13)**

- 102 Introduction to Physical Geography
- 195 Introduction to Environmental Problems
- 101 Introduction to Human Geography
- 200 Field Ecology
- 201 Some Basic Topics of Physical Geography
- 202 Some Basic Topics of Economic and Urban Geography
- 260 Introduction to Cartography and Map Analysis
- T 271 Introduction to Quantitative Research Methods
- 275 Introductory Air Photo Analysis and Remote Sensing
- 391 Field Research, or other half-year course in Geography
- 381 The Nature of Geography
- T 490 (Y) Senior Honours Research Essay

**T Note**

A student may elect to take either Recreation 470-471 or Geography 490, and Recreation 270 or Geography 271.

**Recreation Electives (8)**

Students must elect eight advanced courses in recreation. Five of these courses should be from one of the following areas of concentration.

a) Therapeutic Recreation (200, 252, 253, 254, 361)

b) Leisure Studies (200, 301, 302, 306, 361)

c) Recreation Administration (316, 320, 334, 410, 434)

d) Outdoor Recreation (331, 332, 334, 432, 434, 435)

**Geography Electives (5)**

Students must elect 5 additional upper division courses in Geography.

**Non-Departmental Required Courses (7)**

- Sociology 101 and Psychology 101
- Any two of English 109, 140, 141, 209, 210
- Any three of Business 121, Kinesiology 200, Economics 101, Planning 156, or a course in Fine or Performing Arts.

**Non-Departmental Elective (1)**

Students must elect one course outside of Recreation or Geography that relates to their major area of study.
11

Integrated Studies

Campus Scene
Integrated Studies, a small undergraduate programme of less than 100 students, is an opportunity established within the University of Waterloo in 1969 for students able to structure and pursue their own programmes of study.

This alternative in undergraduate education is distinctive in that the students develop their own programmes which are to some degree both integrated and independent, and the students play a predominant role in the operation of the overall programme.

Integration

By integration, it is primarily meant that students explore interdisciplinary study, particularly in a theme or project approach. Student programmes are expected to cross the boundaries of traditional disciplines bringing a variety of subject matter together in a distinctive focus. Students are encouraged to seek out connections among disciplines in ways not specifically promoted by regular university programmes.

Other aspects of integration are also of concern within the programme. Most students consciously attempt to integrate their learning with their life situation and interests; normally their studies directly reflect this interest. Attempts are also made to integrate a wide variety of approaches to available resources. In addition, many seek to overcome the apparent separation of the university and community. Finally, students are integrated with faculty and staff in the programme's shared decision making process.

Independence

By independence, it is not intended that students work in isolation; indeed we hope for an active community of learning. Students are expected, however, to have the independence to provide the basic thrust for the structure of their studies and to devise programmes utilizing more than the course offerings of the various faculties of the University.

Shared Decision Making

The operation of the programme, with the exception of matters pertaining to the degree, is handled by Operations Council which consists of all members of the programme, its students, Resource Persons and staff. It is responsible for such items as budget development, student project assistance, recommendations for the hiring of personnel, admission of students and year end reviews. Council normally meets every second week. To make Council functional, in view of its potential size, volunteer committees examine issues of concern and submit recommendations for Council's decisions.

Approach to Resources

In designing their studies, the students have access to the wide resources 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. That might entail taking no formal courses at all, or perhaps auditing several and taking some for credit, or a variety of other combinations. The students might work on an individual basis with professors or graduate students from the many University departments or with the programme's own Resource Persons. Groups of students may also work together in a common approach to any given subject or theme. Then, students are also free to pursue studies privately utilizing the libraries and other facilities.

Resource Persons

The programme’s Resource Persons serve as tutors or advisors to assist the students with the development of their studies. As they are normally broadly experienced in interdisciplinary study, they are capable of delineating connections among areas of knowledge. From their knowledge of the University and the community they can direct students to specialized areas of expertise or particular facilities which might serve to further the students’ interests.

Resource Persons 1976-1977

J. M. Jamieson
L. Kendall
H. Miller
M. O'Brien
B. E. Wall

Year End Reviews

Students are encouraged to document the structure and pursuit of their studies as their programmes develop. They are required to report yearly to the programme on this development indicating the nature of their studies, resources used (personnel, facilities and materials) and to provide a critical evaluation of their educational year indicating particular achievements and difficulties. They are also encouraged to include examples of their work and evaluations by others.

Programmes of Study

The following are examples of some approaches to study interests:

Ray focussed his studies on drama as a system of education by drawing upon architecture, sociology, developmental psychology, philosophy of education, and theatre practice. He worked independently with advice from faculty in the drama department and the Ontario Institute for Studies in Education and a programme Resource Person. He has also taken regular drama courses in criticism and literature and, as a particular application of his concern to 'learn by doing', he has been the director of an alternative educational resource centre.
After travelling in Europe and working in a science laboratory in Toronto, Dale returned to the programme, where he had spent two years, to commence his degree studies concentrating primarily on Finnish culture, history and language. This led to a scholarship in Helsinki where he is continuing his studies.

While Elaine was concerned about social issues from the beginning of her programme, it was not until her second year that this interest gained a global perspective, particularly in terms of Third World countries. She then took courses in African history and environmental nutrition and undertook an independent study of foreign aid and development using the resources of the Global Community Centre.

Raphé’s studies in contemporary problems and theories in economics made use of the libraries of this University and of Wilfrid Laurier University, original government and industry ‘fact sheet’ publications, and courses in the department of economics. Three economics professors (one from Wilfrid Laurier) guided and evaluated his programme. He is currently in a graduate programme in business administration.

Ben’s time in the Faculty of Engineering provided the background for his programme studies of ice/water pollution. After graduation he was able to continue this interest through employment with the federal government.

Shirley found in her first year’s study of religion and philosophy that her interest in these subjects was often, in fact, an interest in language and communication. This realization prompted a revival of her interest in writing and literature. She organized an informal writers’ conference which was attended by writers, both aspiring and successful, by several publishers and by a variety of interested people from the K-W area. She has worked with the programme’s Resource People and has taken several literature courses. Shirley’s work in literature is largely directed by her interest in writing her own poetry and short stories.

David’s study of the science of music has taken him into such areas as systems design, psychology, computer science, and electrical engineering. He has taken courses, done a wide range of projects, prepared musical compositions and given public recitals. He has also attended conferences (presenting a paper at one of them) and gave a course of his own to the University community.

Other programmes have dealt with such areas as social and psychological theory, Canadian literature, government in the Caribbean, alternatives in education, philosophy of science, community based treatment Modalities, and microsystems design.

Degree Process

While some of the student programmes last only a year or two (this is an excellent opportunity to explore a particular but limited interest), an increasing number of students work towards a bachelor’s degree.

While students may take and receive grades for regular University courses, the degree awarded through this programme is not based on the accumulation of course credits but on the evidence of competence achieved. The Bachelor of Independent Studies (B.I.S.) degree is at least equivalent to a regular general baccalaureate degree. However, it is neither a three year nor a four year degree. Each degree programme is evaluated on its own merits.

Students who desire the degree and are ready for senior undergraduate work, present a written application to the Academic Board for Integrated Studies documenting their level of achievement and their plans for their final degree period. The Board, consisting of faculty members of the University appointed by Senate, interviews the applicants to determine their preparedness for degree candidacy. Accepted degree candidates then work under appointed supervisors (two of whom must be members of this University’s faculty) for a minimum of two academic terms. During this time the candidates are required to present tangible evidence of their educational development to assist the supervisors with the evaluation of their total baccalaureate programmes. 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.

Academic Board for Integrated Studies

T. L. Batke (Chemical Engineering & Philosophy)
Chairperson
M. Breidenbaugh (Psychology)
T. E. Bunting (Geography)
S. K. Johannesen (History)
S. M. Smith (Biology)
D. M. R. Taplin (Mechanical Engineering)

After Graduation

The responsibility students in this programme must assume for the pursuit of their studies ensures that graduates will possess a high level of organizational skills, self discipline and motivation combined with their attested educational development. These capabilities have prepared them well for further endeavours. Graduates of Integrated Studies have gone on to teachers college, graduate study, employment with the government and business and, as would be expected, a variety of other unconventional opportunities.
Admission Requirements

Students applying to the programme are required to complete the appropriate formal application form (See Chapter 2 of this calendar), and submit academic transcripts from previous educational institutions. In addition, they must provide an autobiographical letter indicating:
1) their previous learning experience,
2) their reasons for wishing to enter Integrated Studies, and
3) an indication of the type of exploration proposed.

Candidates are also encouraged to submit letters of reference assessing their ability to pursue their proposed programmes.

All applicants residing within a reasonable distance of the University are then interviewed by the Admissions Committee consisting of students and programme staff. Decisions on the remaining applicants are made solely on the submitted material.

While general University standards are applicable to Integrated Studies, applicants who do not have a formal educational background but who do show aptitude for self direction and indicate an ability to flourish in an unstructured academic setting are given favourable consideration.

Those interested in this alternative approach to university education are urged to visit the programme to meet with the people currently involved in its operation. In addition, members of Integrated Studies would be happy to visit schools or groups of students to discuss the programme.

For further information J. E. Fauquier, Assistant Registrar, or T. W. Smyth, Co-ordinator.
Faculty of Mathematics

Math students demonstrate microprogramming system using toy cars
Faculty of Mathematics

Mathematics at the University of Waterloo was established as a separate faculty in 1967. General and Honours programmes in Mathematics had been offered through the Faculties of Arts and Science for a number of years and the continued growth and development of these programmes made it natural to unite them under one faculty. At the same time, this unification has led to greater flexibility in the choice of overall programmes.

The Faculty of Mathematics is a close association of the departments of Applied Mathematics, Combinatorics and Optimization, Computer Science, Pure Mathematics, and Statistics. Students may specialize in General and Honours programmes in various areas within these departments and may obtain the degree of Bachelor of Mathematics (B.Math) upon successful completion of a three-year Pass degree programme, a four-year General degree programme, or a four-year Honours degree programme.

The Faculty offers both regular and co-operative programmes in mathematics. The co-operative mathematics programmes, available to Honours and General students, involve re-arrangements in the scheduling of academic terms so as to permit considerable practical experience.

Applicants may also register for the regular programme (not the co-operative programme) through St. Jerome's College. St. Jerome's offers some of the courses leading to a B.Math degree in conjunction with the University.

The graduate school in the Faculty of Mathematics is very strong. Many graduate degrees are conferred each year and active research is carried on in many areas. For information concerning graduate programmes in Mathematics, please consult the University of Waterloo Graduate Studies Calendar.

Brochures
The Faculty of Mathematics publishes a brochure which is specifically designed for Ontario high school students. Copies of this are available in school guidance offices or on request from either the Associate Dean or Assistant Registrar, Faculty of Mathematics.

Applied Mathematics Department
Traditionally, Applied Mathematics has been almost synonymous with Mathematical Physics but times change and today Applied Mathematics, while retaining its interest in the physical sciences, is broadening its scope and is becoming concerned with the applications of mathematics to the social and biological sciences. To handle the types of problems that arise in these areas the Applied Mathematician requires two things: a firm background in mathematics with a mastery of techniques and an ability to understand a problem when that problem is stated in the language of biology, economics, engineering, chemistry, physics or business.

With these considerations in mind the Honours Applied Mathematics programme at Waterloo has been developed as follows: in the first two years the student follows essentially the same programme as every other student in the Faculty of Mathematics and acquires a basic mathematical background; in year three he is given some of the mathematical tools that will be indispensable - calculus of variations, tensor calculus and ordinary differential equations, and gets a firm grounding in mechanics and an introduction to partial differential equations. In his fourth year he is expected to choose some of the purely mathematical subjects such as partial differential equations, non-linear differential equations, Lebesgue integration and operator theory but equal emphasis is placed on the application of mathematics; for example, there is a one term course in continuum mechanics which is followed by either a course in elasticity or hydrodynamics or (we expect) aerodynamics; other courses are: statistical mechanics, quantum mechanics, general relativity theory, electromagnetic theory, control theory and differential geometry.

It is our belief that a graduate from this programme will be able to turn his hand to many things ranging from meteorology, oceanography, seismic exploration and supersonic flow to the problems of navigation in space, control problems, ecological population studies and the study of epidemics.


For those students who wish a strong emphasis on Physics, the Department offers the programme "Honours Applied Mathematics with Physics Minor."

Department of Combinatorics and Optimization
The Department of Combinatorics and Optimization is one of the principal centres for teaching and research in combinatorial mathematics, optimization theory and their applications. Combinatorial principles underlie many areas of pure and applied mathematics and statistics. It is a field of study with a long tradition, which has been thrust into prominence in recent years by the advent of the computer. In fact, the computer has proved an essential tool for much of combinatorial mathematics. Optimization is an area of operations research which has been developed in the post-war years to tackle large scale industrial and governmental problems such as resource allocation, cost analysis and planning. The department is equally concerned with theoretical studies and applied aspects of combinatorics and optimization. The fields of study include Graph Theory, Combinatorial Designs, Enumeration, Linear Programming, Nonlinear Programming, Matroid Theory and Polyhedra Theory.
Computer Science Department
The computational power made available by the electronic computer has revolutionized the approach taken in many areas toward problem solving and research. In recent years a knowledge of Computer Science has become a valuable asset for work in many fields.

In addition to providing the student with a strong core of Mathematics, the Computer Science programme gives him a solid foundation in programming languages, numerical methods, data structures, switching theory and machine architecture. Advanced students are offered courses in numerical analysis, scientific applications, operating systems, business systems analysis, simulation, automata theory, computability theory, formal languages, artificial intelligence, real-time computing, and data communications.

The student is also encouraged to take a series of courses in some other discipline to which he can apply his knowledge of Computer Science.

Upon completion of the Computer Science programme, the student is qualified to enter a rewarding career in the computing profession. In addition, he is well prepared to undertake graduate study in Computer Science.

Department of Pure Mathematics
Pure Mathematics is the study of mathematics both for its own sake and that of possible future applications. A mastery of fundamental areas of mathematics such as algebra, analysis and geometry is essential, not only to the further development of these subjects, but also to their application either to other basic sciences or to technology. Thus, in addition to those who are especially attracted to pure mathematics, the department’s programme is designed also for students who wish ultimately to apply their knowledge, but who would prefer to obtain a thorough understanding of mathematics before committing themselves to some particular area of application. Many of those pure mathematics graduates who do not become direct appliers of their mathematics enter the field of education, anywhere from the primary level to the most advanced research institute. Our objectives are based on the conviction that the ability to think clearly and precisely, and to continue educating oneself, are valuable in any field of endeavour.

The special interests of the department include: Functional Equations and their applications (e.g. to information theory, probability, mathematical psychology, nomography, engineering, science, social science); Algebra (group theory, representation theory, ring theory, lattice theory, universal algebra, linear and multilinear algebra); Analysis (generalized integrals, real and complex analysis, functional analysis); Geometry (algebraic topology, homotopy theory, combinatorial geometry, differential geometry); Logic and Foundations.

The following undergraduate courses are offered by the department. Note that some of the analysis and the differential geometry courses are offered in conjunction with the Applied Mathematics Department, some of the other geometry courses being offered in conjunction with the Combinatorics and Optimization Department.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Introductory</td>
<td>30</td>
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<tr>
<td>Algebra</td>
<td>341, 443, 444, 445, 446, 447, 464</td>
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<tr>
<td>Analysis</td>
<td>351, 352, 451, 452</td>
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<td>Topology</td>
<td>367, 467</td>
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<tr>
<td>Functional Equations</td>
<td>470</td>
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<tr>
<td>Number Theory</td>
<td>441</td>
</tr>
<tr>
<td>Logic and Foundations</td>
<td>430, 432</td>
</tr>
</tbody>
</table>

Department of Statistics
Statistics is the branch of modern applied mathematics which deals with the collection and analysis of data. Statistical methods are extensively used in Biology, Medicine, Health Sciences, Agriculture, Business, Economics, Engineering, and many other fields. Claims based on statistical arguments appear daily in the press, and it is difficult to assess these intelligently without some knowledge of statistical methods.

The statistician’s first job is to determine what numbers to collect, and how to collect them so that they will be without biases and distortion. These problems are dealt with in the Design of Experiments and Sample Surveys. Statistical Inference is concerned with inferring what the population is like on the basis of a small amount of data (the sample). The link between population and sample is provided by Probability Theory, which forms an important part of the Statistics curriculum. Often the purpose for collecting data is to assist in reaching a decision, and 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, and a good background in Computer Science is highly desirable.

The Department also offers courses and programmes in Actuarial Science, which is the application of mathematics and statistics to Financial Problems, with particular emphasis on Life Insurance and Employee Benefit Programmes. The courses offered provide theoretical preparation for the first five examinations of the Society of Actuaries, and include studies of such subject areas as Mathematics of Finance, Life Contingencies, Theory of Risks, and Demography.

Students can also gain valuable background knowledge in economics, finance, administration, and law by carefully selecting their electives.
Admission

General admission requirements and procedures are outlined in detail in Chapter 2. The following requirements relate specifically to programmes in the Faculty of Mathematics.

Applicants from Ontario Year 5
Applicants will normally include Relations and Functions, Calculus, and Algebra in their six Year 5 credits offered for admission. A minimum average of 60% is required for admission to the regular programme; a somewhat higher average is required for the co-operative programme.

Admission as an Adult Student
Any student who has been away from formal education for more than two years and who does not possess the minimum requirements for admission may apply as an adult student. The applicant should, however, have covered the material of the Ontario Year 5 mathematics courses, either through a local high school or through the Correspondence Branch of the Ontario Ministry of Education and should provide evidence of being able to profit from a mathematics programme. Each application will be considered on its own merits by the Admissions Committee (See also Part-time Studies).

Advanced Standing

1) Transfer Credits
Students transferring into the Faculty of Mathematics either from outside or from within the University of Waterloo will normally be given transfer credit for a course 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 taken in a section specifically designated for mathematics students.

A mark of 50-59% in a mathematics course equivalent to a course required for a B.Math degree could give the student exemption from that requirement but not a credit toward the degree.

A maximum of six transfer credits per academic year previously taken will normally be given.

2) Mathematics Average
Courses taken prior to a student's admission to the Faculty of Mathematics will not normally count in the student's subsequent Mathematics Average. However, if the student were registered in a Joint Honours Mathematics programme in another University of Waterloo Faculty, the subsequent average would include all courses that would have been acceptable for credit for a student registered in the Faculty of Mathematics.

3) Co-operative Programmes
It is normally not possible to transfer into a co-operative programme beyond the second-year level. Students applying for transfer at the second-year level must have credit in courses equivalent to the first-year Calculus, Algebra, and Computer Science required of University of Waterloo mathematics students. Past experience has indicated that very few places in the co-operative programmes are available at the second-year level for students applying from other institutions. Applicants in this category who cannot be admitted to a co-operative programme will be considered automatically for the regular programme.

Part-Time Studies
Students wishing to work toward a degree in Mathematics on a part-time basis must meet the regular admission requirements.

Applicants who do not meet these requirements may be admitted as non-degree, part-time students at the discretion of the Admissions Committee. After completing the equivalent of two full Mathematics courses, they may apply for degree candidacy. If regular admission is granted, any credits earned as a non-degree, part-time student will count towards B.Math degree requirements.

The B.Math Pass degree may be obtained entirely by part-time studies. The B.Math General degree requires at least two terms on campus; the B.Math Honours degree requires at least four terms on campus.

Mathematics courses are not normally offered in the evenings or on Saturdays, although a reasonable cross-section of elective courses is available in the evenings, particularly during the Fall/Winter sessions. Many part-time students take courses via University of Waterloo Correspondence Programme. (See page 00 for more details of this programme; a separate brochure is available.)

Fees, Financial Assistance
See Chapters 3 and 4.

Standings and Promotions

Degrees
The Faculty of Mathematics offers several programmes leading to the following degrees: Bachelor of Mathematics (Pass), Bachelor of Mathematics (General) and Bachelor of Mathematics (Honours); details of these programmes appear in a later section. The student who wants a modest amount of mathematics and an approximately even balance between mathematics and non-mathematics courses will usually choose the Pass programme, the student who wants a wider coverage of mathematics but does not intend to be a specialist will normally elect the General programme while the person who wishes to concentrate on mathematics and possibly go on to graduate school will require an Honours degree.
Degree Requirements
A summary of the various degree requirements is presented in the following table.

<table>
<thead>
<tr>
<th></th>
<th>Pass</th>
<th>General</th>
<th>Honours</th>
<th>Honours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum total credits</td>
<td>16</td>
<td>21</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>Minimum math credits</td>
<td>6</td>
<td>12</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>Minimum elective credits</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Minimum math average</td>
<td>60%</td>
<td>60%</td>
<td>70%</td>
<td>70%</td>
</tr>
<tr>
<td>Credits in math average</td>
<td>6</td>
<td>12</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>Maximum full course attempts (or equivalent)</td>
<td>22</td>
<td>27</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Maximum full course failures (or equivalent)</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Complete terms required</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

Footnotes
1 A full-course refers to a two-term (or eight month) course. One credit is awarded for successful completion of a full-course. A half-course refers to a one-term (or four month) course. A half-credit is awarded for successful completion of a half-course. Two half-courses, not necessarily in the same subject, constitute the equivalent of a full-course.

2 Included in the category of math credits are courses with abbreviations AM (Applied Math), CO (Combinatorics and Optimization), CS (Computer Science), Math (faculty non-departmental courses), PMath (Pure Math) and Stat (Statistics, including Actuarial Science). Note that students transferring from other post-secondary institutions require at least 6 U. of W. Math credits.

3 Elective courses are normally non-mathematics courses. MTHEL courses are also offered by the Math faculty as electives for math students.

4 All Faculty and Departmental courses required for a particular degree will be included in the Math Average. For Honours programmes requiring more than 15 Math credits (e.g. Double Honours), all such credits will be included in the Math Average. For Honours programmes which require fewer than 15 Math credits (e.g. the Co-op Chartered Accountancy, Management Accounting and Business Administration options require only 14 Math credits; Honours Applied Mathematics with Physics Minor requires 14.5 credits), only those required credits will be included in the average.

5 There are two deadline dates each term, one for adding courses (this includes changing sections) and a second for dropping courses. The last day to add a course is 2 weeks after the official beginning of lectures. The last day to drop a course is 6 weeks after the official beginning of lectures in the term the course terminates.

6 A full-course attempt refers to a full-course registration not formally cancelled with the Registrar's Office before the drop deadline in the second term of the course.

7 A half-course attempt refers to a half-course registration not formally cancelled with the Registrar's Office before the drop deadline in the term in which the course is taken. Further, if a full-course registration is cancelled after the drop deadline in the first term of the course but before the drop deadline in the second term of the course, the course will be recorded as a half-course attempt.

8 A full-course attempt (half course attempt) not successfully completed constitutes a full-course failure (half-course failure). In particular, a full-course registration cancelled between drop deadlines (see 6 above) constitutes an unsuccessful completed half-course attempt, hence a half-course failure.

9 A complete term is normally one in which a student successfully completes at least five half-courses, two of which must be Mathematics courses. For purposes of satisfying the requirements for a complete term, each term of a full-course will be regarded as a successfully completed half-course, provided the student successfully completes the full-course.

10 The Joint Honours column refers to Joint Honours Programmes with other Faculties (e.g. Math and Psychology, Math and Economics, etc.). In addition to meeting Math Average requirements, students in these programmes must also satisfy Honours average requirements specified by the other department.

1) Examining Body
The Faculty constitutes the examining body for all examinations. All examination results are considered by the Faculty Committee on Standings and Promotions, subsequently by the Faculty Council, and then issued to individual students by the Registrar.
2) Year Classification
For convenience, all students will be classified by year on the basis of the number, N, of successfully completed credits, according to the following scheme:

<table>
<thead>
<tr>
<th>Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>First year</td>
<td>0 ≤ N &lt; 5</td>
</tr>
<tr>
<td>Second year</td>
<td>5 ≤ N &lt; 10</td>
</tr>
<tr>
<td>Third year</td>
<td>10 ≤ N &lt; 16</td>
</tr>
<tr>
<td>Fourth year</td>
<td>16 ≤ N</td>
</tr>
</tbody>
</table>

3) Grade Designations
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), NCR (No 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.

4) Part-time/Full-time
A student on part-time status may register for at most two courses per term and fees are assessed on a per-course basis. A student registering for more than two courses is considered a full-time student and charged a fixed full-time fee which is independent of the number of courses he/she is taking.

Students in the regular programme normally take courses during the fall and winter terms. However, they may also take courses on a part-time or full-time basis during the Spring (May-August) or Summer (July-August) terms. A full-time load during Summer School is two full credits, although students are advised in most instances to limit themselves to at most one math credit during this six-week period. Most mathematics courses offered during Summer School are on a Correspondence basis.

If a student plans to be part-time in the fall term and full-time in the winter term, or vice versa, he/she should discuss the situation with a faculty advisor before pre-registering for either term. If this kind of case is not handled properly, numerous complications can arise.

5) Course Upgrading
If a student is pursuing a Pass or General degree and takes the General version of a course instead of the Honours version (e.g. Math's 220a/b instead of 230a/b in 2nd year), but at a later date decides that he/she wishes to pursue an Honours degree, he/she may petition the Standings & Promotions Committee for special consideration. In the past, in a few rare instances where the academic record of the student in question was of very high calibre, the Committee has permitted the student to count the General course toward an Honours degree. In other cases, the Committee may permit the student to write a special final examination in the Honours course without submitting all the written work normally required during the term. In such cases the grade obtained will be treated in the same manner as if the student had registered in the course and obtained that final mark.

The above does not pertain to Math's 120a/b and 124a/b. Special provisions have been made for these courses. A grade of 80% or higher in one of the General courses may be substituted as the equivalent of the corresponding Honours level course in fulfillment of the Honours degree requirements. This provision exists only for first-year courses and does not extend into upper years. It is intended to allow a very good student who has chosen the Pass or General programmes in year 1 to make a change in programme and continue into second year Honours.

Students admitted from Ontario Year 5 with a Mathematics average less than 75% and/or overall average less than 70% are strongly advised to take Math’s 120a/b and 124a/b.

6) Honours/General Equivalents
A student pursuing a Pass or General degree may substitute the Honours level equivalent course(s) for any required General level math course(s).

7) No Credit/Overlap Courses
Some courses offered by other faculties have considerable mathematical content. These courses typically fall into two categories, those for which no Math student may obtain credit under any circumstances and those for which a student might obtain credit provided he/she does not enrol in the overlapping course(s) offered by the Math Faculty. There are also overlapping Math courses. Lists of all such courses are available at pre-registration times. All undergraduate advisors also have copies for perusal. It is the student’s responsibility to determine whether any of his/her courses fall into these categories.

8) Maximum Course Load
No student may pre-register for more than 6 courses per term. Students in years 3 and 4 may add additional courses, to a maximum of 8, during the two-week course-change period at the beginning of term. However, students in years 1 and 2 must have an academic record of sufficiently high calibre to take more than 6 courses. For new students in year 1, addition of extra courses in the first term will normally be restricted to students with admission averages both at least 80%. For current students in years 1 and 2, addition of extra courses will normally be restricted to students with both overall and math averages at least 75% during the student’s most recent complete term. In cases where the student was registered in more than 6 courses in the previous term and had both averages at least 70% in those courses, he/she will be permitted to register in the same number of courses in the subsequent term. In all cases a student’s “year” will be determined by the number of credits achieved to date according to the current scheme.
9) Letters of Permission
Students in good academic standing are normally permitted to take elective courses at other universities on a part-time basis (e.g., summer school or co-op work term) to count as credits toward a Bachelor of Mathematics degree at Waterloo. However, only under very special circumstances will full-time math students be permitted to take mathematics courses at other institutions to count toward their Waterloo degree requirements. Students wishing to take courses at other universities may apply to the Standings & Promotions Committee for permission by contacting the Assistant Registrar for the Faculty of Mathematics. Please note that permission must be obtained in advance of taking the course. The Committee will not normally approve a course taken elsewhere for Waterloo degree credit if prior approval was not obtained. All courses taken on “letters of permission” at other institutions will be treated as if they had been taken at Waterloo (for Standings and Promotions purposes).

Care should be exercised in the selection of courses to be taken on a letter of permission to ensure that the student does not duplicate any work he/she has already taken or 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 fully accountable for it. It will be his/her responsibility to ensure that an official transcript is sent to the Registrar’s Office within two months of the completion of the course. Otherwise, a grade of NMR (which counts as a failure) will be automatically submitted. Any changes a student wishes to make to an authorized letter of permission must be approved by the Standings & Promotions Committee. The Faculty strongly recommends that students attempt at most one full course in any intensive study programme (e.g., six weeks).

10) Grade Appeals
Any student wishing to appeal a mark must do so by contacting the Assistant Registrar for Mathematics within one month of the official announcement of the grade. There will be a charge of $5.00 per grade appealed, to be refunded if the mark is raised. Please note, however, that a mark may be lowered if a re-examination of the student’s situation in response to a mark appeal leads to the discovery of an earlier error in favour of the student.

11) 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 again (and this will be the case if the course is required for the degree being sought) or replace it by another course. The failed course remains a permanent part of the student’s record at the university, regardless of whether he/she passes the same course on a subsequent attempt, and it is included in course-attempt and failure counts. However, the failing grade will not be included in the Math Average required for the degree in question.

Note that supplemental examination are not available for students in the Math Faculty.

12) Repeated Courses
A student may not normally retake a passed course more than once in an attempt to improve the grade. Both attempts will be included in the student’s quota of course attempts, but the course will be included only once in credit counts and may be counted at most once in the Math Average pertaining to the degree requirements.

13) Exceeding Maximum Course Attempts/Failures
A student who, at the end of a specific term, has accumulated all the requirements for a particular degree, but has simultaneously exceeded the maximum number of failures or course attempts permitted for the degree in question, will not normally be granted the degree. In some cases, depending upon the circumstances, the student might be eligible for a lesser degree. In other instances, however, it is quite possible that the student would be required to withdraw from the Faculty with no degree.

14) Illness or Incapacity
Students missing academic work or examinations for medical or other special reasons should so inform their instructors and provide official documentation to the Assistant Registrar for Mathematics as soon as possible. In cases where extra consideration is deemed warranted, special arrangements can normally be made with the instructors in question.

15) Voluntary Withdrawal
A student may withdraw from the University as late as the last official day of lectures without being held responsible for that term’s courses. Otherwise, any course in which a student is registered after the drop deadline for that term will normally result in grades which form a permanent part of the student’s record at the University. Failure to write a required final examination in a course in which a student is officially registered, or failure to complete such a course for some other reason, will normally 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.

16) Required Withdrawal from Co-op
A student in a co-operative mathematics programme who fails 2 or more full-courses (or the equivalent) over a period of two successive academic terms may be required to transfer from the co-operative to the regular programme. Continuation in the co-operative programme is also contingent upon satisfactory performance on work terms.
17) Required Withdrawal from Honours
When an Honours student has exceeded 4 failures, he/she will be required to withdraw from the Honours programme. In those cases where the student has not fallen into one of the categories warranting required withdrawal from the Faculty (see (18) below), he/she will still be eligible to pursue a Pass or General degree. In such instances, however, the student will not normally be permitted to take an Honours level course when there is a General level equivalent course available.

18) Required Withdrawal from Mathematics
A student will normally be required to withdraw from the Math Faculty if he/she is in one or more of the following categories:

A) exceeded 5 full course failures (or equivalent)
B) by the end of the first term in which the student has accumulated 22 or more full course attempts (or equivalent), failed to achieve an average of 60% on six distinct Math credits, including those required for the Pass Degree (i.e. first year Algebra, Calculus and Computer Science)
C) is unlikely to profit from further study in the Math Faculty (in the opinion of the Standings & Promotions Committee).

A student who has been required to withdraw from the Math Faculty will not normally be readmitted to a degree programme in Mathematics at any point in the future.

19) Intent to Graduate
Under the Math Faculty’s credit system and degree requirements, the onus will be on the student to be aware of the various regulations pertaining to his/her programme of study. When the student has satisfied the requirements for a particular degree, it will be his/her responsibility to submit an “Intent to Graduate” form at the Registrar’s Office.

20) Exceptional Cases
All of the degree requirements described in this section apply except under “exceptional” circumstances. The Faculty Standings & Promotions Committee is the only authorized body which can approve exceptions to normal degree requirements.

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Mathematics
Academic Programmes

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Academic Programmes

General Remarks
In addition to the Pass, General and Honours programmes in which regular students enrol there are special co-operative programmes (Teaching Option, Chartered Accountancy, Management Accounting and Business Administration Options) which are available in both General and Honours versions; for details see pp. 169. Furthermore, double and joint honours programmes with other Faculties are possible; for details see pp. 168.

A first year student will be registered in one of the above-mentioned programmes but is not thereby irrevocably committed; in subsequent years it is quite possible to move from one programme to another provided that the prerequisites of the new programme are met.

The first year programme is such that the student can transfer to other Faculties in the second year if he has chosen his electives judiciously.

In the first two years students are not associated with any department but at the beginning of the third year Honours students must select the department in which they intend to do their major work; Pass and General students may associate themselves with a department—a procedure that allows them to turn to the departmental undergraduate officer for advice but does not subject them to departmental regulations.

Three Year Pass Programme
Required courses: Math 124a/b; 120a/b; CS 116/117 or two of CS 140, CS 150, CS 180, CS 240.

Four Year General Programme
Required courses: Math 124a/b; Math 120a/b; two of CS 140, CS 150, CS 180, CS 240; Math 220a/b; Math 221a/b; Math 321a/b; Math 322b; one of Math 322a, CS 370, CS 371.

*These requirements do not apply to the Co-op Chartered Accountancy, Business Administration or Management Accounting Options: for details see p. 169.
Students interested in the following areas are encouraged to take any or all of the courses listed:

**Actuarial Science**
- Stat 273, 284, 284, 220/221, 373, 374, 383, 384, 474, 475, 476, 480, 485, 486.

**Computer Science**
- CS 140, 150, 180, 240, 370, 371, 330, 331, 340, 342, 360, 369, 446, 450, 454, 482, 484.

**Combinatorics and Optimization**
- Stat 220/221, C&O 239a/b, 249b, 351a/b, 352a/b, 353a, 360a/b, Math 380a/b, C&O 437a/b, 438a/b, 450a/b—through 460a/b.

**Pure Mathematics**

**Statistics**
- Stat 220/221, 330, 331, 332, 430/431.

**Four Year Honours Programmes**

**Required (core)**
- courses: Math 130a/b; Math 134a/b; two of CS 140, CS 150, CS 180, CS 240; Math 230a/b; Math 231a/b; Stat 230/231; Math 331a/b or P Math 341; Math 332b or P Math 352; one of Math 332a, P Math 351, CS 370, CS 371, CS 472, CS 474.

*These requirements do not apply to the Computer Science Programme or to the Chartered Accountancy, Business Administration or Management Accounting Options: for details see p. 167 and p. 169.

**Applied Mathematics**

Core requirements and at least four credits from departmental third and fourth year courses; at least one credit must be at the 400 level. AM 260, AM 270 are recommended courses.


**Combinatorics and Optimization**

Core requirements and an additional six credits in third and fourth year Mathematics including at least three fourth year credits. Courses taken must include two of: C&O 351a/b; 352a/b; 353a; 360a/b; and at least four of: C&O 437a/b; 438a/b; 446a/b—through 460a/b; at least one credit from other departments in the Faculty at the three-hundred or four-hundred level. Recommended courses from other departments include: CS 370, 371; CS 390, 331; CS 360; P Math 361, 362 or 363; P Math 367; Math 380a/b; P Math 441; P Math 430.

**Computer Science**

The following portion of the faculty core requirements: Math 130a/b, Math 134a/b, Math 230a/b, Math 231a/b, Stat 230/231, CS 140, CS 150, CS 240. Computer Science departmental core requirements: CS 340, 342, 360, 369, 370, 371. In addition to the above, a student must take four more Computer Science term courses at the fourth year level, and at least five term courses chosen from the following list (Math 331a must be included): Math 331a/b (or P Math 341), Math 332a (or P Math 351), Math 332b (or P Math 352), Stat 340, Stat 341, AM 381, AM 391, C&O 351a/b, P Math 340 (or P Math 342), or any fourth year (non Computer Science) term course for which one of these or the departmental core term courses are explicit prerequisites.

**Pure Mathematics**

Core requirements including P Math 341, 351, 352; also P Math 367 and four 400 level mathematics credits, at least two of which must be in Pure Mathematics. Not all of P Math 341, 351, 352, 367 need be taken in third year.

**Statistics**

Core requirements and Stat 340/341, 350/351, 450, 451, 452, 454. At least 3 mathematics credits at the 400 level and a total of 8 at the 300 or 400 level are required.

**Actuarial Science**

Core requirements and Stat 273, 284, 374, 304, 475, 405; two half courses from Stat 373, 383, 474, 476, 480, 486. At least 4 mathematics credits at the 400 level and a total of 8 at the 300 or 400 level are required.

**Double Honours Programmes within the Faculty of Mathematics**

A student who has satisfied the requirements for any two of the above honours programmes may elect to have both areas named on his degree.

**Joint Honours Programmes within the Faculty of Mathematics**

In the following programmes, students must satisfy all requirements of the honours programme in the first-named subject.

**Actuarial Science and Computer Science**

Computer Science requirements are CS 140, 240, 370/371, 330/331. In exceptional circumstances, these courses may be replaced by other upper-level half courses in Computer Science.

**Computer Science and Statistics**

Statistics requirements are at least four half-courses in Probability and Statistics at the third or fourth year levels, including Stat 331 or 351, Stat 332 or 454, Stat 430 or 452.

**Statistics and Computer Science**

Computer Science requirements are CS 140, 150, 240, 446, 370/371; an additional half course in Computer Science at the third or fourth year level.
Joint Honours Programmes with other Faculties

Joint Honours leading to a degree in Mathematics

Mathematics and Economics
Mathematics and French
Mathematics and Geography
Mathematics and German
Mathematics and Philosophy
Mathematics and Psychology
Mathematics and Russian
Mathematics and Sociology

Students may take these programmes in either faculty during Years 1 and 2. At the beginning of Year 3 they must register in the appropriate department in Arts or Environmental Studies, and have their programmes approved by that department.

The Mathematics requirements are:

Mathematics 124a/b, 120a/b, 220a/b, 221a/b; at least three additional credits (six one-term courses) in Mathematics at the 100 level or above (which would be acceptable toward a B.Math. degree). Students wishing to specialize in one area of mathematics should consult the undergraduate officer of the appropriate department in the Faculty of Mathematics for advice in selecting their mathematics courses.

Co-operative Mathematics Programmes

For general information on the co-operative programmes, please read Chapter 5 of this calendar. It should be noted that students enrolled in the Chartered Accountancy Option are required to write one formal work report in their first work term. Experience in writing this work report provides the student with a firm grounding in communication skills which form an integral part of a practicing chartered accountant’s responsibilities. For students in the Teaching Option, which has three work terms, three work reports are expected. All students should carefully read the Handbook for Students in Co-operative Mathematics Programmes, as provided by the Department of Co-ordination.

The academic requirements in the co-operative programmes in Actuarial Science, Computer Science, Optimization, and Statistics, are identical with those outlined under the corresponding regular programme. In this section we outline the requirements for certain special options.

Applied Mathematics

(with elective courses from the Faculty of Engineering)

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Math 134a/b, 130a/b, CS 140/150</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Phys 121/122, two electives</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2</th>
<th>Math 231a/b, 230a/b, Stat 230/231, AM 260/270</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 course each term from options A, B, or C</td>
</tr>
<tr>
<td></td>
<td>1 non-math elective credit (could be from A, B, or C)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3</th>
<th>Math 332b, AM 381/391</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Five one-half math courses from AM 330/340, AM 365/371, CS 370/371, Math 332a, 331a</td>
</tr>
<tr>
<td></td>
<td>One course each term from options A, B, or C</td>
</tr>
<tr>
<td></td>
<td>One non-math elective credit (could be from A, B, or C)</td>
</tr>
</tbody>
</table>
Year 4
Three math credits to be selected from: AM 430/440, AM 461, AM 466/476, AM 481, AM 485, AM 382/395, AM 478
One course each term from options A, B, or C
One non-math elective credit (could be from A, B, or C)
One additional credit (math or elective)

Option A
ME 19, 20, Civ E 303, 304, ME 527 and/or ME 525
One or more of Civ E 518, 522, 526, or ME 626

Option B
Sy De 281, 252, Sy De 351 and/or Sy De 353, Sy De 382 and/or Sy De 352
One or more of Sy De 421, 451, 452, 454, 456, 463

Option C
ME 19, 50, 51
One or more of ME 53, 54, 62, 69
One or more ME courses in Heat Transfer, Fluid Mechanics and/or Combustion, Environment Fluid Mechanics

Business Administration Option

<table>
<thead>
<tr>
<th>Honours Programme</th>
<th>General Programme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td></td>
</tr>
<tr>
<td>Math 130a/b, 134a/b</td>
<td>Math 120a/b, 124a/b</td>
</tr>
<tr>
<td>CS 140, 180</td>
<td>CS 140, 180</td>
</tr>
<tr>
<td>Econ 101, 102, 191, 192</td>
<td>Econ 101, 102, 191, 192</td>
</tr>
<tr>
<td>Bus 111, 121</td>
<td>Bus 111, 121</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 2</td>
<td></td>
</tr>
<tr>
<td>Math 230a/b, 231a/b</td>
<td>Math 220a/b, 221a/b</td>
</tr>
<tr>
<td>Stat 230, 231</td>
<td>Stat 220, 221</td>
</tr>
<tr>
<td>Two of CS 150, Stat 270 &amp; C &amp; O 239b</td>
<td>One elective credit</td>
</tr>
<tr>
<td>Bus 352, 362</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 3</td>
<td></td>
</tr>
<tr>
<td>†CS 330, 331</td>
<td>Three math credits (honours required courses are)</td>
</tr>
<tr>
<td>†Stat 331 and 332 or 330</td>
<td></td>
</tr>
<tr>
<td>†C &amp; O: two of 352a/b, 353a, 450a/b, 455a/b, 456a</td>
<td>Business 388, 398, One elective credit</td>
</tr>
<tr>
<td>Business 388, 398</td>
<td></td>
</tr>
<tr>
<td>One math credit††</td>
<td></td>
</tr>
<tr>
<td>One elective credit</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 4</td>
<td></td>
</tr>
<tr>
<td>Three math credits††</td>
<td>Three math credits††</td>
</tr>
<tr>
<td>Bus 481, 491</td>
<td>Bus 481, 491</td>
</tr>
<tr>
<td>Two elective credits</td>
<td>One elective credit</td>
</tr>
</tbody>
</table>

Notes
1) †These three credits constitute the core requirements for this option. One of these credits may be delayed to Year 4 and certain substitutions can be made with special permission.
2) ††Recommended courses are:
Comb. & Opt.: C & O 451a/b, 452a/b, 453a, 454a/b
Comp. Sci: CS 240, 370, 371, 484
Statistics: Stat 340, 430, 440, 442
Actuarial Science: Stat 373, 383, 384, 387, 475, 485, 476, 480
3) At least six 300 or 400 level credits must be included in the honours programme with at least two credits at the 400 level.

Chartered Accountancy Option
It is possible for students enrolled in the co-operative Mathematics programme to choose their non-mathematics elective courses in such a manner that they may be able to write their final Chartered Accountancy examination within a few months of graduation. This programme is offered in co-operation with the Institute of Chartered Accountants of Ontario. The option involves a single stream co-operative programme; students go on their first work term in January.
Notes
1) These three credits constitute the core requirements for this option. One of these credits may be delayed to Year 4 and certain substitutions can be made with special permission.
2) Recommended courses are:
   - Comb. & Opt.: C & O 451a/b, 452a/b, 453a, 454a/b
   - Comp. Sci.: CS 240, 370, 371, 482, 484
   - Statistics: Stat 340, 430, 440, 442
   - Actuarial Science: Stat 373, 383, 374, 475, 485, 476, 480
3) At least six 300 or 400 level credits must be included in the honors programme with at least two credits at the 400 level.

Management Accounting Option
This option is designed to prepare students for a career in Management Accounting. The programme, created in association with the Society of Industrial Accountants, leads to qualification for the designation R.I.A. (Registered Industrial Accountant). Graduates of the programme can qualify for 12 R.I.A. exam exemptions and may, while still undergraduates, also write 3 R.I.A. Uniform National Examinations.

Teaching Option
The co-operative Mathematics Teaching Option is a uniquely integrated programme involving the Faculty of Mathematics and the Faculty of Education of the University of Western Ontario. This programme combines academic work, experience in secondary schools, and professional training, with the graduate fully qualified as a secondary school mathematics teacher.

Students interested in the programme will enrol in the regular programme in Year 1, and are admitted to the co-operative programme in Year 2 on the basis of good academic work and success in an interview process.

There are various recommended courses which are of special interest to persons interested in a career in teaching. A selection of these may be made in consultation with the academic advisor as the student progresses.

Work term arrangements in this option differ from other co-operative programmes because of the nature of the programme. Details concerning this and the Faculty of Education components are outlined in a separate brochure available upon request.

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### Honors Programme

<table>
<thead>
<tr>
<th>Year</th>
<th>Course 1</th>
<th>Course 2</th>
<th>Course 3</th>
<th>Course 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Math 130a/b, 134a/b</td>
<td>Two of CS 140, 150, 180</td>
<td>Three elective credits</td>
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</tr>
<tr>
<td>2</td>
<td>Math 230a/b, 231a/b</td>
<td>Stat 230, 231</td>
<td>MTHEL 206a</td>
<td>One math credit, one term elective</td>
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<tr>
<td>3</td>
<td>One of Math 322a, 330a/b</td>
<td>Two math credits</td>
<td>Phil 311, 312</td>
<td>One math credit, one term elective</td>
</tr>
<tr>
<td>4</td>
<td>Four math credits</td>
<td>Three math credits</td>
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<td></td>
</tr>
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### General Programme

<table>
<thead>
<tr>
<th>Year</th>
<th>Course 1</th>
<th>Course 2</th>
<th>Course 3</th>
<th>Course 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Math 120a/b, 124a/b</td>
<td>Two of CS 140, 150, 180</td>
<td>Three elective credits</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Math 220a/b, 221a/b</td>
<td>MTHEL 206a</td>
<td>Psych 241, 242</td>
<td>One math credit</td>
</tr>
<tr>
<td>3</td>
<td>Math 332b, 321a/b</td>
<td>Two math credits</td>
<td>Phil 311, 312</td>
<td>Soc 207G, one term elective</td>
</tr>
<tr>
<td>4</td>
<td>Three math credits</td>
<td>Two elective credits</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes
1) All students must complete five of Stat 270, C & O 239a, C & O 239b, C & O 249b, C & O 330, C & O 330b, C & O 446a, C & O 446b.
2) Honours students are required to complete at least seven 300 and 400 level credits with at least three credits at the 400 level.
3) All students must complete two full credits in Computer Science.
4) These two credits are required of all students in the co-operative Teaching option. Those students obtaining the B.Ed. degree from the Faculty of Education at Western must use these two credits as part of that degree's requirements. In this case, two additional credits must be taken for the B.Math degree; that is, honours students must complete 26 full year courses, or equivalent, at Waterloo, and general students must complete 23 full year courses, or equivalent.
Honours Statistics – Economics Option

Year 1
Math 134a/b; 130a/b; CS 140; CS 180 or 150.
Econ 101, 102
Two elective credits

Year 2
Math 230a/b; 231a/b; Stat 230/231
Two of AM 260, Stat 273, C & O 239a/b, CS 240
Econ 201, 202, 231, 311

Year 3
Math 331a/b; 332b; Stat 350/351
One of Math 332a; CS 472, 474
Two of CS 370, 371, C & O 352a/b
Four half courses in Economics, including 301, 302, 321

Year 4
At least four of Stat 340, 341, 450, 451, 452, 454
At least two additional half courses in Mathematics
(CS 330, 331 and 446 are recommended).
Econ 401, 402, 411, 413
Faculty of Science

Student at work in Biology Greenhouse
Faculty of Science

Introduction
The first students were enrolled in the Faculty of Science in the autumn of 1959. By the autumn of 1976 approximately 2,000 full-time students, of which 200 are graduate students, are taking programmes within the Faculty.

There are five teaching departments in the Faculty of Science: Biology, Chemistry, Earth Sciences, Physics and the School of Optometry. Extensive instruction is also given by members of the University's Faculties of Arts and Mathematics. Astronomy and Biophysics are taught in the Physics Department; Biochemistry is offered in the Chemistry Department; Botany, Microbiology and Zoology and certain courses embracing these fields together (e.g. Genetics, Cell Biology and Ecology) are taught in the Department of Biology. As of September 1976 a new programme specializing in Psychology is being offered. All the departments as well as the School of Optometry offer postgraduate programmes and research facilities and descriptions are published in a separate Graduate Calendar. In addition, courses are provided for students in five other faculties.

The School of Optometry offers a 4-year professional programme leading to the degree of Doctor of Optometry (O.D.). Further information appears on page 203.

Most Science students are enrolled on a full-time basis studying two terms in a conventional academic year. The Applied Physics and Applied Chemistry programmes are given exclusively on a co-operative basis with alternating terms of academic and industrial work; Refer to Chapter 5 for further information on the co-operative programmes.

The Associate Dean and Department Chairmen will be pleased to receive inquiries about the programmes in this Faculty.

Degrees
The degree of Bachelor of Science (B.Sc.) is awarded by the University on the successful completion of any of the undergraduate programmes involving Biology, Chemistry, Earth Sciences, Physics and Psychology which are discussed under Academic Programmes. The ordinary or pass-level B.Sc. will be awarded on completion of the General Science Programme in either the three or four-year option. The honours degree, B.Sc. (Honours), will be awarded on completion of any of the honours programmes. M.Sc. and Ph.D. degrees are discussed in the Graduate Calendar.

Admission
The admission requirements and procedures for all programmes are outlined in Chapter 2 of this Calendar. The following points emphasize some of the admission requirements which relate specifically to programmes in the Faculty of Science.

Applications from Ontario Year 5
Applicants must present the following Year 5 credits:
Two Science courses, one of which must be Physics or Chemistry. Both Physics and Chemistry are strongly recommended. Calculus and One of Functions & Relations or Algebra, preferably Functions & Relations.

Advanced Standing
Students applying to co-operative programmes in the Faculty of Science will not normally be admitted above the Year 2 Term B level.

Students within the University and from other Universities or accredited institutions desiring to transfer into the Faculty of Science will be given admission credits for relevant courses based on the grades obtained and the number of transfer credits permitted. See page 177 Transfer Students.

Admission as an Adult Student
It is recommended that applicants obtain standing in Ontario Year 5 (Grade 13) Mathematics and Science courses or their equivalent in order to have the proper background for first year University courses in these areas. To discuss admissibility and appropriate qualifying work, applicants are advised to contact the Assistant Registrar, Faculty of Science.

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 programmes.

Students should note that the Faculty of Science operates under a "course system" in which student progress is measured by courses successfully completed rather than by years. Students who have passed fewer than five courses will be considered Year 1 students; those with at least ten but fewer than fifteen, Year 3; and those with fifteen or more, Year 4; Year 5 students will exist only in the Optometry programme for those students in their graduating year.

1) Final Examinations
a) The faculty constitutes the examining body for all examinations. All examination results are considered by the Examinations and Standing Committee and subsequently by the Faculty Council. After the results have been considered by these bodies, they will be issued to individual students by the Registrar. Appeals against faculty decisions made under these regulations should be made in writing to the Registrar's Office within one month of the official announcement of term or year marks. Appeals launched later than two terms after the term in which the mark was obtained will not be considered.
b) Final examinations in one-term courses are held in December, April, or August. Final examinations for all full year courses are held in April, and cover the whole work of each course. The time normally allowed for each examination is three hours.

c) In all courses each student is required to submit, in such form and at such time as may be determined by the instructor, evidence of satisfactory participation in term work. The marks obtained for work during term are used, in part, in determining standing. The ratio in which marks for term work and written examinations are combined is at the discretion of the individual departments. To pass in a course, a student must obtain a minimum of 50% in the combined term and examination marks. At the discretion of the chairman, of the department concerned and of the Dean, a student may be barred from the final examination if the course requirements are not completed to the satisfaction of his instructor. Some courses and/or instructors may not require final examinations; in such cases term work only will be used in determining a final grade.

d) Failure to write an examination is considered a failure to pass. A student who defaults a final examination, except for a properly certified reason, shall have no make-up examination privileges and must repeat the work in class. If a student fails to write for health reasons, a Doctor's certificate, covering the precise period of absence, must be filed in the Registrar's Office within one week after the examination should have been written.

e) In cases where a course (failed or passed) is repeated, both marks will be used in calculating the student's cumulative overall average. If a passing grade is achieved more than once in the same course, it will still only count as one course passed towards the total necessary for graduation. Students in good standing will not normally repeat courses they have passed. No course may be repeated more than once.

f) In cases where more than one course or course-sequence contains the same or similar course content, credit will only be given in one.

g) All examinations which receive a failing grade are automatically re-read.

2) Standing

Marks in individual courses will be reported as numerical marks on the scale 0 to 100. A mark of 50 or better is necessary to pass and receive credit for a course. For Science students, the lowest mark to be recorded and averaged will be 32, equivalent to the weighting factor for the F on the common grading system.

Terminology

INC (either term work, lab work, examinations, etc., are incomplete).

AEG (agnorat-signifying the student's work or examination was incomplete for some acceptable reason (such as illness) and his instructor felt the student should receive credit for the course but a numerical mark could not be set).

CR (credit granted where performance was satisfactory but no specific mark is given and AEG is not applicable).

NCR (credit is not granted where performance was unsatisfactory but no specific mark is given).

DNW (final examination not written in a course that has not been dropped officially whether the course has been attended or not).

AEG or CR will count as a course passed towards the total necessary but will not count in the overall average. 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. Then, if the required courses and accumulated average are met, the student will be allowed to graduate.

Unless there are medical or other extenuating circumstances, a DNW will be weighted for averaging purposes as the lowest possible failing mark (32, equivalent to F- on the common grading system) in determining standing.

"Course" may refer to a lecture course, a laboratory course, or a lecture-laboratory course which includes both lecture and laboratory. A "Course-credit" refers to a lecture, or lecture-laboratory course which extends for one full academic year. A one-term lecture-course is given 0.5 of a "course-credit".

Laboratory courses designated by the letter L following the course number are generally one-term courses, and carry 0.25 of a "course-credit" for a 3 hr/week or alternate week laboratory and 0.50 of a course-credit for a 6 hr/week laboratory.

"Attempt" is a course completed, whether passed or failed or recorded as INC or DNW. Courses dropped before the official deadline are not considered as attempts and do not appear on the transcript.

Overall standing will be determined at the end of each year by the cumulative average of all courses taken while in the Faculty of Science (at any time, whether passed or failed).
General Programmes – 3 year General & 4 year General (Major)
To continue in the general programmes a full-time student carrying the normal 5 course load must maintain a cumulative average of 50% with a minimum of 3.0 course-credits obtained per academic year and no more than 2.0 failed. Failure to meet these requirements could result in a Conditional Standing or a requirement to withdraw. A Conditional Standing may be allowed the first time depending upon the circumstances.

In the 4 year programme a 60% cumulative average must be maintained in the major field of study.

Of the total 15 course-credits required in the 3 year General programme at least 14 must be lecture-course credits. No more than 21 attempts will be allowed.

Of the total course-credits required in the 4 year General programme (20.5 or greater) at least 19 must be lecture course-credits.

No more than 6 attempts over and above the number of course-credits required will be allowed.

Honours Programmes

Introduction
Admission to the Co-operative Applied Chemistry and Physics programmes is at Year 1 (see Chapter 2 for Admission Requirements). All other programmes begin at the Year 2 level, admission to which requires a 60% overall average as well as 60% or better in the field of specialization.

To be eligible for an Honours degree a student must have been enrolled in two out of three of Years 2, 3 and 4 of an Honours Programme, one of which must be Year 4.

Honours Science Programmes
(4 programmes, with specialization in Biology, Chemistry, Earth Sciences, or Physics; and a non-specialized programme).

A 60% cumulative overall average must be maintained in all programmes.

A 60% cumulative average must be maintained in all courses in the field of specialization.

A 60% cumulative average must be maintained in all Faculty of Science courses in the non-specialized programme.

A student who fails one of the course-credits in the field of specialization may be placed on probation in order to clear that requirement. Failure of more than one such course could result in requirement to withdraw from that programme.

In no programme will more than 2.0 failed course-credits be allowed per academic year and normally a minimum of 3.0 course-credits must be obtained.

Honours Programmes
Honours Biology – regular
Honours Biology and Chemistry – regular
Honours Chemistry – regular and co-operative applied
Honours Earth Sciences – regular and co-operative applied
Optometry – regular
Honours Physics – regular and co-operative applied
Honours Psychology – regular

In all programmes an overall cumulative average of 60% must be maintained with a cumulative average of at least 60% in the major field.

In the Optometry programme an overall 60% average as well as a 60% average in the courses of the major subject must be obtained each academic year.

In the Honours Psychology programme a cumulative average of 75% must be maintained in the Psychology courses and a cumulative average of 60% in the Faculty of Science courses.

In the Honours Biology programme any student who fails a Biology course during second or third year will not be permitted to continue in the programme unless reinstated by the department.

Note
Students required to withdraw from the Faculty of Science may be eligible to apply for re-admission only after one year's absence.

Co-operative Programme Evaluation: Students in co-operative programmes will be evaluated by the rules shown modified where necessary to suit their special needs. In particular:

1 Evaluation in Year 1 will be made at the end of term 1B on the entire year's work. Students must have a 60% average to proceed to term 2A. Those below this average may be transferred to the General programme (non-co-op) in good standing if possible or may be allowed to repeat the 1B term in Conditional Standing in order to remain in the co-op programme.

2 Upper year assessment will be made on a term by term basis. Beyond Year 1, the various programmes are mostly composed of one-term courses in which all marks are final. Depending on electives chosen there may be some mixture of term and full-year courses. Assessments made in terms of 2A and 3A will be on the basis of marks in all courses taken; for assessments in terms 2B and 3B, marks given for the second half of a full-year course will be the final mark for the course and will replace the A term mark for average purposes. Terms 4A and 4B will normally be assessed as a unit at the end of the 4B term when both terms are taken consecutively from September to April. Students from any co-operative
programme may be transferred to the General programme (non-co-op) if they are deemed to be making unsatisfactory progress towards their Honours degree. Normally a student may take no more than two upper year terms on a part-time or reduced programme 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 programmes.

The minimum number of related work terms required is normally four.

The minimum number of satisfactory work reports is normally four.

Make-up Examinations
Make-up examination privileges may be granted to students in good standing:

a) In a case where failure to pass is attributable to extraordinary circumstances, especially medical or health-related problems.

b) Only when such failed courses could not be repeated and when a student's progress could be unduly held up by lack of one prerequisite.

In all cases regarding make-up examinations the student must have satisfied all term work requirements in the course and must have the permission of the Examinations and Standings Committee (who must be satisfied the student has a fair chance to pass the examination – the student's overall University record may be used in making this assessment.) Regardless of standing, no student will be allowed make-up privileges if he or she has failed more than two full courses or their equivalent in a given year (except on medical grounds as in a).

Make-up examinations will be held in July for regular programmes. Applications for these examinations must be filed by the end of June on forms provided by the Office of the Registrar. In co-operative programmes, make-up examinations will be written in the term immediately following that in which the respective final examinations are written. Fees for make-up examinations must accompany the application. If the student decides not to write the examination the fee is not refunded.

Except in extraordinary circumstances (e.g. a above), when a make-up examination is passed, the course will count as a course passed toward the degree, but the mark obtained will not be counted in determining cumulative averages (i.e. the original mark will normally be the mark which counts).

Transfer Students
Students will be accepted for transfer from other Year 1 programmes in the University or from other universities. Their programmes will be evaluated in terms of the number of course credits allowed and the number remaining for a degree. Credits will normally be transferred without a cumulative average and only courses with a 60% or better mark.

Students will be accepted for transfer at other than the Year 1 level but will normally be required to complete at least the equivalent of two years' work while registered in the Faculty of Science (i.e. at least 10 full-year course-credits) regardless of the number of transfer credits they present.

Upgrading of B.Sc. Degree
A student who has graduated with a 3-year General degree from this University only, may successfully complete the requirements of the 4-year degree with an official major field designation and exchange the old diploma for a new one. Normally a student may not upgrade a General B.Sc. or its equivalent to a Waterloo Honours B.Sc. 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.

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.

Course and Programme Changes
a) Students may "add and drop" half courses during the first three weeks of the Fall, Winter and Spring terms upon having the appropriate change form completed.

b) Students may "add and drop" full-year courses during the first three weeks of the Fall term upon having the appropriate change form completed.

c) Courses may be dropped after the normal three weeks change period but not after November 1 or July 1 for Fall and Spring one-term courses or March 1 for Winter one-term or full-year courses. The permission of the instructor and the appropriate undergraduate officer or the Associate Dean must be obtained.
Academic Programmes

Students entering first year in the Faculty of Science are essentially enrolled in a common year. Year 1 co-operative Applied Chemistry and co-operative Applied Physics are labelled as such but all other students are officially in Year 1 regular Science. Year 1 regular Science students are not designated as Honours or General or according to any specific programme. (Students planning to enter co-operative Applied Earth Sciences in Year 2 should enrol in Year 1 regular Science.) Essentially the same courses are available to all first year students and any student may enter any Year 2 programme in Science provided he or she has taken the necessary courses in Year 1 and has achieved the necessary passing average; the only exception to this is in the Optometry programme where enrolment limitation may be necessary in Year 2.

First Year Programmes (Regular and Co-operative)
The normal minimum course load for a full-time student in Year 1 Science is 5.0 lecture courses, exclusive of laboratory credits. At least two of these courses must be Faculty of Science courses and students are encouraged to select an Arts elective (preferably English or Psychology). Only students whose secondary school Year 5 average was 70% or better may select 6 lecture-courses if they wish (recommended for students intending to take an Honours Physics programme). Courses should be chosen either with a specific Year 2 goal in mind or to cover many Year 2 programmes. The recommended Year 1 selections for various Year 2 Honours or General Science-Major programmes follow; in most cases the number of required courses is only two or three with up to two more recommended (but not compulsory). To enter a Year 2 programme a student must achieve the Year 1 average necessary and must have taken the required courses.

Reduced programme
Only in exceptional circumstances may an Honours programme be taken on a completely part-time or reduced programme basis; at least two of the upper three years must be taken on a full-time (full programme) basis and no student may spend more than 5 years of full-time study (or its equivalent) for an Honours degree. Only in exceptional circumstances may a first year programme for a full-time student be reduced below the 5 lecture-course minimum.

Type A Teaching Certification
Admission to the Type A Certification programme at the Ontario Colleges of Education requires the completion of a programme of at least twenty full-year University courses, including one or two specialist fields in which the student has obtained at least second class (honours) or equivalent standing. A programme of twenty courses and one specialist field must include at least nine full courses in the field. A programme of twenty courses and two specialist fields must include fourteen full-year courses in the two combined fields, with at least six in each field. Information regarding approved specialized fields can be obtained from the Ontario Ministry of Education.
<table>
<thead>
<tr>
<th>Major Field of Study</th>
<th>Required Courses in Year 1</th>
<th>Recommended Electives in Year 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>Biology 132, Chemistry 121-122 and 121L-122L</td>
<td>Physics 111-112, AM 101-111, Earth Sciences 130</td>
</tr>
<tr>
<td>Biology and Chemistry</td>
<td>Biology 132, Mathematics 113 Chemistry 121-122 and 121L-122L</td>
<td>A first-year Physics course</td>
</tr>
<tr>
<td>Chemistry</td>
<td>Chemistry 121-122 and 121L-122L, Mathematics 113</td>
<td>Biology 131 or 132, Earth Sciences 130, Environmental Studies 195 or a Computer Science course</td>
</tr>
<tr>
<td>Chemistry (Environmental Studies Option)</td>
<td>Chemistry 121-122 and 121L-122L, Mathematics, 113</td>
<td>A Computer Science course</td>
</tr>
<tr>
<td>Chemistry (Mathematics Option)</td>
<td>Chemistry 121-122 and 121L-122L, Mathematics 113</td>
<td>A full-year Algebra course, A Computer Science course</td>
</tr>
<tr>
<td>Chemistry (Physics Option)</td>
<td>Chemistry 121-122 and 121L-122L, Mathematics, 113, Physics 121-122 and 121L-122L or 162-163 and 162L-163L</td>
<td>A first-year Physics course, Mathematics 113</td>
</tr>
<tr>
<td>Earth Sciences (see Note 5)</td>
<td>Earth Sciences 130, Chemistry 121-122 and 121L-122L</td>
<td>Mathematics 113</td>
</tr>
<tr>
<td>Earth Sciences (Geography Option)</td>
<td>Earth Sciences 130, Chemistry 121-122 and 121L-122L Geography 102 and one of: Geography 101, 125R, 126R, 127 or Environmental Studies 195</td>
<td>Mathematics 111A-111B, Chemistry 121-122 and 121L-122L</td>
</tr>
<tr>
<td>Optometry (see Note 4 and page 203 for further details)</td>
<td>Mathematics 113, Biology 132, Physics 111-112 and 111L-112L, Psychology 101</td>
<td>Chemistry 121-122 and 121L-122L</td>
</tr>
<tr>
<td>Physics (see Note 1)</td>
<td>Mathematics 113, Physics 121-122 and 121L-122L or 162-163 and 162L-163L</td>
<td>Psychology 102</td>
</tr>
<tr>
<td>Psychology</td>
<td>Biology 132, Chemistry 121-122 and 121L-122L, Mathematics 113, Psychology 101-102</td>
<td>Mathematics 111A-111B, Chemistry 121-122 and 121L-122L</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Major Field of Study</th>
<th>Required Courses in Year 1</th>
<th>Recommended Electives in Year 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Chemistry (See Note 2)</td>
<td>Chemistry 121-122 and 121L-122L, Mathematics 113</td>
<td>Mathematics 113, 111A-111B, Chemistry 121-122 and 121L-122L</td>
</tr>
<tr>
<td>Applied Physics (See Notes 1 and 3)</td>
<td>Mathematics 113, Physics 121-122 and 121L-122L or 162-163 and 162L-163L</td>
<td>Mathematics 111A-111B, Chemistry 121-122 and 121L-122L</td>
</tr>
<tr>
<td>Applied Earth Sciences (See Notes 3 and 5)</td>
<td>Earth Sciences 130, Chemistry 121-122 and 121L-122L</td>
<td>A first-year Physics course, Mathematics 113</td>
</tr>
<tr>
<td>Applied Earth Sciences (Geotechnical Option) (See Note 3)</td>
<td>Earth Sciences 130, Mathematics 113, Physics 121-122 and 121L-122L, Chemistry 121-122 and 121L-122L, Computer Science 11B, One-term arts elective</td>
<td></td>
</tr>
</tbody>
</table>
Note 1
Students desiring the Biophysics option of the Honours Physics programme are advised to include Biology 131 in their programme.

Students wishing the Theoretical Physics option are advised to select Math 111a-111b, and a computing course.

Students desiring the geophysics option of the Honours Physics programme are advised to include Earth 130 and Chem 121-122 in Year 1.

Students wishing any of the Business Administration options are advised to select Econ 101-102.

Students wishing the elective programme with El E are advised to select Sy D 183 (Fall term) and CS 118 (Winter term).

Note 2
Students in the co-operative Applied Chemistry programme have two methods of taking Year 1: (i) two terms in a row (September-April) or (ii) fall term on campus (September-December), winter term at work (January-April) and spring term on campus (April-August). Since no first-year Biology or Earth Sciences courses are offered in the Spring term (April-August), only students who plan to take two terms in a row may elect these courses. Sci 100, a one-term introductory geology course, is available in the Fall term. Students completing term 1B in the spring must elect both Chem 121-122 and Phys 111-112. Phys 122 and 163 are not offered in the Spring term.

Note 3
All co-operative Applied Physics and Earth Sciences students take Year 1 as two terms in a row (see page 179).

Note 4
Students planning to apply for admission to Year 2 Optometry should note that a year of Chemistry is required for all students lacking a good Chemistry background in Ontario Year 5 or its equivalent—for these students Chem 111-112 is recommended rather than 121-122. Phys 121-122, 121L-122L or 162-163, 162L-163L may be taken instead of Phys 111-112, 111L-112L.

Note 5
Earth Science majors planning to enter the co-operative programme and desiring elective courses in Biology should take Biol 131 during their first year.

By the end of Year 2, students must have completed Phys 111-112 General Physics (or an equivalent physics course), Math 113 Calculus, and an introductory course in computer programming (for example CS 118, 180 or Gen E 121).

High School Teaching
The Ontario Ministry of Education has strongly recommended that all students who are preparing to teach science in High school should take at least one full-year course in Biology.

A brief discussion of the above courses and some other courses available for selection is given below. See Course Descriptions, Chapter 14 of this Calendar for more details.

Faculty of Science Courses
Introductory courses are offered in Biology, Chemistry, Earth Sciences and Physics. Courses from at least two of these areas must be elected. Although there are several first year courses available in Physics there is sufficient overlapping of material that only one of the full-year sequences may be chosen, i.e. only one of Phys 111-112, 121-122, 162-163 and only one of Chem 111-112 or 121-122.

Biology
Biology 130
Introduction to Biology. This course is the same as Biol 131 without the laboratory component. (For non-Biology Majors only).

Biology 131
Introduction to Biology. This course is the normal selection for those wishing a Biology elective in first year and who are not intending to major in Biology or to enter the School of Optometry. It is for all students whether or not Year 5 Biology was taken in secondary school. Biology was taken in secondary school.

Biology 132
Principles of Biology. This course is for those wishing to major in Biology or to enter the School of Optometry. It is for all such students whether or not Year 5 Biology was taken in secondary school.

Earth Sciences
Earth Sciences 130
Introductory Geology. This course is an ideal elective for first year students who are not familiar with this area. It is not necessary to have a Geography or other specific high school background for this course. Students with potential interest in Geology, Geochemistry, or Geophysics should select this course.

Chemistry
Chemistry 121-122
Chemical Structure 121 and Chemical Reaction 122 (with the associated laboratories, 121L-122L) are the normal selection for those wishing to major in Chemistry, or those electing a first year Chemistry course.
Chemistry 111-112
For students without Ontario Year 5 Chemistry (or its equivalent) the General Chemistry courses 111 and 112, (with their laboratories 111L and 112L) are recommended.

All these courses involve 3 lectures and 3 hours laboratory per week.

Physics
Any of the course sequences, 111-112, 121-122 or 162-163 constitute sufficient preparation for higher year courses in physics. Science students must take the appropriate laboratory course if 121-122 or 162-163 is chosen. The laboratory course accompanying 111-112 should be taken if entry to a Physics programme is contemplated.

Phys 121-122 would be the normal selection for those students intending to continue in a physics major programme. Students of demonstrated ability (at least 75% average in secondary school Year 5 Physics and Functions and Relations and Calculus or their equivalent) who prefer an enriched and slightly more challenging course are encouraged to take Phys 162-163.

Phys 111-112 is a one-year survey of the main fields of Physics for students who plan to proceed in Biology, Biology and Chemistry, Co-op Chemistry or Earth Sciences. Phys 111L-112L is recommended for students who want some practical laboratory experience to complement their theoretical studies or to fulfill entrance requirements of certain medical or dental schools.

Students obtaining better than minimum marks in Phys 111-112 and Phys 111L-112L may be accepted into a Physics major programme.

Students do not need Year 5 Physics as prerequisites to take 111-112 although it would be desirable.

Faculty of Mathematics Courses
The first year Mathematics courses, 113 (Calculus), 111a-111b (Algebra and Solid Geometry) may be chosen. Calculus is either required or recommended in all programmes in Science and should be strongly considered. For students wishing some computer science, Sci 160 or the sequence CS 118-150 are suggested. Sci 160 (Computational Methods in Science) is a Science Faculty course, while CS 118 (Introduction to Computing) and CS 150 (Introduction to Computer Science) are offered by the Faculty of Mathematics. Only students who are above average in Mathematics (i.e. approximately 70% or better in at least two Year 5 Mathematics courses) should normally choose three Mathematics courses. AM 101-111 (Applications of Mathematics in the Sciences) is recommended for potential Biology majors.

Faculty of Arts Courses
Usually selections are made from the introductory courses offered in various Departments. English 102 (Regular students only), 105, 106, and 190 are strongly recommended for consideration as are Psychology 101 and 102. Some other popular areas for consideration might be Anthropology, Economics, French, Geography, German, History, Philosophy, Political Science, Russian, Sociology or Religious Studies. Other areas may be suitable if available.
The following Honours Programmes are available

### Honours Biology

#### Year 1

(For a complete discussion of Year 1, see page 179)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Lect</th>
<th>Lab or Tut</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biol 231</td>
<td>Concepts of Ecology</td>
<td>3</td>
<td>0</td>
<td>.5</td>
</tr>
<tr>
<td>Biol 232</td>
<td>Non-vascular Plants</td>
<td>2</td>
<td>3</td>
<td>.5</td>
</tr>
<tr>
<td>Biol 234</td>
<td>Vascular Plants</td>
<td>2</td>
<td>3</td>
<td>.5</td>
</tr>
<tr>
<td>Biol 235</td>
<td>Fundamentals of Microbiology</td>
<td>2</td>
<td>3</td>
<td>1.0</td>
</tr>
<tr>
<td>Biol 237</td>
<td>Introductory Invertebrate Zoology</td>
<td>2</td>
<td>3</td>
<td>.5</td>
</tr>
<tr>
<td>Biol 238</td>
<td>Introductory Vertebrate Zoology</td>
<td>2</td>
<td>3</td>
<td>.5</td>
</tr>
<tr>
<td>Biol 239</td>
<td>Cytogenetics</td>
<td>2</td>
<td>3</td>
<td>.5</td>
</tr>
<tr>
<td>Chem 266</td>
<td>Organic Chemistry 1</td>
<td>2</td>
<td>1</td>
<td>.5</td>
</tr>
<tr>
<td>Chem 267</td>
<td>Organic Chemistry 2</td>
<td>2</td>
<td>0</td>
<td>.5</td>
</tr>
<tr>
<td>Chem 267L</td>
<td>Organic Chemistry Laboratory</td>
<td>0</td>
<td>3</td>
<td>.25</td>
</tr>
<tr>
<td>Stat 202</td>
<td>Elementary Statistics for Biologists</td>
<td>2</td>
<td>1</td>
<td>.5</td>
</tr>
<tr>
<td>One non-Biol elective (half-course)</td>
<td>as specified</td>
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#### Year 2

<table>
<thead>
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<th>Course Title</th>
<th>Lect</th>
<th>Lab or Tut</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biol 331</td>
<td>Vertebrate Zoology</td>
<td>2</td>
<td>3</td>
<td>.5</td>
</tr>
<tr>
<td>Biol 332</td>
<td>Arthropod Zoology</td>
<td>2</td>
<td>3</td>
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</tr>
<tr>
<td>Biol 333</td>
<td>Invertebrate Zoology</td>
<td>2</td>
<td>3</td>
<td>.5</td>
</tr>
<tr>
<td>Biol 334</td>
<td>The Flowering Plants</td>
<td>2</td>
<td>3</td>
<td>.5</td>
</tr>
<tr>
<td>Biol 335</td>
<td>Microbial Form and Function</td>
<td>2</td>
<td>3</td>
<td>1.0</td>
</tr>
<tr>
<td>Biol 338</td>
<td>Plant Morphology &amp; Morphogenesis</td>
<td>2</td>
<td>3</td>
<td>.5</td>
</tr>
</tbody>
</table>

#### Year 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Lect</th>
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<th>Credit</th>
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<tbody>
<tr>
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<td>Mycology 1</td>
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<tr>
<td>Biol 340</td>
<td>Molecular Biology</td>
<td>2</td>
<td>3</td>
<td>.5</td>
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<tr>
<td>Biol 341</td>
<td>Cell Physiology</td>
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<tr>
<td>Biol 342</td>
<td>Vertebrate Physiology</td>
<td>2</td>
<td>3</td>
<td>1.0</td>
</tr>
<tr>
<td>Biol 343</td>
<td>Histology &amp; Cytology</td>
<td>2</td>
<td>3</td>
<td>.5</td>
</tr>
<tr>
<td>Biol 345</td>
<td>Plant Physiology</td>
<td>2</td>
<td>3</td>
<td>.5</td>
</tr>
<tr>
<td>Biol 346</td>
<td>Population Ecology</td>
<td>2</td>
<td>1</td>
<td>.5</td>
</tr>
</tbody>
</table>

#### Year 4

5 full courses of which at least 3 must be Biol 400-level courses. This year is designed to be the specialist year. The course selection should reflect this and must form an integrated group around a particular area of interest. (Chem 432-433 is recommended.)

---

†Students may select only two of the three Zoology courses offered (i.e. Biol 331, 332, 333). Those wishing to take the third course may do so as part of their fourth year programme or as an elective.

††All Honours Biol students who have completed their third year are required to participate in an off-campus field course before entering Year 4; this will cost each student approximately $100. All students must fulfill this field course requirement to obtain their B.Sc. Honours degree in this programme.
Note Regarding Electives
A listing of Science and other electives is found on page 209. Although this list was prepared for the General Science programme many of the courses would be suitable here. Other Honours level courses in Chemistry, Physics or Psychology should also be considered.

<table>
<thead>
<tr>
<th>Honours Biology and Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year 1</strong></td>
</tr>
<tr>
<td><strong>Year 2</strong></td>
</tr>
<tr>
<td>Biol 231</td>
</tr>
<tr>
<td>Biol 232</td>
</tr>
<tr>
<td>Biol 234</td>
</tr>
<tr>
<td>Biol 235</td>
</tr>
<tr>
<td>Biol 237</td>
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<tr>
<td>Biol 238</td>
</tr>
<tr>
<td>Biol 239</td>
</tr>
<tr>
<td>Chem 212</td>
</tr>
<tr>
<td>Chem 220</td>
</tr>
<tr>
<td>Chem 220L</td>
</tr>
<tr>
<td>Chem 221</td>
</tr>
<tr>
<td>Chem 221L</td>
</tr>
<tr>
<td>Chem 264</td>
</tr>
<tr>
<td>Chem 264L</td>
</tr>
<tr>
<td>Elective</td>
</tr>
<tr>
<td><strong>Year 3†</strong></td>
</tr>
<tr>
<td>Biol 331</td>
</tr>
<tr>
<td>Biol 332</td>
</tr>
<tr>
<td>Biol 333</td>
</tr>
<tr>
<td>Biol 334</td>
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<tr>
<td>Biol 335</td>
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<tr>
<td>Biol 336</td>
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<tr>
<td>Biol 338</td>
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<td>Biol 340</td>
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<tr>
<td>Biol 341</td>
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<td>Biol 342</td>
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<td>Biol 343</td>
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<tr>
<td>Biol 345</td>
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<td>Biol 346</td>
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<tr>
<td>Plus</td>
</tr>
<tr>
<td>Chem 332-333</td>
</tr>
<tr>
<td>Chem 364</td>
</tr>
<tr>
<td>Chem 365</td>
</tr>
<tr>
<td>Chem 356L-357L</td>
</tr>
<tr>
<td>(Winter term)</td>
</tr>
<tr>
<td>Chem 364L</td>
</tr>
<tr>
<td>(Fall term)</td>
</tr>
</tbody>
</table>
Students may select only two of the three Zoology courses offered (i.e. Biol 331, 332, 333). Those wishing to take the third course may do so as part of their fourth year programme or as an elective.

<table>
<thead>
<tr>
<th>Year 4</th>
<th>Biol</th>
<th>Any three 400 level full courses offered in Biology or Any two 400-level full courses offered in Biol and Chem 492</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chem 312</td>
<td>Transition Element Chemistry</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chem 316</td>
<td>An Introduction to Transition Metal Chemistry</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chem 419</td>
<td>Biological Aspects of Inorganic Chemistry</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chem 432-433</td>
<td>Biochemistry 3 and 4 Laboratory</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chem 432L-433L</td>
<td>Biochemistry 3 and 4 Laboratory</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>.25</td>
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</tr>
</tbody>
</table>

Honours Chemistry  This programme fulfills the academic requirements for professional membership in the Chemical Institute of Canada

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Normal Year 1 Science (see page 179) including Chem 121-121L, 122-122L, Math 113 and a full-year Phys course.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Year 2</th>
<th>Fall Term</th>
<th>Lect</th>
<th>Lab or Tut</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chem 10 Chemistry Seminar</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Chem 212 Structure and Bonding</td>
<td>2</td>
<td>0</td>
<td>.5</td>
</tr>
<tr>
<td></td>
<td>Chem 220 Introductory Analytical Chemistry</td>
<td>2</td>
<td>0</td>
<td>.5</td>
</tr>
<tr>
<td></td>
<td>Chem 220L Analytical Chemistry Laboratory 1</td>
<td>0</td>
<td>6</td>
<td>.5</td>
</tr>
<tr>
<td></td>
<td>Chem 254 Physical Chemistry 1</td>
<td>2</td>
<td>1</td>
<td>.6</td>
</tr>
<tr>
<td></td>
<td>Math 215 Differential Equations</td>
<td>3</td>
<td>0</td>
<td>.5</td>
</tr>
<tr>
<td></td>
<td>One elective</td>
<td></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Year 3</th>
<th>Winter Term</th>
<th>Lect</th>
<th>Lab or Tut</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chem 10 Chemistry Seminar</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Chem 221 Analytical Chemistry of Multi-Component Systems</td>
<td>2</td>
<td>0</td>
<td>.5</td>
</tr>
<tr>
<td></td>
<td>Chem 221L Analytical Chemistry Laboratory 2</td>
<td>0</td>
<td>3</td>
<td>.25</td>
</tr>
<tr>
<td></td>
<td>Chem 255 Physical Chemistry 2</td>
<td>2</td>
<td>1</td>
<td>.5</td>
</tr>
<tr>
<td></td>
<td>Chem 264 Organic Chemistry 1</td>
<td>2</td>
<td>1</td>
<td>.5</td>
</tr>
<tr>
<td></td>
<td>Chem 264L Organic Chemistry Laboratory 1</td>
<td>0</td>
<td>3</td>
<td>.25</td>
</tr>
<tr>
<td></td>
<td>Phys 243 Electricity and Magnetism</td>
<td>3</td>
<td>0</td>
<td>.5</td>
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<tr>
<td></td>
<td>Phys 243L Electricity and Magnetism Laboratory</td>
<td>0</td>
<td>3 (alt. wks.)</td>
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</tr>
<tr>
<td></td>
<td>One elective</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3</th>
<th>Fall Term</th>
<th>Lect</th>
<th>Lab or Tut</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chem 10 Chemistry Seminar</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Chem 312 Transition Metal Chemistry</td>
<td>2</td>
<td>0</td>
<td>.5</td>
</tr>
<tr>
<td></td>
<td>Chem 314L Inorganic Chemistry Laboratory 1</td>
<td>0</td>
<td>3</td>
<td>.25</td>
</tr>
<tr>
<td></td>
<td>Chem 355 Physical Chemistry 3</td>
<td>2</td>
<td>1</td>
<td>.5</td>
</tr>
<tr>
<td></td>
<td>Chem 355L Physical Chemistry Laboratory 1</td>
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<td>3</td>
<td>.25</td>
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<td>Chem 364 Organic Chemistry 2</td>
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<td>1</td>
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<td>0</td>
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<td>.5</td>
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<tr>
<td></td>
<td>Two electives†</td>
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### Winter Term

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem 10</td>
<td>Chemistry Seminar</td>
<td>1</td>
</tr>
<tr>
<td>Chem 313</td>
<td>Main Group Chemistry</td>
<td>2</td>
</tr>
<tr>
<td>Chem 315L</td>
<td>Inorganic Chemistry Laboratory 2</td>
<td>0</td>
</tr>
<tr>
<td>Chem 356</td>
<td>Physical Chemistry 4</td>
<td>2</td>
</tr>
<tr>
<td>Chem 358L</td>
<td>Physical Chemistry Laboratory 2</td>
<td>0</td>
</tr>
<tr>
<td>Chem 365</td>
<td>Organic Chemistry 3</td>
<td>2</td>
</tr>
</tbody>
</table>

Two electives

### Year 4

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem 10</td>
<td>Chemistry Seminar</td>
<td>1</td>
</tr>
<tr>
<td>Chem 492</td>
<td>Advanced Laboratory</td>
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</tr>
</tbody>
</table>

Eight one-term electives

†In Years 3 and 4, in addition to the required core courses, a total of 6 one-term Chem courses must be selected from the Chem elective courses listed below. At least four of these must be at the 400-level.

### Chemistry Electives

**Note**

Elective courses will be given subject to sufficient demand as determined at preregistration.

1) Available at least once every academic year.

#### Fall Term


#### Winter Term


#### Spring Term

Chem 353

2) Available only once every two years

#### Fall Term

-even years beginning Fall 1976- Chem 342

#### Fall *Term*

-odd years beginning Fall 1977- Chem 351, 440

#### Winter Term

-odd years beginning Winter 1977- Chem 409, 416, 458

#### Winter *Term*

-even years beginning Winter 1978- Chem 359, 362, 417

### Co-operative Applied Chemistry (Honours)

Information about the Co-op work terms and the Co-ordination Department can be found in Chapter 5. Both streams run until the end of academic term 3B whereupon the stream taking 3B in the Fall term will have a double work term. This procedure will allow both streams to take Year 4 together over the regular academic year (Fall-Winter) when a wider range of courses are offered, and to graduate at the same time in May. The required courses in the two co-op streams are exactly the same as for the "regular" Honours Chemistry programme. However, the order in which some of these courses are taken is slightly different for the Second Group which starts its 2A term in the winter. The difference allows this group to take most of their year 3 electives in their 3B Winter term, when a wider selection of courses is available.

This programme fulfills the academic requirements for professional membership in the Chemical Institute of Canada.

**Year 1**

Normal Year 1 Science (see page 179) including Chem 121-121L, 122-122L, Math 113 and a full-year Phys course (111-112).
First Group: Commencing with the Fall 1975 intake into year one††

*For course details see Hons. Chem. (page 184)*

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 2A</td>
<td>Work Term</td>
<td>Year 2B</td>
</tr>
<tr>
<td>Chem 10, 212, 220, 220L, 254</td>
<td></td>
<td>Chem 10, 221, 221L, 255, 264, 264L</td>
</tr>
<tr>
<td>Math 215</td>
<td></td>
<td>Phys 243, 243L</td>
</tr>
<tr>
<td>One Elective</td>
<td></td>
<td>One Elective</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Work Term</th>
<th>Year 3A</th>
<th>Work Term</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chem 10, 313, 314L, 358, 355L, 364, 364L</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Two Electives†</td>
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<table>
<thead>
<tr>
<th>Work Term</th>
<th>Year 3B</th>
<th>Work Term</th>
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<tbody>
<tr>
<td></td>
<td>Chem 10, 312, 315L, 355, 358L, 364</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Two Electives†</td>
<td></td>
</tr>
</tbody>
</table>

| Year 4 | | |
| | Chem 10, 492 | |
| | Eight Electives† | |

Second Group: Commencing with the Fall 1975 intake into year one††

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Term</td>
<td>Year 2A</td>
<td>Work Term</td>
</tr>
<tr>
<td></td>
<td>Chem 10, 220, 220L, 254, 264, 264L</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Math 215</td>
<td>One Elective</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2B</th>
<th>Work Term</th>
<th>Year 3A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phys 243, 243L</td>
<td></td>
<td>One Elective†</td>
</tr>
<tr>
<td>One Elective</td>
<td></td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Work Term</th>
<th>Year 3B</th>
<th>Work Term</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chem 10, 313, 315L, 358, 358L</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Three Electives†</td>
<td></td>
</tr>
</tbody>
</table>

| Year 4 | | |
| | Chem 10, 492 | |
| | Eight Electives† | |

††Students who entered Year 1 in 1974 should consult with the undergraduate officer concerning details of their programmes.

†††In Years 3 and 4, in addition to the required courses, a total of six one-term Chemistry courses must be taken; at least four of these must be at the 400-level. For students in the co-operative Applied Chemistry programme, it is strongly recommended that at least five of these be selected from: Chem 311, 320-320L; 353, 354, 363, 416, 420 or 421, 453 or 457, 454, 456, 456. Other electives may be chosen from the Chemistry Electives list on page 185.
Honours Chemistry (Environmental Studies Option)

This programme is structured to provide the student with a sound knowledge of the discipline of chemistry together with knowledge of environmental problems, approaches to their solution, environmental law and resource management.

This programme fulfills the academic requirements for professional membership in the Chemical Institute of Canada.

Year 1

**Normal Year 1 Science (see page 179)** including Chem 121-121L, 122-122L, Math 113, and a full-year Phys course. Biol 131 or 132, Earth 130, Env St 195, or a Computer Science course are considered desirable electives.

<table>
<thead>
<tr>
<th>Year 2</th>
<th>Fall Term</th>
<th>Lect</th>
<th>Lab or Tut</th>
<th>Credit</th>
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<tbody>
<tr>
<td>Chem 10</td>
<td>Chemistry Seminar</td>
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<td>-</td>
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<td>Chem 212</td>
<td>Structure and Bonding</td>
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<td>Introductory Analytical Chemistry</td>
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<td>Chem 220L</td>
<td>Analytical Chemistry Laboratory 1</td>
<td>0</td>
<td>6</td>
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<td>Chem 254</td>
<td>Physical Chemistry 1</td>
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<td>1</td>
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<td>Math 215</td>
<td>Differential Equations</td>
<td>3</td>
<td>0</td>
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<td>Env St 195</td>
<td>Introduction to Environmental Problems</td>
<td>3</td>
<td>0</td>
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<td>M Env 357</td>
<td>Conservation and Resource Management</td>
<td>3</td>
<td>0</td>
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<tr>
<td>Plan 156</td>
<td>Introduction to Urban and Regional Planning Concepts</td>
<td>2</td>
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<th>Lect</th>
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<th>Credit</th>
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<td>Chemistry Seminar</td>
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<td>Chem 221</td>
<td>Analytical Chemistry of Multi-Component Systems</td>
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<td>Chem 221L</td>
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<td>Chem 255</td>
<td>Physical Chemistry 2</td>
<td>2</td>
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<td>Chem 264</td>
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<td>Chem 264L</td>
<td>Organic Chemistry Laboratory 1</td>
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<td>3</td>
</tr>
<tr>
<td>Phys 243</td>
<td>Electricity and Magnetism</td>
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<td>0</td>
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<td>Phys 243L</td>
<td>Electricity and Magnetism Laboratory</td>
<td>0</td>
<td>3 (alt. wks.)</td>
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| Env St 200 | Field Ecology | 3 | 0 | .5 |
| Earth 221 | Geochemistry 1 | 3 | 0 | .5 |

Year 3

**Fall Term**

| Chem 10 | Chemistry Seminar | 1 | - | - |
| Chem 312 | Transition Metal Chemistry | 2 | 0 | .5 |
| Chem 314L | Inorganic Chemistry Laboratory 1 | 0 | 3 | .25 |
| Chem 355 | Physical Chemistry 3 | 2 | 1 | .5 |
| Chem 355L | Physical Chemistry Laboratory 1 | 0 | 3 | .25 |
| Chem 364 | Organic Chemistry 2 | 2 | 1 | .5 |
| Chem 364L | Organic Chemistry Laboratory 2 | 0 | 6 | .5 |
| Stat 204 | Statistics for the Sciences | 2 | 1 | .5 |

| M Env 356 | Canadian Non-Renewable Resources | 3 | 0 | .5 |
| Env St 358 | Environmental Pollution and its Control | 3 | 0 | .5 |
| Geog 356 | Resources Management | 3 | 0 | .5 |
### Winter Term

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Lect</th>
<th>Lab</th>
<th>Credits</th>
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<td>Chem 315L</td>
<td>Inorganic Chemistry Laboratory 2</td>
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<td>Chem 365</td>
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One of:

- M Env 320: Environmental Economics
- M Env 331: Environmental Issues in a Global Perspective

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<td>Course Code</td>
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</tr>
<tr>
<td>Chem 492</td>
</tr>
<tr>
<td>Env St 400</td>
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</table>

Four one-term courses (Recommended courses include: Chem 311, 320-320L, 332-332L, 419, 420, 455)

Two one-term (or equivalent) courses from:

- M Env 410: Environment Management
- Geog 411: Resource Studies
- Geog 414: Resources Management Workshop
- Earth 421: Geochemistry 2
- Earth 641: Isotope Geochemistry

### Honours Chemistry (Mathematics Option)

This programme fulfills the academic requirements for professional membership in the Chemical Institute of Canada.

#### Year 1

As for Honours Chemistry (see page 179). A first year course in Algebra is also required and at least one term of Computer Science is recommended.

#### Year 2

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<tr>
<th>Course Code</th>
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<th>Lab or Tut</th>
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<td>Chem 212</td>
<td>Structure and Bonding</td>
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<td>Chem 220</td>
<td>Introductory Analytical Chemistry</td>
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<td>Chem 220L</td>
<td>Analytical Chemistry Laboratory 1</td>
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<td>Chem 254</td>
<td>Physical Chemistry 1</td>
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<td>Math 215</td>
<td>Differential Equations</td>
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<tr>
<td>or CS 370</td>
<td>Introduction to Scientific Computation</td>
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One of:

- Math 220a, 221a, 231a, 213.
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<td>Chem 255 Physical Chemistry 2</td>
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<td>Chem 264 Organic Chemistry 1</td>
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<td>Chem 264L Organic Chemistry Laboratory 1</td>
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<td>3</td>
<td>.25</td>
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<tr>
<td>Phys 243 Electricity and Magnetism</td>
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<td>Phys 243L Electricity and Magnetism Laboratory</td>
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One of:

Math 220b, 221b, 231b, 213

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<tbody>
<tr>
<td>Math 322b, 331, AM 371, plus</td>
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<tr>
<td>One elective</td>
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| Year 4 Chem 10 Chemistry seminar     |      |            |        |
| Chem 492 Advanced Laboratory        | 1    | -          | -      |
| Four one-term Chem courses of which two must be at the 400-level. | 0    | 9          | 1.0    |
| Four one-term (or equivalent) Math courses at the 300-or 400-level. | 0    | 9          | 1.0    |
### Honours Chemistry (Physics Option)

This programme fulfills the academic requirements for professional membership in the Chemical Institute of Canada.

#### Year 1

As for Honours Chemistry (see page 179) but the first year Phys course selected should be 121-121L, 122-122L or 162-162L, 163-163L. A full-year course in Algebra and at least one term of Computer Science is recommended.

#### Year 2

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<th>Lect</th>
<th>Lab or Tut</th>
<th>Credits</th>
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<tbody>
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<td>Chem 10</td>
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<th>Lab or Tut</th>
<th>Credits</th>
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<td>Chem 255</td>
<td>2</td>
<td>1</td>
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<td>Chem 264</td>
<td>2</td>
<td>1</td>
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<td>Chem 264L</td>
<td>0</td>
<td>3</td>
<td>.25</td>
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<tr>
<td>Math 215</td>
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<td>Phys 223 or 253</td>
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#### Year 3

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<td>Chem 355L</td>
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## Year 4

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Two one-term Chemistry courses which must be at the 400-level.
Four one-term Physics courses at the 300- or 400 level.
Two one-term electives.

†Year 3 electives may be chosen from: Phys 352-353 plus 352L-353L, 362-363, 364-365, Math 221a-221b, 222b, CS 370

## Honours Earth Sciences

Completion of this programme requires a total of 23.5 course-credits (including Year one). Of these, at least 19 must be from courses in the Faculties of Science and Mathematics, including all required courses, and 2 must be from courses in the Faculty of Arts. In addition, attendance on two third year field trips is required. (see Undergraduate Course Descriptions. Ch. 14).

A list of recommended Science and Mathematics electives is given on page 179.

## Year 1

(For a complete discussion of Year 1, see page 179)

### Year 2

<table>
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<tr>
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<th>Lab/Tut</th>
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<td>Earth 231</td>
<td>Mineralogy</td>
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<td>Earth 232</td>
<td>Petrography</td>
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<td>Earth 235</td>
<td>Stratigraphy</td>
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<td>Earth 236</td>
<td>Principles of Paleontology</td>
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<td>Introductory Structural Geology</td>
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<tr>
<td>Electives</td>
<td>Three course-credits, normally two from courses in Science and/or Mathematics and one from Arts.</td>
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### Note

By the end of Year 2, students must have completed Phys 111-112, General Physics (or an equivalent physics course), Math 113, Calculus, and an introductory course in computer programming (for example CS 118, 180, or Gen E 121)

## Year 3

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<td>Earth 332</td>
<td>Metamorphic Petrology</td>
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<td>Earth 370</td>
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**Science**
Academic Programmes

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### Year 4

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<td>Biostratigraphy</td>
<td>2</td>
<td>2</td>
<td></td>
<td>.5</td>
</tr>
<tr>
<td>Earth 435</td>
<td>Advanced Structural Geology</td>
<td>3</td>
<td>2</td>
<td></td>
<td>.5</td>
</tr>
<tr>
<td>Earth 438</td>
<td>Engineering Geology</td>
<td>2</td>
<td>1</td>
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<td>.5</td>
</tr>
<tr>
<td>Earth 439</td>
<td>Groundwater Geology</td>
<td>3</td>
<td>0</td>
<td></td>
<td>.5</td>
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<tr>
<td>Earth 440</td>
<td>Quaternary Geology</td>
<td>2</td>
<td>3</td>
<td></td>
<td>.5</td>
</tr>
<tr>
<td>Earth 456</td>
<td>Mathematical Geology 2</td>
<td>3</td>
<td>0</td>
<td></td>
<td>.5</td>
</tr>
<tr>
<td>Earth 461</td>
<td>Applied Geophysics 2</td>
<td>3</td>
<td>0</td>
<td></td>
<td>.5</td>
</tr>
<tr>
<td>Earth 470</td>
<td>Metallic Mineral Deposits</td>
<td>3</td>
<td>2</td>
<td></td>
<td>.5</td>
</tr>
<tr>
<td>Electives</td>
<td><em>One course-credit, not from Earth Sciences</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Recommended Mathematics and Science electives:**

**Note**
The Department of Earth Sciences is prepared to work out honours programmes with students who wish to use their electives to specialize in a particular discipline; e.g. Mathematics, Biology, Chemistry, Physics.

---

### Honours Earth Sciences (Geography Option)

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Lect</th>
<th>Lab or Tut</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth 130</td>
<td>Introductory Geology</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Geog 102</td>
<td>Introduction to Physical Geography</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Chem 121</td>
<td>Chemical Structure</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Chem 121L</td>
<td>Chemical Structure Laboratory</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Chem 122</td>
<td>Chemical Reaction</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Chem 122L</td>
<td>Chemical Reaction Laboratory</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Geog 101</td>
<td>Introduction to Human Geography</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Geog 125R</td>
<td>Introduction to the Developing World</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Geog 126R</td>
<td>The Emerging Third World</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Geog 127</td>
<td>Regional Problems of Europe</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>EnvSt 195</td>
<td>Introduction to Environmental Problems</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Electives</td>
<td><em>Two course-credits</em></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Year 2

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth 221</td>
<td>Geochemistry 1</td>
<td>2</td>
</tr>
<tr>
<td>Earth 231</td>
<td>Mineralogy</td>
<td>2</td>
</tr>
<tr>
<td>Earth 232</td>
<td>Petrography</td>
<td>2</td>
</tr>
<tr>
<td>Earth 235</td>
<td>Stratigraphy</td>
<td>2</td>
</tr>
<tr>
<td>Earth 236</td>
<td>Principles of Paleontology</td>
<td>2</td>
</tr>
<tr>
<td>Earth 260</td>
<td>Introductory Structural Geology</td>
<td>2</td>
</tr>
<tr>
<td>EnvSt 200</td>
<td>Field Ecology</td>
<td>2</td>
</tr>
<tr>
<td>Geog 201</td>
<td>Some Basic Topics of Physical Geography</td>
<td>2</td>
</tr>
<tr>
<td>Geog 202</td>
<td>Some Basic Topics of Economic and Urban Geography</td>
<td>2</td>
</tr>
</tbody>
</table>

#### Electives

Three half course-credits including one of:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geog 203</td>
<td>Some Basic Topics of Cultural and Regional Geography</td>
<td>2</td>
</tr>
<tr>
<td>Geog 220</td>
<td>World Regional Geography</td>
<td>2</td>
</tr>
</tbody>
</table>

### Year 3

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth 331</td>
<td>Igneous Petrology</td>
<td>2</td>
</tr>
<tr>
<td>Earth 332</td>
<td>Metamorphic Petrology</td>
<td>2</td>
</tr>
<tr>
<td>Earth 333</td>
<td>Sedimentology 1</td>
<td>2</td>
</tr>
<tr>
<td>Earth 336</td>
<td>Paleontology</td>
<td>2</td>
</tr>
<tr>
<td>Earth 342</td>
<td>Geomorphology</td>
<td>2</td>
</tr>
<tr>
<td>Earth 345</td>
<td>Historical Geology</td>
<td>2</td>
</tr>
<tr>
<td>Earth 370</td>
<td>Geology of non-renewable Primary Resources</td>
<td>3</td>
</tr>
<tr>
<td>Geog 381</td>
<td>Special Topics</td>
<td></td>
</tr>
<tr>
<td>Geog electives</td>
<td>One-course-credit</td>
<td></td>
</tr>
<tr>
<td>Elective</td>
<td>One-course-credit</td>
<td></td>
</tr>
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</table>

### Year 4

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth 436</td>
<td>Honours Thesis</td>
<td>0</td>
</tr>
<tr>
<td>Electives</td>
<td>Three course-credits</td>
<td></td>
</tr>
<tr>
<td>Geog electives</td>
<td>One course-credit</td>
<td></td>
</tr>
<tr>
<td>Elective</td>
<td>One course-credit</td>
<td></td>
</tr>
</tbody>
</table>

#### Co-operative Applied Earth Sciences

The co-operative programme in Earth Sciences is an Honours programme designed to satisfy the requirement of many potential employers that graduating geologists have practical experience as well as good academic training. In the first year, students take the Year 1 Science programme as described on page 10. The co-operative Earth Sciences programme will begin in the fall term of the second year and will be operated as a single co-operative stream. The first work term begins in the Winter term following the Fall term 2A and thereafter academic and work terms alternate until the Winter following term 3B when a double work term commences. Students then take their terms 4A and 4B as a full academic year, graduating the following Spring.

General features and conditions of the co-operative plan at the University of Waterloo are given in Chapter 5.
The normal progress of a student entering co-operative Earth Sciences in his second academic year in the Fall of 1977 is shown in the table above. Completion of this course requires a total of 23 1/2 course-credits (including year one). Of these at least 19 must be from courses in the Faculties of Science and Mathematics, including all required courses, and 2 must be from courses in the Faculty of Arts. In addition, attendance is required on two third year field trips (see Undergraduate Course Descriptions, Ch. 14). A list of recommended Science and Mathematics electives is given on page 179.

### Year 2A

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth 231 Mineralogy</td>
<td>3.5</td>
</tr>
<tr>
<td>Earth 235 Principles of Paleontology</td>
<td>3.5</td>
</tr>
<tr>
<td>Earth 236 Stratigraphy</td>
<td>3.5</td>
</tr>
<tr>
<td>Electives: Three half course-credits, normally two from courses in Science and/or Mathematics and one from Arts.</td>
<td></td>
</tr>
</tbody>
</table>

### Year 2B

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth 221 Geochemistry 1</td>
<td>3.5</td>
</tr>
<tr>
<td>Earth 232 Petrography</td>
<td>3.5</td>
</tr>
<tr>
<td>Earth 260 Introductory Structural Geology</td>
<td>3.5</td>
</tr>
<tr>
<td>Electives: Three half course-credits, normally two from courses in Science and/or Mathematics and one from Arts.</td>
<td></td>
</tr>
</tbody>
</table>

### Note

By the end of Year 2, students must have completed Phys 111-112, General Physics (or an equivalent physics course), Math 113, Calculus, and a course involving computer programming (for example, CS 118 or Gen E 121).

### Year 3A

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth 332 Metamorphic Petrology</td>
<td>3.5</td>
</tr>
<tr>
<td>Earth 333 Sedimentology 1</td>
<td>3.5</td>
</tr>
<tr>
<td>Earth 345 Historical Geology</td>
<td>3.5</td>
</tr>
<tr>
<td>Earth 370 Economic Geology</td>
<td>3.5</td>
</tr>
<tr>
<td>Electives: Two half course-credits, normally one from Science or Mathematics and one from Arts.</td>
<td></td>
</tr>
</tbody>
</table>

### Year 3B

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth 331 Igneous Petrology</td>
<td>3.5</td>
</tr>
<tr>
<td>Earth 336 Paleontology</td>
<td>3.5</td>
</tr>
<tr>
<td>Earth 342 Geomorphology</td>
<td>3.5</td>
</tr>
<tr>
<td>Earth 360 Applied Geophysics 1</td>
<td>3.5</td>
</tr>
<tr>
<td>Electives: Two half course-credits, normally one from Science or Mathematics and one from Arts.</td>
<td></td>
</tr>
</tbody>
</table>

### Year 4A, 4B

Identical to regular programme in Honours Earth Sciences.
Co-operative Applied Earth Sciences (Geotechnical Option)

This co-operative programme follows the same timetable as the geology option described above. The course selection has been made with both the traditional geology programmes and the needs of the geotechnical professions in mind. As such it also provides a good undergraduate background for fields such as hydrogeology. The number of students admitted to this programme is limited by the space available.

In the first year students take the Year 1 Science programme described on page 179.

In addition to the prescribed course work, attendance is required on two third year Earth Sciences field trips (see Undergraduate Course Description, Ch. 14) and in Civ E 291, a non-credit field course in surveying. Civ E 291 may be taken immediately prior to either the 2A or 4A terms.

<table>
<thead>
<tr>
<th>Year 2A</th>
<th>Lect</th>
<th>Lab or Tut</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth 231</td>
<td>2</td>
<td>3</td>
<td>.5</td>
</tr>
<tr>
<td>Earth 235</td>
<td>2</td>
<td>3</td>
<td>.5</td>
</tr>
<tr>
<td>Earth 236</td>
<td>2</td>
<td>3</td>
<td>.5</td>
</tr>
<tr>
<td>Civ E 203</td>
<td>2</td>
<td>2</td>
<td>.5</td>
</tr>
<tr>
<td>Civ E 205</td>
<td>2</td>
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<tr>
<td>Math 114</td>
<td>3</td>
<td>1</td>
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</table>

**Year 2B**

<table>
<thead>
<tr>
<th>Year 2B</th>
<th>Lect</th>
<th>Lab or Tut</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth 221</td>
<td>2</td>
<td>3</td>
<td>.5</td>
</tr>
<tr>
<td>Earth 232</td>
<td>2</td>
<td>3</td>
<td>.5</td>
</tr>
<tr>
<td>Earth 260</td>
<td>2</td>
<td>3</td>
<td>.5</td>
</tr>
<tr>
<td>Civ E 280</td>
<td>2</td>
<td>3</td>
<td>.5</td>
</tr>
<tr>
<td>Math 216 or</td>
<td></td>
<td>3</td>
<td>.5</td>
</tr>
<tr>
<td>Civ E 222</td>
<td></td>
<td>3</td>
<td>.5</td>
</tr>
<tr>
<td>Arts Elective</td>
<td></td>
<td>3</td>
<td>.5</td>
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</table>

**Year 3A**

<table>
<thead>
<tr>
<th>Year 3A</th>
<th>Lect</th>
<th>Lab or Tut</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth 332</td>
<td>2</td>
<td>3</td>
<td>.5</td>
</tr>
<tr>
<td>Earth 333</td>
<td>2</td>
<td>3</td>
<td>.5</td>
</tr>
<tr>
<td>Earth 370</td>
<td>3</td>
<td>2</td>
<td>.5</td>
</tr>
<tr>
<td>Civ E 292</td>
<td>3</td>
<td>2</td>
<td>.5</td>
</tr>
<tr>
<td>Civ E 353</td>
<td>3</td>
<td>3</td>
<td>.5</td>
</tr>
<tr>
<td>Civ E 265</td>
<td></td>
<td>3</td>
<td>.5</td>
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</table>

**Year 3B**

<table>
<thead>
<tr>
<th>Year 3B</th>
<th>Lect</th>
<th>Lab or Tut</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth 331</td>
<td>2</td>
<td>3</td>
<td>.5</td>
</tr>
<tr>
<td>Earth 342</td>
<td>2</td>
<td>3</td>
<td>.5</td>
</tr>
<tr>
<td>Earth 360</td>
<td>3</td>
<td>2</td>
<td>.5</td>
</tr>
<tr>
<td>Earth 355</td>
<td>3</td>
<td>0</td>
<td>.5</td>
</tr>
<tr>
<td>Civ E 200</td>
<td>2</td>
<td>3</td>
<td>.5</td>
</tr>
<tr>
<td>Civ E 354</td>
<td>3</td>
<td>2</td>
<td>.5</td>
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</table>
### Year 4

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth 436: Honours Thesis</td>
<td>3</td>
</tr>
<tr>
<td>Earth 427: Crustal Evolution</td>
<td>2</td>
</tr>
<tr>
<td>Earth 435: Advanced Structural Geology</td>
<td>2</td>
</tr>
<tr>
<td>Earth 438: Engineering Geology</td>
<td>1</td>
</tr>
<tr>
<td>Earth 439: Groundwater Geology</td>
<td>3</td>
</tr>
<tr>
<td>Earth 440: Quaternary Geology</td>
<td>2</td>
</tr>
</tbody>
</table>

**Electives:**
- three half course-credits from Earth Sciences or Civil Engineering (with at least one from Civil Engineering) and one full credit from Arts.

### Honours Physics

The Honours programme is in the form of a core of required courses, plus appropriate electives. The elective courses may be chosen from a wide range of courses offered by the Physics Department and by other departments of the University. By careful selection of his electives, a student can deepen his knowledge of experimental or theoretical physics, or obtain a background in another subject (e.g. Astronomy, Geophysics, Chemistry, Mathematics, Computing, Business Administration). The choice of electives must be made to fit the student’s timetable, and must be approved by the Chairman of the Department of Physics. The programme must include a total of twenty-four course credits (including Year one). It is recommended that students intending to take an Honours Physics programme should take six course credits in first year. Examples of possible elective programmes are given on the pages following the core programme which is listed below. Detailed descriptions of the courses start in Chapter 14.

### Year 1

*For a complete discussion of Year 1, see page 179*

<table>
<thead>
<tr>
<th>Course</th>
<th>Lect</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 2: Core</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phys 252-253: Electricity and Magnetism 1 and 2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Phys 252L-253L: Electricity and Magnetism Labs</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Phys 256: Optics (first term)</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Phys 256L: Optics Laboratory</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Phys 255: Quantum Physics (second term)</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Math 213: Advanced Calculus</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Math 216: Differential Equations</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

**Note 1**

Math 216 may be replaced by Math 226

**Note 2**

If Phys 265 is elected, Phys 253L may be omitted.
### Academic Programmes

**Year 3**

<table>
<thead>
<tr>
<th>Course</th>
<th>Core</th>
<th>Lect or Tut</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phys 360A</td>
<td>Intermediate Laboratory</td>
<td>0</td>
<td>18/Term</td>
</tr>
<tr>
<td>Phys 360B</td>
<td>Intermediate Laboratory</td>
<td>0</td>
<td>18/Term</td>
</tr>
<tr>
<td>Phys 362, 363</td>
<td>Two of Phys 371A, 371B, 352L or 353L</td>
<td>0</td>
<td>18/Term</td>
</tr>
<tr>
<td>Phys 364</td>
<td>Classical Mechanics 1 and 2</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Phys 365</td>
<td>Mathematical Physics 1</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Phys 366</td>
<td>Mathematical Physics 2</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Phys 354</td>
<td>Atomic and Molecular Physics</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Phys 358</td>
<td>Thermodynamics</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Phys 359</td>
<td>Statistical Mechanics</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

**Note**

Students desiring Phys 444 must elect Phys 355

**Year 4**

<table>
<thead>
<tr>
<th>Course</th>
<th>Core</th>
<th>Lect or Tut</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phys 434A</td>
<td>Introductory Quantum Mechanics</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Phys 441</td>
<td>Electromagnetic Theory</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Phys 355</td>
<td>Nuclear and Particle Physics (if not taken in Year 3)</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Phys 437</td>
<td>Experimental Research Project</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>or Phys 437</td>
<td>Theoretical Physics Project</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

**Note**

Phys 434B is strongly recommended for students intending to do graduate work, and Phys 443 is strongly recommended for students intending to do graduate work or intending to work as industrial physicists.

### Elective Programmes

The flexibility of this "core plus electives" structure is demonstrated by the following examples of possible programmes, all of which are sufficient preparation for graduate work in Physics, although each has a slightly different emphasis. Details of other possible programmes may be obtained from the Chairman of the Physics Department. In choosing electives, the student should make sure that his programme contains a minimum of 24 course credits.

#### Ex 1 Honours Physics

(with extra emphasis on experimental physics)

Core plus: Year 2
Phys 259, 259L, 270-271, CS 210 and CS 240.

Core plus: Year 3

Core plus: Year 4
Phys 432, 433, 435, 464, 465
Two of: Phys 442, 443, 445, 452, 453

#### Ex 2 Honours Physics

(eespecially suitable as preparation for secondary school teaching)

Core plus: Year 2

Core plus: Year 3

Core plus: Year 4
Phys 433 or 437, 435, Chem 356-357, Sci 400, Arts Electives totalling .50 or 1.00 credit

#### Ex 3 Honours Physics

(with Biophysics)

Core plus: Year 2
Stat 220
Three of: Chem 254, 255, 266, 267, Biol 245, 246

Core plus: Year 3
Three of: Phys 352, 352L, 353, 353L, 360, 381
One of: Biol 341, 343, 239, Chem 356, 357, 332, 333, 353

Core plus: Year 4
Phys 433, 434B, 435, 480, 481
2.00 credits from: Biol 434, 448, 449, Chem 432, 433, 434, 453, 454, 457
Ex 4 Honours Physics
(with Computing)
Core plus: Year 2
Phys 259, 259L, CS 210, CS 240, Phys 265 or Arts Elective

Core plus: Year 3
Phys 352, 352L, 353, 353L.
Two of: Stat 220, CS 340-342, CS 472-474

Core plus: Year 4
Phys 435, 452, 453, EIE 324, Phys 433 or 437, electives totalling 1.00 or 1.50 credits.

Ex 5 Honours Physics
(with Chemistry)
Core plus: Year 2
Chem 218-219, 254-255, CS 210 or CS 240

Core plus: Year 3
Phys 352, 352L, 371A, Chem 266-267, Elective

Core plus: Year 4
2.00 credits from Phys 434B, 435, Chem 350, 355, 358, 312, 311; Elective

Ex 6 Honours Physics
(with Astrophysics)
Core plus: Year 2
Phys 250, 251, 270, CS 210, CS 240

Core plus: Year 3
Phys 350, 351, 352-352L, 353-353L, 449, 450, 451, 451, Arts Electives totalling 1.00 credit

Core plus: Year 4
Phys 434B,

Ex 7 Honours Physics
– Business Administration Option
See comments regarding the Business Administration Option on page 211.

Core plus: Year 1 Special Requirements
Econ 101-102, CS 116 or CS 140

Core plus: Year 2
Econ 201-202, 191-192

Core plus: Year 3
Bus (WLU) 212-222, 255-275, MSci 406

Science
Academic Programmes

Core plus: Year 4
Econ 399-394, Bus (WLU) 385-395, 386-398, MSci 407
(Phys 360A and 360B are not normally taken with this option)

Ex 8 Honours Physics
(with Geophysics)
Core plus: Year 2
Phys 259, 259L, Earth 231, 232, 235

Core plus: Year 3
Phys 368, 369, Earth 260, 1.0 credit from Earth Sciences

Core plus: Year 4
Four credits from: Phys 352-352L, 353-353L, 433, 438, CS 210-240, selected Earth Science courses

Ex 9 Honours Physics
(with Electrical Engineering)
Core plus: Year 1 Special Requirements
SyDe 183 (Fall term), and CS 140 (Winter term)

Core plus: Year 2
Phys 259, 259L, EIE 221, 241

Core plus: Year 3
Phys 352, 353, 352L, 353L, EIE 316 and one or two of EIE 324, 380, 361

Note
It may be possible to replace Phys 360A-360B by an Electrical Engineering course if two of the Electrical Engineering courses chosen have labs associated with them.

Core plus: Year 4
Phys 433, 435, 435, EIE 428, 429, 435, 436

Theoretical Physics Programme
Students with an interest in theoretical physics may wish to emphasize the more mathematical aspects of the subject. A suitable programme consists of the "Honours Physics" core plus the following elective scheme:

Core plus: Year 2
Phys 259, 259L, Math 231a-231b, elective

Core plus: Year 3
Phys 355, Mathematics Elective, elective

Core plus: Year 4
Note

Students interested in this programme are advised to take Math 111a-111b, and a computing course in Year 1 to ensure having the necessary prerequisites for later year Mathematics courses. Suggested Mathematics electives are the following: CS 472-474, C & O 351a-351b, C & O 352a-352b, AM 362, AM 382, CS 369, CS 360, AM 461, C & O 437a-437b, C & O 453a, AM 468, AM 478, CS 484, P Math 470.

Co-operative Applied Physics (Honours)

Applied Physics is an Honours programme 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 programme 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 interests where possible. Many work term experiences, especially in the upper year, 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.

The programme must include a total of twenty-four course credits (including Year 1). It is recommended that students intending to take an honours physics programme should take six course credits in first year.

Examples of possible elective programmes are given in the following pages.

The core programme is listed below. A detailed description of the courses starts in Chapter 14.

The following table shows the normal progress of students in the Applied Physics programme. This arrangement has been found advantageous since it provides more relevant work experience in senior years.
## Science
### Academic Programmes

<table>
<thead>
<tr>
<th>Year 1</th>
<th>(For a complete discussion of Year 1, see page 179)</th>
</tr>
</thead>
</table>

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<thead>
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<tbody>
<tr>
<td>Fall</td>
<td>Winter</td>
<td>Spring</td>
<td>Fall</td>
<td>Winter</td>
<td>Spring</td>
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<td>Second Term</td>
<td>Work Term</td>
<td>Third Term</td>
<td>Work Term</td>
<td>Fourth Term</td>
<td>Work Term</td>
</tr>
<tr>
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<td>1B</td>
<td>1</td>
<td>2A</td>
<td>2</td>
<td>2B</td>
<td>3</td>
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</table>

Further information about the co-operative work terms and the Co-ordination Department can be found starting in Chapter 5.

### Year 1

#### Year 2A

- **Core**
  - Phys 252: Electricity and Magnetism 1
    - Lect: 2
    - Credit: .50
  - Phys 252L: Electricity and Magnetism 1 Laboratory
    - Lab: 3 (alt. wk.)
    - Credit: .25
  - Phys 256: Optics
    - Lect: 1
    - Credit: .50
  - Phys 256L: Optics Laboratory
    - Lab: 3 (alt. wk.)
    - Credit: .25
  - Math 213a: Advanced Calculus
    - Lect: 3
    - Credit: .50
  - Math 216: Differential Equations
    - Lect: 3
    - Credit: .50

#### Year 2B

- **Core**
  - Phys 253: Electricity and Magnetism 2
    - Lect: 2
    - Credit: .50
  - Phys 253L: Electricity and Magnetism 2 Laboratory
    - Lab: 3 (alt. wk.)
    - Credit: .25
  - Phys 255: Quantum Physics
    - Lect: 3
    - Credit: .50
  - Math 213b: Advanced Calculus
    - Lect: 3
    - Credit: .50

#### Note

Phys 265 is recommended.

### Year 3A

- **Core**
  - Phys 354: Atomic and Molecular Physics
    - Lect: 2
    - Credit: .50
  - Phys 358: Thermodynamics
    - Lect: 3
    - Credit: .50
  - Phys 360A: Intermediate Laboratory
    - Lab: 18/Term
    - Credit: .25
  - Phys 362: Classical Mechanics 1
    - Lect: 3
    - Credit: .50
  - Phys 364: Mathematical Physics 1
    - Lab: 18/Term
    - Credit: .25

#### Year 3B

- **Core**
  - Phys 360B: Intermediate Laboratory
    - Lab: 18/Term
    - Credit: .25
  - Phys 359: Statistical Mechanics
    - Lect: 3
    - Credit: .50
  - Phys 363: Classical Mechanics 2
    - Lect: 3
    - Credit: .50
  - Phys 365: Mathematical Physics 2
    - Lab: 18/Term
    - Credit: .25

#### Note

Students desiring Phys 444 must elect Phys 355.
**Science**

**Academic Programmes**

<table>
<thead>
<tr>
<th>Year 4A-4B</th>
<th>Core</th>
<th>Lect</th>
<th>Lab or Tut</th>
<th>Credit</th>
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<tbody>
<tr>
<td></td>
<td>Phys 434A</td>
<td>2</td>
<td>1</td>
<td>.5</td>
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<tr>
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<td>1.0</td>
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<tr>
<td></td>
<td>Phys 355</td>
<td>3</td>
<td>0</td>
<td>.5</td>
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</tbody>
</table>

**Note**

Phys 434B is strongly recommended for students intending to do graduate work, and Phys 443 is strongly recommended for students intending to do graduate work or intending to work as industrial physicists.

**Options**

Some suggested programmes are given below.

In choosing his electives the student should make sure that his programme contains a minimum of 24 course credits.

**Ex 1 Co-op Applied Physics**

(Solid State)

Core plus: Year 2A
Phys 270, CS 240

Core plus: Year 2B
Phys 259, 259L, 271, Chem 311 or CS 210

Core plus: Year 3A
Phys 352, 352L, 371A

Core plus: Year 3B
Phys 353, 353L, 355, 371B

Core plus: Year 4A
Phys 433, 435, 452, 464

Core plus: Year 4B
Phys 433, 434B, 442, 453, 465

**Ex 2 Co-op Applied Physics**

(Biophysics)

Core plus: Year 2A
1.00 credit from Chem 254, 266, Biol 245, 203, 341, 239, Phys 360

Core plus: Year 2B
1.00 credit from: Chem 255, 267, 332, 353, Phys 265

Core plus: Year 3A
1.00 credit from: Chem 332, 353, Phys 352, 352L, 371A 371A

Core plus: Year 3B
1.00 credit from: Chem 255, 267, 333, 357, Biol 246, 343, Phys 353, 353L, 355, 381

Core plus: Year 4A and 4B

**Ex 3 Co-op Applied Physics**

(with Chemistry)

Core plus: Year 2A
Chem 254, 212

Core plus: Year 2B
Chem 264, Phys 259, 259L, Arts Elective

Core plus: Year 3A
Chem 255, or 364, Phys 352, 352L

Core plus: Year 3B
Phys 353, 353L, Chem 311

Core plus: Year 4A
Phys 433, 435, 464, Chem 332 or 353 or 455

Core plus: Year 4B
Phys 433, 434B, Chem 332 or 333

**Ex 4 Co-op Applied Physics**

(with Computing)

Core plus: Year 2A
Math 221a, CS 240

Core plus: Year 2B
Math 221b, CS 210, Phys 259, 259L

Core plus: Year 3A
CS 340, Phys 352, 352L

Core plus: Year 3B
CS 342, Phys 353, 353L
### Core plus: Year 4A

CS 472, Phys 435, 452, 464

### Core plus: Year 4B

CS 474, Phys 453, 465

### Ex 6 Co-op Applied Physics

- Business Administration Option
- See comments regarding Business Administration Option on page 211.

### Core plus: Year 1 Special Requirements

Econ 101-102, CS 118 or CS 116

### Core plus: Year 2

Econ 201-202, 191-192

### Core plus: Year 3

Bus (WLU) 212-222, 255,275, MSci 406

### Core plus: Year 4

Econ 393-394, Bus (WLU) 385-395, 388-398, MSci 407 (Phys 360A and 360B are not normally taken with this Option).

### Honours Psychology

**Year 1**

*is a normal Year 1 programme of the Faculty of Science (see page 179) with Mathematics 113, Physics 111-112, Biology 131 or 132, Chemistry 121-122 and 121L-122L, Psychology 101-102*

<table>
<thead>
<tr>
<th>Year 2</th>
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<tbody>
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<td>Psych 283</td>
<td>Statistical Methods in Psychology</td>
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<tr>
<td>Psych 284</td>
<td>Experimental Design</td>
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<tr>
<td>One of Psych</td>
<td>Research</td>
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<tr>
<td>293, 295 or 297</td>
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<td>Psych Electives*</td>
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<td>Science Electives**</td>
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<tr>
<td>Unspecified Elective</td>
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</table>

<table>
<thead>
<tr>
<th>Year 3</th>
<th>Credit</th>
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</thead>
<tbody>
<tr>
<td>Psych 265</td>
<td>Tests and Measurements</td>
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<tr>
<td>One of Psych</td>
<td>Research</td>
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<tr>
<td>393, 395, or 397</td>
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<td>Psych Electives*</td>
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<tr>
<td>Science Electives**</td>
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<table>
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<td></td>
</tr>
<tr>
<td>Unspecified Elective</td>
<td></td>
</tr>
</tbody>
</table>

*This includes a .50 credit prerequisite to the specific research course selected

**No more than two Science courses may be Science labelled courses
Optometry Programme

The School of Optometry of the Faculty of Science offers a four-year professional programme leading to the degree of Doctor of Optometry. It is the only School of Optometry in Canada offering a programme with English as the language of instruction. The immediate purpose of the programme is to qualify men and women for the practice of optometry and graduates are eligible to apply for registration as optometrists in the province of their choice. The programme 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 graduate programme in Physiological Optics leading to the Master of Science degree is now available at the School and a programme leading to the Doctor of Philosophy degree has been proposed and is expected to be available soon.

Requirements for Admission

Citizenship

Applications are accepted from candidates who are Canadian citizens or from legal residents of Canada who have held landed immigrant status for at least twelve months prior to the registration day of the Fall term. Proof of landed immigrant status must accompany the application. Applications will not normally be accepted from foreign students on student visa.

Prerequisites

The minimum requirements for admission are successful completion of at least a full year of university work beyond Ontario Year 5 or equivalent level. The university credits required are for full courses in General Chemistry, General Biology, General Physics, Calculus and Introductory Psychology. The courses in Chemistry, Biology and Physics should include laboratory sections. Applicants hoping to be admitted after fulfilling the minimum requirements should have at least an overall second class standing ('B') in the university programme. Specific information on the preprofessional programme for optometry is given on page 179. Additional admission requirements and regulations for Examinations and Standings will be found on pages 174-176.

Selection Factors

All applicants should note that enrolment in the first professional year is limited to sixty and that in 1976 there were approximately three hundred and fifty applications for those places. Consequently, neither acceptance to nor successful completion of the preprofessional programme can guarantee admission to the first professional year. Applicants are selected on a competitive basis considering scholarship, interest, motivation, general qualifications for the profession and recommendations.

While admissions of well-qualified applicants are made from all the provinces, prospective students are advised that some preferential consideration must be given to Ontario residents. Preferential consideration is also given to applicants completing their preprofessional programme at the University of Waterloo, but applicants to Year 1 regular Science of the University of Waterloo who have completed their secondary school education in provinces other than Ontario should consult with the science Undergraduate Officer to ensure that their background in Science and Mathematics has prepared them for Year 1 regular Science as given at the University of Waterloo.

The provinces of Alberta, Manitoba and Saskatchewan have entered into an agreement with the School of Optometry regarding admission of applicants from those provinces. The agreement establishes that a maximum of seven applicants from Alberta, a maximum of three applicants from Saskatchewan and a maximum of three applicants from Manitoba may be admitted to the first professional year. Applicants from these three provinces must meet the same admission criteria as other applicants. The location of the University where studies have been undertaken is not a criterion in the selection of these applicants. When two or more applicants are considered equal in other respects, preference will be given to a candidate who has studied at the University of Waterloo. Information on the residency qualifications for applicants from Alberta, Saskatchewan and Manitoba can be obtained by writing the Admissions Officer of the School of Optometry.

There is no age limit for applicants but only in exceptional circumstances will applicants older than thirty years be seriously considered for admission.

Application Procedures

Students enrolled at the University of Waterloo make application to the optometry programme by preregistering for the first professional year during the spring preregistration in March. Graduates of the University of Waterloo or persons who were at one time registered at the University of Waterloo in any type of programme also apply by preregistering in March. At that time an interview with the admissions committee will be arranged for the students. Students who have completed the preprofessional programme at another university must apply through the Ontario Universities Application Centre. Such applicants should obtain the appropriate OUAC application form from the Registrar of the University of Waterloo. These forms will not ordinarily be available from the Registrar prior to January 1, 1977. After the OUAC form has been processed by the Centre the applicant will receive a supplementary application package from the Registrar of the University of Waterloo. This will contain details on required transcripts, letters of reference and the autobiographical resume. The deadline for receipt of academic transcripts and other material is June 15. It is expected that the decisions of the admission committee will be mailed by July 15.
Students granted direct admission to the first professional year who have taken courses equivalent to those required in the upper years of the programme may apply for exemptions from these courses immediately after acceptance into the programme. Details on the policy of exemptions may be obtained by writing to the Admissions Officer of the School.

†As with other health care professions, graduates in optometry must hold the certificate of the licensing body of the province in which they choose to practice.

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 programme leading to the O.D. degree. For more information write: The Admissions Officer, School of Optometry.

Note
Interviews with the Admissions Officer of the School are required in the case of applicants in certain categories before any application can be processed. These categories include:
1) Applicants over age 30.
2) Applicants with undergraduate or graduate training who have not completed prerequisites for the first professional year and who are considering a “make-up” year.
3) Applicants considering a “make-up” year to repeat courses for the purpose of raising grades.
4) Applicants who are presently engaged in another vocation such as teaching, engineering, research, etc., and who may find it necessary to terminate employment before the admissions decision had been made.

Appointments for interviews can be made by phone or letter to the Admissions Officer of the School of Optometry.
## Academic Programme

### Year 2

#### Fall Term

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Lect</th>
<th>Lab or Tut</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biol 201</td>
<td>Anatomy, Histology and Embryology (first term)</td>
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<tr>
<td>Chem 268</td>
<td>Introductory Organic Chemistry</td>
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<td>Chem 268L</td>
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<td>Optom 200</td>
<td>History and Orientation</td>
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<tr>
<td>Optom 206</td>
<td>Geometrical Optics</td>
<td>3</td>
<td>3</td>
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<tr>
<td>Optom 224</td>
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#### Winter Term

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<tr>
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<td>Optom 211</td>
<td>Physiological Optics</td>
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<td>Optom 234</td>
<td>Anatomy of the Eye and Associated Structures</td>
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<td>Phys 246</td>
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<td>Chem 237</td>
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<td>Biol 301</td>
<td>Vertebrate Physiology (first term)</td>
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<td>3</td>
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<td>Physiological Optics</td>
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<td>Optom 302</td>
<td>Clinical Optometry</td>
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<td>Optom 305</td>
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#### Winter Term

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<tr>
<td>Biol 301</td>
<td>Vertebrate Physiology (second term)</td>
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<td>Psych 206</td>
<td>Perceptual Processes</td>
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### Year 4

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<td>Optom 402</td>
<td>Clinical Optometry</td>
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<tr>
<td>Optom 404</td>
<td>Physiology of Visual Systems</td>
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<tr>
<td>Optom 405</td>
<td>Ocular Pathology</td>
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<td>Optom 406</td>
<td>Optometrical Optics</td>
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<td>Optom 407</td>
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<td>Optom 408</td>
<td>Optometry Clinic</td>
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<tr>
<td>Optom 409</td>
<td>Light and Illumination</td>
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#### Winter Term

<table>
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<tr>
<td>Optom 414</td>
<td>Physiology of Visual Systems</td>
<td>3</td>
<td>2</td>
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<tr>
<td>Optom 415</td>
<td>Ocular Pathology</td>
<td>3</td>
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<tr>
<td>Optom 418</td>
<td>Optometry Clinic</td>
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<td>0</td>
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<tr>
<td>Optom 427</td>
<td>Optometric Specialties: Aniseikonia and Low Vision Aids</td>
<td>2</td>
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### Summer

<table>
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<th>Course</th>
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<tbody>
<tr>
<td>Optom 426</td>
<td>Summer Clinic</td>
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</table>

*(total 120 hours)*
Subject to the availability of programmes students in good standing are required to participate in vision care projects involving up to 400 hours during the period between their fourth and fifth years.

<table>
<thead>
<tr>
<th>Year 5</th>
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<tbody>
<tr>
<td><strong>Fall Term</strong></td>
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<tr>
<td>Optom 500: Optometrical Jurisprudence and Praxis</td>
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<tr>
<td>Optom 501: Physiological Optics</td>
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<tr>
<td>Optom 502: Advanced Clinical Optometry</td>
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<td>Optom 504: Ocular Pharmacology</td>
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<td>Optom 508: Optometry Clinic</td>
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<td>Optom 509: Community Health Optometry</td>
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<td>Psych 375: Psychopathology</td>
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<th>Winter Term</th>
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<tr>
<td>Optom 510: Optometrical Jurisprudence and Praxis</td>
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<tr>
<td>Optom 511: Physiological Optics</td>
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<td>Optom 512: Advanced Clinical Optometry</td>
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<td>Optom 513: Optometric Communication</td>
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<td>Optom 514: Genetics for Optometrists</td>
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<tr>
<td>Optom 518: Optometry Clinic</td>
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<td>Optom 519: Community Health Optometry</td>
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</tbody>
</table>

Note: Students with a particular interest in and an aptitude for research in physiological optics may substitute Optom 505-511 for Psych 357 and Optom 513. A student is required to complete one or the other of these alternatives.
The Honours Science Programme

The Honours Science programme allows a student to study sciences in greater depth than permitted in the General Science programme, but without as intense a degree of specialization as required in the more specialized programmes such as Honours Biology, Honours Chemistry, etc. Students desiring a somewhat broader background in the Sciences might find this programme more suitable than the more traditional specialized programmes. However, students contemplating graduate study in the traditional disciplines following their undergraduate studies are advised to pursue the more specialized Honours programmes.

Course programmes must be discussed with and approved by the appropriate Department Undergraduate Officer or his delegate. No more than eight term-courses (or their equivalent) offered under the “Science” label at the 100-, 200- or 300-level may be applied towards any Science degree programme.

A 60% cumulative overall average is required plus 60% cumulative average in the field of specialization if applicable. This is the same as for all Honours programmes in the Science Faculty.

One of the five programmes described below should be selected: Programme (1) is non-specialized; programmes (2), (3), (4) and (5) have a field of specialization: Biology, Chemistry, Earth Sciences or Physics respectively. All programmes lead to the degree of “Honours Science”.

Specific Requirements

Programme (1)

Honours Science (non-specialized)
(For Year 1, see page 179).

Years 2, 3 & 4
4 Science course-credits per year plus 2 other course-credits per year in Years 2 and 3; 1 other course-credit in Year 4. Of the total required 14 Faculty of Science course-credits, at least 10 must be at the 200-level or higher and at least 4 of them other than any Science labelled credits must be at the 300 or 400-level.

Programme (2)

Honours Science (with specialization in Biology)
(For Year 1, see page 179).

Year 2
3 course-credits from Biology 231, 232, 234, 235, 237, 238, 239, Chemistry 266-267 and 267L
2 other course-credits (Stat 202 is recommended).

Year 3
3 course-credits from Biology 331, 332, 333, 334, 335, 336, 338, 340, 341, 342, 343, 345, 346, Chemistry 332-333 and 332L-333L
2 other course-credits

Year 4
4 Science course-credits at least 2 of which are Biology course-credits from the 400-level or the list of 300-level courses above
1 other course-credit

Programme (3)

Honours Science (with specialization in Chemistry)
(For Year 1, see page 179). (except: a Year 1 Physics course is recommended (but optional))

Year 2 (see notes 1, 2 and 3)
3 Chemistry lecture course-credits at least 2 of which must be chosen from Chemistry 212, 220, 221, 264, 254, 255.
1 lecture-course-credit to be chosen from Physics, Biology or Earth Sciences. (Not Science-labelled courses)
Elective course-credits to give a total of at least 6 course credits in the Year.

Year 3 (see notes 1, 2 and 3)
3 Chemistry course-credits at the 300-level or higher.
1 lecture-course-credit (to be chosen from Physics, Biology or Earth Sciences (Not Science-labelled courses)
2 Elective course-credits

Year 4 (see notes 1, 2 and 3)
2 Chemistry course-credits at the 300-level or higher. At least 1.0 must be at the 400-level.
2 lecture-course credits chosen from Physics, Biology, Chemistry or Earth Sciences (Not Science-labelled courses)
1 Elective course-credit

Note 1
Before graduation a student must obtain at least one lecture course-credit in each of the following areas of Chemistry: Analytical, Inorganic, Organic, Physical.

Note 2
Before graduation a student must obtain at least 0.5 laboratory course-credits in each of the four areas of Note 1. Wherever possible, the laboratory chosen should accompany the appropriate lecture-course.

Note 3
All students in Chemistry programmes are also required to register in Chemistry 10 in each term of their programme beyond Year 1.
Programme (4)
Honours Science (with specialization in Earth Sciences)
In total at last 22 course-credits of which 10 are Earth Sciences course-credits, selected as indicated below. In addition at least four other Science course-credits and eight other course-credits must be chosen (Chem 121-122 and 121L-122L, Phys 111-112 or equivalent, Math 113, CS 118 or equivalent must be among these choices). A suggested year by year breakdown is as follows:

(For Year 1, see page 179)

Year 2
Earth 221, 231, 232, 235, 236, 260
1 other Science course-credit
2 other course-credits

Year 3
3 or 4 Earth course-credits at the 300-level (chosen from Earth 331, 332, 333, 336, 342, 345, 360, 370)
At least 1 other Science course-credit
At least 1 other course-credit (for a total of 6 course-credits in Year 3)

Year 4
4 Science course-credits of which at least 2 are Earth course-credits at the 400-level
1 other course-credit

Programme (5)
Honours Science (with specialization in Physics)
This programme is designed to allow a student the broadest possible selection of courses consistent with specialization in Physics.

Years 1 and 2 should include the following Honours courses from Mathematics and Physics:

Phys 121-122 and 121L-122L or 162-163 and 162L-163L, Math 113

Phys 252-253, 252L-253L, Phys 256, 256L, Phys 255 (or 324-325 in third year), Math 216, 213.

In Years 3 and 4, to complete this programme, the student must elect at least 6 course-credits of Physics at the 300 or 400 level. At least two and one-half of these course-credits must be lecture course-credits from the core of Years 3 and 4 of the Honours Physics programme. In addition, at least one and one-half credits of Physics laboratory must be completed during the four years of the programme.

General Science Programme

The General Science Programme is available as a three- or four-year option. Students may specialize in a particular subject area in the three-year programme or may elect to pursue a broad range of Science subjects (especially a “non-major” programme). The three-year programme is titled “General Science” with no area of specialization designated. The four-year programme is the official majoring General Science programme. It is only available with a selected major field (Biology, Chemistry, Earth Sciences, Physics, or as a General Science and Business programme in which a broad range of specified Science courses is required, rather than a majoring area). It is officially titled “General Science, Biology Major”, “General Science, Chemistry Major”, etc.

Graduates of the three-year programme who have taken the required courses are qualified to apply for admission to medical school in Ontario. Students who have passed the first year of the programme with appropriate choice of courses are qualified to apply for admission to a dental school. Graduates also may be eligible for admission to the Type B course at a College of Education in Ontario or for various industrial positions such as senior laboratory technicians, technical sales representatives, and so forth.

Graduates of the four-year programme who have taken appropriate courses will be eligible for certain categories of industrial and government employment for which the three-year programme will not fit them; likewise they can meet the subject requirements for application to Type A courses at a College of Education in Ontario with specialization in a single subject.

Depending on the option chosen, a student may graduate with the General B.Sc. after either three or four years; the graduation diploma will indicate whether the three- or four-year programme has been completed. A student who has graduated from the three-year programme may apply to register for the four-year programme; upon successful completion of the latter, a new graduation diploma will be issued in exchange for the original. Students may transfer from one of these options to the other; for transfer from the three- or the four-year programme, the student must have the necessary course selection and standing required for a major field.

General Science – Three-year Programme
The three-year programme B.Sc. requires the successful completion of 15 course-credits at least 14 of which must be lecture course-credits. Normal progress is 5 lecture course-credits per year. At least half of the 15 course-credits must be in Science and normally no more than 7 are allowed from the same subject area (i.e. no more than 7 Biology course-credits or 7 Mathematics course-credits or 7 English courses, etc.). Also, at least 6 of the 15 courses must be at the 200-level or higher.
If students wish to specialize in a particular subject area in Science they are advised to follow the recommendations of Years 1-3 of the four-year programme. Alternatively, a broader selection of science subjects may be chosen but students should be warned not to make their course selection so broad and varied as to find their background of little use following graduation. The responsibility of arranging a programme selection over the three years ultimately rests with the student and he/she should ensure it meets his/her needs. To ensure that proper advice is available and given regarding course selection, the student's programme must be approved at Registration time each year by a Faculty advisor.

Students are encouraged to take at least 4 courses (an average of better than one per year) from non-Science areas such as Arts or Mathematics.

The minimum standard for graduation from the three-year programme will be a cumulative (overall) average of 50% calculated for all courses taken (in any year—whether passed or failed).

**Recommended Programme**

**Year 1**
Any 5 lecture courses, two of which must be in Science. Since Year 1 is common to all subsequent programmes in Science, the student is advised to select a Year 1 programme which can lead to an area of specialization in Year 2 if desired (see page 179)

**Year 2**
5 course-credits of which 2 or 3 should normally be in Science.

**Year 3**
5 course-credits of which 2 or 3 should normally be in Science.

**Some possible electives (other than Year 1 courses described on page 179)**

The following list, while not complete, indicates some of the courses from which a choice should be made. Since some Departments offer Honours or General equivalents of the same course area, or co-operative or regular versions of the same course area, duplication of subject matter is not allowed. It is usually obvious from the course descriptions where such duplication is possible and care should be taken to avoid it as credit for only one such overlapping course will be allowed (e.g., credit for one of Chemistry 220-221, 226-227; one of Physics 111-112, 121-122, 162-163; etc.). In addition, where Departmental course listings clearly indicate an elective is available only to Arts students, or Engineering students, or Human Kinetics and Leisure Studies students, etc., such courses may not be selected in the General Science programme. Students must also have any necessary prerequisites listed before attempting upper year courses; these are listed in the Departmental descriptions. (No more than eight term courses at the 100-, 200- or 300-level may be selected from the courses under the “Science” label).

**Science courses recommended**
(Other than Year 1 courses)

Biology 231, 232, 234, 237, 238, 239, 245-246, 331, 332, 333, 334, 335, 336, 338, 340, 341, 342, 343, 345, 346, but not 110, 201, 203, 204, 235, 301


Earth Sciences 221, 231, 232, 235, 236, 260, 331, 332, 333, 336, 342, 345, 355, 368-369, 370


**Mathematics courses recommended**
Mathematics 113, 111a-111b, 226, CS 118, 150, 160, 210, 250; AM 101-111; Stat 204-205.

**Arts courses recommended**
It is impossible to list all options here since tastes vary. Many students select first or second year options from the following subject areas: Anthropology, Arts, Economics, English, French, Geography, German, History, Philosophy, Political Science, Psychology, Russian, Sociology, Religious Studies. Subject to prerequisites and timetable, a wide range of Arts courses is available.

**General Science—Four-year Majoring Programmes**
The four-year programme requires the successful completion (with at least a passing mark in each) of 20 course-credits for the B.Sc. An official major field (from Biology, Chemistry, Earth Sciences and Physics) must be selected; at least 8 course-credits from this major field must be completed as specified and normally not more than 10 from the major field area will be allowed. The only exception to the requirement of a major field is in the General Science and Business programme where a broad range of Faculty of Science courses is required.

While considerable flexibility to take electives exists in this programme, students must take the courses required by their major Departments (there are at least 8 free electives available in each programme; Departments may have published recommendations regarding electives which should be strongly considered although they are not compulsory). Upon graduation, at least half of the 20 course-credits presented must be in Science. Students are encouraged to take at least 4 courses (an
average of one per year) from non-Science areas such as Arts or Mathematics.

The minimum standard for graduation from the four-year majoring programmes will be a cumulative (overall) average of 50% calculated for all courses taken (in any year—whether passed or failed) plus a 60% cumulative average for the major field courses. Students who do not maintain their major field average in the four-year programme will be transferred to the three-year ("non-major") programme where a major field average is unnecessary.

Recommended Programme
The selection of courses in upper years will be restricted partly by limitations imposed by the timetable, and partly by the necessity in many courses of having completed prerequisites. Each student's programme must, therefore, be approved by the Undergraduate Officer of the Department of his major field.

The following programmes are those recommended by the department of major study in their fields. The University will make every effort to ensure that the timetable accommodates these programmes.

**Biology Major**
*Year 1*
Including Biol 132 and Chem 121-122 and 121L-122L (see page 179).

*Year 2*
Two course-credits from: Biol 231, 232, 234, 235, 237, 238, 239
Chem 266-267 and 267L
Two other course-credits

*Year 3*
Two or three course-credits† from Biol 331, 332, 333, 334, 335, 336, 338, 340, 341, 342, 343, 345, 346.
Three or two non-Biology electives (Chem 332-333 and 332L-333L recommended).

*Year 4*
Five courses at least two† of which are 400-level Biology courses or from the above list of 300-level Biology courses.

†Students wishing to apply for the Ontario Department of Education Type A certificate must choose three courses in Biology in Year 3 or take a third Biology course as an extra course. In Year 4, three Biology courses should be selected.

**Chemistry Major**
*Year 1*
Including Chem 121-122 and 121L-122L and Math 113 and a full-year Physics course

*Year 2††*
Chem 226-227 and 226L-227L, 266-267, 267L, 218, 219
2 Elective course-credits†

*Year 3††*
Chem 316-316L, 356-357, 356L-357L, 366-366L
2 Elective course-credits†

*Year 4††*
Five elective course-credits to complete the requirements for the degree†

†Electives can be freely chosen provided that before graduation at least two Chemistry course-credits are obtained at the 300- or 400-level, in addition to the required courses listed above. At least 19.0 lecture course-credits must be obtained before graduation.

††All students in Chemistry programmes must also register in Chem 10 in each term of their programme beyond Year 1.

**Earth Science Major**
*Year 1*
Including Earth 130 and Chem 121-122 and 121L-122L (see page 179).

*Year 2*
Earth 221, 231, 232, 236, 235, 260
Two Electives

**Note**
Students should note that Phys 111-112 is a prerequisite for the Applied Geophysics course Earth 360 given in the third year. Math 113 and an introductory course in computer programming are prerequisites for Earth 355, 456 and 461 given in the third and fourth years.

*Year 3*
Two or three course-credits from:
Earth 331, 332, 333, 336, 342, 345, 355, 360, 370
Two or one course-credits from Science or Mathematics Arts elective: One course-credit

*Year 4*
Two or three course-credits from:
Earth 421, 427, 432, 433, 434, 435, 438, 439, 440, 456, 461, 470
Three or two course-credits from non-Earth Sciences courses

Some possible electives are shown in the list under the three-year programme. These courses would be suitable choices here. (Physics 301-302 is especially recommended.)
**Physics Major**

**Year 1**
Including Phys 121-122 or 162-163 and Math 113 (see page 179).

**Year 2**

Phys 222-223 and 222L-223L, 226-227 and 226L-227L
One of: Math 226, 220a, b or a course in computing
One of: Chem 218-219, 266-267, Sci 251-252, Earth 130 or 231-232
Elective

**Year 3**

Phys 324-325
One or two of: Phys 250-251, 352 and 352L, 353 and 353L, 355-359, 368-369, 380-381; or 364-365
Two or one of: Math 221a, b or Stat 204-205, Chem 218-219 or 356-357
Arts or Mathematics Elective

**Year 4**

Two or one non-Physics Science courses
Arts or Mathematics Electives

**Business Administration Option**

There is a growing need for graduates who have a competence in the combined disciplines of science and business administration. For those students whose leanings are towards administration in industry, marketing, analysis, etc., rather than scientific research or teaching, the following courses are strongly recommended for inclusion in the four-year majoring programmes shown above. In some terms, six half courses are required. Because courses for this option are given by several faculties at two universities, timetable changes may occur from time to time. It is the students' responsibility to keep informed about these changes. These business and economic courses normally provide the prerequisite background for a Master of Business Administration course. Admission requirements for postgraduate studies in Business Administration depend on the admitting university. In some instances, an entrance examination may be required. It is the students' responsibility to obtain information regarding admission from the university of their choice.

**Specific Requirements Over and Above the Major Requirements**

**Year 1**

Econ 101-102; CS 140 or 116 and Math 113 if not in major programme selected

**Year 2**

Math 215 or 216; Econ 201-202, 191-192

**General Science and Business**

The following four-year General Science programme provides a broad scientific background in many relevant areas of Science and Mathematics (without requiring a particular majoring area of Science) and is designed for the student wishing to combine the disciplines of science and business administration/economics. Students whose leanings are towards administration in industry, marketing, analysis, etc., will find it ideal for their purposes.

The programme is made up of at least 20 course-credits with 10 required in Science (including at least 4 at the 300-level or higher) and the remainder in Mathematics, Economics and Business Administration. The Business courses are given at Wilfrid Laurier University and may be taken by University of Waterloo students through co-operation between the two Universities; Economics courses are offered by the Department of Economics, University of Waterloo. Because courses for this option are given by several faculties at two universities, timetable changes may occur from time to time. It is the students' responsibility to keep informed about these changes. The business and economics courses provide the prerequisite background for a Master of Business Administration programme. Admission requirements for postgraduate studies in Business Administration depend on the admitting university. In some instances, an entrance examination may be required. It is the students' responsibility to obtain information regarding admission from the university of their choice. It will not normally be made beyond the Year 2 level.

**Year 1**

5 lecture course-credits:

at least 2.0 course-credits must be from Biol 131 (or 132), Chem 121-122 + lab, Earth 130, and Phys 111-112.

Math 113

Econ 101-102

CS 118 or 116

**Years 2, 3 and 4**

8 Science course-credits at the 200-level or higher and at least 4 must be at the 300 or 400-level. No more than eight term courses (or their equivalent) offered under the "Science" label at the 100-200- or 300-level may be applied towards the degree.

**Specific requirements:**

**Year 2**

Econ 191-192

Econ 201-202
Year 3
Econ 221 or Bus (WLU) 255
an Economics one-term elective—Bus (WLU) 275 is
recommended
Bus (WLU) 352-362

Year 4
Bus (WLU) 388
Bus (WLU) 390
Bus (WLU) 385-395
Econ 393-394

WLU (Wilfrid Laurier University) courses required in the
Business Programmes, as specified on p. 211. (Each is a
0.50 credit course)

Bus 255—Basic Statistics
Bus 275—Decision Analysis
Bus 352—Introd. to Marketing
Bus 362—Marketing Functions
Bus 385—Operation Analysis and Control Techniques
Bus 388—Organizational Behaviour
Bus 395—Operations Management
Bus 396—Administrative Practises
Undergraduate Course Descriptions

Arts and Crafts sale – Campus Centre
Course Description Information

Explanatory Notes and Terminology
The course descriptions in the following chapter have changed in appearance from previous calendars. Each course description now begins with a line of coding as shown in the sample below. The course numbers are now prefixed by a subject code, the terms offered, number of hours per week and type of instruction are displayed, and the asterisk has been replaced by "credit weight". For some courses, information concerning terms offered and type of instruction was not available at the time of publication.

The course descriptions now resemble more closely the format of the Timetable Enrollment Report and the Course Offerings List, two documents students use when preregistering. However students should keep in mind that the calendar is not a preregistration document. Information in the calendar is subject to change; students should consult the Course Offerings List and the Timetable Enrollment Report when preregistering.

Sample Course Description

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Course Name: Basic French

Course Description: An elementary course designed to give the student a solid beginning in oral expression in the French language, as well as an understanding of the basics of French sentence structure.

Extra information about course requirements: Prereq: Consent of Department

Terminology

Terms Offered
F  Fall term
S  spring term
W  winter term
J  summer, first half, July
A  summer, second half, August
M  summer, both terms, July, August
Y  September - April - 8 month session

Type of Instruction
C  Lecture
L  Laboratory
T  Tutorial
S  Seminar
D  discussion
R  reading course
wkshp  workshop
std  studio
fldlab  fieldlab
prereq  prerequisite
coreq  corequisite
P  Practicum
### Subject Codes

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Undergraduate Course Descriptions

Note
Many of the listed courses are given irregularly. While this calendar is as up-to-date as deadlines permit, students should consult the course offerings list issued at preregistration.

Anth 101 S,F 3C .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.
Also offered at St. Jerome's College

Anth 102 W 3C .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.
Also offered at St. Jerome's College

Anth 103 F 3C .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 104 W 3C .5
Language Learning
First and second language learning are considered from linguistic and anthropological points of view, with emphasis on problems arising in second language learning. Examples stress English, French, and the Native languages of Canada.

Anth 105 F,W
Explorations in Anthropology
The following courses (Anth 105A-K) illustrate general principles of anthropology through the exploration of specific topics.

Anth 105A F 3C .5
Human Ecology and Adaptability
This course focuses on various ecological systems which include human populations. Emphasis will be on societal and individual adaptations to environmental problems such as altitude, cold, and fluctuations in food supply.
Anth 105B  F  3C  .5
Anthropology

Ancient Man the Hunter
This is a general introduction to Prehistoric Archaeology. It examines the evidence for ancient man in the Old World and New World with emphasis on tool making and cultural ecology. The popular view is contrasted with the traditional anthropological approach.

Anth 105C  F  3C  .5
Prehistoric Man in North America
This is a general introduction to North American Archaeology. The traditional cultural ecological approach is compared and contrasted with the more revolutionary ideas recently expounded by popular writers.

Anth 105D  W  3C  .5
Cultural Evolution and Human Adaptation
The technological and social transformations of the past 14 million years are examined as uniquely human solutions to the problems of survival in a changing natural and cultural environment. Based on archaeological and comparative ethnological and primatological evidence.

Anth 105E  F  3C  .5
Anthropology, Colonialism, and Revolution
European expansion's effects on diverse cultures and societies are explored. The role of the anthropologist as agent for the oppressor and as advocate for the oppressed is examined. The prospects of anthropology in a post-colonial world are suggested.

Anth 105F  F  3C  .5
Anthropology Through Science Fiction
Basic anthropological concepts, such as biological and cultural evolution, culture, human adaptability, and culture contact will be explored through examples from science fiction and related anthropological studies.

Anth 105H  W  3C  .5
The Cultural Anthropology of Canada
The principles of cultural anthropology will be taught by using the ethnic cultures in Canada as a descriptive base.

Anth 105K  W  3C  .5
Cultures in Contrast
Examined are a variety of human societies from technologically primitive bands of Australia to tribal peoples of South America and New Guinea through peasant cultures, rural communities, and urban gang of Europe and North America.
Anth 231 W 3C .5
North American Indians 1
The society and culture of North American Indian hunters and gatherers (excluding big game hunters dependent upon the horse) is surveyed. The course concentrates on the adaptation exhibited by these peoples at the time they were first contacted by Europeans.
Prereq: Second year standing (Anth 102 or 105 is desirable)

Anth 232 North American Indians 2
Not offered 1977-78

Anth 233 W 3C .5
Eskimo Cultures
Eskimo cultures of Alaska, Canada, and Greenland from the time of European and Asian contact to the present. Administrative systems imposed on the Eskimo will be analyzed and compared, as will the contemporary problems these communities face today.
Prereq: Second year standing (Anth 102 or 105 is desirable)

Anth 236J Social and Cultural Change in South East Asia
Not offered 1977-78

Anth 237 Circumpolar Peoples
Not offered 1977-78

Anth 238 Caribbean Society
Not offered 1977-78

Anth 240 Canadian Indian-White Relations: 1830-1950
Not offered 1977-78

Anth 241 F 3C .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 247 F 3C .5
Urban Anthropology
Approaches to the study of urban centres as undertaken by anthropologists. Selected topics such as urban social networks, the urbanization of non-western societies, and the culture of poverty will be pursued.
Prereq: Anth 102 or Anth 105 or permission of the instructor

Anth 248 Peasant Society
Not offered 1977-78

Anth 249 Band and Tribal Societies
Not offered 1977-78

Anth 258 Anthropology and the Future of Man
Not offered 1977-78

Anth 260 W 3C,1L .5
Human Evolution
Data, methods, and theory in the study of the origin and evolution of man. Emphasis will be on the fossil evidence.
Prereq: Anth 101 or Anth 105 or permission of the instructor

Anth 261 F 3C .5
Primate Behaviour
An introduction to the behaviour of the non-human primates with emphasis on the relevance to the origin of man. Topics will include sexual behaviour, mating systems, aggression, territoriality, and communication.

Anth 262 W 3C,1L .5
An Introduction to the Study of the Non-human Primates
Topics discussed will include comparative anatomy, genetics, and physiology of the living primates as well as the fossil evidence for primate evolution.
Prereq: Anth 260 or permission of the instructor

Anth 263 Evolution of Human Behaviour
Not offered 1977-78

Anth 271 S .5
Archaeological Field Methods
Data gathering techniques will be studied and applied in field work on archaeological sites. Two weeks' of eight hour days involvement with archaeological sites in the Waterloo area. Materials and transportation fee of $20-30.

Anth 275 W 3C .5
Principles of Archaeology
An introduction to the working assumptions, analytic approaches, and integrative and descriptive methods of archaeological anthropology. Recommended to Honours Anthropology students

Anth 283 F 3C .5
Phonology for Non-Linguists
Devising adequate writing systems for unwritten languages. The class will simulate field sessions, with an informant who speaks an unfamiliar language.

Anth 285 Descriptive Grammar 1 – Morphology
Not offered 1977-78

Anth 286 Descriptive Grammar 2 – Syntax
Not offered 1977-78

Anth 310 Indians of the Canadian Subarctic
Not offered 1977-78

Anth 320 Pleistocene Prehistory in the Old World
Not offered 1977-78
Anth 321 W 3C .5
Recent Prehistory in the Old World
Cultural development from the agricultural revolution to
the rise of literacy. Special attention to the development
of agriculture as a means of subsistence and to the rise of
early civilization in the Near East.
Primarily for Honours Anthropology students.
Prereq: Anth 275 or permission of the instructor

Anth 322 W 3C .5
Prehistoric Man in the Great Lakes Area
An in-depth study of the archaeological evidence of
prehistoric man in the Great Lakes area from his arrival
to the coming of Europeans. Cultural ecology and cultural evolution will be stressed.

Anth 330 W 3C .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 Anth or consent of the instructor

Anth 333 W 3C .5
Canadian Communities and Planned Change
The nature of planned programmes and their
implications for the communities involved through
ethnological studies of small communities in Canada and
abroad. Reasons for the success or failure of
programmes of change are sought in relation to
community structure.

Anth 335 Anthropology and Education
Not offered 1977-78

Anth 342J Introduction to the Study of Acculturation
Not offered 1977-78

Anth 345, 346, 347, 349 .5
Special Problems in Anthropology
Lecture or seminar in special problems in anthropology.
Topics may include problems in archaeology, physical
anthropology, linguistics, or social/cultural anthropology
and will vary by term and instructor.

Anth 350 Sex Roles in Anthropology
Not offered 1977-78

Anth 355J Ethnic and Cultural Pluralism in World
Perspective
Not offered 1977-78

Anth 359 W 3C .5
Political Anthropology
The study of political behaviour in both state and
non-state society. A comparative approach will be used
with a thorough examination of the political systems of
selected societies.
Prereq: Anth 102 or Anth 105 or permission of the
instructor

Anth 365 W 3C, 1L .5
Fossil Man
A detailed examination of the fossil evidence for human
evolution with particular emphasis on interpretation and
reconstruction.
Prereq: Anth 260 or permission of the instructor

Anth 370 W 3C 5
Ethnographic Field Methods
The techniques and problems of ethnographic field work
will be explored. Emphasis will be on field work in
contemporary society and students will be expected to
complete a field project on their own.
Prereq: Anth 202 or consent of the instructor

Anth 372 Archaeological Techniques
Not offered 1977-78

Anth 373 W 3C .5
Archaeological Reporting
Various ways of processing archaeological data will be
demonstrated and discussed. The major emphasis will
be on writing up archaeological reports.
Primarily for Honours Anthropology students
Prereq: Permission of the instructor

Anth 375 Genetics and Variability in Human Populations
Not offered 1977-78

Anth 376 Human Population Genetics
Not offered 1977-78

Anth 380 F 3C .5
Language and Culture
Language is examined as a vehicle of culture (a
linguistics code as a device for communication), as a
mirror for culture (lexical and semantic aspects), and as a
tool of society (uses and functions of language).
Illustrations will be from a variety of languages.
Prereq: One half-credit from each of linguistics and
socio-cultural anthropology

Anth 381 W 3C .5
Semology
A linguistic approach to the study of meaning expressed
in the grammatical systems and lexical sets of particular
languages.
Prereq: One half-credit in linguistics or permission of the
instructor
Anth 388 F 3C .5
Applied Anthropology
The technical and ethical aspects of directed culture change will be examined.
Prereq: One-half-credit in socio-cultural anthropology

Anth 390, 392 Y 1.0
Reading in Anthropology
Guided reading in a selected portion of the anthropological literature.
Prereq: Anthropology major or honours student and permission of the instructor

Anth 391, 393, 395, 397 S,F,W .5
Reading in Anthropology
Guided reading in a selected portion of the anthropological literature.
Prereq: Anthropology major or honours student and permission of the instructor

Anth 401/402 Seminar in the Literature of Social and Cultural Anthropology
Not offered 1977-78

Anth 420 F 3S .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 449 W 3S .5
Honours Seminar
Seminar on selected contemporary issues in anthropology. Open only to Honours anthropology students.

Anth 450 Honours Seminar
Not offered 1977-78

Anth 451 The Formative Years of Cultural Theory
Not offered 1977-78

Anth 452 Contemporary Cultural Theory
Not offered 1977-78

Anth 460 Advanced Physical Anthropology
Not offered 1977-78

Anth 480 .5
Theoretical Approaches to Linguistic Description
Different theoretical approaches—stratificational, transformational, and signals grammar, one approach to be emphasized during each offering.
Prereq: Anth 286 or Engl 375 or permission of the instructor
Given on request

Anth 499 Y 1.0
Honours Essay
Directed reading and research in a selected area of anthropology inquiry. Open only to Honours Anthropology students
School of Architecture

Associate Professor, Acting Director
D. B. McIntyre, BArch (Toronto), MRAIC

Assistant Professor, Associate Director
F. Thompson, BArch, MArch (Toronto), MRAIC

Professors
T. E. Bjornstad, BArch (Iowa State), PhD (Liverpool), A.I.A., MRAIC
L. A. Cummings¹, AB (Washington), AM (Missouri), PhD (Washington)
R. H. Sims, AADip (Hon) (London), RIBA
F. H. Watts, AADip (London), MLA (Harvard), RIBA, MRAIC

Associate Professors
A. Banerji, BArch (Calcutta), MArch (North Dakota State)
A. H. Schrecker, BA (Kalamazoo), MA (Wellesley), PhD (Bryn Mawr), BArch (Toronto)
R. M. Schuster, BS, MS (North Dakota State), PhD (Iowa State), PEng
J. Zvina

Assistant Professors
A. Brown, BArch (Toronto)
O. Dutt, BA (Punjab), BSc (Hon) (London), MS (Wisconsin), PhD (Waterloo), PEng
M. Elmrit, National Diploma in Design (High Wycombe)
B. Hunt, AA Dip (London), RIBA, MRAIC
J. C. Somfay, BArch (N.S.W. Sydney), MArch (Toronto) MRAIC
R. Wiljer, BA (Waterloo), MA (Ottawa), (on Sabbatical Leave 1977-78)

Lecturers
E. R. Haldenby, BES, BArch (Waterloo)

Assistant Professors (Part-time)
E. Gustavs, BArch, MArch (Toronto), MRAIC

Visiting Critics
J. Belisle, BArch, (McGill), MArch, MLA (California)
A. E. LeRoux, BArch (Rand), MRAIC
H. Plumb, BArch, MArch (Toronto), MRAIC
H. Schefter, BArch (Cornell), MRAIC

Visiting Lecturers
B. Schneider, Dipl, Ing Architekt (Berlin)

Special Lecturers
W. G. Dailey, BArch (Liverpool)

D. K. Lansdowne

Faculty members holding cross and joint appointments as shown
¹ Architecture and English

Undergraduate Course Descriptions

Courses for Bachelor of Environmental Studies (Pre-Professional Architecture)

For Recommended Programme, see page 130.
For Elective Course Requirements, see page 227.

Systems and Measures

Courses in this theme area give preparation leading to the application of mathematics, statistics and computer science as tools for analyzing quantitative and behavioural problems as prerequisites for ensuing studies; to develop an understanding of the qualities of materials and structural behaviour; to propose alternatives in structural engineering; and to perform independent mathematical checks on simple, statically determinate and indeterminate structures.

Arch 102 F 3C,2L .5

Mathematics

Calculus and Vector Geometry
Elementary differential and integral calculus, applications to problems involving rates of change, areas, volumes, centroids, moments of inertia; introductory vector geometry in two and three dimensions.
Prereq: None

Arch 103 W 3C .5

Statistics

Descriptive statistics, sampling, curve fittings, regression and correlation; elementary queuing models, emphasis on the description of environmental processes through observation data.
Prereq: Arch 102 or Math 130

Arch 112 & 113 F,W 2C,2L .5

Computer Science

Introduction to Programming
This course is essentially the same as Math 132, with emphasis on solving architectural problems.

The language applied is Fortran with Watfiv. A machine language simulation "Spectre" is also taught for a better understanding of the way computers operate.
Prereq: None

Arch 163 W 1C,2L .5

Statics

Basic concepts, forces, moments, system of forces, resolution of forces, transformation of couples; resultant of force systems; centre of gravity of a system of forces and of composite bodies; equilibrium, free body diagrams; shears, moments, bar forces in simple trusses; friction; moment of inertia.
Prereq: Arch 102 or Math 130
Arch 212   F  2C,2L .5
Computer Science Simulation
Simulation programming is developed in Fortran so as to build up meaningful architectural simulation concepts necessary in architectural planning. Specific simulation languages such as G.P.S.S. is introduced.
Prereq: none

Arch 213   S  4C .5
Computer Generated Design 1
Architectural Design 1
An overview of design logic and computer system requirement currently used for architectural design.
Prereq: Arch 212 or consent of instructor

Arch 262   F  2C,2L .5
Strength of Materials
Concept of simple stress and strain; statically indeterminate axially loaded members; thermal stresses, torsion, shear and bending moments in simple beam; shear and moment diagrams, qualitative deflected shapes, flexural and shearing stresses, deflection calculations; combined stresses, beams of different materials, compression members, Euler’s formula.
Prereq: Arch 163

Arch 263   S  2C,2L .5
Theory of Structures 1
Historic review of building structures; live and dead loading, wind, snow, earthquake, reactions, stability, and indeterminacy of structural systems; shears, moments and qualitative deflected shapes; bar forces in pin-connected frameworks; approximate methods of analysis for high rise building frames; deflection calculations by the moment area method, influence lines, introduction to arches and cables.
Prereq: Arch 262

Arch 265   S  1C,2L .5
Structural Morphogenesis
Prereq: Architecture students should have completed first year; other students require consent of instructor

Env St 271 Introduction to Quantitative Research Methods
See Environmental Studies course descriptions, page 294.

Env St 272 Computer Programming in Environmental Studies
See Environmental Studies course descriptions, page 294.

Arch 313   F,W  4C .5
Computer Generated Design 2
Architectural Design 2
Input from various other courses is formulated into comprehensive data structures and simulated behaviour patterns; methods of synthesis problem-solving techniques, analysis of thought processes and protocol analyses. Course is project oriented.
Prereq: Arch 213

Arch 363   F  2C,2L .5
Theory of Structures 2
Advantages, limitations and principles of indeterminate structures; analysis of continuous beams and rigid frames by consistent deformations, moment distribution, slope deflection methods.
Prereq: Arch 263

Arch 372   W  2C,2L .5
Mechanical Systems 1
Plumbing and drainage; heating, ventilating and air-conditioning systems; electrical distribution for power and light; illumination; acoustics, geometrics and materials; vertical transportation systems.
Prereq: Arch 293, or consent of instructor

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.

Env St 111 Introduction to the Study of the Future
See Environmental Studies course descriptions, page 294.

Env St 195 Introduction to Environmental Problems
See Environmental Studies course descriptions, page 294.

Env St 200 Field Ecology
See Environmental Studies course descriptions, page 294.

Arch 223   S  2C .5
Human Ecology
Social behaviour as the Human/Physical Interface
The biological and psychological basis of perception and cognition of environments; factors affecting percepts, images and meanings; small groups and the social environment; the structure, functioning and change of neighbourhoods and communities.
Prereq: Env St 195
### Course Descriptions

#### Architecture

**Arch 224** F,W,S 1C,2std  .5
**An Introduction to Landscape Design**
An introduction to the design of landscape with emphasis upon the architectural attributes of plant and land forms.  
**Prereq:** Arch 192 and 193

**Env St 252** Media Tools for Environmental Studies
See Environmental Studies course descriptions, page 294

**Env St 253** Media Tools for Environmental Studies - Advanced Level
See Environmental Studies course descriptions, page 294.

**Env St 358** Environmental Pollution and its Control
See Environmental Studies course descriptions, page 295.

**Env St 380/381** Environmental Studies Workshop
See Environmental Studies course descriptions, page 295.

**Env St 400** Environmental Law
See Environmental Studies course descriptions, page 295.

**Env St 411** Alternative Future Environments 1
See Environmental Studies course descriptions, page 295.

**Env St 412** Alternative Future Environments 2
See Environmental Studies course descriptions, page 295.

**Env St 417** Land Use History and Landscape Change 1
See Environmental Studies course descriptions, page 295.

**Env St 418** Land Use History and Landscape Change 2
See Environmental Studies course descriptions, page 295.

### 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 of 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 where all faculty members are consultants to the students; (5) to provide a vehicle for persons from faculties of different disciplines and from outside of the university to discuss with students their problems and projects from different points of view.

**Arch 091** .5
**An Introduction to Studies in Architecture**
Created for those who wish to study architectural first principles. Objectives include participant exposure and visual communicative techniques including free-hand drawing etc. related to explorations in general design.  
**Prereq:** None

**Arch 095** .5
**An Introduction to Visual Design**
Intensive studio participation involving seminars and lectures develops problem solving abilities through the introduction of man-made and natural structural models. Knowledge integration, the genesis of form is applied in the search for new ideas and methods. 
**Prereq:** None

**Arch 192** F 2C,6std 1.0
**Design Fundamentals**
**Design Fundamentals and Workshop**
Perceptual techniques and methods; principles of graphic communication, what “media” are and what are their best applications, the qualities of materials in construction and the qualitative, behavioural characteristics of structural forms and shapes; perspectives, and instrument and free-hand drawing. 
**Prereq:** Architecture students only

**Arch 193** W 7C,7wkshop 1.5
**Design Fundamentals and Studio**
Space notation, serial vision; the sensory input and stimuli of the environment to man, pattern recognition; design exercises for the students to observe and communicate about action and reaction of materials in the environment, the individual responses physiologically and psychologically to objects in the environment, and the methods of communicating specific messages from man to man using graphic media. 
**Prereq:** Arch 192
Course Descriptions
Architecture

Arch 194 W 2C .5
Visual Interdisciplinary Language
Theory and practice of visual form based on formative processes and heirarchial structures. Propositions: form follows process, rotation is a universal form-generating process, symmetric form is a result of an asymmetric process and freedom is the single organizing principle.
Prereq: Consent of instructor

Arch 252 W .5
Creative Problem Solving
Development of creative skills through group behaviour in problem solving sessions by: 1) developing a clear understanding of each participant's own creative thought processes; 2) increasing his/her ability to consciously and deliberately make use of his/her own creative potential; 3) engendering an awareness of the capacity to use himself/herself and the people he/she works with to produce better solutions to the problems identified by the group.
Prereq: Consent of instructors

Arch 284,285 F,W 3C .5
Architectural Research
This offers a student an opportunity for independent research study 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) U.G.A.C.

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. The finalized solution is presented and construction documents produced.
Prereq: Arch 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.
Prereq: Arch 292

Arch 384,385 F,W R .5
Architectural Research
This offers a student an opportunity for independent research study 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) U.G.A.C.

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 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 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

Culture

Courses in cultural history give the student a critical and creative understanding of the basic ingredients of all creative work, recognizing the seemingly unrelated forces for change in the cultural history of man, and comprehending the present as a part of the historical past. Open to any University student upon consent of instructor. No prerequisites are required for these courses except for Architecture students.

Arch 022 .5
Architecture & its Social Context
A critical view of the social forces that shape buildings. Examples, both historical and contemporary, from differing cultures, will be used: Medieval architecture, Masai villages, Scandinavian buildings, Shaker architecture, the organization of architects offices, clients aspirations. If deemed useful, there will be a small design project.
Prereq: Consent of instructor
Arch 045  .5  
**British and North-American Architecture**  
The development of modern architecture in Britain from 1930 until the present. Introduction to the major forces and forms of North American architecture.  
*Prereq: None*  

Arch 452  F  2C  .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: B.E.S. standing*  

Arch 462  F  2C,2L  .5  
**Structural Synthesis 1**  
*Steel and Concrete Design*  
Design and behaviour of structural steel systems, application of current building specifications, proportioning structural elements based on pertinent design considerations, bolted and welded; criteria for choosing steel systems; introduction to plastic design.  
*Prereq: B.E.S. standing*  

Arch 463  W  2C,2L  .5  
**Structural Synthesis 2**  
*Concrete and Timber Designs*  
Design and behaviour of structural concrete systems, application of building specifications; analysis and design of concrete elements using ultimate strength principle; criteria for choosing structural concrete systems; introduction to prestressed concrete. Behaviour and design of modern wood structures; fasteners, ring connectors and their significance in timber construction; proportioning and design of sawn and laminated timber members.  
*Prereq: Arch 462*  

Arch 472  F  2C  .5  
**Mechanical Systems 2**  
Heating, ventilating and air conditioning systems for buildings; plumbing and drainage; electrical distribution for power and light in buildings; illumination; acoustics, geometrics and materials; and vertical transportation systems.  
*Prereq: Arch 372*  

Arch 484,485  F,W  3R  .5  
**Architectural Research**  
This offers a student an opportunity for independent research study 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) U.G.A.C.*  

Arch 492,493  F,W  3C,18std  2.0 each  
**Design Studio**  
The intent of these courses is to develop skills and gain experience in architectural design through the application of design and analysis techniques to complex building types. This is approached through a series of design projects aimed at the exploration of generative factors in the definition of built form. Projects are closely related to existing contexts and parallel current practicing conditions. Both individual and group work are included.  
*Prereq: B.E.S. or its equivalent*  

Arch 554  W  3C  .5  
**Development and Financing**  
Introduction to the important determinants of the development, growth and re-planning of the various man environments, including development law, land use development, land use planning, appraisal, mortgage lending and accounting.  
*Prereq: Arch 455*  

Arch 555  S  2C  .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: B.E.S. standing*  

Arch 563  W  3C  .5  
**Suspended and Space Structures**  
State-of-the-art review of cable-suspended construction. Analysis of cable networks, basic equations. Effect of live loads on cables; dynamic considerations. Double cable systems; synclastics and anticlastic surfaces. Cable-stayed systems; analysis of space structures; space frames and roof systems; one and two-way design.  
*Prereq: 4B architecture standing or equivalent*
Arch 142  F  2C,2L .5
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  2C,2L .5
Iconography 2
A survey of the symbolic Nature of the Environment
A study centred on ancient life to initiate the student into the stream of cultural history and the complex problems of what the artist is, the quality of human existence, culture, environment, as well as the working of the icon from raw state of perceived image to its function as an expressive symbol in poetry, music, dance, architecture and other works of art; a study of modern work in comparison to ancient achievement.
Prereq: Arch 142

Arch 244  F  2C,3D .5
History of Gardens of Europe and Western Asia
To study the garden as a work of art reconciling man with his world. Gardens of Europe and Western Asia are studied as responses to the stress and aspirations of an age to the climate and landscape of the land in which they were created.
Prereq: Arch 142, 143, and 246 for architecture students and completion of first year for others

Arch 245  W,S  1C,2L .5
Survey of Contemporary Architecture
Formative years in Europe, early North American scene, study of contemporary works in Architecture, analyses of important buildings of twentieth century. Philosophies of internationally known architects and designers. Study of the development of architectural styles, trends and schools of thought in North America and other countries.
Prereq: Second year standing

Arch 246  F  2C,2L .5
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.
Prereq: Arch 143

Arch 247  S  2C,2L .5
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.
Prereq: Arch 246

Arch 346  W  2C,2L .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 the autonomous human will through a study of selected works in philosophy, literature, art and architecture.
Prereq: Arch 247 or consent of instructor

Arch 347  4C .5
The Roots of Civilization
(For Recommended Programme, see page 131)
The courses for the Bachelor of Architecture Programme 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.
Architectural Research
This offers a student an opportunity for independent research study 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) U.G.A.C.

Design Studio
The course provides an opportunity for the student to select an area of concentration for study and design in depth. A thesis topic is to be submitted and approved during term 8 (4b) and all research work completed by the end of the 6 month co-op work term 5. Terms 9 and 10 (5a and 5b) will be spent developing the thesis for presentation during term 10. The thesis is to be a vehicle for thinking and design at an innovative level. Thus considerable emphasis is placed on formulation of policy and development of design solutions from the knowledge gained during the research period.

Prereq: 492 and 493

Electives
Students are permitted to study courses given by the University at large which are in the area of the student's individual interest. This will hopefully provide better orientation and more inter-disciplinary communications relevant to the student's academic pursuits.

Electives are divided into the following two categories:

(TE)
Theme Elective (BES Degree) courses within the Faculty of Environmental Studies which deal with ecological issues. Theme Elective (BArch Degree) any course within the School of Urban and Regional Planning.

Each student pursuing a BES degree must have accumulated one and a half-course credits in the theme area of Ecology by or before his/her 6th academic term.

Each student pursuing a BArch degree must have one half course credit in the theme area of Planning by or before his/her 10th academic term.

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

Note
Department approval is mandatory for both TE and FE.
Arts

Visiting Professors
A. Newcombe, BA (McMaster), MA, PhD (Toronto) G

Professors
G. T. Barrett-Lennard, BSc, BA (Western Australia), PhD (Chicago)
W. Klaassen, BA (McMaster), BD (McMaster Divinity School), DPhil (Oxford) G
A. R. Mahrer, BS (Western Reserve), MA, PhD (Ohio State)
D. E. Smucker, BA (Bluffton), BD (Princeton Theological Seminary), MA, PhD (Chicago) G

Associate Professors
F. H. Epp, BA (Bethel), MA, PhD (Minnesota) G
P. H. Smith, Jr., BA (Harvard), PhD (Pennsylvania)

Assistant Professor
C. G. Brunk, BA (Wheaton), MA, PhD (Northwestern)

Lecturers
C. M. Lim, BA (Taiwan Provincial Chung-Hsing Uni.)
E. Regehr, BA (Waterloo)
C. C. Wang, BS (Taiwan Provincial Chung-Hsing University), BA, MA (National Taiwan University)

Undergraduate Course Descriptions

Several courses formerly offered under the designation "Arts" are now offered under "Interdisciplinary Social Science". See course descriptions in the Social Development Studies section of the Calendar.

Courses designated "Arts", such as 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. With the exception of Chinese language and literature courses, Arts courses are elective courses in General and Honours programmes and do not satisfy either the Group A or Group B requirements. Chinese language and literature courses with the Arts designation satisfy the Aii requirement. Arts courses are administered through the Office of the Dean of Arts.

Arts 105 F,W 3L .5 Introduction to the Science of Man
The course is intended to introduce the engineering, mathematics and science undergraduates to two of the sciences of man (anthropology and sociology). The course will be conducted on the basis of both lecture and tutorial hours. Lectures will be under the supervision of a single person responsible for the conduct of the course. He will have charge of inviting participants from among faculty members in the interested disciplines. This course will not substitute for Anth 101/102, Soc 101

Arts 122G/123G F,W 2C,1D .5 Quest for Meaning in the 20th Century
Against the background of rapidly shifting values in western culture, this course asks the student to examine his or her perspective and then face the resources of others in answering the question of Who am I? What is my obligation to society? What is my relationship to the natural world? Is there an ultimate meaning to life? Teaching methods include personal statements, thematic and biographical books and films.

Arts 190/191 .5 Introductory Chinese
A course designed to impart a knowledge of the basic structure and grammar of modern Chinese. Emphasis will be divided equally between reading and conversation. The student will be expected to master a minimum of 500 characters. Limited to students with no prior knowledge of Chinese. Prereq: Permission of instructor; in addition, Arts 190 is a prereq for Arts 191
Arts 192/193
Introductory Chinese
Similar course to Arts 190/191 but for speakers of any Chinese dialect except Mandarin. The course emphasizes standard pronunciation practice and analysis of Chinese literary forms.
Prereq: Permission of instructor; in addition, Arts 192 is a prereq for Arts 193.

Note
Students may not receive credit for both Arts 190/191 and Arts 192/193

Arts 200G F 2C,1D .5
Issues in Mass Communication 1
An introductory and interdisciplinary approach to those factors in mass media behavior that contribute to good communication or to distortion, including the historical, psychological, legal, sociological, semantic, etc. Emphasis will be on the domestic scene.

Arts 201G W 2C,1D .5
Issues in Mass Communication 2
The emphasis of this course will be on the mass media role in National and International affairs and a study of those factors in mass media performance, which contribute to better international understanding and conflict resolution. Topics will include propaganda, economic and political factors, government information systems, press freedom, language and stereotypes.

Arts 205G F 3C .5
Peace and Conflict Studies 1
An examination of the phenomenon of human conflict. Special attention is given to influential theories of the roots of conflict (e.g. Marx and Freud), the question of the inevitability of conflict, the diverse forms of conflict and the moral implications of various types of conflict.

Arts 206G W 3C .5
Peace and Conflict Studies 2
This course explores various means of conflict resolution on both global and domestic levels. Included are critical assessments of coercion, law, behavior control and nonviolence as models of resolution.
Prereq: Arts 205G encouraged but not required.

Arts 211/212 .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 PL1. Applications will include word indexes, text concordances, methods of computer-aided text comparison. Arts 212 will stress data management, JCL, SORTing, and the use of programme utilities.
No previous knowledge of computing is assumed. 212 presupposes 211 or permission of the instructor.

Arts 215 Y 3C 1.0
Man in Crisis (Literary Views)
A critical study of such themes as freedom vs. happiness, nihilism, collectivism vs. individualism, old tablets vs. utopias, alienation, earthbound fragmentation vs. the transcendental in the artistic writings of Kafka, Brecht, Hesse, Nietzsche, Solzenitsyn, Dostoevsky, Zamiatin, Camus, and others. Taught in English.
Prereq: none

Arts 218G Love in the Western World
Not offered in 1977/78

Arts 219G .5
Dissent
A study of individuals who emerge in every society to challenge the prevailing consensus as advanced agents of a new cultural outlook. Consideration will be given to Socrates, Jeremiah, Jesus, Galileo, Conrad Grebel, Marx, Wilberforce, Woodsworth, Riel, Gandhi and Martin Luther King. Through these studies the course will formulate a conception of innovation and social change.

Arts 220R F 3C .5
Chinese Thought and Culture 1
An examination of the phenomenon of human conflict. Special attention is given to influential theories of the roots of conflict (e.g. Marx and Freud), the question of the inevitability of conflict, the diverse forms of conflict and the moral implications of various types of conflict.

Arts 221R W 3C .5
Chinese Thought and Culture 2
An investigation of the dynamics of the new China: education, medicine, the arts, the position of women, foreign policy, the Cultural Revolution, rural and urban organization, the role of the army, the role of the Chinese Communist Party, and the philosophy of Mao Tse Tung.
Prereq: Arts 220R or consent of instructor.

Arts 230G .5
Non-Violence and Political Reality
This course will concentrate on the question of the possibility 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.
Course Descriptions

Arts

Arts249J J 1.0
Current Problems in Family Life Education
The course will examine human sexuality from a biological, psychological, and social perspective. The significant principles of sex education and some of the most relevant methods and programmes will be discussed as well.

Arts250J A 1.0
Basic Issues in Family Life Education
This course will study marriage and the family from psychological, sociological, philosophical and theological perspectives. Methods for incorporating significant knowledge about marriage and the family into family life programmes will also be given attention.

Arts250R Art and Society
Not offered in 1977-78

Arts271G/272G F,W 3C .5
Introduction to Peace Research 1 and 2
This course will focus on the current basic issues including personality and aggression, international tension, cause of war and the predictability of war, United Nations voting patterns, disarmament studies, and case studies in non-violence and peace activism.

Arts290/291 .5
Intermediate Chinese
This course is designed to extend the knowledge of the structure and grammar of Mandarin Chinese beyond the base provided by Arts190/191.
Prereq: Arts 190/191; Arts 290 is a Prereq. for Arts 291

Arts292/293 .5
Intermediate Chinese
Description same as Arts290/291
A continuation of Arts 192/193
Prereq: Arts 192/193, Arts 292 is a Prereq. for Arts 293

Note
Students may not receive credit for both Arts 290/291 and Arts 292/293

Arts301G/302G Seminar in 20th Century Values,
Not offered 1977/78

Arts320R/321R F,W 3C,3C .5/.5
Special Topics in Chinese Thought and Culture
An indepth study of courses arising out of Arts220R/221R

Arts393/394 .5
Classical Chinese
Course description same as Arts 391/392, but for speakers of any Chinese dialect.
Prereq: Arts 192/193, 292/293, or permission of instructor

Arts395/396 F,W 3C .5/.5
Confucianism
This course involves a careful literary analysis of the basic source materials upon which Confucianism was built—The Analects, The Mencius, The Great Learning, and The Doctrine of Mean.

Arts398G/399G Special Topics in Peace and Conflict Studies
Department of Biology

Professor, Chairman of Department
J. K. Morton, BSc, PhD (Durham), FLS

Professor, Associate Chairman of the Department
J. E. Thompson, BSA (Toronto) PhD (Alberta)

Professor, Graduate Officer
A. D. Harrison, MSc, PhD (Capetown)

Assistant Professor, Graduate Officer
S. M. Smith, MSc (McMaster), PhD (Manitoba)

Associate Professor, Undergraduate Officer
H. R. N. Eydt, MSc, PhD (McMaster)

Assistant Professor, Undergraduate Officer
J. C. Carlson, MSc, PhD (Massachusetts)

Assistant Professor, Undergraduate Officer
W. R. Hawthorn, MSc (McMaster), PhD (Western)

Professors
C. R. Barnes, BSc (Birmingham), PhD (Ottawa)
C. H. Fernando, BSc (Ceylon), DPhil (Oxford)
H. B. N. Hynes, PhD, DSc (London), ARCS, FRSC
W. B. Kendrick, BSc, PhD (Liverpool)
G. Power, BSc (Durham), PhD (McGill)

Associate Professors
R. D. Beauchamp, BA (McMaster), MA, PhD (Brown)
J. C. H. Carter, BA (Toronto), MSc, PhD (McGill)
A. M. Charles, MSc, PhD (Manitoba)
R. G. H. Downer, MSc (Queen’s Belfast), PhD (Western)
E. B. Dumbroff, MForestry, PhD (Georgia)
H. C. Duthie, BSc, PhD (Wales)
W. E. Inniss, MSA (Toronto), PhD (Michigan State)
A. G. Kempton, MSA (Toronto), PhD (Michigan State)
J. Kruuv, MSc (Waterloo), PhD (Western)
P. E. Morrison, MSc (Western), PhD (McMaster)
G. G. Mulamoottil, BSc (Mysore), MSc (Bombay), PhD (Delhi)
J. J. Pasternak, MA (Toronto), PhD (Indiana)
J. B. Theberge, BScA (Guelph), MSc (Toronto), PhD (UBC)
K. Zachariah, BSc (Madras), BA Hons (Oxford), MA, PhD (Princeton)

Assistant Professors
J. J. Dodson, BSc (Waterloo), PhD (McGill)
M. Globus, MSc (McGill), PhD (Toronto)
D. E. Hart, MSc (Western), PhD (Carleton)
R. J. Hebda, BSc (McMaster), PhD (UBC)
C. I. Mayfield, BSc, PhD (Liverpool)
C. A. Peterson, MSc (Alberta), PhD (California, Davis)
J. C. Semple, BSc (Tufts), MA, PhD (Washington U, St. Louis)

Adjunct Faculty
I. R. Ball, BSc (Liverpool), PhD (Waterloo).
Royal Ontario Museum.
R. W. McCauley, MA (Toronto), PhD (Western)
Wilfrid Laurier University

Faculty members holding cross appointments as shown
1 Biology and Earth Sciences
2 Biology and Physics
3 Biology and Urban and Regional Planning
4 Biology and Optometry

Undergraduate Course Descriptions

All Honours Biology students who have completed their third year are required to participate in an off-campus field course before entering Year 4. These courses are held either in April (following examinations but before the end of term) or the following September (after Labour Day). The cost will be approximately $100 per student.

Note
The Huntsman Marine Laboratory, St. Andrews, New Brunswick offers a summer course "Introduction to Marine Biology". This course will be accepted as 0.50 transfer course credit towards a BSc if taken by students of the University of Waterloo.

Biol 110 W 2C, 3L .5
Introductory Zoology
An introduction to the principles of zoology. The course will include the structure and function of animals, survey of the animal kingdom, cell structure, embryology, human biology and general ecological concepts. (Primarily for students of Kinesiology. Available also to students in Faculties other than Science)

Biol 130 Y 2C 1.0
Introduction to Biology
This course is the same as Biology 131 without the laboratory component. (For non Biology majors only)

Biol 131 Y 2C, 3L 1.0
Introduction to Biology
The principles of biology are developed by reference to all biology (including genetics), growth and development, and to selected organisms. Man is discussed as a biological organism. Labs on alternate weeks. (For all students other than those intending to major in Biol or to enter the School of Optometry)
Course Descriptions
Biology

Biol 132 Y 2C,3L 1.0
Principles of Biology
An introductory course designed to give a grounding in the main branches of biology. Emphasis is laid on an understanding of biological processes and on relating these to the structure and diversity of living organisms. (For Science students intending to major in Biol or to enter the School of Optometry)

Biol 201 Y 2C,3L 1.0
Anatomy, Histology and Embryology
A survey of functional mammalian anatomy and histology, with particular emphasis on the human, and an introduction to basic embryology.
Prereq: Biol 132 or equivalent
(For Optometry Students only)

Biol 203 F 2C,3L .5
Human Physiology
An integrated study of basic physiological processes with particular emphasis placed on the cardiovascular and respiratory system. Other topics which will be discussed include digestion, excretion and endocrinology.
Not open to students who have taken Biol 342
(Primarily for students in Kin. Available to other students except those whose major field is Biol)

Biol 204 W 2C,3L .5
Human Physiology
A detailed study of physiological processes associated with nerve and muscle function, and consideration of the integrative role of the central nervous system.
Not open to students who have taken Biol 342
(Primarily for students in Kin. Available to other students except those whose major field is Biol)

Biol 231 F 3C/11aob .5
Concepts of Ecology
An introduction to the study of the relationships of plants and animals to their environment. The nature of ecosystems, ecological energetics, biogeochemical cycling, community ecology, introduction to population biology.
Field trips as required

Biol 232 F 2C,3L .5
Non-Vascular Plants
An introductory course which will survey the evolution, morphology, ecology and importance to man of the fungi, algae, and bryophytes.
Prereq: Biol 131 or 132

Biol 234 W 2C,3L .5
Vascular Plants
An introductory course which will survey the evolution, morphology, ecology and importance to man of the vascular plants.
Prereq: Biol 131 or 132

Biol 235 Y 2C,3L 1.0
Fundamentals of Microbiology
Introduction to fundamental theories, principles and methods of microbiology. Structure, systematics, growth and metabolism of microorganisms. Outline of the major groups of microorganisms. Discussion of their role in natural habitats, industrial processes and disease.
Prereq: Biol 131 or 132
(Only for students in Biol Honours Programmes and 4-year Biol majors)

Biol 237 F 2C,3L .5
Introductory Invertebrate Zoology
A study of the functional anatomy of selected invertebrate types with special emphasis on the various grades of organization and development in the different phyla.
Prereq: Biol 131 or 132

Biol 238 W 2C,3L .5
Introductory Vertebrate Zoology
Comparative functional anatomy and development of selected vertebrate types, with special emphasis on the broad aspects of evolution within this group.
Prereq: Biol 131 or 132

Biol 239 W 2C,3L .5
Cytogenetics
Chromosomes as the physical basis of heredity. Chromosomal mechanisms in mitosis and meiosis. The origin, inheritance and adaptive significance of aberrations and changes in number. Variant chromosomal systems.
Prereq: Biol 131 or 132

Biol 245 F 2C,3L .5
General Microbiology 1
History and scope of microbiology. Study of the characteristics of bacteria and other microorganisms.
(Available to students excluded from Biol 235)

Biol 246 W 2C,3L .5
General Microbiology 2
Relationships of microorganisms to man and his environment.
Prereq: Biol 245
(Available to students excluded from Biol 235)

Biol 301 Y 2C,3L 1.0
Human Physiology
The physiology of the major organ systems of the body. The topics discussed include circulation, respiration, digestion and nutrition, metabolism, muscle, nervous system, special senses, and the endocrine system.
Prereq: Biol 131 or 132
(For Optometry students only)
Biol 331 W 2C,3L .5
**Vertebrate Zoology**
Major topics in vertebrate zoology as exemplified by both living and fossil members of the subphylum Craniata.
Prereq: Biol 238

Biol 332 W 2C,3L .5
**Arthropod Zoology**
A survey of the phylum Arthropoda, including the insects, with emphasis on their classification, interrelationships and ways of life.
Prereq: Biol 237

Biol 333 F 2C,3L .5
**Invertebrate Zoology**
A survey of the major invertebrate phyla other than the arthropods, with emphasis on their functional anatomy, classification and ways of life.
Prereq: Biol 237

Biol 334 F 2C,3L .5
**The Flowering Plants**
A study of floral morphology in relation to classification and evolution. An introduction to taxonomy and nomenclature. History of taxonomy. Systems of classification. Mechanisms of pollination and dispersal. (Students entering this course are required to make a plant collection during the long vacation prior to the course.)

Biol 335 Y 2C,3L 1.0
**Microbial Form and Function**
Prereq: Biol 235 or permission of instructor

Biol 336 F 2S,3L .5
**Mycology I**
Fungal taxonomy and ecology; medical mycology; plant pathology; industrial applications; food and food processing; toxins and hallucinogens; biological control; fungi as coprophiles, predators, and symbionts with plants and animals.
Prereq: Biol 232

Biol 338 W 2C,3L .5
**Plant Morphology and Morphogenesis**
Plant structure in relation to function and development with particular reference to the vascular plants. Cell, tissue and organ differentiation.
Prereq: Biol 234

Biol 340 W 2C,3L .5
**Molecular Biology**
Molecular biological aspects of chromosome replication, expression of genetic information, functional translation of specific eukaryotic proteins, cell division, gamete formation, embryogenesis, hormone action, cellular interactions and cell differentiation.

Biol 341 F 2C,3L .5
**Cell Physiology**
The functional organization of cells with particular reference to cell-cell interaction, the structure, function and development of organelles and the biological roles of cellular membranes.
Prereq: Biol 131 or 132
Coreq: Chem 332-333

Biol 342 Y 2C,3L 1.0
**Vertebrate Physiology**
A study of the physiology of vertebrate organ systems and their integration, with emphasis placed upon the effects of current developments on basic physiological concepts.
Not open to students who have taken Biol 203,204
Prereq: Biol 238
Coreq: Chem 332-333

Biol 343 F 2C,3L .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 131 or 132

Biol 345 W 2C,3L .5
**Plant Physiology**
An integrated study of plant function: the dynamics of nutrient and water movement, photosynthesis, control mechanisms of growth and development.
Prereq: Biol 234
Coreq: Chem 332-333

Biol 346 F 2C,1T .5
**Population Ecology**
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 231 and Stat 202
Biol 431 Y 2C,3flab/T 1.0
Quantitative and Experimental Ecology
A consideration of various procedures employed to study
populations, population interactions, and community
relationships such as diversity and stability. Topics
include: the analysis of model properties, evolutionary
aspects of ecology, structural descriptions of vegetation,
systems ecology.
Prereq: Biol 346

Biol 432 Y 2C,3L 1.0
Microbial Ecology
The roles of microorganisms in selected habitats
including fresh water, soil, plants and animals will be
studied. Microbial functions in nutrient cycling,
biodegradation, and symbiotic and parasitic
relationships will also be examined.
Prereq: Biol 235

Biol 433 F 2C,3L .5
Entomology
Introduction to morphology, systematics and biology of
insects.
Students entering this course are required to make an
insect collection preferably during the long vacation
prior to the course.
Prereq: Biol 332

Biol 434 W 2C,3L .5
Genetics
A survey of genetics with emphasis on bacterial and
bacteriophage genetics and the molecular basis of gene
action.

Biol 435 Y 2C,3L 1.0
Microbial Physiology
The study of microorganisms with special reference to
the physiology and metabolism of bacteria,
cell-permeability, macromolecular biosynthetic
processes, cellular regulatory mechanisms, quantitative
experimental methodology.
Prereq: Biol 235, Chem 332-333

Biol 437 F 3C/S .5
Bio-systematics and Evolution
A study of the processes of evolution: the differentiation
of populations and the origin of new forms of life.
Prereq: Biol 239

Biol 441 Y 2C,3L 1.0
Plant Physiology
A detailed study of the physical and chemical processes
that govern plant growth and function.
Prereq: Biol 345

Biol 442 Y 2C,3L 1.0
Comparative Animal Physiology
A comparative study of physiological processes in the
animal kingdom with emphasis on endocrine physiology.
Prereq: Biol 342

Biol 443 Y 2C,3L 1.0
Applied Microbiology
Properties of pathogenic microorganisms and special
groups related to food and fermentation microbiology.
Prereq: Biol 335

Biol 445 W 2S,3L .5
Mycology 2
The growth of mycological knowledge will be traced, and
current developments analyzed. Extensive literature
surveys, class participation, and a lab project, will
be required.
Prereq: Biol 232, 336

Biol 446 W 2S,3L .5
Phycology
A study of topics in the biology of algae.
Prereq: Biol 232

Biol 447 F 3C .5
History of Biology
The development of biological thought from Greek and
Roman times to the present; i.e. from classification to the
present experimental approach.
Prereq: Registration in Year 4 Biology
(Not to be taken in conjunction with Science 400)

Biol 448 F 2C,3L .5
Developmental Biology
Analysis of embryonic development of selected
organisms with emphasis on growth and the processes of
sub-cellular, cellular and organ differentiation stressing
recent experimental methodology.

Biol 449 Y 2C,3L 1.0
Immunology and Virology
The course will consist of an introduction to the nature of
antigens and antibodies and their reactions,
hypersensitivity and blood groups, as well as a study of
the nature and interactions of animal, insect bacteria and
plant viruses and their hosts.
Prereq: Biol 235

Biol 450 F 2C,3S/flab .5
Aquatic Biology
An introduction to physical, chemical and biological
oceanography. A study of the flora and fauna of selected
aquatic environments. Includes an intensive 2-week field
course at Huntsman Marine Laboratory, St. Andrews,
N.B. Limited to 24 students in Honours Biology or
Honours Biology and Chemistry.
Prereq: Biol 332, 333
Biol 499 Y 1.0
Senior Honours Project
The aim of this course is to provide able undergraduate students the opportunity to pursue original research, under the close supervision of a member of the Biology department. The results of this study will be presented in thesis form and will be critically examined by members of this and, where pertinent, other departments. Before selecting this course students must obtain approval for doing so from both the professors under whose direction they wish to work and the undergraduate officers in Biology. Normally, only students attaining at least a 75% average in the major field(s) will be accepted into this course.

Graded on a Credit/No Credit basis.
Canadian Studies

Associate Professor, Acting Chairman of the Canadian Studies Group
R. R. Kerton, DComm (Toronto), MA (Carleton), PhD (Duke)

Assistant Professor, Director of the Programme
S. E. McMullin, BA, MA (Carleton), PhD (Dalhousie)

Members of the Canadian Studies Group

Professors
H. S. Coblentz, BA Hons (Durham), MRP (North Carolina), FRTP, AIP, FSS, PGP
H. MacKinnon, BA (Montreal), PhL, STL (Gregorian), MA (Toronto), DPhil (Oxford)
W. U. Ober, BA (Washington and Lee), PhD (Indiana)
J. M. Wilson, BA, MA (Toronto)

Associate Professors
J. R. Dugan, BA, MA (Toronto), PhD (Yale)
G. R. Boyle, BSc, PhD (Aberdeen)
S. M. Weaver, BA, MA, PhD (Toronto)
K. Westhues, BA (Conception, MA, PhD (Vanderbilt)

Participating Faculty (1976-77)

Professors
R. R. Krueger, BA, MA (Western), PhD (Indiana)

Associate Professors
L. A. Johnson, BA (Waterloo), MA, MPhil

Assistant Professors
S. E. McMullin, BA, MA (Carleton), PhD (Dalhousie)
P. Socken, BA (Toronto), MA (Iowa), PhD (Toronto)
R. J. Williams, BA, MA (McMaster), PhD (Toronto)

Guest Lecturers
Professor I. Drummond, University of Toronto
Dr. R. Crowley, Department of Labour, Canada

Course Descriptions

Canadian Studies

The core course for each year of the programme is an inter-disciplinary study of Canadian problems, offered either in a lecture/tutorial format or a seminar format (depending on the number of students registered), and staffed by interested faculty members of the participating departments and of the University and by eminent scholars from other parts of Canada who will visit the University for brief or extended periods during the year.

Core Courses

CdSt201 F 2C,1S .5
Social Regionalism
An interdisciplinary course offered both through lectures and discussion groups devoted to the Canadian social and physical environments. The course works from the assumption that regional identities are varied and complex in Canada, and that an understanding of this complexity is essential in the process of dealing with Canadian problems.

CdSt202 W 2C,1S .5
Cultural Regionalism
Also an interdisciplinary approach to the study of the cultural environment in Canada. Canadian culture is examined within a regional context.

CdSt300 Y 3S 1
Regionalism
A seminar course, staffed by at least two faculty members from different departments, in which particular themes and problems relating to Canada will be investigated. The content of the programme each year will vary according to the interest and inclination of faculty and students. Prereq: CdSt 201/202 or permission of the instructors

CdSt400 Y T 1
Research Essay
An extensive senior research essay, supervised by a committee composed of faculty members from two or more of the participating departments, which deals with a specific aspect of Canada utilizing material and methods from several different disciplines. Prereq: CdSt 300
Principal Canadian Content Courses Offered by the Participating Departments

Anthropology

Anth 105C  Prehistoric Man in North America
Anth 105H  The Cultural Anthropology of Canada
Anth 222  Prehistoric Man in the Great Lakes Area—A Survey (Honours Anthropology students should take Anth 322)
Anth 231  North American Indians 1
Anth 232  North American Indians 2
Anth 233  Eskimo Cultures
Anth 240  Canadian Indian-White Relations: 1830-1950
Anth 241  The Contemporary Canadian Indian Scene
Anth 310  Indians of the Canadian Subarctic
Anth 322  Prehistoric Man in the Great Lakes Area
Anth 333  Canadian Communities and Planned Change
Anth 499  Honours Essay

Economics

Econ 101  Introduction to Microeconomics
Econ 102  Introduction to Macroeconomics
Econ 241  Cost-Benefit Analysis and Project Evaluation
Econ 263  Economic History of Canada
Econ 333  Interregional Economics
Econ 341  Public Finance
Econ 343  Urban Economics
Econ 347  Industrial Organization
Econ 351  Labour Economics
Econ 353  Population Economics
Econ 355  Economics of Energy and National Resources
Econ 363  Contemporary Canadian Problems
Econ 364  Contemporary Canadian Problems

English

Engl 205R  The Canadian Short Story
Engl 208F  Themes in Canadian Literature
Engl 313  Canadian Literature to 1920
Engl 314  Canadian Poetry Since 1920
Engl 315  Canadian Prose Since 1920
Engl 316  Canadian Drama
Engl 415  Major Canadian Writers
Engl 495  Senior Honours Essay (Canadian Literature option)

French

Fr 151  Basic French
Fr 152  Basic French
Fr 190  French Language, or French 151/152 if students have not passed the equivalent of Year 5 French
Fr 191  French Language
Fr 192  French Language
Fr 205  Spoken French

Geography

Fr 206  Spoken French
Fr 250  Intensive Language Training
Fr 271  Poetry and Song in Québec
Fr 274  Survey of French Language and Literature
Fr 300  Advanced Instruction in Written French
Fr 375  Contemporary French-Canadian Novel
Fr 401  Advanced Language Study
Fr 402  Advanced Language Study
Fr 471  French-Canadian Poetry
Fr 472  Contemporary Québec Theatre
Fr 501  Problems of French Language
Fr 502  Problems of French Language

History

Hist 123  Major Themes in Canadian History
Hist 224  Canadian History Since 1867
Hist 265  Canadian History
Hist 266  The History of Selected Racial and Regional Minorities
Hist 267  Canadian Non-Indigenous Minorities 1
Hist 268  Canadian Non-Indigenous Minorities 2
Hist 275  Comparative Studies in Canadian Regionalism to 1850
Hist 276  Comparative Studies in Canadian Regionalism after 1850
Hist 381  Studies in the History of Canadian Regionalism
Hist 382  Canadian Intellectual History
Hist 383  History of French Canada in 1867
Hist 384  Canada in Crisis
Hist 386  Ontario History to Confederation
Hist 387  Ontario History Since Confederation
Hist 388  History of Canada/American Relations
Hist 389  Canada in World Affairs: The Twentieth Century
Hist 390  History of North American Indians
Hist 420  Senior Seminar in Nineteenth-Century Canadian History
Hist 421  Senior Seminar in Ontario History
Hist 423  Senior Seminar in Modern Québec
Hist 425  Senior Seminar in Canadian Cultural History
Hist 450  Marxism and Canadian History
Political Science
P Sci 102 Introduction to Politics 2
P Sci 232 Policy Making in Canada
P Sci 260 Canadian Government and Politics
P Sci 291 The Canadian Legal Process
P Sci 292 Aspects of Canadian Law
P Sci 293 Political Journalism
P Sci 294 Women in Politics
P Sci 331 Public Administration 1
P Sci 332 Public Administration 2
P Sci 341 Provincial Politics
P Sci 343 Urban Politics 1
P Sci 344 The Politics of Local Government
P Sci 373 Political Parties
P Sci 374 Interest Group Politics
P Sci 377 Political Socialization
P Sci 431 Canadian Public Policy 1
P Sci 432 Canadian Public Policy 2
P Sci 434 Canadian Foreign Policy
P Sci 442 Politics in Ontario
P Sci 443 Politics in Western Canada
P Sci 444 Politics in Québec
P Sci 445 Politics in the Atlantic Provinces
P Sci 451 Comparative Parliamentary Systems
P Sci 461 Problems in Canadian Politics 1
P Sci 462 Problems in Canadian Politics 2
P Sci 473 Voting Behaviour
P Sci 478 Research Seminar in Political Socialization

Sociology
Soc 101 Introduction to Sociology
Soc 120R Fundamentals of Sociology
Soc 201 Canadian Society: Structure and Development
Soc 205 Sociological Analysis of Social Problems
Soc 215 Sociology of Sex Roles
Soc 216 An Introduction to the Sociology of Marriage and the Family
Soc 250 Crime and Society
Soc 251 Ethnic and Racial Relations
Soc 262 Canadian Population
Soc 300 Canadian Social Institutions
Soc 301 Urban Sociology
Soc 303 Crisis in Social Structure and Character
Soc 304 Crisis Management
Soc 315 Social Stratification
Soc 323 Project in Sociological Research
Soc 327R Canadian Ethnic and Cultural Minorities
Soc 330 Comparative Social Structure
Soc 372 Medical Sociology
Soc 398 Seminar in Nationalism and Ideology in Canada and Québec
Soc 399 Research Seminar in Canadian Society
Soc 499 Honours Essay

Urban and Regional Planning
Plan 156 Introduction to Urban and Regional Planning Concepts
Plan 222 Canadian Regional Issues
Plan 255 Planning Surveys and Analysis
Plan 330 Urban Social Planning
Plan 332 The Sociology of Regions
Plan 333 The Sociology of Regional Planning
Plan 342 Urban and Regional Planning 1
Plan 343 Urban and Regional Planning 2
Plan 344 Principles of Recreation Planning
Plan 358 Regional Planning and Development
Plan 370 Land Development Planning
Env St 400 Environmental Law
Plan 414 Housing Policies
Plan 430 Social Policy Planning
Plan 431 Citizen Involvement, Planning and Social Change

Principal Canadian Content Courses Offered by Other Arts Departments

Fine Arts
Fine 316 Canadian Art
Fine 317 Canadian Art

Inter-Disciplinary Social Science
ISS 221R Community Issues

Philosophy
Phil 225 Problems in Social and Political Philosophy in Canada
Phil 312 Philosophy of Education 2

Psychology
Psych 242 Educational Psychology: Learning Disabilities
Psych 454 Senior Seminar in Educational Psychology

Religious Studies
RS 264P Religion in Canada 1
RS 265P Religion in Canada 2

Social Work
Socwk 120R Introduction to Social Work
Socwk 121R Social Problems
Department of Chemical Engineering

Professor, Chairman of Department
E. Rhodes, BSc, Tech, MSc, PhD (Manchester), PEng

Associate Professor, Associate Chairman
(Graduate Studies)
C. W. Robinson, BASc (UBC), PhD (U.C. Berkeley)

Associate Professor, Associate Chairman
(Undergraduate Studies)
l. F. Macdonald, BEng (N.S.T.C.), PhD (Wisconsin)

Professors
T. L. Batke, BASc, PhD (Toronto)
I. J. Byerley, BASc, MASc (Toronto), PhD (UBC)
K. S. Chang, BS (Hanyang Inst. Tech., Seoul), MSc, PhD (Northwestern)
F. A. L. Dullien, Dipl Ing (Budapest Technical University), MASc, PhD (UBC), PEng
T. Z. Fahidy, BASc, MSc (Queen's), PhD (Illinois), PEng
R. K. Huang, BASc (National Taiwan University), MASc, PhD (Toronto)
R. R. Hudgins, UE, BASc, MASc (Toronto), MA, PhD (Princeton)
M. Moo Young, BASc (London), MASc (Toronto), PhD (London), PEng
K. F. O'Driscoll, BChE (Pratt Inst.), MA, PhD (Princeton)
D. C. T. Pei, BEng (McGill), MASc (Queen's), PhD (McGill)
A. Rudin, BSc (Alberta), PhD (Northwestern)
G. S. Mueller, BASc (Waterloo), MSc, PhD (Manchester), PEng
G. L. Rempel, BSc, PhD (UBC)
J. R. Wynnyckyj, BEng (McGill), MASc, PhD (Toronto)

Assistant Professors
J. M. Scharer, BSc, PhD (Pennsylvania)

Faculty members having cross-appointments as shown
1 Chemical Engineering, Management Science, and Statistics
2 Chemistry and Chemical Engineering
3 Chemical Engineering and Chemistry

Undergraduate Course Descriptions

ChE 100 F 3C, 1T, 6L for first six weeks only .5
Introductory Engineering Concepts 1
An introduction to the basic methods and principles used by engineers in the analysis and design of physical processes: units, dimensions, and measurements; mass balances; behaviour of fluids. Laboratory on visual communication is included.

ChE 101 W, S 3C, 1T, 3L .5
Introductory Engineering Concepts 2
An extension of the topics covered in ChE 100: energy balances; Laboratory experiments illustrate the physical principles discussed.

ChE 102 F 3C, 1T .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.

ChE 211 S, F 3C, 2L .5
Transport Processes 1 (Fluid Mechanics)
Fundamentals of fluid flow; conservation laws for mass, momentum and mechanical energy; flow of fluid in conduits; flow past immersed bodies. Description, collection and separation of particulate systems.

ChE 220 W, F 3C, 1T .5
Applied Mathematics 1
Statistical frequency distributions, tests of significance, correlations, curve fitting, sampling theory, applications: errors, design of experiments.

ChE 230 W, F 3C, 1T .5
Physical Chemistry 1
Introduction to physical chemistry. Ideal and real gases, the kinetic theory of gases, first law of thermodynamics, thermochemistry, heats of reaction, second law, chemical equilibria in simple systems, phase equilibria in simple systems, third law.
Course Descriptions
Chemical Engineering

ChE231 S,F 3C,1T .5
Physical Chemistry 2
Prereq: Ch E230

ChE232 W,F 3C .5
Inorganic Chemistry 1
Wave mechanics, atomic structure and the periodic table, chemical bonding, structural chemistry of elements and compounds, introductory transition metal chemistry, some thermodynamic aspects of inorganic chemistry.

ChE233 S,F 3L .5
Physical Chemistry Laboratory
Experiments on viscosity of gases and liquids, chemical kinetics, adsorption, homogeneous and heterogeneous catalysis, thermochemistry, phase equilibria, diffusion. Determination of molecular weight of polymers, training in technical report writing.

ChE312 W,S 3C,1T .5
Transport Processes 2 (Heat Transfer)
Introduction to heat transfer, momentum-heat transfer analogies and dimensional analysis, steady and transient heat conduction, convection and applications to engineering problems, radiant heat transfer and heat transfer with change of phase.
Prereq: Ch E211

ChE315 W,F 6L .5
Chemical Engineering Laboratory
Experimental application of physical and chemical principles using pilot scale equipment, experiments illustrating major unit operations (distillation, absorption, extraction, drying, humidification).
Prereq: Ch E312

ChE320 W,S .5C .5
Applied Mathematics 2
Gamma-, beta-, and error-functions; sine-, cosine-, exponential- and elliptic-integrals, linear differential equations, Wronskian, Green function; initial and boundary value problems; Bessel functions; Fourier series, integrals and transforms; orthogonal functions; Laplace transforms; applications.
Prereq: Ch E220

ChE330 W,S 3C .5
Chemical Engineering Thermodynamics
Thermodynamics of flow processes, vapour power plants, internal combustion engines, liquefaction of gases, refrigeration and evaporation, chemical equilibria in chemical reactions, thermal pollution, the energy crisis, efficient energy utilization and thermodynamics.
Prereq: Ch E231

ChE331 W,F 3C .5
Chemical Reaction Engineering
Homogeneous reactors: batch, CSTR, tubular flow systems, ideal models, residence time distributions in ideal reactors, temperature effects, steady states, semi-batch systems, nonideal behaviour. Heterogeneous catalysis: mass transfer effects; catalytic rate equations, fixed and fluidized bed reactors.
Prereq: Ch E231

ChE332 W,S 3C .5
Inorganic Chemistry 2
Introductory electrochemistry; electrolysis, electrolytic conductance and transport, reversible electrode processes, irreversible electrode processes and electrode kinetics, electrochemical measurements and their analytical applications, chemistry of corrosion.
Prereq: Ch E232

ChE334 W,G 3L .5
Instrumental Methods of Chemical Analysis
An introduction to modern analysis including optical, electrochemical, radiochemical, chromatographic and spectroscopic methods.

ChE420 S,F 3C .5
Process Dynamics and Control 1
Block and signal flow diagrams, proportional-integral-derivative controllers, frequency response techniques, analytical and graphical stability criteria. Introduction to modern control theory.
Prereq: Math 216, Ch E312
ChE 422  S,F  3C  .5  
Engineering Economics
Mathematics of annuities, mortgages, bonds and small loans; cost accounting, including direct costing, depreciation, taxes and financial statements, estimation of sales and capital and operating costs of a new process or products, study of criteria for the appraisal of capital expenditures, critical path method, linear programming.

ChE 482  S,F  3C  .5  
Technical Seminar and Process Design
Technical seminars will be presented and criticized. Subject material will be from recent literature or industrial experience. Lectures on the sizing and costing of equipment, problems on the design of process components.

ChE 501  W  3C  .5  
The Chemical Engineer as an Entrepreneur
How an individual engineer may develop a new small business to supply goods or services to Canadian chemical industries, while performing his/her own technical and management functions; technical, economic, legal and financial aspects.

ChE 510  S,F  3C  .5  
Prediction of Physico-chemical Properties
Methods of estimating physico-chemical properties of gases and liquids in cases where experimental values are absent. Prediction is usually based on correlations of a form suggested in part by theory, with empirical constants based on experimental data.

ChE 515  W  3C  .5  
Two-Phase Flow Operations
Introductory theory to one-dimensional two-phase flow: conventions, definitions, homogeneous theory, separated flow (Lockhart-Martinelli), particulate characterization and behavior; applications: two-phase flow in pipes, boiling and evaporation, sedimentation, filtration.

ChE 517  W  3C  .5  
Performance of Separation Processes
Introduction, patterns of change and computational approaches, group methods, limiting flows and stage requirements, capacity and efficiency of contacting devices, energy requirements, selection, optimal design and operation, mass transfer with chemical reaction.

ChE 520  W,F  3C  .5  
Chemical Engineering Analysis
Application of advanced mathematical techniques to the analysis of chemical engineering processes. 
Prereq: Permission of instructor

ChE 521  W  3C  .5  
Process Dynamics and Control 2
Analog computation, time domain analysis, control of complex chemical systems. 
Prereq: ChE 420

ChE 523  W  4L  .5  
Process Control Laboratory
Experiments on process dynamics and control and analog simulation of chemical processes. Time constant, step and frequency response, controller settings, and cascade control of thermal, liquid level, and reaction systems. 
Prereq: ChE 420

ChE 540  S,F  3C  .5  
Introduction to Polymer Science
Basic concepts of polymer chemistry, classification of polymers, introductory physical chemistry of polymers, organic chemistry of polymerization reactions of polymers, naturally occurring polymers.

ChE 541  W  3C  .5  
Physical Chemistry of Polymers
Polymer solutions, molecular characterization of polymers, molecular weight distributions, morphology and crystallinity in polymers, reaction kinetics and mechanism of addition and condensation polymerization. 
Prereq: ChE 540

ChE 543  W  3L  .5  
Polymer Laboratory
Experimental studies of polymerization and physical properties of polymers: condensation and addition polymerization, copolymerization, molecular weight, extrusion rheology, etc. 
Coreq: ChE 541

ChE 550  S,F  3C  .5  
Introduction to Extractive Metallurgy
Physical and chemical nature of ores and intermediates, introductory pyrometallurgy, hydrometallurgy and electrometallurgy, survey of extraction processes, application of the principles of thermodynamics and kinetics to metallurgical processes.

ChE 551  W  3C  .5  
Metallurgical Chemistry
Ionic equilibria, thermodynamics and kinetics of reactions in solution, bonding, stability and stereochemistry of coordination compounds and mechanisms of their reaction, introductory hydrometallurgy, corrosion and homogenous catalysis.
ChE 553 W 3C .5
Principles of High Temperature Extractive Metallurgy
Principles of important Canadian metallurgical processes, kinetics of roasting and reduction industrial roasting, blast and electric furnace reduction; nature of melts and slags, slag metal reactions; converting, refining and fused salt electrolysis.

ChE 560 S,F 3C .5
Introduction to Biochemical Engineering
Aspects of microbiology and biochemistry of interest to the biological process industries and to environmental pollution. Classification and growth characteristics of microorganisms. Physico-chemical properties of biological compounds. Metabolism and biochemical kinetics. Course includes some lab work.

ChE 561 W 3C .5
Fermentation Operations
Engineering principles involved in the production of antibiotics, yeast, enzymes, beverage alcohol and other microbial products, and in biological waste treatment. Specialized mass transfer, heat transfer, mixing and rheology applications. Course includes some lab work.
Prereq: ChE 560 or permission of instructor

ChE 563 W 3C .5
Food Processing
Formulation, processing, preservation and quality evaluation of natural and textured foods, food components and additives: mixing, extrusion, sterilization, separation, purification and concentration operations.
Prereq: ChE 560 or permission of instructor

ChE 570 W,F 3C .5
Air Pollution
Treatment of gaseous waste products from representative Canadian industries; characterization and toxicity of filtration, scrubbing, cycloning, electrostatic precipitation, and other chemical treatment, legal, socio-political, economic and engineering aspects.

ChE 571 W 3C .5
Water Pollution
Treatment of waste water from metals processing industries; waste characterization; toxicity; recycle; treatment by electro-oxidation/reduction, ion exchange, solvent extraction, absorption, electrodialysis, reverse osmosis etc.; economics, regulations, moral, legal, social and political implications.

ChE 581 W 12L 1.0
Research-Design Project 2
Continuation of ChE 580. Equivalent to two one-term courses. A written report, meeting minimum technical report standards, and a public oral presentation will be required.

ChE 583 W 2T,4L .5
Process System Design
The undergraduate curriculum is brought together to accomplish by team effort the basic objective of the process engineer: the design of an integrated process. A written report, meeting minimum technical report standards, and a public oral presentation will be required.

ChE 585 W 6L .5
Technical Elective Project
An individually supervised research or design project, based on one of the technical elective courses taken in the 4A term. A written report, meeting minimum technical report standards, and a public oral presentation will be required.

ChE 007, 280, 281, 380, 381, 480, 481 W,S,F 1C 0
General Awareness Seminar
Informal discussions on the Chemical Engineering Programmes.
Course Descriptions
Chemistry

Department of Chemistry

Professor, Chairman of Department
W. A. E. McByrde, MA (Toronto), PhD (Virginia), FCIC

Professor, Dean of the Faculty of Science
W. B. Pearson, DFC, MA, DSc (Oxon), FRSC, FCIC

Associate Professor, Associate Dean of the Faculty of Science
D. A. Brisbin, BSc (Alberta), PhD (Toronto)

Professor, Director of the Guelph-Waterloo Centre for Graduate Work in Chemistry
A. J. Carty, BSc, PhD (Nottingham)

Professors
J. Cizek, RNDr (Charles University, Prague), CSc (Czechoslovak Academy of Sciences, Prague)
B. O. Fraser-Reid, MSc (Queen's), PhD (Alberta)
D. E. Irish, BSc (Western), MSc (McMaster), PhD (Chicago), FCIC
F. W. Karasek, BS (Elmhurst), PhD (Oregon State), FCIC
H. G. McLeod, MA, PhD (Toronto)
J. B. Moffat, BA, PhD (Toronto), FCIC
J. Paldus, RNDr (Charles University, Prague), CSc (Czechoslovak Academy of Sciences, Prague)
L. W. Reeves, BSc, PhD, DSc (Bristol), FCIC
A. Rudin, BSc (Alberta), PhD (Northwestern)
G. Socrates, Dottore in Chimica (Genova), LibDoc
H. D. Sharma, MSc (Delhi), PhD (California)
J. G. Smith, MA, PhD (Toronto)
T. Viswanath, MSc, PhD (Mysore)
R. G. Woolford, MSc (Western), PhD (Illinois), FCIC

Adjunct Professor
R. H. F. Manske, MSc (Queen's), PhD (Toronto), DSc (Manchester), FRSC, FCIC

Associate Professors
G. F. Atkinson, MA, PhD (Toronto), FRIC
J. B. Capindale, MA, DPhil (Oxford)
W. L. Elsdon, MSc (Western), PhD (McGill)
T. E. Gough, BSc, PhD (Leicester)
R. J. LeRoy, BSc, MSc (Toronto), PhD (Wisconsin)
J. L. Koppel, BA, PhD (Toronto)
D. Mackay, BSc, PhD (Aberdeen)
A. D. Maynes, MA, PhD (Toronto)
F. R. McCourt, BSc, PhD (UBC)
G. L. Rempe, BSc, PhD (UBC)
V. A. Snieckus, BSc (Alberta), MS (California), PhD (Oregon)
G. E. Toogood, BSc, PhD (Nottingham)

Assistant Professors
L. J. Brubacher, BA (Goshen College, Indiana), PhD (Northwestern)
P. C. Chieh, BSc (Nat. Taiwan), MSc (Nat. Tsing Hua), PhD (British Columbia)
R. J. Friesen, BSc, MSc (Manitoba)
M. Tchir, BSc (Alberta), PhD (Western)

Senior Demonstrators
E. L. T. Cooper, BSc (Waterloo)
G. O. Este, BSc (Waterloo)
M. C. Michael, MSc, BSc (Waterloo)
T. Rudensky, BSc (Waterloo)
M. Vatcher, HNC (Bolton Technical College), BSc (Waterloo)

Faculty members holding cross appointments as shown

Chemistry and Physics
Chemistry and Applied Mathematics
Chemistry and Chemical Engineering

Undergraduate Course Descriptions

Details of the undergraduate programmes offered by the Faculty of Science are to be found in Chapter 13.

Prerequisites for a course are a reliable guide to the background necessary for the course. In lieu of the specific courses listed, an equivalent background fro

Pre-University Chemistry

The course covers the material considered essential preparation for first-year chemistry courses. Included are formulae, nomenclature, stoichiometry, and an introduction to thermochemistry, solution chemistry, chemical equilibria, acids, bases and oxidation reduction reactions, kinetics and bonding.

Successful completion of this course fulfills the University Admission requirements where high school Chemistry is necessary. Offered by correspondence only, one term. No University credit.

Chem 1001 F, W, S 1 C 0

Pre-University Chemistry

General Chemistry Seminar

Required for all Chemistry students beyond Year 1, this seminar brings together students from all years to receive information concerning the activities of the Chemistry Department and the Chemical Institute of Canada, and to hear invited speakers.

Chem 10 F, W, S 1 C 0

General Chemistry Seminar

Required for all Chemistry students beyond Year 1, this seminar brings together students from all years to receive information concerning the activities of the Chemistry Department and the Chemical Institute of Canada, and to hear invited speakers.
Chem 26  F,W  3C,3L  .5  
**Organic Chemistry I**
The basic chemistry of the important classes of aliphatic and aromatic compounds. A laboratory course on preparative organic chemistry and organic techniques accompanies the lectures.
(Normally for students in Year 2 Engineering)

Chem 36  F,S  3C  .5  
**Organic Chemistry 2**
An introduction to the important classes of hetero-cyclic compounds and natural products.
Prereq: Chem 26  
(Normally for students in Year 2 Engineering)

Chem 111  F  3C  .5  
**General Chemistry 1**†
Structure and properties of matter, formulae, nomenclature, stoichiometry, atomic and molecular structure.
Prereq: Grade 12 Chem
Science students must take Chem 111L with this course

Chem 111L  F  3L  .25  
**General Chemistry 1 Laboratory**†
Selected experiments for students taking Chemistry 111.

Chem 112  W  3C  .5  
**General Chemistry 2**†
Chemistry 111 continued to include chemical equilibria and rates of reaction and oxidation reduction reactions.
Prereq: Chem 111
Science students must take Chem 112L with this course

Chem 112L  W  3L  .25  
**General Chemistry 2 Laboratory**†
Selected experiments for students taking Chemistry 112.

**Note**
† Chem 111-112, and their associated laboratories 111L-112L, are designed for students who have not completed Ontario Year 5 Chemistry (or its equivalent). Normally, all other Science students will be expected to take Chem 121-122 and their associated laboratories. Credit will not be allowed for both 111-112 and 121-122

Chem 121  F  3C  .5  
**Chemical Structure**
Stoichiometry and structure; periodic atomic properties and their chemical implications; descriptive chemistry of selected compounds; special interest topics.
Prereq: Yr 5 Chem, Math (Functions and Relations; and Calculus)
Science students must take Chem 121L with this course

Chem 121L  F  3L  .25  
**Chemical Structure Laboratory**
Selected experiments for students taking Chemistry 121.

Chem 122  W,S  3C  .5  
**Chemical Reaction**
Ionic equilibria in aqueous solutions; oxidation-reduction; reaction kinetics and mechanisms in aqueous solutions; special interest topics.
Prereq: Chem 121
Science students must take Chem 122L with this course

Chem 122L  W,S  3L  .25  
**Chemical Reaction Laboratory**
Selected experiments for students taking Chemistry 122

Chem 212  F  2C  .5  
**Structure and Bonding**
Ionic and valence bond models; molecular orbital theory; bond lengths and bond energies; hydrogen bond and other weak interactions; properties; structures and stereochemistries of typical inorganic compounds; acid-base behaviour; nomenclature. (Primarily for Honours students majoring in Chemistry).
Prereq: Chem 121

Chem 218  F  2C,1T  .5  
**Development of Chemical Bonding and Structure**
Prereq: Chem 121

Chem 219  W  2C,1T  .5  
**Chemistry of Non-Transition Metals**
Group trends in main group chemistry. Emphasis will be placed on correlation of structure with physical properties in various groups of compounds.
Prereq: Chem 218

Chem 220†  F,W  2C  .5  
**Introductory Analytical Chemistry**
The principles underlying quantitative measurements. (Primarily for Honours students majoring in Chemistry)
Prereq: Chem 121-122
† Students registering in Chem 220 must also register in Chem 220L

Chem 220L  F,W  6L  .5  
**Analytical Chemistry Laboratory 1**
Selected experiments for students taking Chemistry 220.

Chem 221††  F,W,S  2C  .5  
**Analytical Chemistry of Multi-Component Systems**
Applications of electroanalytical methods, spectroscopic methods, and analytical separations to the quantitative description of multi-component systems. (Primarily for Honours students majoring in Chemistry.)
Prereq: Chem 220
†† Students registering in Chem 221 must also register in Chem 221L
Chem 221L F,W,S 3L .25
Analytical Chemistry Laboratory 2
Selected experiments for students taking Chemistry 221.

Chem 224 Y T 1.0
Chemical Spectroscopy
An introductory survey of the principles and applications of spectroscopic techniques used in the modern chemical laboratory. Topics will include electronic, vibrational and rotational spectroscopy, and magnetic resonance spectroscopy.
Prereq: A first year Chemistry course, and a knowledge of Calculus.

Chem 226† F 2C .5
Chemical Analysis 1
A variety of classical and modern analytical methods.
Prereq: Chem 121-122
† Students registering in Chem 226 must also register in Chem 226L

Chem 226L F 3L .25
Chemical Analysis 1 Laboratory
Basic techniques of analytical methods.

Chem 227†† W 2C .5
Chemical Analysis 2
The evolution of some modern analytical methods.
Prereq: Chem 226 or 220
†† Students registering in Chem 227 must also register in Chem 227L

Chem 227L W 6L .5
Chemical Analysis 2 Laboratory
The application of analytical methods to contemporary problems in Chemistry and other Sciences.

Chem 237 W 3C .5
Introductory Biochemistry
The basic chemistry of amino acids, peptides, proteins, carbohydrates and lipids including some aspects of metabolism.
Prereq: Chem 268
(For Optometry students only.)

Chem 237L W 3L .25
Introductory Biochemistry Laboratory
Selected Experiments for students taking Chemistry 237

Chem 254 F,W 2C,1T .5
Physical Chemistry 1
Kinetic theory of gases and elementary transport properties. Thermodynamics of ideal systems. Rate of chemical reactions and applications to the elucidation of reaction mechanisms.
Prereq: Chem 121-122, Calculus (eg. Math 113)
(Primarily for Honours students majoring in Chemistry)

Chem 255 F,W,S 2C,1T .5
Physical Chemistry 2
Introductory quantum mechanics. Phase equilibria, phase rule, and the properties of liquids and solutions.
Prereq: Chem 254, Math 215
(Primarily for Honours students majoring in Chemistry)

Chem 264 W,S 2C,1T .5
Organic Chemistry 1†
Preparation and reactions of typical organic functional groups examined from the basis of the reaction mechanisms. Introduction to spectroscopic correlations of these functional groups. Stereochemistry of organic molecules.
Prereq: Chem 121-122
(Primarily for Honours students majoring in Chemistry)

Chem 264L W,S 3L .25
Organic Chemistry Laboratory 1
Selected experiments for students taking Chemistry 264.

Chem 266 F 2C,1T .5
Organic Chemistry 1†
The properties, preparation, reaction and basic structural theory of the common classes of aliphatic compounds. Introduction of electrophilic and nucleophilic reaction mechanisms.
Prereq: Chem 121 and 122

Chem 267 W 2C .5
Organic Chemistry 2
The properties, preparation, reactions and basic structural theory of the common classes of aromatic compounds: A continuation of organic reaction mechanisms. Introduction to the chemistry of carbohydrates, proteins, steroids, etc.
Prereq: Chem 266

Chem 267L W 3L .25
Organic Chemistry Laboratory
Selected experiments for students taking Chemistry 267.

Note
†(For students needing a full year of Organic Chemistry as a prerequisite to medicine, the sequence 266-267 and 267L should be selected; for Honours students majoring in Chemistry, 264-264 plus the appropriate laboratory courses 264L-364L should be selected.)

Chem 268 F 3C .5
Introductory Organic Chemistry
The basic chemistry of the important classes of aliphatic and aromatic compounds including aspects of stereochemistry and reaction mechanisms.
Prereq: Ont. Year 5 Chem.; (Yr. 1 Chem desirable), (For Optometry students only.)
Chem 266L  F  3L  .25  
**Introductory Organic Chemistry Laboratory**
Selected experiments for students taking Chemistry 266.

**Note**
Most 300-level honours courses are listed as 2 hour lectures; an additional 1 hour tutorial may be scheduled at the discretion of the instructor.

Chem 311  W  2C  .5  
**Radiochemistry**
*Prereq: Chem 121 or equiv.*

Chem 312  F,S  2C  .5  
**Transition Element Chemistry**
The transition elements and their compounds. Stereochemistry of complex ions; ligand field and molecular orbital theories of metal-ligand bonding; electronic spectra and magnetoochemistry of complexes; reaction mechanisms. 
*Prereq: Chem 212, (for Honours students)*

Chem 313  W  2C  .5  
**The Chemistry of the Main Group Elements**
A systematic approach to the synthesis, properties, reactions and structures of main group element compounds. Trends in chemical behaviour, bonding and stereochemistry. Electron deficient compounds, the rare gases, chemistry of phosphorus, nitrogen and sulphur will be dealt with in detail. 
*Prereq: Chem 212, (for Honours Students)*

Chem 314L  F,W,S  3L  .25  
**Inorganic Chemistry Laboratory 1**
An introduction to practical inorganic chemistry. 

Chem 315L  F,W  6L  .5  
**Inorganic Chemistry Laboratory 2**
Advanced experiments in inorganic chemistry. 
*Prereq: Chem 314L.*

Chem 316  F  2C  .5  
**An Introduction to Transition Metal Chemistry**
The transition elements and their compounds. An elementary approach to crystal and ligand field theory will be used to rationalise the spectra, magnetism, structures and properties of transition metal complex compounds. 
*Prereq: Chem 218 or 212*

Chem 316L  F  3L  .25  
**Inorganic Chemistry Laboratory**
Selected experiments for students taking Chemistry 316.

Chem 320  W  2C  .5  
**Chemical Instrumentation**
The principles of operation, practical limitations and preferred uses of various devices commonly used to make accurate measurements of importance in modern chemistry. 
*Prereq: Chem 221 or 227*

Chem 320L  W  3L  .25  
**Chemical Instrumentation Laboratory**
Selected experiments for students taking Chemistry 320.

Chem 332  F,W  2C  .5  
**Biochemistry 1**
*Prereq: Chem 264 or 267*

Chem 332L  F,W  3L  .25  
**Biochemistry 1 Laboratory**
Qualitative and quantitative measurements of biochemically important materials for students taking Chemistry 332.

Chem 333  F,W  2C  .5  
**Biochemistry 2**
Introduction to the chemistry and metabolism of carbohydrates and lipids. 
*Prereq: Chem 332*

Chem 333L  F,W  3L  .25  
**Biochemistry 2 Laboratory**
A continuation of Chemistry 332L for students taking Chemistry 333.

Chem 342  **Quantum Chemistry**
(Even years only)
*(Not offered 1977)*

Chem 344  Y  T  1.0  
**Inorganic and Nuclear Chemistry**
Survey of transition metal chemistry including ligand field theory of co-ordination compounds and an introduction to organometallic chemistry. Introduction to nuclear and radiochemistry. 
*Prereq: Chem 212 or 218 or equiv. (equivalent to 311-312)*

Chem 350  F  2C  .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 255*
Chem351  F (odd years only)  2C .5  
**Statistical Thermodynamics**
Ensembles, postulates of statistical mechanics; Boltzmann, Fermi-Dirac, and Bose-Einstein Statistics; microcanonical, canonical and grand canonical ensembles; Equilibrium statistical mechanics and statistical thermodynamics; application to ideal gases.  
*Prereq: Chem 355*

Chem353  F,S  2C .5  
**Introduction to Polymer Science**
Basic definitions and polymer nomenclature, molecular weight averages and distributions, polymer constitution, configuration and conformation, step-growth and free-radical chain-growth polymerization and copolymerization.  
*Prereq: Chem 254*

Chem354  W  2C .5  
**Applied Kinetics**
Introduction to kinetics and mechanism of elementary chemical processes in homogeneous systems, reversible, consecutive and simultaneous reactions, interpretation of kinetic data. Application to industrial processes, both batch and continuous.  
*Prereq: Chem 255*

Chem355  F,S  2C .5  
**Physical Chemistry 3**
Elementary statistical mechanics. Introduction to the physical chemistry of surfaces and simple macro-molecules.  
*Prereq: Chem 255 and Math 215.*  
(Primarily for Honours Students majoring in Chemistry)

Chem355L  F,W,S  3L .25  
**Physical Chemistry Laboratory 1**
Selected experiments for students taking Chemistry 355.

Chem356  F  2C .5  
**General Physical Chemistry 1**
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 122 and Math 113*

Chem356L  F  3L .25  
**General Physical Chemical Laboratory 1**
Selected experiments for students taking Chemistry 356.  
*(A special section in Winter term will be available for Honours Biol and Chem students only)*

Chem357  W  2C .5  
**General Physical Chemistry 2**
An introductory survey of the concepts and principles of quantum mechanics; the application of these principles to the study of atomic and molecular structure and spectra, and to photochemical phenomena. Chemical kinetics.  
*Prereq: Chem 356*

Chem357L  W  3L .25  
**General Physical Chemistry Laboratory 2**
Selected experiments for students taking Chemistry 357.

Chem358  F,W  2C .5  
**Physical Chemistry 4**
Some theories of rates of chemical reactions. Basic electrochemistry and transport properties of ionic solutions. Application of quantum mechanics to atomic spectroscopy.  
*Prereq: Chem 355*  
(Primarily for Honours Students majoring in Chemistry)

Chem358L  W  6L .5  
**Physical Chemistry Laboratory 2**
Selected experiments for students taking Chemistry 358.

Chem359  W (even years only)  2C .5  
**Application of Chemical Thermodynamics**
Partial molar quantities: Gibbs chemical potential and non-ideal systems; chemical equilibrium; theory of electrolytes.  
*Prereq: Chem 254 and 255*  
*Next offering Winter '78*

Chem360  F,W,S  T  .5  
**Organic Chemistry 3**
Stereochemistry of organic compounds; conformational isomers, geometrical (cis-trans) isomers, optical isomers and diastereomers. Introductory carbohydrate chemistry.  
*Prereq: Chem 261*

Chem361  W,S  T  .5  
**Organic Chemistry 4**
Acidity and basicity of organic compounds. Formation and reaction of enolate anions with emphasis on their synthetic utility. Cycloaddition reactions.  
*Prereq: Chem 360 or 261 or 364*

Chem362  W (even years only)  2C .5  
**Theoretical Organic Chemistry**
A number of topics in physical and organic chemistry treated from a semi-empirical consideration of molecular structure.  
*Prereq: Chem 364, Math 215 or equiv.*  
*Next offering Winter '78*
Chem 363 W 2C .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 364 or 267*

Chem 364 F,W 2C,1T .5  
**Organic Chemistry 2**  
The treatment of organic chemistry in Chemistry 264 is continued and extended to aromatic compounds.  
*Prereq: Chem 264*  
(Primarily for Honours students majoring in Chemistry.)

Chem 364L F,W 6L .5  
**Organic Chemistry Laboratory 2**  
Selected experiments for students taking Chemistry 364.

Chem 365 F,W,S 2C .5  
**Organic Chemistry 3**  
Stereochmistry and conformational analysis of organic molecules. Acidity and basicity. Formation and reactions of enolate anions with emphasis on their synthetic utility.  
*Prereq: Chem 267 or 267*

Chem 366 F 2C .5  
**Structural and Synthetic Organic Chemistry**  
Stereochmistry of organic molecules: synthesis of selected organic compounds examined in detail with emphasis on cyclo-addition reactions and condensation reactions.  
*Prereq: Chem 267 or 264*

Chem 366L F 3L .25  
**Organic Chemistry Laboratory**  
Selected experiments for students taking Chemistry 366.

Chem 367 W 2C .5  
**Selected Topics in Organic Chemistry**  
Some of the following topics will be discussed: natural products, photochemistry, organometallic compounds, carbohydrates.  
*Prereq: Chem 365 or 366*

Chem 395 W (even years only) 3C .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.  
*Next offering Winter 1978*

Chem 409 W (odd years only)  
**Solid State Chemistry**  
(Not offered 1978)

Chem 411 F 2C .5  
**Organometallic Chemistry**  
*Prereq: Chem 312*

Chem 416 W (odd years only)  
**Applied Inorganic Chemistry**  
(Not offered 1978)

Chem 417 W (even years only) 2C .5  
**Synthesis and Structure of Inorganic Compounds**  
The chemistry of selected groups of important inorganic compounds will be discussed to emphasize synthetic methods, structure and reactivity.  
*Prereq: Chem 312 or 313*  
*Next offering Winter 1978*

Chem 419 W 2C .5  
**Biological Aspects of Inorganic Chemistry**  
Metalloproteins and other metal-containing biological molecules in hydrolytic enzymes; redox reactions; nitrogen fixation and oxygen transport; the role of alkali and alkaline earth metal cations.  
*Prereq: Chem 312 or 316*

Chem 420 F 2C .5  
**Analytical Chemistry**  
Selected topics in modern analysis of inorganic materials such as rocks, ores, ceramics, metals and alloys; Atomic flame spectroscopic methods, analytical X-ray techniques, methods for ultra-pure materials, trace and micro determinations.  
*Prereq: Chem 221 or 227*

Chem 421 W 2C .5  
**Spectrometric Analysis**  
The techniques and fundamental principles of infrared, mass spectrometry and NMR as applied to the qualitative identification of chemical compounds.  
*Prereq: Chem 221 or 227*

Chem 432 F 2C .5  
**Biochemistry 3**  
Kinetics, stereospecificity, structure and function of enzymes. bio-energetics, oxidative phosphorylation.  
*Prereq: Chem 333*
Chem 432 L  F  3L .25  
**Biochemistry 3 Laboratory**  
Selected experiments for Honours Biology and Chemistry students taking Chemistry 432.

Chem 433 W  2C .5  
**Biochemistry 4**  
Chemistry and biosynthesis of porphyrins. Metabolism of amino acids, purines and pyrimidines. Roles of vitamins in biological transformations. Respiration, muscular contraction.  
Prereq: Chem 432

Chem 433 L W  3L .25  
**Biochemistry 4 Laboratory**  
Selected experiments for Honours Biology and Chemistry students taking Chemistry 433

Chem 434 W  2C .5  
**Applied Biochemistry**  
Chemistry and function of antibiotics; blood coagulation and related topics. Immuno-chemistry. Nutritional aspects of food.  
Prereq: Chem 333

Chem 440 F (odd years only)  2C .5  
**Group Theory**  
Basic group theory, irreducible representations, molecular symmetry groups, character tables, reduction of representations. These various concepts will be illustrated by application to specific examples.  
Prereq: Math 215

Chem 453 F  2C .5  
**Polymer Properties and Polymerization**  
Polymerization reactions; control of polymer structure and properties.  
Prereq: Chem 353 or equiv.

Chem 454 F  2C .5  
**Surface Chemistry**  
An introduction to the physical chemistry of surfaces. Qualitative and quantitative descriptions of surfaces and interfaces and the development of relevant techniques and theories. Application to surface tension, spreading, wetting, absorption, and other interfacial phenomena.  
Prereq: Chem 254 and 255

Chem 455 F  3C .5  
**Electrochemistry**  
Electrolytic conductance and transport, thermodynamics of electrolytic cells. Reversible and irreversible electrode processes, metallic corrosion; study of selected industrial electrochemical processes.  
Prereq: Chem 254 or 356

Chem 456 W  2C .5  
**Catalysis**  
An introduction to heterogeneous catalysis. Examination of the physical manifestations of catalysis and the development of experimental techniques and theoretical methods for the measurement and elucidation of catalytic phenomena.  
Prereq: Chem 254 and 255

Chem 457 W  1C.3L .5  
**Experimental Aspects of Polymer Science**  
Selected experiments to describe properties of polymers and polymerization processes.  
Prereq: Chem 353 or equiv.

Chem 458 W (odd years only)  
**Quantum Chemistry**  
(Not offered 1978)

Chem 464 F  2C .5  
**Spectroscopy in Organic Chemistry**  
Elucidation and identification of organic structures by contemporary spectroscopic techniques.  
Prereq: Chem 364, 350

Chem 465 W  2C .5  
**Special Topics in Organic Chemistry**  
Topics will be selected from photochemistry, organometallics, synthesis, heterocycles, natural products, molecular rearrangements. (May be taken in third and fourth years as 465A and 465B provided topics are different).  
Prereq: or coreq: Chem 365

Chem 492 Y  9L  1.0  
**Advanced Laboratory**  
9 hours laboratory. See Chem 492 co-ordinator for details.
Department of Civil Engineering

Professor, Chairman of the Department
T. H. Topper, BASc (Toronto), PhD (Cambridge), PEng

Professor, Dean of Engineering
W. A. McLaughlin, PEng (Saskatchewan), MS, PhD (Purdue), PEng

Professor, Associate Dean of Engineering
H. H. E. Leipholz, DiplEng, Dring, Docent Habil (Stuttgart), PEng
Recipient of the Distinguished Teacher Award

Professor, Associate Chairman, Graduate Studies
W. C. Lennox, BASc, MSc (Waterloo), PhD (Lehigh), PEng

Professor, Associate Chairman, Undergraduate Studies
J. Roorda, BASc (Waterloo), PhD (London), PEng

Professors
S. T. Ariaratnam, BASc (Eng.) (Ceylon), MSc (London), PhD (Cambridge)
M. Z. Cohn, CSc (Bucharest), PEng
G. M. L. Gladwell, BSc, PhD, DSc (London)
R. Green, BSc (Eng) (London), MSc (Queen’s), MSc (Waterloo), PhD (Texas), PEng
V. K. Handa, BSc (Calcutta), BSc (Eng) (London), MSc (Queen’s), MSc (Waterloo), PhD (Waterloo), PEng
R. C. G. Haas, BSc, MSc (Alberta), PhD (Waterloo), PEng
B. G. Hutchinson, BE (Sydney), MSc (Queen’s), PhD (Waterloo), PEng
N. C. Lind, MSc (Tech. Univ. of Denmark), PhD (Illinois), PEng
G. M. McNeice, BASc (Waterloo), PhD (London), PEng
J. T. Pindera, Dr. of Tech. Sciences (Warsaw), Docent Habil (Cracow), PEng
T. Prasad, BSc, MSc (Banaras Hindu Univ.), PhD (Cambridge), PEng
J. Schroeder, BEng, MEng (McMaster), PhD (Waterloo), PEng
A. N. Sherbourne, BSc (Manchester), MS (Lehigh), MA, PhD (Cambridge), PEng
T. E. Unny, BE (Madras), M Tech (Kharagpur), Dr Ing (Dresden), PEng

Associate Professors
E. F. P. Burnett, BSc (Cape Town), DIC, MS, PhD (London), PEng
R. W. Cockfield, BSc, MSc (Queen’s), PhD (Waterloo), PEng
H. J. Edens, MSc (Delft), MA Economics (York), PEng
G. J. Farquhar, BASc (Waterloo), PhD (Wisconsin), PEng
D. E. Grierson, BASc, MSc, PhD (Waterloo), PEng
B. LeLievre, BEng (West Australia), MSc, PhD (Waterloo), PEng
E. L. Matyas, BASc (Toronto), DIC, PhD (London), PEng
R. M. Schuster, BS, MS (North Dakota State), PhD (Iowa State), PEng
J. Shortreed, BEngSc (Western), MSc (Queen’s), PhD (Northwestern), PEng
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S. I. Solomon, CivHyd Eng (Bucharest), PhD (City University, London), PEng
J. C. Thompson, BASc (Toronto), MS, PhD (Illinois), PEng
O. L. White, BSc (Melbourne), MSc, PhD (Illinois), PEng
S. Yagar, BASc, MSc (Toronto), PhD (Illinois), PEng

Assistant Professors
N. Kouwen, BASc, PhD (Waterloo), PEng
E. A. McBean, BASc (UBC), SM, PhD (MIT), PEng
J. F. Sykes, BASc, MSc, PhD (Waterloo), PEng

Adjunct Professors
D. C. Aird, MBA
P. M. Allen
M. Batty, BA (Manchester)
D. G. Havard, BSc (London), MSc, PhD (Waterloo), PEng
J. J. Munk, BSc (Sir George Williams), BEng (McGill), LLB (Osgoode Hall), PEng
D. T. McClurkin, Chartered Accountant
N. W. McLeod, BSc (Alberta), MSc (Saskatchewan), ScD (Michigan), PEng
P. Novak, BSc (London), PhD (Prague), DSc (Prague)
O. Stradal, CE, DSc (Prague)

Adjunct Lecturer
J. B. Kerr, MSc (Waterloo)

Faculty members holding cross appointments as shown
1 Civil Engineering and Computer Science
2 Architecture and Civil Engineering
3 Civil Engineering and Earth Sciences
Undergraduate Course Descriptions

Civil Engineering

Civ E 110 W 3C .5
Urban Transport Problems and Prospects
Overview of urban development and role played by transport. Dimensions of current issues such as congestion, travel equity, pollution and energy consumption. Transport demands and relation to land use. Transport planning options; transport technology, general development options.
Not intended for civil engineering students at any level
Not recommended for first year students

Civ E 116 W,S 2C,4L/T .75
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.
Year 1 Engineering

Civ E 190 F, W 3C .5
Technology in Urban & Regional Planning
The influence of transportation, water and sewage systems on the form, function and development of cities and regions; the application of this knowledge in urban and regional planning.
Not intended for Civil Engineering students at any level.
Prereq: Plan 271 or equivalent

Civ E 200 S,F 2C,3T .5
Civil Engineering Project 1
Preliminary designs of standard civil engineering structures. The creation and evaluation of alternative locational and spatial configurations in accordance with user requirements. Informational content of previous courses is augmented with case studies of typical civil engineering problems and solutions.

Civ E 203 F,W 2C,2T .5
Statics
An analytic treatment of static equilibrium of particles and rigid and deformable bodies. Internal forces in straight beams and columns, diagrams of axial force, shear force and bending moment.

Civ E 204 S,F 3C,2T .5
Dynamics
An introduction to the Kinematics and Kinetics of particles and rigid bodies. Newton's Second Law, energy and momentum, impulsive motions, systems of particles, plane motion of rigid bodies: equations of motion.

Civ E 205 F,W 3C,2T
Mechanics of Deformable Solids 1
Introduction of the concepts of stress and strain. Stress-strain relations for linearly elastic and other materials; analysis of the response of prismatic members to axial, shearing, flexural or torsional loads.

Civ E 206 S,F 3C,2T .5
Mechanics of Deformable Solids 2
An extension of Civ E 205. Combined stress and strain states, Mohr's circle yield and failure criteria, energy methods, virtual work buckling of columns, and an introduction to simple statically indeterminate structures.

Civ E 221 F, W 3C,2T .5
Calculus
A continuation of Math 12. Infinite series and power series, partial derivatives, multiple integration with applications, vector analysis, theorems of Green and Gauss, line integrals and Fourier analysis.

Civ E 222 S,F 3C,2T .5
Differential Equations

Civ E 265 F,W 3C,2T .5
Probability and Statistics
A course in aspects of probability and statistics. Sample spaces, calculus of events, probability, conditional probability, independence, Chebychev's inequality, random sampling, parameter and interval estimation, hypothesis testing, regression, analysis of variance.

Civ E 260 S,F 3C,3L/T .5
Structure and Properties of Materials
Topics include: crystalline and non-crystalline arrangements, bonding forces, structural defects, phase equilibria, non-equilibrium transformations, heat treatment, deformation resistance: elasticity, anelasticity, plasticity, creep, fracture, fatigue, properties of plain concrete and polymers.

Civ E 208 S,F 3C,3L/T .5
Fluid Mechanics
An introductory course in fluid mechanics. Unit and dimension, fluid statics, fundamentals of fluid flow, viscous effects, closed conduit flow, pipe network analysis.
Civ E291 1wk lab .5
Survey Camp
A one-week course in surveying. Introduction to
surveying, length measurements, levelling, transit
surveys. Approximate cost to each student $60.

Civ E292 F,W 3C,2T .5
Socio-Economic Aspects of Civil Engineering
An overview of the man-environment interaction.
Economic concepts of human welfare and resource
allocation, engineering economic decisions, break-even
and minimum cost analysis, engineering methods and
scheduling of resource allocation, interest, evaluation of
alternatives.

Civ E298 F,W 1S .0
Civ E299 S,F 1S .0
Seminar
The engineer in society. Principles, methods and
practice of Civil Engineering. Informal lectures.

Civ E300 F,W 2C,3T .5
Civil Engineering Project 2
Detailed design of projects by student teams. Each team
member is assigned a portion of a project which he is to
design. Each of the individual designs are integrated to
produce a complete design in the form of a report.
Emphasis is placed on the integration of knowledge
acquired in other courses.

Civ E303 W,S 3C,2T .5
Structural Analysis 1
An introduction to structural analysis. Degree of internal
indeterminacy and stability of structural systems;
analysis and construction of influence lines for beams,
frames, arches and trusses, calculation of
displacements; energy principles.

Civ E304 F,W 3C,2T .5
Structural Analysis 2
Statically determinate and indeterminate structures.
General theorems of linear elastic structures. General
methods of structural analysis and applications to
beams, frames, arches and trusses. Moving loads and
influence lines. Approximate analysis. Introduction to
plastic analysis.

Civ E315 F,W 3C,1T .5
Structural Design 1
An introductory course in structural design intended to
acquaint the student with the behaviour of typical
engineering materials. The behaviour of sections under
various loading conditions, the design of connections in
steel and concrete structures, design of beams and
columns.

Civ E342 W,S 3C,2T .5
Urban Transport Planning 1
An introduction to the analytical tools of transport
planning. Urban transport planning process, trip
generation, modal split analysis, trip distribution, traffic
assignment. Economic evaluation of transport systems.
Transport technology. Transport plan development and
urban planning principles.

Civ E343 Urban Transport Planning 2
Not offered 1977-78

Civ E353 W,S 3C,3L .5
Geology and Soil Mechanics
An introduction to geology and rock mechanics with
emphasis on topics related to civil engineering.
Mineralogy and petrology, structural geology, geo-
morphology (especially glacial geology), aggregates, soil
classification, permeability and groundwater flow.
Approximate cost of field trips: $10.

Civ E354 F,W 3C,2L .5
Soil Mechanics and Foundations
A study of theories of soil mechanics and their use in soil
engineering. Introduction to engineering properties of
soils. Procedures for the design of earth structures and
shallow foundations.

Civ E375 F,W 3C,2L .5
Sanitary Engineering
An introductory course in sanitary engineering.
Fundamentals of microbiology and chemistry, water
treatment; water quality, clarification, filtration,
disinfection, removal of dissolved materials, waste water
characteristics; primary, secondary and tertiary
treatment, sludge handling industrial wastes.

Civ E381 W,S 3C,2T .5
Hydraulics
An introductory course in hydraulics. Open channel flow,
hydrometeorological concepts, statistical hydrology,
reservoir operation, dimensional analysis, hydraulic
structures, hydro electric power.

Civ E393 W,S 3C,1T .5
Environmental Engineering
An introduction to environmental, urban and municipal
engineering. Characteristics of urbanization, measuring
demands for municipal services, developing and testing
plans, implementation considerations, performance and
measurement consideration.

Civ E396 W,S 1S .00
Civ E399 F,W 1S .00
Seminar
The engineer in society. Principles, methods and
practice of Civil Engineering. Informal lectures.
Civil Engineering Project 3
Design of civil engineering projects, building structures, bridges, highway and municipal engineering works. Emphasis is given to the interrelationship between practical design and the various sciences and disciplines covered in the undergraduate course of studies.

Structural Steel Design
A concise presentation of basic features of the behaviour and design of steel structures. Materials, applications. Types of construction; elastic and plastic action; design of tension members, beams, columns, bolted and welded connections, plate girders, composite construction, light gauge members.

Structural Concrete Design
The basic features of the behaviour and design of structural concrete. Properties of concrete, reinforcing steel, reinforced concrete; flexural behaviour, shear, bond, combined axial and bending loads singly and doubly reinforced flexural sections. Design of continuous beams; yield line analysis for slabs.

Structural Design 2
A continuation of Civ E413 and 414. Loadings, layout, components, assemblage and economics of various building systems; design of one and two-way floor systems; effects of temperature, creep, shrinkage, concentrated loads, etc; industrial and multistory framed structures; bridges.

Transportation Economics
A course in public enterprise economics with emphasis on spatial or transportation related effects in economics. Topics include welfare economics, costing, pricing theory, project evaluation and practical application problems.

Foundation Engineering
A continuation of Civ E354. Engineering properties of soils, special problems and techniques in the design of foundations, earth structures and excavations, shallow and deep foundations, case studies.

Engineering Law
Introduction to law and the Common Law legal systems; contracts, effect of mistakes on contracts, interpretation of contracts, breach of contracts, legal remedies; technical specifications; sale of goods; the Law of Agency; the Tort of Negligence, professional negligence; restrictive trade practices; Patent Law.
Civ E 518† W 3C,1T .5
Plates and Shells
Elementary methods of analysis and design of plates and shells. Types, uses, typical materials and methods of construction; membrane theory for shells, elementary bending theory for plates and shells, derivation and solution of governing equations; limitations of methods, solutions.

Civ E 520† Advanced Computer Programming for Engineers
Not offered 1977-78

Civ E 522† W 3C,2T .5
Engineering Analysis

Civ E 524† Probability, Statistics and Decision Theory
Not offered 1977-78

Civ E 525† W 3C .5
Introduction to Finite Element Methods
The concept and theoretical basis of the finite element method are presented as a logical extension to solid body stress analysis of the matrix methods applied to structural frames. Students will analyze representative two- and three-dimensional problems using available programmes.

Civ E 526† S,F 4C .5
Continuum Mechanics
Mathematical preliminaries: Co-ordinate transformations, cartesian tensors, tensor fields, integral theorems; Analysis of stress, strain and rate of deformation. Fundamental laws: Conservation of mass, momentum, moment of momentum and energy. Constitutive equations: Application to specific continua.

Civ E 534† Model Analysis of Engineering Structures
Not offered 1977-78

Civ E 536† W 3C,2T .5
Model-Aided Design of Engineering Structures

Civ E 540† S,F 3C .5
Highway Design
The design of urban roads and streets. Driver characteristics, intersection capacity, alignment, cross sections, pavements, parking, signing, lighting, trade-offs in design of urban roads.

Civ E 541† W 3C .5
Traffic
A course in traffic analysis and design. Car following theories, delays at street intersections, deterministic and stochastic traffic patterns, computer simulation of traffic behaviour.

Civ E 542† W 3C,2T .5
Pavement Structural Design
A course in pavement design. Soil identification, subgrade design, base courses, flexible pavement design, dense to graded hot mix asphaltic concrete, surface treatments.

Civ E 543† W 2C,3T .5
Land Use Models
An introduction to analytical models for forecasting urban land use patterns. Urban development in Canada, available urban development models, population forecasting, economic activity forecasting, the Lowry model.

Civ E 544† Systems Analysis
Not offered 1977-78

Civ E 545† W 3C,2T .5
Transportation Planning Practice
The practice of transportation planning using case studies to illustrate current practice. Airport and air terminal planning; urban rapid transit, demand scheduled bus systems. Students will be required to complete a planning and design problem in one area.

Civ E 551† W 2C,2T .5
Engineering Terrain Analysis
Introduction to engineering terrain analysis. Use of geologic and pedologic information and air photo interpretation techniques, prediction of engineering properties of soils, planning of engineering soil surveys; permafrost and muskeg; terrain evaluation systems.

Civ E 556† W 3C .5
Soil Engineering (Case Histories)
A study of the application of procedures of design and construction of foundations and earth structures through consideration of case histories. Prereq: Civ E 454

Civ E 560† W 3C .5
Mechanical Behaviour of Materials
A review of crystalline and non-crystalline structures. Elastic and inelastic properties, imperfection and plasticity in crystals; plastic deformation and creep; brittle, ductile and fatigue fracture. Plasticity in ceramics and polymers. Cyclic deformation.
Course Descriptions
Civil Engineering

Civ E 572† S,F 2 C .5
Topics in Wastewater Treatment
A course in wastewater treatment. Wastewater
characterization industrial wastes, treatment processes:
solid-liquid separating, ion exchange, adsorption,
biological treatment, reactor flow patterns.

Civ E 573† W 2 C .5
Pollution in the Aquatic Environment
A waste management course involving characteristics of
receiving waters. Diffusion, biological responses to
nutrients, self purification, thermal discharge,
limnological aspects.

Civ E 580† S,F 3 C .5
Elements of Water Resources Management
An introduction course in water resources management.
Uses of water, institutional characteristics, multi-use of
water, water quality management, systems analysis,
comprehensive water resources planning.

Civ E 583† Water Distribution and Collection Systems
Not offered 1977-78

Civ E 584† W 3 C .5
Technological Forecasting and Long-range Planning
Needs for advanced forecasting and long-range planning
in various physical, technological and social systems.
Evaluation of different forecasting models and
applications. Data requirements. Example economic,
demographic, environmental and other problems.

Civ E 586† S,F 3 C .5
Hydrology
A course in hydrology, following Ch E 381. Hydrologic
cycle, river basin characteristics, climatology,
evaporation, probability in hydrology, hydrographs, time
series, data banks, models, floods, groundwater.

Civ E 589† W 3 C .5
Open Channel Flow
A course in open channel flow. Classification of open
channel flow, energy and momentum principles, critical
flow, uniform flow, design of channels, gradually and
rapidly varied flows, flood routing.

Note
Courses numbered within 500 series are considered to
be undergraduate courses but are intended to form a
transition from the undergraduate to the graduate
programme in certain areas of Civil Engineering. They
serve two major functions:
1) to provide electives for the undergraduate so that the
student may specialize in a particular area.
2) to provide background information for the graduate
student when such is lacking. Courses of this series
may be credited toward a graduate degree.

†Dagger indicates the offering of this course is
contingent on sufficient demand and/or available
teaching resources.
Department of Classics and Romance Languages

Associate Professor and Chairman of the Department
J. R. Dugan

Classics Faculty

Professors
P. Keresztes, MA (Toronto), PhD (Graz)
D. C. Mackenzie, BA, MA, PhD (Princeton)

Associate Professor
P. Forsyth, AB (Mount Holyoke), MA, PhD (Toronto)

Assistant Professors
S. B. P. Haag, BA, MA (Queen's), MA (Waterloo), MPhil (Toronto)

Spanish Faculty

Professor
J. C. McKegney, BA (Western), MA (Oregon), PhD (Washington), Diploma (Santander)

Associate Professor
C. M. Fernandez, Lic en Arq (Madrid), MA (Tulane), DLit et Phil Universitas Complutensis (Madrid)

Assistant Professor
B. Thalman, BA (DePauw), MA, PhD (Ohio State)

Lecturer
S. Harrison, BA (Oxford), MA (Toronto)

Italian Faculty

Assistant Professor
E. Evans, BA (Calcutta), DPaed (Prodova)

Sessional Lecturers
A. Guattieri, BA (Toronto), MA (Colorado)
V. F. Golini, BA (McMaster), MA (Colorado)

French Faculty

Professors
A. Ages, BA (Carleton), MA, PhD (Ohio State)
J. R. Finn, CR, BA (Western), MA (Toronto), PhD (Illinois)
R. L. Myers, BA (Western), MA, PhD (Johns Hopkins)

Associate Professors
J. J. Sinamo, Len PhilRom, Agrege (Brussels)
J. R. Dugan, BA, MA (Toronto), PhD (Yale)
J. LaFrancois, BPaed, MA, PhD (Laval)
C. Racine, BA (Joliette), Lic en Péd, Lic ès Lettres, DES (Montréal, Doctorat ès Lettres (Nice)
W. D. Wilson, MA, PhD (Trinity College, Dublin)

Assistant Professors
P. H. Dubé, BA, MA (Toronto), PhD (Ohio State)
R. J. Fournier, BA, MA, PhD (Western)
P. Socken, BA (Toronto), MA (Iowa), PhD (Toronto)

Sessional Appointments
C. C. Abbott, BA, MA, PhD (Ohio State)
P. Aplevich, BA, MA (Waterloo)
H. S. Fournier, BA (Toronto), MA, PhD (Western)
M. Hennig, BA (Western), MA (Waterloo)

Co-ordinators
M. Levert-Phillips, BA en Péd, (Quebec), Graduée du conservatoire d'art dramatique de l'Université de Montréal, BA-UQAM (Montreal), MA (Waterloo)
N. Vassiliadis, BA-Lic ès Lettres, MA

General Remarks
1) The number of lectures per week shown after certain course numbers is an attempt to indicate the "normal". The instructor will determine how often a particular class will meet.
2) In choosing courses each year, students should always bear in mind the requirements of the profession they intend to enter after graduation. The members of the department are at all times willing to advise students.
3) Students entering their second year will require the following number of departmental courses in order to graduate with major or honours standing in French, Spanish or Classics:
   a) Major in 3 Year programme—6 courses (except Classics—5 courses)
   b) Double honours programmes—8 courses (except French and Political Science—7 courses)
   c) Singlehonours programme—10 courses

Undergraduate Course Descriptions

Classics

Classical Civilization (courses in Translation)

CCiv 101 F 3C .5

Colossos—The Major Figures of Ancient Greece
An introductory study of the achievement of ancient Greece through some of its most prominent figures. These seminal figures have been selected as representatives, for good or bad, of the Greek experience. Each year two of the following will be featured: Theseus: The Minoan-Mycenaean Age of Bronze; Pericles and the Rise of Democracy; Socrates, Man and Martyr; Alexander the Great and the Age of Expansion.
C Civ 102  W  3C   5
**Colossos - The Major Figures of Ancient Rome**
An introductory study of the achievement of ancient Rome through some of its most prominent figures. Each year the Roman experience will be examined in two of the following topics: Caesar, Cicero and the Collapse of the Republican Ideal; Augustus: The Empire Rises; Nero and the Corruption of Power; Hadrian and the Imperial Machine.

C Civ 201  F,J  3C  .5
**Ancient Greek Society**
A survey of several aspects of the civilization of Classical Greece. Topics studied, based on primary (in English translation) and secondary sources, will include the individual, the city, institutions and amusements.

C Civ 202  W,A  3C  .5
**Ancient Roman Society**
A course similar to 201 above, but dealing with Classical Rome.

**Note**
With regard to the following two courses, Classical Civilization 251-Classical Civilization 252, the Classics Division will accept History 255 as an alternative for Classics credit. But a student may not take both History 255 and Classical Civilization 251-Classical Civilization 252.

C Civ 251  F  3C  .5
**Near Eastern and Greek History**
A survey of the civilizations of the Near East and of Greece, emphasizing their political, military, social and economic aspects. This course is acceptable for credit by the History department.

C Civ 252  W  3C  .5
**Roman History**
A military, political, social, economic survey of Rome from earliest times to the Empire's fall. This course is acceptable for credit by the History department.

C Civ 255  Mediaeval Civilization
Not offered 1977-78

C Civ 256  Mediaeval Civilization
Not offered 1977-78

C Civ 265  Classical Verse in Translation 1
**Greek and Roman Epic and Early Tragedy**
Not offered 1977-78

C Civ 266  Classical Verse in Translation 2
**Tragedy, Comedy and Other Verse Forms**
Not offered 1977-78

C Civ 270  Y  3C  1.0
**Mythology and Religion**
A general survey of Graeco-Roman mythology. Attention will also be devoted to such topics as the state cults, Oriental mystery religions in the Mediterranean area, and the Ruler Cult and worship of the Roman Emperor.

C Civ 321  Forms of Classical and Neo-Classical Satire
Not offered 1977-78

C Civ 322  Pastoral and Mythological Aspects of Classical and Neo-Classical Poetry
Not offered 1977-78

C Civ 351  F  3C  .5
**Greek Art and Architecture**
A survey of the art and architecture of the ancient Greek world from the Minoan to the Hellenistic periods. (Same as Fine Arts 310)

C Civ 352  Roman Art and Architecture
Not offered 1977-78

C Civ 365  W  2S  .5
**Problems in Greek History 1**
A detailed study of a selection of problems in Greek History. This course is acceptable for credit by the History department.
Prereq: C Civ 251 or Hist 255

C Civ 366  Problems in Greek History 2
Not offered 1977-78

C Civ 371  F  3C  .5
**Christianity and the Roman Empire 1**
A study of the relationship between Christianity and the Roman Empire from the earliest beginning to 200 A.D. This course includes topics such as the trial of Christ; the trials of Paul before governors of the Empire; the burning of Rome in 64 A.D. and the subsequent outlawing of Christianity; the suppression of the Bacchanals; legislation governing the persecution of Christians, and others.

C Civ 372  W  3C  .5
**Christianity and the Roman Empire 2**
A continuation of C Civ 371. Topics included are the persecutions by the Emperors Decius and Valerian, the 'Great Persecution' and finally the triumph of Christianity under the Emperor Constantine.

C Civ 381  From Diocletian to Constantine
Not offered 1977-78

C Civ 382  Constantine the Great
Not offered 1977-78
CCiv 386 Classical Prose in Translation
Not offered 1977-78

CCiv 401 F 2S .5
Atlantis: The Making of Myth
A study, through the legend of Atlantis, of how ancient myths arose and developed. Topics include the Platonic account of Atlantis, modern theories of lost continents, and the general concept of utopia in the ancient world; special attention will be given to Minoan Crete as a possible prototype for Atlantis, and to the destruction of the Minoan civilization through the volcanic eruption of the island of Thera.
Prereq: CCiv 251 or CCiv 351 or CCiv 270; or consent of instructor

CCiv 490 Y 2S 1.0
Roman Civilization and History
Senior seminar. An in-depth study of various problems and aspects of Roman Civilization and History (Same as History 400)

CCiv 492-496
Senior Tutorials
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.

CCiv 390 Y 3C 1.0
Introductory Ancient Greek
A course designed for students beginning the study of ancient Greek or who have not yet reached the level expected in Greek 200. The aim is to attain as rapidly as possible the ability to read simple prose. The emphasis is on forms and structure; reading of connected passages will begin early in the first term.
Prereq: Yr 5 Grk, Grk 100 or instructor's permission

Grk 265 The Birth of History
Not offered 1977-78

Grk 266 The Drama of Euripides
Not offered 1977-78

Grk 365 F 3C .5
The Greeks at War
Selections from Thucydides' history of the struggle between Athens and Sparta.

Grk 366 Lyric and elegiac Poetry
Not offered 1977-78

Grk 375 Aeschylus and Early Greek Tragedy
Not offered 1977-78

Grk 376 W 3C .5
Classical Drama
Sophocles and Aristophanes. An analysis of the female tragic figure in the Antigone of Sophocles, and of the female comic figure in the Lysistrata of Aristophanes.

Grk 395-399
Senior Tutorials
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.
Latin

Lat 100 Y 3C 1.0
Introductory Latin
A course designed for students beginning the study of Latin who have not yet reached the level expected in Lat 150. The aim is to attain as rapidly as possible the ability to read simple prose. The emphasis is on forms and structure: reading of connected passages will begin early in the first term.

Lat 150 Y 3C 1.0
A survey of Latin Literature
A general survey of Latin prose and poetry from its beginnings to the Fall of the Roman Empire. The literary achievement of Rome will be examined mainly through selections in Latin with occasional readings in translation.
Prereq: Year 5 Latin, Lat 100, or instructor's permission.

Lat 251 F 3C .5
Latin Composition and Grammar
Composition, translation, basic grammar with intensive analysis of selected works.

Lat 261 F 3C .5
Latin Prose 1
Selections from the letters of Cicero and Pliny.

Lat 262 Latin Prose 2
Not offered 1977-78

Lat 272 An Introduction to Vergil
Not offered 1977-78

Lat 281 Latin Poetry 1
Not offered 1977-78

Lat 282 W 3C .5
Latin Poetry 2
Selections from Ovid and Martial.

Lat 352 The History of the Latin Language
Not offered 1977-78

Lat 361 Cicero
Not offered 1977-78

Lat 362 Lucretius
Not offered 1977-78

Lat 363 Roman Comedy
Not offered 1977-78

Lat 371 F 3C .5
An Introduction to the Roman Historians
Selections from Sallust and Livy; a study of the development of Roman historiography.

Lat 372 Tacitus
Not offered 1977-78

Lat 381 Mediaeval Latin
Not offered 1977-78

Lat 382 Mediaeval Latin
Not offered 1977-78

Lat 461 Vergil 1
Not offered 1977-78

Lat 462 Vergil 2
Not offered 1977-78

Lat 471 F 2S .5
Roman Elegy
Selections from Propertius, Tibullus, and Ovid.

Lat 481 W 2S .5
Roman Satire 1
Selections from Horace and Persius.

Lat 482 Roman Satire 2
Not offered 1977-78

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.
Romance Languages

French

Waterloo at Laval
There is an arrangement between the Department and the Université Laval, at Québec, whereby Waterloo students may study for a year or a term at Laval. Further particulars may be obtained from the Department.

First-Year French Courses
Students should read the following carefully in order to enrol initially in the appropriate course. When in doubt, consult the Department.

Fr101 F 3C,1L .5
Reading French
An elementary course, taught in English, designed to give the student a rapid and adequate reading knowledge of French. Basic elements of French sentence structure are explained, and reading passages from diverse academic disciplines are studied. This course will not give the student training in oral French.

Note This course is intended for students who have never had French before.
Prereq: Consent of Department.

Fr102 W 3C,1L .5
Reading French
A continuation and completion of the work begun in French 101.
Prereq: Fr 101 or consent of Department.

Note 1
There is no follow-up to Fr 102. Students wishing a basic French course leading to further courses should see Fr 151 below.

Note 2
Successful completion of Fr 102 will satisfy the "reading knowledge of French" requirement of University of Waterloo Graduate programmes.

Level 1: Courses for Students Who have not Completed High School Year 5 French

Note
Students enrolling in these courses will be required to take the French Language Placement Test administered by the Department at the beginning of the Fall term.* (see note below)

Fr151 F,S 3C,1L .5
Basic French
An elementary French language course designed to give a comprehensive approach to French language study to the student who does not have the equivalent of High School Year 5 French. Involves reading, writing and speaking French. Successful completion of Fr 151 qualifies a student to take Fr 152.

Note
Students will be placed into sections appropriate to their ability and background in French. Also offered at St. Jerome's College.

Fr152 W 3C,1L .5
Basic French
A continuation of the work done in Fr 151. Successful completion of Fr 152 qualifies a student to take Fr 191, Fr 192 or Fr 195.
Prereq: Fr 151 or consent of Department.
Also offered at St. Jerome's College.

Note
Students completing Fr 152 with high standing may petition the Department for admission into the General French or Honours French Degree programmes.

Level 2: Courses for Students who Normally Have Completed High School Year 5 French, or who Have Otherwise Acquired an Equivalent Command of French

Note 1
Students wishing to enrol in these courses will be required to take the French Language Placement Test administered by the Department at the beginning of the Fall term.** (see note in following column)

Note 2
Credit will not be awarded to any student for more than one of Fr 191, 192, 192A/192B or 195/196.

Note 3
Successful completion of any course at this level automatically entitles the student to register in the General or Honours Degree programme in French.

Fr191 Y 4C,1L 1.0
French Language and Literature
This intensive course taught in French, has two components: a) French language: emphasis on oral expression, comprehension, reading and writing; b) Lectures and discussion on a representative selection of French novels and short stories. 2 hours language study, 1 hour lab., 2 hours lecture.
Prereq: Year 5 French, Fr 152 or consent of Department.
Also offered at St. Jerome's College.
Fr192  Y  4C,1L  1.0  
French Language
A very intensive French language course, taught in French. Emphasis will be placed exclusively on strengthening oral expression, comprehension of spoken French, reading and writing skills.
Prereq: Year 5 French, Fr 152 or consent of Department.

Fr192A  F  4C,1L  .5
French Language
Fall term of Fr 192;
see note below

Fr192B  W  4C,1L  .5
French Language
Winter term of Fr 192;
see note below

Note
These half-courses are available only to students in the co-operative System or with the permission of the Department.

Fr195  F,W  2C,2L  .5
Oral French for Co-operative Students
Intensive oral and aural training in the classroom as well as in the language laboratory, exercises in comprehension and conversation.
Prereq: Year 5 French or equivalent, Fr 152, or consent of Department.

Fr196  F,W,S  2C,2L  .5
Oral French for Co-operative Students
A continuation and completion of work begun in French 195.
Prereq: Fr 195 or consent of Department.

Note
Successful completion of this course does not qualify the student for admission to Fr 250.

**The French Language Placement Test is designed to assist the student to find the French language course level best suited to his/her needs. The Department reserves the right to refuse admission to any of its language courses on any level to a student who has, in the Department’s view, attained a level of competence either inferior to or superior to the levels of competence outlined in each course description. In order to permit proper evaluation of performance in the French Language Placement Test, the Department reserves the right to delay as necessary the commencement of classroom instruction.

Second-Year French Courses

Language

Fr205  F,W  3C,1L  .5
Spoken French
Intensive oral and aural training in the classroom. There will be particular emphasis on comprehension and conversation, with the class being divided into small groups for practice in speaking. These groups will be streamed according to the fluency of the students.
Prereq: normally one of: Fr 152, 191, 192, 192B, 196, or consent of Department.

Fr206  W,S  3C,1L  .5
Spoken French
Continuation and completion of work begun in French 205.
Prereq: Fr 205 or consent of Department.

Fr207  F,S  3C,1L  .5
Spoken French (Former Level C of Fr205)
Continued intensive oral and aural training in the classroom. There will be particular emphasis on comprehension and conversation, with the class being divided into small groups for practice in speaking.

Note
A student having taken Fr 205/206 at the C level may not register in Fr 207.
Prereq: Fr 206

Fr208  W  3C,1L  .5
Spoken French (Former Level C of Fr206)
Continuation and completion of work begun in Fr 207.
Prereq: Fr 207 or consent of the Department.

Note 1
Each classroom section of this course will be limited to a maximum enrolment of 12 students.

Note 2
A student may repeat the course, on successive levels of difficulty. He/she will, however, receive a maximum of 1 credit for the course regardless of the number of times it is taken.

Note 3
A student registered in the General French or Honours French Degree programmes may include this course as one of his/her non-French electives (regardless of the number of times he/she may repeat). He/she may not count this course as one of the French courses required to complete his/her degree.
Fr250 Y 3C,1L 1.0
French Language
Continued training in spoken and written French, with a
concentration on more difficult problems of the
language.
Prereq: Fr190, 191, 192, 192A/192B or consent of
Department.

Fr251 F 3C,1L .5
French Language
Fall term of Fr250;
see note below

Fr252 W 3C,1L .5
French Language
Winter term of Fr250;
see note below

Note
These half-courses are available only to students in the
co-operative System or with the permission of the
Department.

Literature

Fr231 F 3C .5
Survey of Seventeenth Century French Literature
This course will trace the development of French
literature from 1600-1700. This course is taught entirely
in French.
Prereq: Fr191, 192, 192A/192B or consent of
Department.
N.B. Not open to students who have taken Fr 200, Fr 281
or Fr 282.

Fr232 W 3C .5
Topics and Problems in Seventeenth Century French
Literature
A more detailed study of writers/works of the classical
period. This course is taught entirely in French.
Prereq: Fr191, 192, 192A/192B or consent of
Department.
N.B. Not open to students who have taken Fr 200, Fr 281
or Fr 282.

Fr253 F 3C .5
Survey of Nineteenth Century French Literature
This course will trace the development of French
Literature from the French Revolution to the end of the
nineteenth century. This course is taught entirely in
French.
Prereq: Fr191, 192, 192A/192B or consent of
Department.
N.B. Not open to students who have taken Fr 200, Fr 281
or Fr 282.

Fr254 W 3C .5
Topics and Problems in Nineteenth Century French
Literature
This course will study in depth one genre of the
nineteenth century. This course will be taught entirely in
French.
Prereq: Fr191, 192, 192A/192B or consent of
Department.
N.B. Not open to students who have taken Fr 200, Fr 281
or Fr 283.

Fr273 Aspects of Québec
Not offered 1977-78

Fr274 W 3C .5
Survey of French-Canadian Literature
This course will trace the development of French-
Canadian literature from its origins to the present. This
course is taught entirely in French.
Prereq: Fr191, 192, 192A/192B or consent of
Department.
N.B. Not open to students who have taken Fr 272.

Fr291 F 3C .5
French and French-Canadian Civilization
This course traces the cultural development of France
and Québec from their origins to the beginning of the
Napoleonic Empire. Emphasis is given to the study of
music, art, architecture, literature, ideas and “daily life”
in their historical context.

Note
This course will be taught in English except in the
Correspondence programme, where lectures are in
French. It is open to Arts students in second year and
higher, and to others in any year. Open to students
majoring or honouring in French only with the
permission of the Department.

Fr292 W 3C .5
French and French-Canadian Civilization
This course completes the study of cultural development
of France and French Canada to 1900. After that the
course emphasizes a study of life in these two areas
today. Considerable attention will be paid to popular
music, art, politics, industry, etc.
Prereq: Fr 291 is recommended.

Note
See note under French 291
Advanced Level French Courses

Language

Fr300  Y  3C.1L  1.0
French Language
Advanced grammar and composition, including translation; oral practice and corrective phonetics. Prereq: Fr250 or consent of Department

Fr301  F  3C.1L  .5
French Language
Fall term of Fr300
see note below

Fr302  W  3C.1L  .5
French Language
Winter term of Fr300
see note below

Note
These half-courses are available only to students in the co-operative System or with the permission of the Department.

Fr401  F  .5
Advanced Language Study
Consult the Department for further details of this course. Prereq: Fr300

Fr402  W  .5
Advanced Language Study
Consult the Department for further details of this course. Prereq: Fr401 or consent of Department

Fr501  F  .5
Problems of the French Language
Advanced training in stylistics and in problems of translation. Admission to the course by permission of the Department only.

Fr502  W  .5
Problems of the French Language
Advanced training in stylistics and in problems of translation. Admission to the course by permission of the Department only.

Literature Courses

Period Numbering System

Fr409-419

Fr420-429
Fr230-239, 330-339, 430-439
Fr340-349, 440-449
Fr253-259, 350-359, 450-459
Fr360-369, 460-469
Fr270-279, 370-379, 470-479

French-Canadian Literature

Courses offered in the Literature Courses number sequences may vary from year to year, and course numbers will be adjusted accordingly. Although there are no firm Course Admission Requirements, it is recommended that the student have completed a literature course on the 200 level.

Note 1
The Department requires that students registered in the General French degree programme complete, before graduation, at least three full credits in French on the 300 or 400 levels. Furthermore, the student must have taken one half-credit in at least three of the areas listed above.

Note 2
The Department requires that the students registered in the Honours French degree programme complete, before graduation, at least six full credits in French on the 300 or 400 levels. Furthermore, the student must have taken one half-credit in at least six of the areas listed above.

Note 3
The Department requires that students registered in a Joint Honours programme combining French with another subject complete before graduation, at least four credits in French on the 300 or 400 levels. Of these, one half-credit must be taken in at least five of the above areas.

Fr331  F  3C  .5
Le Grand Siècle
A study of those major authors of the seventeenth century who, by influence or by reaction, provide the foundations of many future literary works. Taught in French.

Fr341  W  3C  .5
Eighteenth Century Literature: The Aesthetic Dimension
Readings in the novel, drama, poetry, and criticism of the eighteenth century. Taught in French.
Fr351  F  3C  .5
Romanticism
A study of the French novel from 1800-1850. Selected authors will include Chateaubriand, Balzac, Stendhal and Hugo.
Taught in French.

Fr352  W  3C  .5
Realism and Naturalism
A study of the French novel from 1850-1900. Authors studied will include Flaubert, Maupassant, Zola and Huysmans.
Taught in French.

Fr361  F  3C  .5
Contemporary French Literature
A study of selected texts by authors such as Alain-Fournier, Gide, Apollinaire, the Surrealists, Malraux.

Fr362  W  3C  .5
Gide, Proust and their Contemporaries
A study of selected texts by authors such as Alain-Fournier, Gide, Apollinaire, the Surrealists, Malraux.

Fr375  W  3C  .5
Contemporary French-Canadian Novel
A study of a limited number of texts by authors such as Gabrielle Roy; Anne Hébert; Jacques Godbout; André Langevin; Hubert Aquin; Gérard Bessette.
Taught in French.

Fr409  F  3C  .5
Medieval French Language
An introduction to the early development of French.
Offered at St. Jerome's College.

Fr421  F  3C  .5
French Prose of the Renaissance
Readings in sixteenth century literature: Rabelais, Montaigne, etc.

Fr422 French Poetry of the Renaissance
Not offered 1977-78

Fr431 Classical French Tragedy
Not offered 1977-78

Fr441 "The Philosophers": French Prose Writers of the Eighteenth Century
Not offered 1977-78

Fr443  W  3C  .5
Comedy and "drame bourgeois" of the 18th Century
A study of examples of the comedy and "drame bourgeois" of the 18th century: Marivaux, La Chaussée, Voltaire, Diderot, Palissot, Sedaine, Beaumarchais.
Taught in French.

Fr451  F  3C  .5
Movements and Themes in Nineteenth Century Poetry
A survey of lyric poetry in the nineteenth century.
Taught in French.

Fr461  W  3C  .5
French Literature between the Wars
A study of some of the most significant literary works of the period in their historical, social and intellectual setting.
Taught in French.

Fr471  F  3C  .5
French-Canadian Poetry
A study of its evolution from Octave Crémazie to Anne Hébert.
Taught in French

Fr472  W  3C  .5
Contemporary Quebec Theatre
A study of the themes, structures and evolution of Contemporary Québec theatre, based on the principal plays of authors such as Gratien Gélinas; Marcel Dubé; Yves Thériault; François Loranger; Anne Hébert; Jacques Ferron; Jacques Langirand; Michel Tremblay.
Taught in French

Fr473 Poetry and Song of Quebec
Not offered 1977-78

Fr490-498
Senior Tutorials
By arrangement with the Department, an individual student or a small group of students follows a course of study under the supervision of a faculty member.
Italian

The following courses are administered by St. Jerome's College

Ital 100J Y 3C,1L 1.0
Introduction to Italian (formerly Ital110J)
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.
Offered at St. Jerome's College

Ital 101J F 3C,1L .5
Introduction to Italian
Fall term of Ital 100J: see note below.

Ital 102J W 3C,1L .5
Introduction to Italian
Winter term of Ital 100J: see note below

Ital 190J Y 3C,1L 1.0
Intermediate Italian (formerly Ital210J)
Advanced study of grammar, conversation and an intensive study of one novel. Some finer points of grammar will be studied but will actually be a secondary aspect. A survey course in Italian literature of the Risorgimento (19th century) will be offered, giving special emphasis to the major writers of this period.
Prereq: Ital 110J or consent of instructor.
Offered at St. Jerome's College

Ital 191J F 3C,1L .5
Intermediate Italian
Fall term of Ital 190J: see note below

Ital 192J W 3C,1L .5
Intermediate Italian
Winter term of Ital 190J: see note below

Note
Ital 101J, 102J, 191J and 192J are available only to students in the co-operative system or with the permission of the Classics and Romance Languages Department of St. Jerome's College.

Ital 212J Y 3C 1.0
Italian Culture (formerly Ital230J)
This course, given in English, aims at giving the student a well-balanced view of Italy and her culture, through the study of her Geography, History, Religion, Literature, Art, Music and her contribution to the world and to North America in particular.
Prereq: Second Year standing.
Offered at St. Jerome's College.

Course Descriptions
Classics and Romance Languages
# Course Descriptions

## Classics and Romance Languages

### Spanish

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Days</th>
<th>Term</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Span 101</td>
<td>F,W</td>
<td>3C,D</td>
<td>1 L</td>
<td>Introduction to Spanish&lt;br&gt;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.</td>
</tr>
<tr>
<td>Span 102</td>
<td>W,F</td>
<td>3C,D</td>
<td>1 L</td>
<td>Introduction to Spanish&lt;br&gt;A continuation of Spanish 101&lt;br&gt;Prereq: Span 101 or consent of Division.</td>
</tr>
<tr>
<td>Span 111</td>
<td>F</td>
<td>3D,2L</td>
<td>0.5</td>
<td>Conversational Spanish&lt;br&gt;Intensive oral and aural training with particular emphasis on comprehension and speaking. Intended for students with no knowledge of Spanish. Limited to a maximum of 20 students.</td>
</tr>
<tr>
<td>Span 115</td>
<td>F</td>
<td>3C,D</td>
<td>0.5</td>
<td>Reading Spanish&lt;br&gt;Elementary course, taught in English, designed for rapid and adequate reading knowledge of Spanish. Basic elements of sentence structure. Reading passages from academic and other fields are studied according to personal interest. Not for spoken Spanish.</td>
</tr>
<tr>
<td>Span 116</td>
<td>W</td>
<td>3C,D</td>
<td>0.5</td>
<td>Reading Spanish&lt;br&gt;A continuation and completion of the work begun in Spanish 115.&lt;br&gt;Prereq: Span 115</td>
</tr>
<tr>
<td>Span 191</td>
<td>F</td>
<td>3C,D</td>
<td>1 L</td>
<td>Intermediate Spanish&lt;br&gt;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.&lt;br&gt;Prereq: Span 101/102 or Grade 13 Spanish</td>
</tr>
<tr>
<td>Span 192</td>
<td>W</td>
<td>3C,D</td>
<td>1 L</td>
<td>Intermediate Spanish&lt;br&gt;A continuation of Spanish 191&lt;br&gt;Prereq: Span 191 or consent of Division</td>
</tr>
<tr>
<td>Span 210</td>
<td>Y</td>
<td>3C,D</td>
<td>1.0</td>
<td>Spanish Civilization&lt;br&gt;A study in English of the main historical and cultural currents in Spain and Spanish America. No knowledge of Spanish is required. Satisfies A(ii) requirements.</td>
</tr>
<tr>
<td>Span 213</td>
<td>F</td>
<td>3C,D</td>
<td>0.5</td>
<td>Commercial Spanish&lt;br&gt;How to compose a business letter in Spanish. Basic commercial vocabulary. Examination of the situation of foreign businesses in Spanish America today.&lt;br&gt;Prereq: Permission of the instructor</td>
</tr>
<tr>
<td>Span 251</td>
<td>F</td>
<td>3C,D</td>
<td>0.5</td>
<td>Composition and Conversation&lt;br&gt;Intensive language study based on literary texts, including grammar, syntax, structure. Essay writing, speeches, discussion.&lt;br&gt;Prereq: Span 191/192 or permission of Division</td>
</tr>
<tr>
<td>Span 252</td>
<td>W</td>
<td>3C,D</td>
<td>0.5</td>
<td>Composition and Conversation&lt;br&gt;A continuation of Spanish 251.&lt;br&gt;Prereq: Span 251</td>
</tr>
<tr>
<td>Span 255</td>
<td>F</td>
<td>3C,D</td>
<td>0.5</td>
<td>Survey of Spanish Literature&lt;br&gt;A brief survey of Peninsular Spanish literature from the Poema de Mio Cid to the present.&lt;br&gt;Prereq: Span 191/192&lt;br&gt;†Required of all majors and honors students. Prereq. to all 3rd-and 4th-year courses.</td>
</tr>
<tr>
<td>Span 256</td>
<td>W</td>
<td>3C,D</td>
<td>0.5</td>
<td>Survey of Spanish American Literature&lt;br&gt;A survey of literary trends and most significant works from the Conquest to the present.&lt;br&gt;Prereq: Span 191/192&lt;br&gt;†Required of all majors and honors students. Prereq. to all 3rd-and 4th-year courses.</td>
</tr>
<tr>
<td>Span 265</td>
<td>F</td>
<td>2C,D</td>
<td>0.5</td>
<td>The Spanish Short Story&lt;br&gt;Selected stories from outstanding writers in Spain, primarily of the 20th century.</td>
</tr>
</tbody>
</table>
Span 266  W  2C,D  .5
The Spanish American Short Story
Selected stories from outstanding writers in Spanish America of the 19th and 20th centuries.

Span 217  F  3C,D  .5
Verse and Drama of the Golden Age
A study of one verse drama each of Lope de Vega, Tirso de Molina, and Calderon de la Barca; also outstanding sonnets of the period by Garcilaso, Herrera, Gongora, Lope and Quevedo.

Span 318  W  3C,D  .5
Prose Fiction of the Golden Age with Particular Reference to Cervantes
A study of short selections from Amadis de Gaula, the Diana of Montemayor, Lazarillo de Tormes, and Guzmán de Alfarache, which will provide a background for Don Quixote in the second half of the course.
†Required of all majors and honors students.

Span 331  F  2R  .5
The Spanish Novel in Translation
A study of the Peninsular novel including the picaresque, Don Quixote, 19th-century realistic novel, Generation of 1898, and the post-Spanish Civil War.
Taught in English.
† No Spanish Credit for majors and honors students. It is not acceptable as fulfilling the A(ii) requirements, but satisfies A(iii) requirements.

Span 332  W  2R  .5
Contemporary Spanish American Fiction in Translation
A study of some of the novels and short stories of the outstanding writers of South America: Borges, García Márquez, Fuentes, Rulfo, Cortázar, Vargas Llosa, Asturias.
Taught in English.
† No Spanish Credit for majors and honors students. It is not acceptable as fulfilling the A(ii) requirements, but satisfies A(iii) requirements.

Span 341  F  2R  .5
Romantic Drama and Poetry in Spain
A study of the most important dramatists and poets of the romantic literature of the 19th century, including Rivas, Zorrilla, Espronceda, and Bécquer.

Span 342  W  2R  .5
The Spanish Novel of the 19th Century
Costumbrismo, romanticism, realism and naturalism in the Peninsular novel of the past century, including Alarcón, Valera, Pereda, and Pardo Bazán.

Span 343  F  2R  .5
Galdós
A study of Pérez Galdós’ Fortunata y Jacinta, equivalent to three novels in length, and two other representative novels.

Span 351  F  2C,D  .5
Advanced Composition and Conversation
Writing of essays and discussion based on selected themes or topics relating to Spain or Spanish America.
Prereq: Span 251/252

Span 352  W  2C,D  .5
Advanced Composition and Conversation
A continuation of Span 351
Prereq: Span 351

Span 355  F  2C,D  .5
Spanish American Poetry from the Conquest to Modernism
A study of the texts of poets representing the major developments of colonial and 19th-century poetry.

Span 356  W  2C,D  .5
Modern Spanish American Poetry
A study in depth of major poets and movements since Modernism.

Span 395  F  2C,D  .5
Spanish American Prose
A critical study of Spanish American prose from the Cortés letters to the works of Sarmiento.

Span 396  W  2C,D  .5
Recent Spanish American Prose
A critical study of masterpieces in prose from Sarmiento to the present.

Span 417  F  2R  .5
Prose and Poetry of the Generation of '88 and Followers
A study of selected prose and poetry with emphasis on Unamuno, Ortega y Gasset, Antonio Machado, Juan Ramón Jiménez.

Span 444 Medieval Spanish
Not offered in 1977-78

Span 490-494  2T  .5
Senior Tutorials
By arrangement with the Division, an individual student or a small group of students will follow a course of study under the supervision of a faculty member.

Span 495  F  2C,D  .5
The Novel in Mexico
Principal stress will be placed on novels dealing with the Mexican Revolution.
Span 496  W  2C,D  .5
The Novel in the Andean Countries
The works of selected novelists from Colombia, Ecuador, Peru, and Bolivia, principally from the 20th century.

Span 498  W  R  .5
Senior Honours Reading Course
Selected readings in Peninsular and/or Spanish American literature from the origins to the present day. List distributed on student's declaration of honours programme. Tested by the whole Division at the end of the 4th year.
†Required of all honours students.

† By arrangement, most 400-level courses in 20th-century Peninsular literature, and senior composition and conversation will be taught at Wilfrid Laurier University. Medieval Spanish will be taught in alternate years at Wilfrid Laurier University. Please check Cross-Registration procedures.
Dance Group

Assistant Professor, Chairman of Dance Co-ordinating Committee; Associate Dean, Faculty of Human Kinetics and Leisure Studies
W. N. Widmeyer, BA (Western Ontario), BPE (McMaster), MA (California), PhD (Illinois)

Dean, Faculty of Human Kinetics and Leisure Studies
G. S. Kenyon, BPE (UBC), MS (Indiana), PhD (NYU)

Professor
N. J. Ashton, BSc (McGill), MS (Michigan)

Assistant Professor
R. Priddle, BPHE (Toronto), MSc (Springfield), MA (Waterloo)
J. Officer, ARAD (Adu + ATC) (London)

Lecturers
R. Ryman, BA (York), MA (York)
L. Smith

Instructor
J. Jarvis, BA (Toronto)
G. Micelli, BSc (Waterloo)
H. Olsin, BA (California)

Undergraduate Course Descriptions

Dance 162 F 2C,2std .5
Introduction to the Dance
An overview of dance as manifest through its earliest forms as an expression of folk culture to its artistic presentation in contemporary investigation of perspectives from which dance can be studied.

Dance 163 W 2C,2std .5
A Study of the Medium of Movement
A course leading to an understanding of the broad conceptual framework of movement emphasizing the qualitative nature of movement and its relationship to creative expression.
Prereq: Dance 162 or consent of instructor

Dance 262 F 2C,3std .5
Dance Theory: Process
This course focuses upon selected compositional theories of major dance artists as examples of the changes in choreographic approach from the 30's to 70's.
Prereq: Dance 163 or consent of instructor

Dance 264 F 2C,2std .5
History of the Classic Dance to 1909
Historical survey of the development of the classics from elements appearing in the Greek Theatre to the end of the Russian classic period in the early 20th century.
Prereq: Dance 162 or consent of instructor

Dance 265 W 3C .5
20th Century Ballet: Part 1 (History)
An in depth study of the factors affecting the Ballet in the 20th century from the advent of the Russians in Paris in 1909 to the influence of contemporary dance in recent years.
Prereq: Dance 264

Dance 272 F,W 1C,3std .5
Technique and Notation Analysis of Ballet
A theoretical and practical study of ballet technique. The course will explore the principles and technique of basic ballet emphasizing movement analysis through Benesh Notation.
Prereq: Dance 191/192 or consent of instructor††
††To obtain consent of instructor students must audition during registration week.

Dance 273 F,W 1C,3std .5
Technique and Notation Analysis of Modern Dance
A theoretical and practical study of modern dance technique. The course will examine the fundamental principles and technique of modern dance emphasizing movement analysis through Labanotation.
Prereq: Dance 193/194 or consent of instructor.††
††To obtain consent of instructor students must audition during registration week.
Course Descriptions
Dance Group

Dance 362  W  2C,2std  .5
Socio-cultural Study of the Dance
Dance as an avenue for socio-cultural expression is examined from the perspective of the social sciences.
Prereq: Soc 101 and Dance 264 or permission of instructor
Offered alternate years

Dance 363  W  2C,2std  .5
Dance Ethnology
A comparative study of ethnic dance forms with a particular emphasis on dance style as significant cultural pattern. The course attempts to develop an understanding of the effect of particular ideologies and political systems on the development of a cultural dance form.
Prereq: Dance 264 or consent of instructor
Offered alternate years

Dance 364  F  2C,2T  .5
Development Aspects of Movement
A study integrating the cognitive and perceptual developments in children as they relate to motor development. Primary emphasis is placed on investigating movement experiences suitable for children.

Dance 365  W  3C  .5
Dance Criticism
This course covers questions about the role of the critic, his audience, his credentials, etc. The course also focuses upon particular dance events, in the studio and on the stage, for the purpose of developing critical faculties in a living context.
Prereq: Dance 262, 265
Offered alternate years

Dance 367  F  2C,2std  .5
20th Century Ballet: Part 2 (Choreography)
Analysis and study of the themes and styles of 20th century ballets and the changing attitudes to the theatre. Consideration is given to the adaptations of the classical idiom to the artistic trends of this century.
Prereq: Dance 265
Offered alternate years

Dance 368  W  2C,4std  .5
Dance Theory: Product (Modern Dance)
This course focuses upon theories of dance as they engender a particular view of art and a particular view of the human body and thus delimit the nature of the created work itself. The nature of a theory is discussed, as is the nature of scientific and aesthetic theories.
Prereq: Dance 262
Offered alternate years

Dance 372  F,W  1C,3std  .5
Principles and Technique of Ballet
A theoretical and practical study of selected aspects of ballet. The student is asked to draw upon his knowledge of anatomy and basic mechanics in order to better understand and perform ballet movements.
Prereq: Dance 272 plus Kin 200 or consent of instructor.

Dance 373  F,W  1C,3std  .5
Principles and Technique of Modern Dance
A theoretical and practical study of selected aspects of modern dance. The student is asked to draw upon his knowledge of anatomy and basic mechanics in order to better understand and perform modern dance movements.
Prereq: Dance 273 plus Kin 200, or consent of instructor.

Dance 382  F,W  2C,2std  .5
Benesh Notation
The course examines the basic theoretical concepts of the Benesh Notation system for the graphic notation of human movement. Emphasis is given to the reading and writing of notated dance scores, especially ballet scores.
Prereq: Dance 272 or consent of instructor
Offered alternate years

Dance 383  F,W  2C,2std  .5
Labanotation
The course examines the basic theoretical concepts of Laban’s system for the graphic notation of human movement. Emphasis is given both to the reading and the writing of notated dance scores.
Prereq: Dance 273 or consent of instructor
Offered alternate years

Dance 420  F,W  wkshp  .5
Workshop Series
The following courses are designed to give the student an opportunity to take theoretical knowledges to the applied setting. Offerings each year are determined by student interests. Topics available include:
- a) Dance with Children and Adolescents
- b) Advanced Ballet (Performance)
- c) Advanced Choreography
- d) Dance Production

The workshop series is open only to 3rd and 4th year honours dance students. Two workshops may be taken in the 420 series toward the honours degree.
Dance 461/462
Research Project
An independent research project on an approved topic, supervised by a faculty member. Required of all students enrolled in Honours Dance. Dance 461 includes an approved design and the completion of the first segment of the paper.
Prereq: depending upon the topic selected, the student is required to achieve at least 60% in appropriate courses. A complete listing is available in the Departmental office.
Dance 462 includes the completion of the project begun in Dance 461
Prereq: Dance 461

Dance 463  W  3C  .5
Seminar in Dance
An examination of current and major issues in dance.
Prereq: Honours Dance students only.

Dance 464  F  3C  .5
Philosophy of the Dance
The concern of this course is the relationships of man to the art products which he fashions. Questions such as, are all people creative? are discussed as is the validity of a distinction between art and life. A phenomenological analysis of dance is presented, discussed, critiqued and evaluated.
Prereq: Phil 100 and two full courses in Dance

Dance 474  F,W
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. May be repeated in subsequent terms.
Prereq: Consent of faculty

Studio Courses
The following studio courses are elective and non-credit. Students should consult with a faculty advisor concerning the applicability of these courses for entry into future courses and possible careers such as teaching.
Dance 191 Beginning Ballet, F
Dance 192 Beginning Ballet, W
Dance 193 Beginning Modern Dance, F
Dance 194 Beginning Modern Dance, W
Dance 197 Folk Dance, F
Dance 198 Jazz, W
Dance 491 Advanced Ballet, F
Dance 492 Advanced Ballet, W
Dance 493 Advanced Modern Dance, F
Dance 494 Advanced Modern Dance, W
Drama and Theatre Arts Group

Associate Professor, Chairman of the Department
W. R. Chadwick, BA, MA (Toronto), PhD (London)

Lecturers
T. Bentley-Fisher, Drama Centre, London
M. van Dijk, BA, MA (Wellington), PhD (Toronto)
M. Evans
J. M. Kelman, BA (Waterloo)

Undergraduate Course Descriptions

Sequence of Study
In the first term all students must take Drama 101 and in the second term should take Drama 102. All students are strongly advised to take Drama 251 in the Fall term of their second year.

The Honours programme is designed so that a student could work through a particular sequence of courses in one field (acting, 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. Students planning to major in Drama and Theatre Arts should confer with the Undergraduate Advisor for the Division before registering.

Note
Laboratory sessions and rehearsal periods may be added to any course at the discretion of the instructor.

Drama 101  F  3C .5
Introduction to the Theatre
Introductory study of the theatre as a major art form. Selected plays as produced in their historical contexts. Contributions of the actor, designer, and technician to theatrical production.

Drama 102  W  4L .5
Introduction to Acting
An introduction to acting. The class will be structured as a rehearsal, where the students will explore improvisation and text work, concentrating on the practical problems of an actor's experiences in creating a role.
Limited Enrolment
Prereq: Drama 101 and permission of the department

Drama 221  F  4L .5
Intermediate Acting 1 (Drama 221 and Drama 222 formerly Drama 225)
An extension of Drama 102. This course stresses development of the actor through scene study.
Prereq: Permission of the instructor

Drama 222  W  4L .5
Intermediate Acting 2
An extension of Drama 221.
Prereq: Permission of the instructor

Drama 226  F  5L .5
Seminar in Voice 1
Prereq: Drama 101 and Drama 102

Drama 227  F  5L .5
Seminar in Voice 2
Prereq: Drama 101 and Drama 102
Drama 231 F 3LD .5  
**Design for the Theatre 1** (formerly Drama 228)  
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 101

Drama 232 W 3LD .5  
**Design for the Theatre 2** (formerly Drama 229)  
An extension of the studies described in Drama 231, concentrating on the practicalities of set design.  
**Prereq:** Drama 101 and Drama 243 or consent of instructor

Drama 243 F 1C,2L .5  
**Introduction to Technical Production 1** (Drama 243 and Drama 244 formerly Drama 242)  
Theory and practice of building, painting, rigging and shifting scenery; construction of properties; familiarity with lighting instruments, sound equipment and their control systems. Students will be required to spend a certain number of hours working on department productions.  
**Prereq:** Drama 101

Drama 244 W 1C,2L .5  
**Introduction to Technical Production 2**  
An extension of the studies described in Drama 243.  
**Prereq:** Drama 101

Drama 251 F 3C .5  
**Survey of Dramatic Literature and Dramatic Theory 1**  
The Greek and Roman periods.

**Note**  
This and the next four courses divide the dramatic literature and theory of the Western world into five historical periods. Each course will cover about fifteen plays and the major works of dramatic theory of the period.

Drama 252 3C .5  
**Survey of Dramatic Literature and Theory 2.** (Engl 232)  
The Middle Ages, the Elizabethans and Jacobean (excluding Shakespeare) and the Spanish Golden Age.

Drama 253 3C .5  
**Survey of Dramatic Literature and Theory 3.** (Engl 233)  
French neo-classicism, the Restoration period, the comedy of manners tradition through to the twentieth century.

Drama 254 3C .5  
**Survey of Dramatic Literature and Theory 4.**  
The eighteenth, nineteenth and early twentieth centuries, romanticism and naturalism.

Drama 255 3C .5  
**Survey of Dramatic Literature and Theory 5.**  
The twentieth century from Brecht to the present.

Drama 261 F 4C,L .5  
**Introduction to Directing 1** (Drama 261 and Drama 262 formerly Drama 325)  
Analysis of production and performance problems from the director's point of view. Study in the principles of stage direction. Special projects in directing, including the production of a workshop production.  
**Prereq:** Drama 101, and at least one dramatic literature class.

Drama 262 W 4C,L .5  
**Introduction to Directing 2**  
Consideration of problems involved in the directing of a production. Each student in the course will be required to form his own production company and mount a play.  
**Prereq:** Drama 261, two dramatic literature classes and permission.

Drama 301 F 3C .5  
**Script Interpretation 1**  
Advanced study and analysis of plays in the process of production covering selected periods and types of playwriting.  
**Prereq:** Drama 101, and two dramatic literature classes.

Drama 302 W 3C .5  
**Script Interpretation 2**  
An extension of the studies described above in 301.  
**Prereq:** Drama 101, and at least two dramatic literature classes.

Drama 306 (ABC) F std .5  
**Special Studies in Theatre Production 1** (formerly Drama 326)  
Production participation and the study of selected problems of theatrical production.  
**Prereq:** Drama 101 and permission of play director.

Drama 307 (ABC) W std .5  
**Special Studies in Theatre Production 2** (formerly Drama 327)  
See Drama 306.  
**Prereq:** Drama 101 and permission of play director.

Drama 321 F 4L .5  
**Advanced Acting 1** (Drama 321 and Drama 322 formerly Drama 425)  
Advanced work in acting. Course involves individual and ensemble work in selections from specific plays with attention given to various periods and styles in acting.  
**Prereq:** Drama 221 and Drama 222.
Drama 322 W 4L .5
Advanced Acting 2
An extension of the studies described in Drama 321.
Prereq: Drama 321 or permission.

Drama 343 F 2C,2L .5
Theatre Technology 1
Advanced study of theory and practice of specific areas of technology in the theatre.
Prereq: Drama 243 and Drama 244.

Drama 344 W 2C,2L .5
Theatre Technology 2
See Drama 343.
Prereq: Drama 243 and Drama 244.

Drama 348 F 3C .5
Arts Administration 1
An introduction to management in and of the performing and fine arts. Topics will include theatre and company management, marketing, elementary accounting, touring and contracts.

Drama 349 W 3C .5
Arts Administration 2
Additional topics in performing and fine arts management, including copyright, cultural policy, taxation, funding, research and audience development.

Drama 371 F 3C .5
Theatre History 1 (Drama 371 and Drama 372 formerly Drama 329)
A survey of theatre history from Classical Greece to 1600. Students are advised to take this course in their third year.
Prereq: Drama 101.

Drama 372 W 3C .5
Theatre History 2
An extension of studies described in Drama 371.
Prereq: Drama 101.

Drama 381 F 3C,L .5
Costuming 1
Design and practice in the construction of costume for the stage. Research into the historical styles of costumes from antiquity to the present and the adaptation of these styles to stage use. Laboratory and production participation required.
Prereq: Drama 101.

Drama 382 W 3C,L .5
Costuming 2
An extension of the studies described in Drama 381.
Prereq: Drama 101.

Drama 406 (ABC) F std .5
Theatre Workshop 1 (formerly Drama 426)
Participation in stage production for advanced students.
Prereq: Permission of the play director and Drama 101.

Drama 407 (ABC) W std .5
Theatre Workshop 2 (formerly Drama 427)
Participation in stage production for advanced students.
Prereq: Permission of play director and Drama 101.

Drama 409 F 3C .5
Theatre Criticism (formerly Drama 430)
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 490 (A-E) F wkshp .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 .5
Selected Seminars in Drama and Theatre Arts
Seminars in special areas of drama and theatre.
Prereq: Permission of the department.

Drama 499 Y T 1.0
Senior Seminar
Open only to drama students in their fourth year. It is designed to give the student an opportunity to complete a comprehensive presentation in his/her major area of concentration.

Course Descriptions
Drama and Theatre Arts Group
Course Descriptions
Earth Sciences

Department of Earth Sciences

Professor, Chairman of the Department
C. R. Barnes, BSc (Birmingham), PhD (Ottawa)

Professor, President of the University
B. C. Matthews, BSA (Toronto), AM (Missouri),
PhD (Cornell)

Professors
R. N. Fairvolden, MSc (Alberta), PhD (Illinois)
P. F. Karrow, BSc (Queen's), PhD (Illinois)

Associate Professors
E. C. Appleyard, BSc (Western), MSc (Queen's),
PhD (Cambridge)
J. A. Cherry, BSc (Saskatchewan), MS (Cal. Berkeley),
PhD (Illinois), PEng
P. Fritz, Dipl Geol, Dr Rer Nat (Technische Hochschule
Stuttgart)
D. E. Lawson, BSc, MSc (New Brunswick),
PhD (Reading)
R. W. Macqueen, BA, MA (Toronto), PhD (Princeton)
R. G. Roberts, BA (Cambridge), MSc, PhD (McGill)
O. L. White*, BSc (Melbourne), MASC (Toronto),
PhD (Illinois), PEng

Assistant Professors
E. O. Frind, BASc, MASc, PhD (Toronto), PEng
J. E. Gale, BSc, BEd (Memorial), MSc (Western),
PhD (Cal. Berkeley)
J. P. Greenhouse, BSc, MSc (UBC), PhD (California)
J. A. Legault, BSc, MSc (Ottawa), PhD (Oklahoma)
A. V. Morgan*, BSc (Leicester), MSc (Calgary),
PhD (Birmingham)
E. J. Reardon, BSc (St. Francis Xavier), PhD (Penn. State)

* Research Assistant Professor
R. W. Gillham, BSA (Toronto), MSc (Guelph),
PhD (Illinois)

Adjunct Professors
C. I. Dell, BA, MA (Toronto), PhD (Michigan)
R. M. Brown, BSc (Bishops), PhD (McGill)
P. H. von Bitter, MSc (Acadia), PhD (Kansas)

Senior Demonstrators
M. L. Copp, BA (Minnesota)
D. Nowlan, BA (Trinity)

1 Earth Sciences and Biology
2 Earth Sciences and Civil Engineering
3 Earth Sciences and Man-Environment Studies

Undergraduate Course Descriptions

Details of the undergraduate programmes offered by the
Faculty of Science are to be found in Chapter 13.

Earth 130, or the consent of the instructor, is prerequisite
for all later courses in Earth Sciences. However, Sci 100
may be substituted for Earth 130 as prerequisite for
Earth 235, 236 and 336. Second and third year courses
usually involve field trips in the fall. All those majoring in
Earth Sciences are required to take a two-week field
camp at the end of third year and attend a week-long field
excursion at the start of third year. (Expenses in excess of
$100 are to be anticipated.) Earth Sciences students are
encouraged to seek geological employment in the
summers.

Earth 130 Y 2C,3L 1.0
Introductory Geology
An elementary introduction to rocks, minerals, and
fossils, geological processes and their effects, structural
geology, economic geology, and historical geology. Map
study. Field trips.
Students who are taking, or have taken Sci 100 may not
take Earth 130 for credit because of overlapping
material.

Earth 221 W,S 2C,3L 0.5
Geochemistry 1
Origin and abundances of elements. Chemical
characteristics of sedimentary, igneous, and
metamorphic rocks. The geological application and
interpretation of geochemical data in sedimentary and
exploration geochemistry. Introduction to isotope
geology and radiometric dating.

Earth 231 F 2C,3L 0.5
Mineralogy and Crystallography
Introductory mineralogy and crystallography. Structures
of minerals related to physical and morphological
properties. Mineral chemistry. Determinative
mineralogy. Occurrence of rock-forming minerals. The
nature of light; determination of refractive index.

Earth 232 W,S 2C,3L 0.5
Petrography
Optical properties and identification of minerals under the
microscope. The study of rocks in thin section. The
classification and identification of sedimentary, igneous,
and metamorphic rocks.
Prereq: Earth 231

Earth 235 F 2C,3L 0.5
Stratigraphy
The principles of stratigraphy, and an introduction to the
structural framework of North America.
Earth 236  F  2C,3L  0.5
Principles of Paleontology
The principles of paleontology with particular stress on
the species concept and evolution; examples will be
drawn primarily from the fossil record of plants and
vertebrates. Laboratory work will include projects and
reference to field trip collections.

Earth 260  W,S  2C,3L  0.5
Introductory Structural Geology
An introduction to the deformation of rocks, the effect of
stress on rock materials, and the application of
experimental and theoretical data to naturally deformed
rocks (tectonites); elementary rock mechanics; the
results of deformation, the types of structures produced;
the analysis of simple structures.

Earth 331  F  2C,3L  0.5
Igneous Petrology
The principles and theories of igneous rock genesis.
Silicate phase equilibria in magmatic systems. Magmatic
differentiation; distribution and occurrence of magma
types.
Prereq: Earth 231, 232

Earth 332  W  2C,3L  0.5
Metamorphic Petrology
Principles and theories of metamorphic rock genesis.
Intensive parameters controlling silicate phase
equilibrium in metamorphism. Mobility of elements and
solid state crystal growth. Origin and interpretation of
metamorphic textures. Zonal and facies classifications.
The concept of facies series.
Prereq: Earth 231, 232

Earth 333  W  2C,3L  0.5
Sedimentology 1
The chemical and physical background of sedimentation
and sediment movement by fluid flow. Sedimentary
petrology. Features and interrelationships of
sedimentary tectonics. Dispersal and current systems.
Basin analysis and the sedimentary model.

Earth 336  F  2C,3L  0.5
Paleontology
Advanced paleontology emphasizing morphology,
classification, evolution, paleoecology and stratigraphic
value of fossil invertebrates. Field trips and laboratory
study of fossil collections.
Prereq: Earth 236

Earth 342  F  2C,3L  0.5
Geomorphology
The process of landscape evolution and the classification
of landforms. Geomorphic effects of glacial, fluvial,
marine and slope processes. Physical and chemical
weathering, soil formation. Laboratory study of
topographic maps and air photo interpretation. Field
trips.

Earth 345  W  2C,2L  0.5
Historical Geology
A systematic review of the geological history of North
America from the Precambrian to Recent exemplified by
regional geology. Laboratory work will include study of
rock and fossil regional suites and geological maps.
Prereq: Earth 235

Earth 355  F  3C  0.5
Mathematical Geology 1
Introduction to the principles of probability and statistics
and their application in the Earth Sciences. Evaluation
of quantitative data; statistical models.
Prereq: Math 113 and an introductory course in
computer programming.

Earth 360  F  3C,2L  0.5
Applied Geophysics 1
An introduction to seismic, gravity, electric,
electromagnetic and magnetic methods of exploration
geophysics.
Prereq: Physics 111-112 or consent of instructor

Earth 368  F  2C  0.5
Geophysics 1
Introductory topics on the physics of the earth.
Seismology and the earth's interior. Thermal history of
the earth. Gravity and isostasy. Origin of the continents
and continental drift. (Identical to Phys 368)
Prereq: Math 113, Phys 121-122 or equiv.

Earth 369  W  2C  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. (Identical to
Phys 369)
Prereq: Earth 368

Earth 370  W  3C,2L  0.5
Economic Geology
The occurrence and geological setting of metallic,
non-metallic minerals and construction materials.
Energy resources. Special emphasis on Canada's
resource industry. The laboratory will involve sampling
methods, ore calculation and property evaluation.
Prereq: Earth 231, 232
Course Descriptions
Earth Sciences

Earth 421 F 2C,3L 0.5
Geochemistry 2
An introduction to geochemical processes in the Earth's crust. Fundamental principles are reviewed and applied to the understanding of sedimentary rocks, the hydrosphere and hydrothermal systems. The laboratory is analytically orientated and familiarizes students with techniques used in geochemical investigations.
Prereq: First year Chem., Earth 221

Earth 427 W 2C,2S 0.5
Crustal Evolution
An analytical critique of the plate tectonics theory, its historical development, the evidence on which it is based, past and present criticisms. Tectonic syntheses based on the theory in the light of the world geology.

Earth 432 W 2C,2L 0.5
Precambrian Geology
The geology, tectonics, stratigraphy and history of the Canadian Precambrian Shield. The early evolution of the earth's crust. The Precambrian time scale and problems of geochronology. Life, climate and physical conditions in Precambrian time.

Earth 433 W 2C,3L 0.5
Sedimentology 2
Prereq: Earth 333

Earth 434 F 2C,2S 0.5
Biostratigraphy
Methods of using paleontological data to solve stratigraphic problems. Fauval provinces in space and time. Effects of continental drift and climatic change on biogeography through the Phanerozoic.
Prereq: Earth 236

Earth 435 F 3C,2L 0.5
Advanced Structural Geology
The geometry, kinematics and dynamics of structural geology. The relationship of structures from the microscopic to the megascopic scale; statistical studies of structural elements.
Prereq: Earth 260

Earth 436 Y 3L 1.0
Honours Thesis
A course for honours Earth Sciences students only. Each student will work under the direction of a member of the Department on a short research project. The results of this will be presented in thesis form and will be critically examined by members of this and, where pertinent, other departments.

Earth 438 W 2C,1wkshp 0.5
Engineering Geology
The application of geology to civil engineering problems. Introductory soil and rock mechanics. Urban and environmental geology.

Earth 439 F 3C,1T 0.5
Groundwater Geology
Groundwater hydrology. The location, exploitation, and conservation of groundwater resources, physical and chemical interaction of water with subsurface geologic materials, relations between groundwater and surface water regimens.

Earth 440 F 2C,3L 0.5
Quaternary Geology
Stratigraphy and history of Quaternary Period with emphasis on glaciation. Laboratory studies on glacial deposits. Field trips. A previous course in geomorphology is recommended.

Earth 456 W 3C 0.5
Mathematical Geology 2
Boundary value problems in geophysics and hydrogeology. Mathematical modelling of geological systems; simulation.
Prereq: Math 113, Earth 355

Earth 461 W 3C 0.5
Applied Geophysics 2
Physical and mathematical foundations of applied geophysics, advanced methods of treatment of geophysical data, with emphasis on problems from geophysical exploration.
Prereq: Earth 360

Earth 470 F 3C,2L 0.5
Metallic Mineral Deposits
The petrology and genesis of metalliferous ore deposits. The description of classic deposits; the stability of ore minerals; ore minerals in aqueous systems. The laboratory will include instruction and practice in ore microscopy.
Prereq: Earth 370

Earth 480 S 1dlab 0.5
Field Study
Depending on the demand and the availability of an instructor, a six week field course may be offered in an area of unusual geological interest during the spring or summer. This course will consist of two weeks of classroom lectures and one month in the field location. Expenses are to be paid by the student.
Prereq: consent of the instructor.
Course Descriptions
Economics

Undergraduate Course Descriptions

Some Economics courses do not have a “term offered” indicated. This information will be available at pre-registration and students can confirm the “term offered” with their Departmental advisor.

The “normal” number of lectures per week in each course is three; however each instructor determines how often his particular class will meet.

Econ 100 1.0
Introduction to Modern Economics
A study of the principles of economics that contribute to an understanding of modern economic problems. Emphasis is given to the evolution of economic thinking from Ricardo and Marx to modern post-Keynesian Analysis as a base from which to analyze the operation of modern capitalist and socialist economics.

Econ 101 F,W .5
Introduction to Microeconomics
An introduction to the central economic problems of society, the functioning of a mixed capitalist enterprise system, the economic role of government, the composition of pricing of national output, pricing of productive factors, and income distribution.
Also offered at St. Jerome’s College.

Econ 102 F,W .5
Introduction to Macroeconomics
Determination of national income; the banking system; government fiscal and monetary policy; international trade and finance; and current economic problems.
Also offered at St. Jerome’s College.

Econ 191 F,W 2C,2L .5
Introduction to Financial Accounting 1
Recording transactions; measuring income; preparation and analysis of financial statements; accounting for assets, liabilities, and owner equity.

Econ 192 F,W 2C,2L .5
Introduction to Financial Accounting 2
Analysis of accounting principles; preparation of statements of sources and uses of working capital; cash flow analysis; basic concepts associated with manufacturing and responsibility accounting and budgeting.
Prereq: Econ 191
## Department of Economics: Course Offerings

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Econ 193/194 F,W .5/.5
Economics and the Administrator 1, 2
The course is designed to present an opportunity to examine and discuss a broad range of situations where analysis and decision making are required. The course divides into five parts: financial function, personnel administration, production/services function, information and marketing function, and general administration in business, non-profit organizations, and the government sector.
Prereq: Econ 193 is a prereq. for Econ 194 and should be taken prior to P Sci 231

Econ 201 F,W .5
Microeconomic Theory
Theory of consumer demand; production theory; market structure; resource pricing and allocation under perfect and imperfect competition.
Prereq: Econ 101

Econ 202 F,W .5
Macroeconomic Theory
Theory of the determination of the level of national income, employment and the price level.
Prereq: Econ 201

Econ 211 F,W .5
Mathematics for Economists
Application of elementary mathematics to problems in economic theory. Topics include the graphing of functions, elementary analytical geometry, derivation, exponential and logarithmic functions and differentiation—all developed within the context of economic theory.
Prereq: Econ 101, 102

Econ 221 .5
Statistics for Economists
An introduction to the underlying logic of statistical procedures most commonly employed by economists. No mathematical training beyond high school algebra is presumed. Emphasis is given to solving problems as a way of learning statistical theory.
Prereq: Econ 101, 102

Econ 231 F,W .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

Course Descriptions
Economics

Econ 241 W .5
Cost-benefit Analysis and Project Evaluation
Methods for evaluating private and public projects; decision rules, efficiency conditions and methods of conducting cost-benefit analysis. Application of the technique.
Prereq: Econ 201

Econ 263 W .5
Economic History of Canada
A study of the economic development of Canada; export staple theory, industrial structure and national policies analysed in a Classical-Marxian framework.
Prereq: Econ 101, 102

Econ 291 F,W .5
Intermediate Financial Accounting 1
Includes a review of the foundations of accounting theory and the accounting process. This is followed by an in-depth treatment of the accounting problems associated with the asset side of the balance sheet. Included would be cash, temporary investments, accounts receivable, inventories, plant assets and intangibles.
Prereq: Econ 191, 192

Econ 292 F,W .5
Intermediate Financial Accounting 2
The major subject matter of this course will be an in-depth treatment of the accounting problems associated with the equity side of the balance sheet. This would include bonds payable, pensions and leases, accounting for income taxes and shareholder's equity (including earnings per share). The treatment of accounting changes and the statement of changes in financial position will also be covered.
Prereq: Econ 291

Econ 293 .5
Auditing
Internal and external auditing, its effects and uses. A study is made of budgeting, centralized and decentralized control, internal audit, performance measurement, the role of an external auditor, the techniques used by an external auditor, services available from a Public Accounting firm and the evaluation of the services provided.
Prereq: Econ 191, 192
Econ 294  .5  
**Business Law**
The course will cover the judicial process, torts, contracts, sale of goods or services, consumer protection, credit, negotiable instruments, bankruptcy, property, business organization, agency partnership, corporations.  
*Prereq: Econ 191/192*

Econ 301  F  .5  
**Intermediate Microeconomics**
Distribution theory; production, consumption and general equilibrium analysis; welfare economics.  
*Prereq: Econ 201, 231*

Econ 302  W  .5  
**Monetary Theory and Banking**
Monetary theory and banking in an open economy; national policies for achieving full employment, price stability, and equilibrium in the balance of payments.  
*Prereq: Econ 201, 202, 231*

Econ 303  .5  
**Economic Thought**
A critical survey of the development of economic thought from Adam Smith through J. M. Keynes.  
*Prereq: Econ 201, 202, 231*

Econ 311  .5  
**Introduction to Mathematical Economics**
Mathematical treatment of some micro- and macro- partial and general equilibrium models; programming and game theoretic techniques; stability analysis; simple growth models.  
*Prereq: Econ 201, 202, 211 (or Math 130)*

Econ 321  .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  .5  
**International Trade Theory**
An examination of the modern theory of international trade. Topics include comparative advantage and the gains from trade, tariff theory, economic integration, and the interaction between international trade and economic growth.  
*Prereq: Econ 201, 231*

Econ 332  W  .5  
**International Monetary Theory**
The monetary aspect of international economic relations. Topics include analyses of the foreign exchange and international capital markets, the theory of balance of payments policy, monetary integration, and reform of the international monetary system.  
*Prereq: Econ 202, 231*

Econ 333  .5  
**Inter-regional Economics**
Application of economic theory to analyses of structural characteristics, growth and development in inter-regional systems. Models examined include input-output, export-base, shift-share, neo-classical, cumulative causation.  
*Prereq: Econ 201, 231*

Econ 335  .5  
**Economic Development**
The nature of the problem of economic development; theories of economic development; major policy issues in economic development.  
*Prereq: Econ 201, 202, 231*

Econ 341  .5  
**Public Finance**
The economic rationale of governmental activity; alternative measures of fiscal operations, the structure and economic effects of government revenues and expenditures; the role of fiscal policy in economic stabilization and growth.  
*Prereq: Econ 201*

Econ 343  .5  
**Urban Economics**
Application of economic analysis to location decisions of firms and households; discussion of policy problems, for example, urban renewal and housing.  
*Prereq: Econ 101 (Econ 201 is recommended)*

Econ 345  .5  
**Industrial Organization**
An analysis of the characteristics of industrial structure, behaviour and performance with special reference to Canada. Competition and “rationalization” policy in Canada and other selected countries.  
*Prereq: Econ 201*

Econ 347  .5  
**Economics of Transportation and Communication**
Not offered 1977-78
Econ 351 .5
Labour Economics
Wage theory, training and mobility theory; economics of information in Canadian labour markets; other investments in human capital; manpower policies.
Prereq: Econ 201

Econ 353 .5
Population Economics
Demographic techniques; economic interrelationships with fertility, mortality, morbidity; theory of an optimum population.
Prereq: Econ 201

Econ 355 .5
Economics of Energy and Natural Resources
An analysis of the economics of conservation, especially the adequacy of the market mechanism as an allocator of resource use over time. The political economy of the world's supply of and demand for energy resources and major issues in Canadian energy policy will be considered.
Prereq: Econ 201 (Econ 241 is recommended)

Econ 357 .5
Environmental Economics
Application of economic theory to problems of the environment, in particular, air, water, and land pollution. Emphasis is on the theory of the management of common property resources.
Prereq: Econ 201

Econ 361 North American Economic History
Not offered 1977-78

Econ 363/364 F,W .5/.5
Contemporary Canadian Problems 1, 2
A "topic oriented" seminar course. The class agrees to study a Canadian problem selected from a list that includes poverty, unemployment, industrial policy, and so forth. The format assists the student in gaining analytical skill through work on the selected topic.
Prereq: Econ 201, 202

Econ 381-389 .5 each
Special Topics
One or more special half courses will be offered at different times as announced by the Department.
Prereq: Consent of Instructor

Econ 391/392 F,W .5/.5
Cost and Management Accounting 1, 2
Accounting and reporting of costs for inventory valuation and management control. Introduces product costing, overhead cost analysis, standard cost systems and responsibility accounting. Emphasis is placed upon the use of accounting information for decision making.
Prereq: Econ 191, 192
Econ 391 is a prerequisite for Econ 392
Econometrics 1, 2
Review of linear algebra, and development of basic statistical inference; formulation, identification, estimation, and tests of single equation and simultaneous equation regression models of micro- and macroeconomics; empirical models.
Prereq: Econ 201, 202, 211, 221, 321

Econ 431  F  .5
Advanced International Economics
Analysis of selected topics such as the theory of trade blocs and systems of customs unions, economic integration, devaluation theory, theory of dominant currencies, international transmission of inflation, gold/bimetallic/dollar standard theories and optimum currency areas.
Prereq: Econ 301, 302, 331, 332

Econ 432  W  .5
International Economic Policy
Analysis of selected policy problems, such as monetary and fiscal policy mix in open economies, optimum tariff policy, trade and environmental policies, trade in public goods and bads, international monetary reform, control of international capital flows, the multi-national firm, and so forth.
Prereq: Econ 301, 302, 331, 332

Econ 441  F  .5
Economics of the Public Sector 1
An overview of fiscal functions and institutions; the theory of social goods; expenditure and revenue structures; fiscal incidence.
Prereq: Econ 231, 301, 302, 341

Econ 442  W  .5
Economics of the Public Sector 2
Fiscal stabilization, fiscal federalism, public pricing, international public finance, social security and other contemporary policy issues.
Prereq: Econ 441

Econ 451  .5
Advanced Topics in Resource Economics
Advanced analysis of selected topics in the area of energy, land, and labour resources.
Prereq: Econ 201, 202, 231, 355

Econ 481-489  .5 each
Special Studies
Research and reading courses under the direction of individual instructors.
Admission by consent of instructor

Econ 491  .5
Advanced Accounting 1
The major emphasis of the course is long-term intercorporate investments and business combinations. The balance of the course will deal with selected specialized accounting areas.
Prereq: Econ 291-292

Econ 492  .5
Advanced Accounting 2
Theoretical analysis of accounting and in particular, income theory and various income models. The course will also cover price level and current value accounting, as well as foreign currency transactions.
Prereq: Econ 291, 292

Econ 493  .5
Taxation
The prime purpose of the course is to gain a broad understanding of the Canadian tax system in its economic, legal, and accounting settings. Fundamental legal and economic concepts will be studied as well as specific provisions and problems that commonly arise. The second purpose of the course is to relate the provisions of the taxing statutes to frequent business problems with emphasis on tax planning.
Prereq: Econ 292
Department of Electrical Engineering

Professor, Chairman
K. D. Srivastava, BSc, BE (Hons) (Roorkee), PhD (Glasgow), PEng

Associate Professor, Associate Chairman (Graduate Studies)
Y. L. Chow, BEng (McGill), MASc, PhD (Toronto)

Associate Professor, Associate Chairman (Undergraduate Studies)
J. D. Aplevich, BE (Saskatchewan), PhD (Imperial College, London), PEng

Professor, Dean of Graduate Studies
L. A. K. Watt, BSc (Manitoba), MS (Chicago), PhD (Minnesota)

Professors
J. H. Anderson, BSc (Leeds), MSc, PhD (Manchester), PEng
R. G. Anthes, BASc, MASc (Toronto), PEng
P. R. Bryant, MSc (London), MA, PhD (Cambridge)
E. L. Heasell, BSc, PhD (Imperial College, London)
S. N. Kaira, BSc (Punjab), MS, PhD (Illinois), PEng
R. H. MacPhie, BASc (Toronto), MS, PhD (Illinois)
R. S. Ramshaw, BSc, PhD (Nottingham), PEng
H. C. Ratz, BASc (Toronto), SM (M.I.T.), PhD (Saskatchewan), PEng
J. Reeve, BSc, MSc, PhD, DSc (Manchester), PEng
D. J. Roulston, BSc (Belfast), PhD (Imperial College, London)
J. Vlach, Dipl Ing, CSc (Technical Univ. of Prague)
L. Y. Wei, BS (National Northwestern College, China), MSc, PhD (Illinois)

Associate Professors
I. F. Blake, BSc, MSc (Queen's), MA, PhD (Princeton)
S. G. Chamberlain, MSc, PhD (Southampton), PEng
J. D. Cross, BSc (Cardiff), MSc, PhD (Carleton), PEng
G. J. Dufault, BA (Ottawa), BSc (Carleton)
J. A. Field, BE (Saskatchewan), MASc, PhD (Toronto), PEng
J. V. Hanson, BASc (Toronto), MSc, PhD (Imperial College, London)
T. Kameda, BS, MS (Tokyo), PhD (Princeton)
J. S. Keeler, BASc, MASc (Toronto), PEng
W. D. Little, BASc, MASc, PhD (U.B.C.), PEng
J. C. Majithia, BSc (London), MEng, PhD (McMaster), PEng
J. W. Mark, BASc (Toronto), MEng, PhD (McMaster), PEng
W. N. Meikle, BASc, MASc (Toronto), PEng
V. H. Quintana, IIE (Chile), MSc (Wisconsin), PhD (Toronto)
R. G. vanHeeswijk, Dipl Ing (Delft, Holland), PEng

Assistant Professors
M. I. Elmasyr, BSc (Cairo), MASc, PhD (Ottawa), PEng
E. Sadeh, BSc, (Technion, Israel), MS (Washington, St. Louis), PhD (Minnesota)
W. J. Wilson, BE, MSc (Saskatchewan), PhD (Cambridge), PEng

Adjunct Professors
J. Carr, BASc (Toronto), MASc, PhD (Waterloo) May 1/76 to Apr. 30/77

Visiting Professors
I. N. Hajj, BE (Beirut), MS (New Mexico), PhD (Berkeley) Sept. 1/76 to Aug. 31/77

Laboratory Director
R. L. Wright, PEng

Undergraduate Programme

Details of the undergraduate programme in Electrical Engineering may be found on page 109. Each course extends over one term only.

Undergraduate Course Descriptions

EIE14  W,F  3C,11/2L,2T  .50
Electrical Engineering 1
Kirchhoff’s Laws, mesh current and node voltage equations, super-position theorem, phasors, measuring instruments, power factor and its correction, magnetic circuits, transformers, introduction to d.c. and a.c. motors and generators, polyphase circuits.
Prereq: Gen E 122, Math 12, Math 21 or equivalent

EIE32  W,S  3C,11/2L,2T  .50
Electrical Engineering 2
Introduction to electronic devices and their characteristics; integrated circuits; operational amplifiers; digital circuits and systems; electric power control using semiconductor devices and circuits; electronic instruments and instrumentation systems.
Prereq: EIE 14 or equivalent

EIE201  W,F  1C  .00
Seminar
General Seminar

EIE202  S,F  1C  .00
Seminar
General Seminar

EIE203  Concepts in Electrical Engineering
Not offered 1977-1978
EIE 205 (Math 211)  W, F  2C, 2T  .50  
Advanced Calculus for Electrical Engineers 1  
Differential calculus of several variables. Differential 
equations, Multiple integrals. Applications to Electrical 
Engineering will be stressed.

EIE 206 (Math 212)  S, F  2C, 2T  .50  
Advanced Calculus for Electrical Engineers 2  
Fourier series, partial differential equations, separation 
of variables, wave equations, heat equation and 
Laplace's equation, Fourier integral, properties of 
complex analytic functions, complex integration.

EIE 221  W, F  3C, 1L, 1T,  .50  
Principles of Digital Circuits & Systems  
An introduction to digital systems, switching algebra, 
combinational logic analysis and synthesis. Minimization 
using map methods. Elementary treatment of sequential 
circuits including design of clocked circuits with 
specified transition tables. Number representation 
and arithmetic processes. Codes and parity.

EIE 223  W, F  3C, 1T  .50  
Physical Electronics  
Particle and wave theory of light, photoelectric effect, 
Compton effect. Structure of hydrogen atom; many 
electron atoms. Solid state physics: semiconductors, n 
and p-type materials, Fermi levels, mass action law, 
charge neutrality, diffusion. Introduction to p-n junctions.

EIE 241  W, F  3C, 2T  .50  
Electrical Networks 1  
Introduction to network variables and laws, resistors, 
sources and simple circuits; resistance networks; 
capacitors and inductors; first order circuits, sinusoidal 
steady state analysis.

EIE 261  S, F  3C, 1T  .50  
Energy Processing & Conversion  
Principles of energy conversion by direct methods. 
Magnetic circuits in homogeneous media. 
Excitation of magnetic circuits by dc and ac sources. 
Energy transformation in two and three winding 
magnetic circuits. Permanent magnets in magnetic 
circuits.

EIE 271  S, F  3C, 1T  .50  
Electric and Magnetic Fields  
Vector analysis, Coulomb's law and electric field 
intensity; electric flux density; Gauss' law and 
divergence; energy and potential; conductors, 
dielectrics, capacitance; experimental mapping 
methods; Poisson's and Laplace's equations; the steady 
magnetic field; magnetic forces, materials and 
inductance; time varying fields and Maxwell's equations.

EIE 283  W, F  1C, 3L  .50  
Measurement and Instrumentation 1  
Safety in the laboratory, measurement errors, accuracy. 
The oscilloscope, d'Arsenval meters, rms and mean 
values, ac measurements, electrodynamometer 
instruments, bridges, thedecibel, signal sources, 
transducers. Laboratory experiments.

EIE 294  S, F  3C, 3L  .50  
Measurement and Instrumentation 2  
A continuation of EIE 293 to include topics from: digital 
instruments, sampling oscilloscope, spectrum analysis, 
design ofexperiments, data handling, experimental 
technique; laboratory experiments.

EIE 301  W, S  1C  .00  
Seminar  
General Seminar

EIE 302  W, F  1C  .00  
Seminar  
General Seminar

EIE 316  W, S  2C, 2T  .50  
Probability and Statistics  
Conditional probability and independence; Bayes' 
Theorem; random variables; functions of random 
variables; distribution functions; applications to 
reliability and failure rates; marginal and conditional 
distributions; correlation and applications to regression 
and statistical testing.

EIE 317  W, S  2C, 1T  .50  
Signal Analysis Methods  
Fourier series, periodic functions; Fourier transforms, 
non-periodic functions; The discrete Fourier transform, 
discrete time sequences; the Z transform, discrete time 
systems.

EIE 324  W, F  2C, 2L, 1T  .50  
Introduction to Digital Computers  
Information representation in binary systems. Binary 
arithmetic. Computer organization. Assembly language 
programming, basic programming techniques. Memory 
units, arithmetic logic units, control units, I/O devices. 
Assemblers, compilers, loaders, linking. Operating 
systems, interrupts, program status. Computer case 
studies. Microcomputers.  
Prereq: EIE 221 or equivalent

EIE 342  W, S  2C, 2T  .50  
Electric Networks 2  
Review of sinusoidal steady-state, node, and mesh 
analysis; the Laplace transformation and applications; 
transient response of second and higher order circuits.
EI E351 W,S 2C,3L,1T .50
Electronic Devices
Review of semiconductor properties, Boltzman relations
Derivation of d.c. and a.c. characteristics of p-n junctions and bipolar transistors. Small and large signal models
Introduction to field effect transistors.

EI E352 W,F 2C,3L,1T .5
Electronic Circuits
Large signal amplifiers; biasing networks and stability
single and multi-stage small-signal amplifiers; the
hybrid-pi model; high and low frequency effects;
feedback amplifiers and stability criteria; oscillators;
noise in electronic circuits.

EI E362 W,S 2C,3L,1T .50
Dynamic Energy Conversion
Energy conversion by use of dynamic magnetic circuits.
Translational and rotational transducers used in the
electrical mechanical energy conversion process.
Prereq: EI E261 or equivalent

EI E372 W,F 2C,2L,1T .50
Transmission Lines and Electromagnetic Fields
Transmission lines; distributed parameters;
telegrapher's equations; sinusoidal waves; terminated
lines, matching with the Smith Chart; Electra-magnetic
Fields; Maxwell’s equations; plane waves; reflection and
refraction; Poynting vector; waveguides.

EI E380 W,F 2C,3L,2T .50
Introduction to Systems and Control
An introduction to control. Advantages of closed-loop
feedback systems. The role of the system mathematical
model. Block diagrams and signal flow graphs. The basic
control system design problem. Stability in control
systems. Frequency response analysis techniques.

EI E418 S,F 3C,1T .50
Signal Analysis and Frequency Domain Methods
Introduction to Fourier Series and Transforms and their
use in the analysis of deterministic signals in linear
systems; bandwidth, distortion and filter characteristics;
input/output relationships in linear filters; linear
modulation and demodulation techniques; channel and
receiver noise.

EI E419 W 3C,1L,1T .50
Communication Systems
Probability theory and the description of random
processes, the analysis of analog and digital com-
munication systems including phase and frequency
modulation of analog waveforms and pulse amplitude
modulation, pulse code modulation for digital signals.

EI E425 S,F 3C,3L .50
System Simulation
Computer simulation techniques; principles of analog
computation; models, scaling and procedures; digital
simulation languages, computer simulation and
investigation of continuous systems; differential
equations, transfer functions, boundary value problems,
system design; application of hybrid computers.

EI E426 W 3C,3L .50
Software Engineering
Block structured languages (Algol), actual and formal
parameters, recursion, formal description, relationship to
machine code. Structured programming. Data
structures, arrays, lists, stacks, associative structures.
Searching and sorting. Compilers. Operating system
organization, co-operating processes, process
synchronization primitives.
Prereq: EI E324 or equivalent

EI E427 S,F 3C,2L .50
Digital Hardware Engineering
Analysis and synthesis of sequential circuits. Design with
MSI/LSI chips. Arithmetic processors. Computer
subsystems and I/O interfacing. Microprocessor
applications.
Prereq: EI E221, EI E324 or equivalent

EI E433 W 2C,2T .50
Quantum Electronics and Magnetics
Laser principles: solid state, semiconductor and gas
lasers. Laser applications, holography. Ferromagnetism,
ferrimagnetism, diamagnetism and paramagnetism,
electron spin resonance, core and bubble memories.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Credits</th>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIE 435</td>
<td>S,F</td>
<td>3C,1T</td>
<td>Semiconductor Devices 1</td>
<td>This course deals with the theory and characteristics of modern semiconductor devices; SCRs, power rectifiers, MOSFETs, JFETs, radiation detectors, solar cells, LEDs, CCDs, IMPATT and Gunn effect devices, step recovery diodes, P-I-N diodes, Schottky diodes, memory devices.</td>
</tr>
<tr>
<td>EIE 436</td>
<td>W</td>
<td>3C,1T</td>
<td>Semiconductor Devices 2</td>
<td>Techniques for the design and realization of discrete and integrated circuit elements; bipolar, JFET and MOSFET models. Integrated circuit biasing. Design and implementation of logic circuit elements. Semiconductor memories; RAMs, ROMs, shift registers.</td>
</tr>
<tr>
<td>EIE 443</td>
<td>W</td>
<td>3C,1T</td>
<td>Electric Networks 3</td>
<td>Topics from the following: general passive network functions; passive driving point functions; reactance functions and reactance networks; scattering parameters, reactive passive filters; active networks and active filters, digital filters.</td>
</tr>
<tr>
<td>EIE 446</td>
<td>S,F</td>
<td>3C,1T</td>
<td>Linear Systems</td>
<td>Three types of linear multivariable systems are studied: 1) real time-continuous systems; 2) real time-discrete systems; and 3) modulo-two time-discrete systems. The unifying approach of state equations is developed and the importance of linear algebra is emphasized. Topics include: time domain analysis, transform analysis (Laplace- and Z-transforms), stability considerations, system equivalence, system decomposition, system realization. The necessary matrix and linear-algebra theory is developed as required.</td>
</tr>
<tr>
<td>EIE 454</td>
<td>S,F</td>
<td>2C,3L,1T</td>
<td>Nonlinear Electronic Circuits</td>
<td>Switching characteristics of semiconductor devices, non-sinusoidal wave generation and shaping, voltage and current sweeps, binary circuits and gates, digital integrated circuits, DCTL, DTL, ECL, T-type and I-type.</td>
</tr>
<tr>
<td>EIE 459</td>
<td>W</td>
<td>2C,3L,1T</td>
<td>Sound, Noise and Electroacoustics</td>
<td>An interdisciplinary study of acoustical physics, human response to sound and audio engineering; Main topics include: the physics of sound, electroacoustical systems, human audiolog, acoustical measurements, audio electronics and applications.</td>
</tr>
<tr>
<td>EIE 463</td>
<td>S,F</td>
<td>2C,1T</td>
<td>Power Electronics</td>
<td>The steady state control of electrical machines; thyristors for power applications; steady state control of apparatus by power electronics; transient response of electromechanical translational transducers.</td>
</tr>
<tr>
<td>EIE 464</td>
<td>W</td>
<td>3C,1.5L</td>
<td>High Voltage and Insulation Engineering</td>
<td>Nature and origin of high voltage surges encountered on power systems. Travelling waves on transmission systems; insulation engineering; electrostatic fields in high voltage apparatus, insulation failure; corona; insulation testing; circuit breakers and surge protection devices; insulation co-ordination. Prereq: EIE 463 or equivalent</td>
</tr>
<tr>
<td>EIE 465</td>
<td>W</td>
<td>2C,2T</td>
<td>Power Systems</td>
<td>Introduction to system concepts; co-ordinate systems, sequence impedances and transmission line constants; analysis of unbalanced systems protection techniques and fault analysis; voltage and reactive power control; power transfer and system stability; load flow; computer methods; transient response; introduction to HVdc transmission.</td>
</tr>
<tr>
<td>EIE 473</td>
<td>S,F</td>
<td>2C,3L,1T</td>
<td>Microwave Engineering</td>
<td>Rectangular and circular waveguides; simple waveguide discontinuity; periodic transmission systems; microwave scattering theory; ferrite components; klystrons; travelling wave amplifiers; backward-wave oscillator, magnetron; solid-state microwave devices.</td>
</tr>
<tr>
<td>EIE 474</td>
<td>W</td>
<td>2C,3L,1T</td>
<td>Antenna and Propagation Engineering</td>
<td>An introduction to the theory of radiation and of antenna and propagation engineering; linear antennas, linear arrays; aperture antennas, frequency independent antennas, measurement theory; ground wave propagation, ionospheric propagation, plasmas.</td>
</tr>
</tbody>
</table>
EIE 482     W    .50
Control Systems 2
Review of multi-variable state space methods with
emphasis on control applications. Performance indices
and optimal control. Continuous and discrete time state
feedback control of linear systems. Systems with
inaccessible states. Stability analysis.
Prereq: EIE 446, EIE 481

EIE 499A    S,F    9L    .50
Project
An engineering assignment requiring the student to
demonstrate initiative and assume responsibility. The
student will select a project at the end of the 3B term from
an approved list prepared by the Department. A short
progress report at the end of the 4A term and a full report
at the end of the 4B term are required.

EIE 499B     W    9L    .50
Project
Either a continuation of EIE 499A or a separate one-term
project
Department of English

Professor, Chairman of the Department
W. U. Ober, BA (Washington and Lee), PhD (Indiana)

Associate Professor, Associate Chairman and
Undergraduate Officer
W. R. Macnaughton, BA (Toronto), MA, PhD (Wisconsin)

Associate Professor and Graduate Officer
G. E. Slethaug, BA (Pacific Lutheran),
MA, PhD (Nebraska)

Professor and Associate Dean, Undergraduate Affairs
J. C. Gray, BA (Washington State), MA (Connecticut),
PhD (Syracuse)

Professor and Associate Dean, Special Programmes
K. I. Ladbetter, AB (Central College, Mo.),
MA, PhD (Illinois)

Professors
J. Gold, BA (Birmingham), PhD (Wisconsin)
G. R. Hibbard, BA, MA (London)
C. F. MacRae, BA (Western), MA (McMaster),
PhD (Toronto)
W. R. Martin, MA, DLitt et Phil (South Africa)
W. K. Thomas, MA, PhD (Toronto)

Associate Professors
R. R. Dubinski, BA, MA (Western), PhD (Toronto)
A. I. Dust, MA, PhD (Illinois)
R. N. Gosselin, BA (Kansas), MA, PhD (Colorado)
R. N. Honeyford, BA, PhD (Toronto)
N. C. Hultin, BA (Concordia), MA (Chicago),
PhD (John's Hopkins)
H. R. Ellis, BA (Rollins), MA, PhD (Illinois)
P. M. Hinchcliffe, BA (UBC), MA, PhD (Toronto)
R. M. Levitsky, BSEd (Central Missouri S.C.), MSED
(Illinois Normal), PhD (Missouri)
H. M. Logan, AB (Franklin and Marshall),
PhD (Pennsylvania)
J. S. North, BA, MA (UBC), PhD (Alberta)
E. F. Shields, BA (Chestnut Hill), MA (Villanova),
PhD (Illinois)
J. S. Stone, MA (UBC)
H. Tuyn, MA (Utrecht and Oxon), Docteur de l'Universite
de Paris R

Assistant Professors
S. Fogel, BA (Carleton), MA (UBC), PhD (Purdue)
D. S. Keppel-Jones, BA (Natal), MA, PhD (Queen's)
Sister M. Leon, SSND, BA (Toronto), MA (Detroit)
D. R. Letson, BA (Waterloo), MA (McMaster), PhD
(Toronto)
R. Lister, BA, MA, PhD (Toronto)
E. P. McCormack, MA (Glasgow), PhD (Manitoba)
S. E. McMullin, BA, MA (Carleton), PhD (Dalhousie)
M. G. Thysell, MA (Montana), PhD (Iowa)

Lecturer
L. Dorney, BA, MA (Louisville) J (part-time)

For courses in Drama, see Drama and Theatre Arts
Group in this Chapter.

Although the Department of English provides advisors to
help students to choose their programmes, to arrange
their courses and to conform with the University, Faculty,
and departmental regulations, students are urged to
study the Calendar very carefully because they are
themselves responsible for failure to abide by these
regulations.

First Year
Either Engl 101 or 102 is the recommended first-year
course. However, a first-year student may – without
formal permission from the Department – take courses
from the following list instead of either 101 or 102:
Engl 108, 180, 211-212, and 230-231. All other English
courses are open to first-year students, but only with the
permission of the Chairman of the English Department
and the instructor of the course. Students may use only
one full course equivalent in English from the 100-level to
fulfill the minimum English requirements.

Upper Years
Engl 251 is strongly recommended for second year. With
the consent of the Department upper-year courses may
be taken at any time during the upper years without
regard to course number or "level".

Note 1
W. K. Thomas's Correct Form in Essay Writing is the
official style sheet for all undergraduate English courses.

Note 2
The "normal" number of lectures per week in each
course is three; however, each instructor determines
how often his particular class will meet.

Note 3
In all English courses, emphasis will be placed on
student essays written in connection with the reading.
Undergraduate Course Descriptions

Group One
1) Courses in this group carry full degree credit and count as electives in any programme in the University. None of them, however, may be counted as fulfilling minimum core requirements for a major or honours programme in English.

A) Courses in Group 1(A) are primarily concerned with assisting students to improve their writing.
Engl109 Introduction to Essay Writing 1
Engl110 Introduction to Essay Writing 2
Engl209 Advanced Essay Writing
Engl210 Report Writing
Engl309 Seminar in Essay Writing
Engl335 Creative Writing

B) Courses in Group 1(B) are primarily designed to make students aware of the different functions of language in various contexts and to assist them to improve their writing.
Engl150 English as an Instrument of Thought and Communication 1
Engl151 English as an Instrument of Thought and Communication 2
   (Formerly English 140/141.)

The following courses are administered by Renison College:
Engl140R Use of English 1
Engl141R Use of English 2
Engl245R Form and Function
(These courses may not be applied as credit towards the English component of an Honours or a General degree in English.)

1A)
Engl109 F,W,S .5
Introduction to Essay Writing 1
The course teaches the construction of the expository essay with attention to the structure of good paragraphs, to techniques of putting the essay together, and to the nature of the language. Ten to twelve short writing assignments are required.

Note
Persons whose native language is not English should be registered in a section identified with the division suffix "Z." Also offered at St. Jerome's College

Course Descriptions
English

Engl110 W .5
Introduction to Essay Writing 2
The course teaches the construction of the persuasive essay, with attention to the elements of logical thinking, to the techniques of successful persuasion, and to the demands of the library research paper. Six to eight writing assignments are required.
Prereq: Engl109

Engl209 F,W .5
Advanced Essay Writing
Provides further opportunities for serious students of writing to study and to practise descriptive, expository, argumentative, and persuasive writing. In addition to lectures, there are workshop sessions in which student writing is discussed.
Prereq: Engl109/110 or Engl150/151 or consent of instructor.

Engl210 F,W,S .5
Report Writing
The many functions of the report—an orderly and objective communication of factual information which serves some specific purpose—are taught. Students will receive practice in research, in organization, and in writing many kinds of reports.
Prereq: Second-year standing or above

Engl309 W .5
Seminar in Essay Writing
Classical theories of rhetoric and the various devices available to an author to achieve various ends are the key theoretical principles of the course as students pursue extended and sophisticated forms of the essay.
Prereq: Engl209 or consent of instructor

Engl335 3C .5
Creative Writing
Aimed at encouraging students to develop their creative and critical potentials, the course consists of supervised practice, tutorials, and seminar discussions.

1B)
Engl150 F .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 various media the various ends that are served by language: objective reporting; persuasion; argument; and emotional, social, and artistic expression. About eight written exercises are assigned.
Engl 151 W .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 and to examine fiction and other forms of literature. About six written exercises are assigned.
Prereq: Engl 150

Engl 140R .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 help students to write clearly and effectively themselves.

Engl 141R .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 1245R 1.0
Form and Function
The uses of literacy and the functions of language as acquired in Engl 140R/141R. These will be applied to the more advanced form of the literary and critical assignment essay, involving comparison, evaluation and exposition.

Group Two
Courses in this group carry full degree credit and may be counted as fulfilling the minimum requirements for a major or honours English programme.

Engl 101 Y 1.0
The Living Tradition
An examination of examples of the greatest literature in English and its relation to the periods of its origin. Figures such as Chaucer, Shakespeare, Milton, Swift, Blake, Keats, Tennyson, Dickens, and T.S. Eliot will be examined. The basic text will be the one-volume Norton Anthology.
Also offered at St. Jerome's College

Engl 102 Y 1.0
Poem, Play and Story
Different kinds of literature will be explored so as to discover how the shape of a literary work contributes to its meaning. Students will read ballad, lyric, and narrative poetry; classic tragedy and comedy and absurdist, existential and expressionist plays; novels and short stories.

Engl 108 .5
Themes of Literature
An exploration of the great variety of literature through thematic perspectives.

Engl 108A .5
The Hero
A study of human excellence in thought and action, embodied in representative men and women, as seen through works of literature.

Engl 108B .5
Utopia and Anti-Utopia
This course will attempt to acquaint the student with forms of the literary artist's moral vision of man in "Utopian" writings. It will involve an examination of the role of the imagination in helping to inform and embody cultural ideals of various periods.

Engl 108C .5
Literature and Morality
Works in English literature from its beginnings are selected for their bearings on questions of morality.

Engl 108D The Quest Theme in Literature
Not offered in 1977-78

Engl 108E .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 earth mothers, people, sex objects, and bitches.

Engl 108F .5
The Rebel
A study of various works of literature in which the protagonist is a rebel against existing norms. The course will examine a number of rebel types and concepts, moral implications and final outcomes either in successful realization or in tragic defeat.
Also offered at St. Jerome's College

Engl 108H .5
Isolation and Alienation
This course includes the study of a variety of works centering on the theme of man in crisis, the stress being on the individual at variance with his inner self, his fellow man, or his world. The course will discuss the process in which wisdom and maturity are gained as the ultimate products of suffering.
Also offered at St. Jerome's College
Engl 190  F,W  .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 201  .5
The Short Story
Examples are the stories of Hemingway, Faulkner, James, D. H. Lawrence, and modern Canadian writers.

Engl 202  Y  1.0
The Bible and Literature
The study of major themes, stories, myths, and characters of the Old and New Testaments of the King James Bible, and their influence on other English literature.

Engl 203  F  .5
Introduction to Folklore 1
An introduction to the scope and aims of folklore, together with a survey of the major types of folklore in the English tradition from nations of the English-speaking world. Topics such as oral literature, myth, legend, tale, and **märchen** will be discussed.

Engl 204  W  .5
Introduction to Folklore 2
Similar to 203 but dealing with folk-drama, ballads, songs, medicines, riddles, chants, proverbs, and charms.

Engl 205R  F,W  .5
The Canadian Short Story
The Canadian short story, from its beginnings in the bush, in the north, on the land, in the small towns through the struggles of an urbanizing society to the present. Students will be expected to work in some depth with individual authors.

Note
*R Courses are those administered by Renison College.*

Engl 206  The Art of the Essay
Not offered in 1977-78

Engl 208  .5
Literary Genres and Themes

Engl 208A  .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  .5
Science Fiction
Various examples drawn, for instance, from Utopian and anti-Utopian science fiction, social science fiction, "gadget" science fiction, parapsychology, and alternate worlds and beings, will be considered. Some attention will be given to the historical development of the genre.

Engl 208C  .5
Studies in Children's Literature
This course will deal with classic works of children's literature, including fantasy written primarily for children. Selections by such authors as Kipling, Woolf, C.S. Lewis, George MacDonald, Kenneth Grahame, and Thurber will be studied.

Engl 208D  .5
Modern Satire
The mode of satire in the fiction, drama, poetry, and discourse of the 20th century. Particular attention to the literary works of Waugh, Huxley, Orwell, Parker, Heller, Hiebert, and a dramatist of the absurd, but also attention to satiric cartoons and nightclub satire.

Engl 208E  .5
Women Writers of the 20th Century
A study of such major 20th-century women writers as Woolf, Hellman, Murdock, 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  .5
Themes in Canadian Literature
The course will explore a theme which is significant in the understanding of the Canadian literary mind. Examples include: the impact of the landscape, rural-urban conflict, isolation, social conservatism, regional reality. Novels, poetry, drama, essays and biography may be considered.
*Also offered at St. Jerome's College*

Engl 208H  .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.
Engl208K
Detective Fiction
The history and characteristics of the "detective novel," the "novel of crime," and the "thriller." Attention will also be given to the novel of intrigue and espionage. Such authors as Poe, Collins, Doyle, Chesterton, Hammett, Buchan, Greene, Deighton and Le Carre will be discussed. The course includes the examination of critical approaches to the form of detective fiction.

Engl211/212
The Novel
The novel, by its nature, constitutes an attempt to formulate and to interpret the bewildering human experience. This course undertakes an exploration of the forms that attempt can take. British, Canadian and American novels will be studied. The two halves of the course may be taken independently.

Engl211
The Novel 1
A study of the novel in English from its beginnings to the late 19th century.
Also offered at St. Jerome's College

Engl212
The Novel 2
A study of the novel in English from the later 19th century to the present.
Also offered at St. Jerome's College

Engl230
Narrative Poetry
A study of the major narrative forms in English poetry including the ballad, epic, mock epic, and dramatic monologue.
Also offered at St. Jerome's College

Engl231
Lyric and Other Poetry
A study of the development of various lyric forms (e.g., erotic, religious), the ode, elegy, meditative-descriptive verse, and perhaps other forms.
Engl230 is not a prereq.
Also offered at St. Jerome's College

Engl232
The Development of Drama to 1660
A study of the origins and development of English drama, with special concentration on 16th-century non-Shakespearian drama.
(Cross-listed with Drama 252).

Engl233 Drama from 1660
Not offered in 1977-78

Engl236
Literature of Ideas 1
This course considers such problems as idealism versus realism, the individual versus society, and rebellion versus revolution. Texts include classics such as Machiavelli's The Prince, More's Utopia, Marx's Communist Manifesto, and Mill's On Liberty, and 20th-century counterparts of these works.

Engl237 Literature of Ideas 2
Not offered in 1977-78

Engl251
The Practice and Theory of Criticism
The study and practice of the skills needed for a close, analytical reading of literary texts and for the writing of critical analyses on them; studies of theories concerning literature and literary criticism.
Also offered at St. Jerome's College

Engl290
American Literature
The meaning of America—the myth, the dream, and the reality—as experienced through its major literary works. Sin, guilt, madness, mysticism, and grace; the search for fulfillment and peace by such writers as Poe, Thoreau, Whitman, Twain, and Crane.
Also offered at St. Jerome's College

Engl291
Modern American Literature
Approaches to reality amid the confusion and uncertainty of 20th-century America. Emphasis on such major writers as Faulkner, Miller, and Cummings.
Prereq: Engl290
Also offered at St. Jerome's College

Engl305
Old English
An introduction to the literature and language of pre-Conquest England. The principal literary methods, themes, and types of English literature up to the 12th century constitute the material of study in this course.

Engl310
Middle English
A study of Middle English literature with special emphasis on the work of Geoffrey Chaucer.
Also offered at St. Jerome's College

Engl312
Literature of the Commonwealth
A survey of Australian poetry and prose, with some consideration of the literatures, in English, from South Africa and the West Indies.
Course Descriptions

English

Engl313 .5
Canadian Literature to 1920
A study of Canadian prose and verse to 1920, with particular attention given to the poetry of the School of the Sixties and to the historical and idyllic novels of the 19th and early 20th centuries.
Also offered at St. Jerome's College

Engl314 .5
Canadian Poetry Since 1920
Also offered at St. Jerome's College

Engl315 .5
Canadian Prose Since 1920
The Canadian novel since the appearance of Morley Callaghan, with brief consideration of the essay and short story during the period.
Also offered at St. Jerome's College

Engl316 .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 with Drama 351)

Engl330 1.0
Elizabethan Literature (excluding Drama)
A study of the principal writers of prose and of lyric and narrative poetry in England during and immediately preceding the reign of Elizabeth I. Reserved for special attention is Spenser's epic poem glorifying Elizabeth I and England—The Faerie Queene.
Also offered at St. Jerome's College

Engl339 .5
Contemporary British Literature
A study of the major trends in British literature from World War II to the present. The course will consider the rise of the angry generation and social protest, the renaissance in drama, the return to tradition and the reaction against experimentation, and other topics related to the literary emergence of a new England.

Engl345/346/347 .5
Studies in American Literature
(Usually only one or two courses from this series are offered each year)

Engl346C W .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: Engl290 or consent of instructor

Engl350 1.0
Seventeenth Century Non-Dramatic Literature
Special attention will be given to the poetry of Donne, Jonson, Herbert, Vaughan, and Marvell and to the prose works of Bacon, Burton, and Browne. Approximately half the course will be devoted to an intensive study of Milton's English poetry and a selection of his prose works.

Engl355 Forms of Classical and Neo-Classical Satire
Not offered in 1977-78

Engl356 Pastoral and Mythological Aspects of Classical and Neo-Classical Poetry
Not offered in 1977-78

Engl362 .5
Shakespeare 1
A study of those plays of Shakespeare written up to 1600, including the early comedies, the histories, Romeo and Juliet, and Julius Caesar.
Also offered at St. Jerome's College

Engl363 .5
Shakespeare 2
A study of those plays of Shakespeare written after 1600, including the late comedies and the major tragedies.
Also offered at St. Jerome's College

Engl365/366 1.0
Selected Studies
Designed to provide a study in depth of problems and/or authors selected by the instructor. Students interested in initiating such courses are encouraged to do so by bringing their ideas to the attention of individual instructors.
Prereq: consent of instructor
Also offered at St. Jerome's College

Engl373 1.0
An Introduction to the History of English
The process of linguistic change as exemplified in the development of the English language from its origins in Indo-European and Germanic through modern dialects. Traditional, structural and generative approaches will be employed.
Engl375 1.0
Linguistics and English Grammar
Linguistics and its application to the study of grammar and language. Included are 1) an introduction to descriptive and historical linguistics and the principles of linguistic analysis and 2) an evaluation of English grammars ranging from the traditional to the structural and transformational-generative.

Engl376R 0.5
Our Changing Language: Syntax and Semantics 1
In its evaluation of modern systems of syntax, the course will provide a thorough and practical grounding in the structure of language and will stress the need for semantic interpretation. (An extensive knowledge of syntax is not assumed.)
Prereq: Engl141R and 245R

Engl377R 0.5
Our Changing Language: Syntax and Semantics 2
Continuation of Engl376R. The semantic approach expanded: meaning conditions form and practical significance in language teaching. Of interest to intending teachers of English as the native or as a second language.
Prereq: Engl376R

Engl385R 1.0
Twentieth Century Literature
A survey of writing in the age of anxiety from the psychoanalytic novel to the theatre of the absurd. The concept of the anti-hero. Satirical, emotional and intellectual writing as studied in novels and plays by Graham Greene, Aldous Huxley, D. H. Lawrence, Evelyn Waugh and Harold Pinter.

Note
R courses are administered by Renison College.

Engl400 1.0
The Development of English Literature
The course explores the origin, growth, and transformation of philosophical ideas and of literary themes, motifs, genres, forms, and movements from the beginning of English literature to the present.
Also offered at St. Jerome's College

Engl410 1.0
The Augustan Age
A study of English literature from 1660 to 1798: the comedy of the Restoration; the satire of Dryden, Swift, and Pope; the probing of mores and manners by Pope and Johnson; the emergence of the novel with Richardson, Fielding, and Sterne; and the transformation from classicism to romanticism.
Also offered at St. Jerome's College

Engl415 0.5
Major Canadian Writers
An intensive study of the work of two or three major Canadian authors. Writers who may be studied include Morley Callaghan, F. P. Grove, Robertson Davies, A. M. Klein, Thomas Haliburton, Irving Layton, Margaret Atwood, and Margaret Laurence.
Prereq: Consent of instructor

Engl430 1.0
The Romantic Movement
An historical and critical study of the principles and practice of the English Romantic authors from Blake to Keats, with primary emphasis on poetry.
Also offered at St. Jerome's College

Engl451 1.0
Literature of the Victorian Age
An historical and critical study with emphasis on the major poets (Browning, Tennyson, Arnold), novelists (Dickens, Thackeray, Eliot), and essayists (Newman, Ruskin, Mill, Huxley). Provision will be made for students who wish to study other writers such as Hopkins, Swinburne, Carroll, Morris or Pater.
Also offered at St. Jerome's College

Engl460 1.0
British Literature from Shaw to Eliot
A study of the major writers in British Literature from 1890 to World War 2, with special emphasis on such writers as Shaw, Yeats, Eliot, Conrad, Joyce, and Lawrence.

Note
The following course is administered by St. Jerome's College

Engl480J Senior Seminar
Not offered in 1977-78

Engl495 Supervision of Senior Honours Essay
Environmental Studies

There are a number of courses offered in the Faculty of Environmental Studies of an integrative nature which extend across the academic interests of the four units, School of Architecture, Department of Geography, Department of Man-Environment Studies, and School of Urban and Regional Planning. The courses are of general interest and are open to all students in the University. There is no Department of Environmental Studies.

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:

Professor
P. H. Nash, BA, MA (U.C.L.A.), CE (Grenoble), MCP, MPA, PhD (Harvard), MCIP

Associate Professor
R. T. Newkirk, BA, MSc, PhD (Western)

Adjunct Professor
D. B. Greenspan, BA (Toronto), LLB (Osgoode Hall)
D. Estrin, BA, LLB (Alberta)

Adjunct Associate Professor
D. H. Wood, BComm, LLB (Toronto)

Adjunct Lecturers
B. Steele
D. G. E. Wicken, Diploma AA

Faculty members cross appointments as shown:

Planning and Environmental Studies

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Course Descriptions

Environmental Studies

Env St 111  F  3C  .5
Introduction to the Study of the Future
Non-technical survey of current approaches to thinking about and refining views of the "Future". The role of images and scenarios, contributions of the arts and concepts of space and time. Impacts of regional science, ekistics, bioethics, synergetics, and prognostics. Paths to "inventing" the future and the comprehensive design of "optimum" environments.
No prerequisite

Env St 195  F,W  2C,1L  .5
Introduction to Environmental Problems
A discussion of some major environmental problems and issues such as the population explosion, the impact of urbanization of man's environment, environmental pollution, resource management, conservation, and environmental planning.
Not available to Man-Environment students

Note
Students in the Faculty of Environmental Studies may take this course in their first or second year only.

Env St 200  F,W  2C,2L  .5
Field Ecology
To introduce the main concepts and principles of ecology as a basis for understanding 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; "designing with nature".
Prereq: 2nd, 3rd and 4th year students only

Env St 252  F,W  3C  .5
Media Tools for Environmental Studies
Through actual experience, the student will learn photographic and darkroom techniques, audio recording and sound production. A small lab fee will be charged for materials. The student is expected to do much of the course work outside the classroom in field situations and to use initiative in project development.
Prereq: Env St student only or consent of Instructors

Env St 253  W  3C  .5
Media Tools for Environmental Studies - Advanced Level
An expanded version of 252 in which the student will choose one or more of the following formats: television, sound, photography, film, slide-tape. The student will develop presentations around a central theme in consultation with the instructors. Much initiative is expected of the student. The student will be required to purchase materials.
Prereq: Env St 252 or consent of Instructors
Env St 271  F, W  3C, 1L  .5
Introduction to Quantitative Research Methods
An introduction to scientific method; descriptive and inferential statistics; sampling design. The course emphasizes the methodological and interpretative problems involved in using selected quantitative methods to investigate selected environmental topics. **Prereq:** only for students in Environmental Studies

Env St 272  W  3C  .5
Computer Programming in Environmental Studies
The course emphasizes programming skills and applications in the context of environmental problems. **Prereq:** Env St 271

Env St 358  F, W  3C  .5
Environmental Pollution and its Control
Guests and University of Waterloo lecturers, expert in their respective fields, discuss specific problem areas related to the environment. Representative topics include impact on groundwater of waste disposal, effect of air pollution on plant life, population problems, viruses in surface water, reutilization of waste materials. **No prereq**

Env St 380/381  F, W  C  .5
Environmental Studies Workshop
An interdisciplinary workshop focusing upon environmental issues in a project or research format. **Prereq:** 3rd and 4th year students in Environmental Studies; enrolment is by research team only with representatives from at least 3 units of the faculty (max. 7 people) and subject to selection of an advisor and a satisfactory project or research proposal.

Env St 400  F, W  3C  .1
Environmental Law
Conflict as the core of all aspects of environmental relationships. A review of several current conflicts in: community planning law; ecological law; and natural resource law. We will isolate and define the legal tools available to the interests involved in such conflicts, and seek to understand both the effect and the limits of these tools under current legislation and practice. **Prereq:** 3rd and 4th year students

Env St 411  F  2C  .5
Alternative Future Environments 1
Analysis of “ideal” environments of the past, including “utopian” communities. Scrutiny of current “concepts” of future environments, including distillation of works of Bell, Clarke, Commoner, de Chardin, de Jouvenel, Dror, Doxiadis, Ehrlich, Forrester, Fuller, Kahn, Mead, Meadows, McHale, Michael, Polak, Theobald, Thompson, Toynbee, and Ward. **Prereq:** 3rd or 4th year standing
Fine Arts

Professor, Chairman
V. Burnett, BS (Columbia), MA (California)
(Sabbatical 1977-78)

Professor
A. M. Urquhart, BFA (Buffalo)
(Acting Chairman 1977-78)

Associate Professors
N. L. Patterson, BA (Washington)
H. Martens, BA, MA (Minnesota), PhD (Columbia)

Assistant Professors
B. Irland, BFA (Illinois), MFA (Massachusetts)
W. Janzen Jr., BMus (Manitoba), MM (Wisconsin),
AMM, GD
D. I. MacKay, BFA (Mt. Allison), MFA (Cornell)
J. Uhde, MA (Purkyne’s University, Brno,
Czechoslovakia), PhD (Waterloo)

Lecturers
C. Crockford, BEd (Alberta), MA (UBC)
E. Kliman, MA (Toronto)
A. Roberts

Undergraduate Course Descriptions – Fine Arts

Fine 110 F 3C .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.
No prereq.

Fine 111 W 3C .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.
Prereq: Fine 110

Fine 120 F 1C,1std .5
Fundamentals of Visual Art 1
An introduction to the fundamental principles and
concepts of visual art, through a series of experimental
studio problems in two and three dimensional materials
and media.
Lab fee

Fine 121 W 3std .5
Fundamentals of Visual Art 2
A continuation of Fine 120 with emphasis on colour.
Prereq: Fine 120

Fine 210 F 2½S .5
Modern Art 1
An examination of the history of Modern Art from the late
18th century up to the time of Impressionism.
Prereq: Fine 110 or consent of instructor

Fine 211 W 2½S .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.
Prereq: Fine 210 or consent of instructor

Fine 212 F 3S .5
Italian Renaissance Art 1
A survey of painting, sculpture, and architecture,
especially in Florence and Siena, starting with Giotto and
his contemporaries and covering innovations in
perspective, anatomy, and iconography through the end
of the 15th century.
Prereq: Fine 110/111, or consent of instructor
Course Descriptions
Fine Arts

Fine 213  W  3C,S .5
**Italian Renaissance Art 2**
A continuation of Fine 212 starting with the masters of the High Renaissance, Leopardo, Raphael, and Michelangelo, and proceeding through Mannerism, Baroque, and Rococo in Florence, Venice and Rome.
Prereq: Fine 212 or consent of instructor

Fine 214  F  C,S .5
**British Art**
An examination of British Art from the sixteenth century up to the modern period.
Prereq: Fine 110/111 or consent of instructor.

Fine 215  W  C,S .5
**Art of the United States**
An examination of the art of the United States from the seventeenth century up to the modern period.
Prereq: Fine 110/111 or consent of instructor.

Fine 216  Western Religious Art
Not offered 1977-78

Fine 220  F  6std .5
**Fundamentals of Painting 1**
Exploration of painting problems in various media as vehicles for serious creative expression: the fundamentals of composition and painting techniques (paint, materials, and preparation of painting surfaces) will be presented through studio projects. Lab fee.
Prereq: Fine 120/121

Fine 221  std .5
**Fundamentals of Painting 2**
The creation of both non-objective and representational forms on a two-dimensional surface using various mediums. The course will build upon concepts learned in Fine 220 but with more emphasis on individual expression. Lab fee.
Prereq: Fine 220

Fine 222  F  3std .5
**Fundamentals of Sculpture 1**
Exploration of sculpture problems in various media as vehicles for serious creative expression: emphasis will be given to developing understanding and mastery of three dimensional forms and the preparation and handling of sculptural materials and tools. Lab fee.
Prereq: Fine 120/121

Fine 223  W  3std .5
**Fundamentals of Sculpture 2**
Exploration of sculpture problems in various media as vehicles for serious creative expression: emphasis will be given to developing understanding and mastery of three dimensional forms and the preparation and handling of sculptural materials and tools.

Fine 224  F  4std .5
**Introduction to Drawing**
Half the time will be devoted to drawing from the model and the remainder to a series of drawing concepts. At least one field trip will be included: Art Gallery of Ontario or the Albright Knox in Buffalo. Lab fee.
Prereq: Fine 120/121

Fine 225  W  4std .5
**General Drawing**
Analytical and expressive drawing in a variety of media. Lab fee.
Prereq: Fine 120/121

Fine 226  **Printmaking**
Introduction to materials and methods of printmaking. Current offerings are given below.

Fine 226A  F  std .5
Introductory etching with emphasis on intaglio printing. Lab fee.
Prereq: Fine 120/121

Fine 226B  W  std .5
Introductory relief printing with emphasis on woodcut. Lab fee.
Prereq: Fine 120/121

Fine 226C  W  std .5
Introductory silkscreen. Lab fee.
Prereq: Fine 120/121

Fine 227  W  std .5
**Scientific Drawing**
Through studio experiences, students will learn techniques for making accurate scale drawings of biological subjects in line and value, using various media. Methods of preparing drawings for reproduction will be included.

Fine 228  **Applied Arts**
The history, design and practice of various applied arts will be explored in slide lectures and studio projects. Specific arts will vary from year to year; current offerings are given below.
Fine 228A W C, Std .5  
Expressive Textile Forms  
The history of textile arts and problems of design for  
textile media will be explored combining lectures and  
studio projects in both two and three dimensional  
expressive forms. Traditional textile materials and  
methods will be applied to the creation of contemporary  
expressive and autonomous forms. Students will supply  
their own materials.

Fine 228B W The Visual Arts and the Theatre  
Not offered 1977-78

Fine 228C W C, Std .5  
Images and Effigies  
A study of contemporary and historical images and  
effigies in art, ritual, and drama, and a series of studio  
projects in which three-dimensional images are  
constructed.

Fine 234 Introduction to Film Making 1  
Not offered 1977-78

Fine 235 Introduction to Film Making 2  
Not offered 1977-78

Fine 244 F D, C .5  
History of Film 1  
General history of world cinema in its silent era  
(1885-1928), covering the work of outstanding directors  
and important movements and the contribution to the  
film medium as an independent art form. (Regular  
screening of a variety of films.) Film Fee.

Fine 245 W D, C .5  
History of Film 2 Sound Film  
A continuation of Fine 244 the expression of film history  
into the sound era (since 1929) including the most recent  
period. (Regular screening of a variety of films.) Film Fee.

Fine 246 J .5  
Religion and Film 1 (Religious Studies 266R)  
A theological approach to the study of film as a world-  
transforming phenomenon for man. An assessment of  
film's special characteristics as an art form capable of  
addressing man's quest for a significant existence.  
Consideration of a wide range of films and directors, with  
particular emphasis on Ingmar Bergman. Film fee $5.00

Fine 247 S, A .5  
Religion in Film 2 (Religious Studies 267R)  
An exploration of selected themes - death, evil, guilt, fate,  
alienation, love, redemption - in the films of several of  
today's leading directors: Bunuel, Pasolini, Kurosawa,  
Fellini, Antonioni, Polanski. Film fee $5.00

Fine 310 3C .5  
Greek Art and Architecture (C Civ 351)  
A survey of the art and architecture of the ancient Greek  
world from the Minoan to the Hellenistic periods. Consult  
Classics listing.

Fine 311 (C Civ 352) Roman Art and Architecture  
Not offered 1977-78

Fine 312 Renaissance Art Outside Italy 1  
Not offered 1977-78

Fine 313 Renaissance Art Outside Italy 2  
Not offered 1977-78

Fine 314 F C, S .5  
Medieval Art 1  
A survey of painting, sculpture, architecture, and related  
arts from the time of early Christian art to the emergence  
of the Romanesque style, and including the Byzantine art  
of this period.  
Prereq: Fine 110/111 or consent of the instructor

Fine 315 W C, S .5  
Medieval Art 2  
A survey of painting, sculpture, architecture and related  
arts commencing with the Romanesque period,  
continuing through to the beginning of the late Gothic  
period, and including Byzantine art to the capture of  
Constantinople.  
Prereq: Fine 314 or consent of instructor

Fine 316 F .5  
Canadian Native Art  
The arts and crafts of Canadian Indian and Inuit (Eskimo)  
peoples are examined with slide lectures, films, and  
student presentations.  
No prereq.

Fine 317 W .5  
Canadian Art  
An examination of Canadian Art extending through the  
important styles of settlers, especially from Britain and  
France, in the seventeenth, eighteenth and nineteenth  
centuries, to the development of the nationalist styles of  
early twentieth century, culminating in contemporary  
Canadian art.  
No prereq.

Fine 318 Canadian Ethnic and Traditional Arts  
Not offered 1977-78

Fine 319 F .5  
Contemporary Art  
A seminar exploring contemporary artistic concepts  
through critical analysis, historical correlation  
discussions with artists and visits to studios and galleries.  
Prereq: consent of instructor
Course Descriptions
Fine Arts

Fine 320 Advanced Painting 1
Not offered 1977-78

Fine 320a F std .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 220 or consent of instructor

Fine 321 W std .5
Advanced Painting 2
A continuation of Fine 320 with emphasis on independent problems.

Fine 322 F .5
Advanced Sculpture 1
An introduction to clay, glaze materials and firing techniques. Three dimensional form will be explored with the emphasis on the handling of clay as an expressive medium, enhanced by surface treatment and a variety of firing procedures. Lab fee.
Prereq: Fine 222 or consent of instructor

Fine 323 W .5
Advanced Sculpture 2
A continuation of Ceramic Sculpture (322). Organization and integration of sculptural concepts in clay to develop a series of sculptures using a choice of materials and techniques learned in 322.
Prereq: Fine 322

Fine 323A W S, std .5
Assemblage
A two and three dimensional study of the various aspects of assemblage, including visual poetry, processes, events, conceptualization, structuralism.

Fine 324 F std .5
Advanced Drawing
A course in which drawing is investigated as a means of expression and communication. An understanding of the human figure—its structure, its movement, and its connotation—will be a central goal of the work. Objects and the landscape will also be studied as sources of artistic possibility. The student will be encouraged to experiment with imagery, to develop personal vision, and to devise individual formal means of expression.
Lab fee.
Prereq: Fine 224 and consent of instructor

Fine 325 W std .5
Advanced Drawing 2
Continuation of Fine 324

Fine 326 Advanced Printmaking 1
Not offered 1977-78

Fine 327 W std .5
Advanced Printmaking 2
A continuation of Fine 326 with emphasis on independent problems. Lab fee.
Prereq: Fine 326

Fine 328 F C std .5
Calligraphy
A study of the art of written forms, combining studio projects with slide lectures on the history of writing, illuminating, and lettering. Students will strive for mastery in various calligraphic forms including Roman, Uncial, Gothic, Italic and Fraktur.
Lab fee. No prereq

Fine 329 Illustration
Not offered 1977-78

Fine 330 Advanced Film Making 1
Not offered 1977-78

Fine 335 Advanced Film Making 2
Not offered 1977-78

Fine 346R/347R .5/.5
Special Topics in Film
Special topics will be announced from year to year.

Fine 348R The Films of Chaplin
Not offered 1977-78

Fine 349R F2C.1D .5
The Films of Fellini
An historical and thematic consideration of the cinema of Frederico Fellini, with attention to motifs, style, and development in the overall work.
Prereq: Fine 244/245 or Fine 246/247 (RS 266R/267R) or consent of instructor.

Fine 370 F D, std .5
Film Theory 1 (Anatomy of Film)
Discussion of the aesthetic aspects of cinematographic work (principles known as "film language").
Prereq: consent of instructor

Fine 371 W D, std .5
Film Theory 2 (Film Aesthetics and Criticism)
An extension of Fine 370. The main accent will be placed upon major theories of cinematography, such as those of Kracauer, Metz, and Eisenstein, and upon the development of the students own judgment in the form of critical expression.
The impact of the film medium upon modern society will also be discussed as well as the relationship between film and television.
Prereq: Fine 370
Course Descriptions
Fine Arts

Fine 390 F R .5
Selected Subjects in Fine Arts
Research and reading courses under the direction of individual instructors.
Admission by consent of instructor.

Fine 390A F S .5
Methods in the History of Art
For students planning a Senior Honours Presentation in Art History as it is currently understood. Students will examine methods of formal and stylistic analysis, iconographical interpretation and the application of social and political history to understanding of works of art. Required of all art history majors who take Fine 490/491.
Prereq: consent of instructor.

Fine 391 W R .5
Selected Subjects in Fine Arts
Research and reading courses under the direction of individual instructors.
Admission by consent of instructor.

Fine 392 F R, std .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 .5
Selected Subjects in Fine Arts
Studio and practice courses under the direction of individual instructors.
Admission by consent of instructor.

Fine 420 F std,S .5
Senior Seminar in Graphics Techniques 1
Admission by consent of instructor.

Fine 421 W S, std .5
Senior Seminar in Graphics Techniques 2
Admission by consent of instructor.

Fine 434 Senior Seminar in Film Techniques 1
Not offered 1977-78.

Fine 435 Senior Seminar in Film Techniques 2
Not offered 1977-78.

Fine 470 F .5
Senior Seminar in Film Concepts 1
Admission by consent of instructor.

Fine 471 W .5
Senior Seminar in Film Concepts 2
Admission by consent of instructor.

Fine 472 std .5
Senior Seminar in Graphics Concepts 1
Admission by consent of instructor.

Fine 473 std .5
Senior Seminar in Graphics Concepts 2
Admission by consent of instructor.

Fine 490 S, std,R .5
Senior Honours Presentation 1
Each student will work under the direction of a Fine Arts faculty member on an advanced creative project; the result of this endeavor will be presented in the form of an exhibition or its equivalent (i.e., film, illustrated book, portfolio, or essay), which will be examined by faculty members of Fine Arts and also where pertinent, by members of other departments. Required of all students in Honours Fine Arts.
Admission by permission only.

Fine 491 S, std,R .5
Senior Honours Presentation 2
A continuation of Fine 490.
Admission by permission only.
Undergraduate Course Descriptions – Music

Music 150G F,J 3C .5
Introduction Music 1
Examination by means of listening and analysis, of styles of music ranging from early Christian Chant to electronic and computer music. Compositions to be studied include major forms such as sonata, symphony, opera, mass, etc., as well as smaller forms.

Music 151G W,A 3C .5
Introduction to Music 2
Continuation of 150G.
Prereq: Music 150G or consent of instructor

Music 160G F 1C,3L .5
Choral Literature 1
Choral literature from the Renaissance period to the present will be introduced through singing reading sessions, discussion and performance. Repertoire will vary from year to year and will be suited to the existing choral ensemble.
Prereq: Permission of the instructor

Music 161G W 1C,3L .5
Choral Literature 1
Continuation of 160G
Prereq: Music 160G or consent of instructor

Music 166G F,W std .5
Music Studio
Practical performance study with approved instructor and examination administered by Music Faculty. A half-course credit normally requires two terms of private study, but may be achieved in one term if supplemented with approved related studies in music literature.
Prereq: Consent of Music Faculty

Music 250G F 2C,1L .5
Music Theory
The study of music, past and present, to discover how tones and melodies are combined to create harmony and counterpoint, and how larger works are organized.
Prereq: Grade 2 Theory (Toronto Conservatory) or consent of the instructor

Music 251G W 2C,1L .5
Music Theory 2
The study of music, past and present, to discover how tones and melodies are combined to create harmony and counterpoint, and how larger works are organized.
Prereq: Music 250G

Music 254G F 3C .5
Bach to Beethoven
Music from around 1700 to 1827, the Baroque and Classical Periods of Music. Major composers studied are Bach, Haydn, Mozart, and Beethoven. Listening to music is an integral part of the course.
Prereq: Music 150G/151G

Music 255G W 3C .5
Music of the Romantic Period (19th century)
Included among the many musical compositions studied are operas of Wagner, Verdi and Mussorgsky, the lied of Schubert, Schumann and Wolf, symphonies of Brahms, Mendelssohn, Tschaikowsky, and piano music by Chopin.
Prereq: Music 150G/151G

Music 260G F 1C,3L .5
Choral Literature 2
Choral Literature from the Renaissance period to the present will be introduced through singing reading sessions, discussion and performance. Repertoire will vary from year to year and will be suited to the existing choral ensemble.
Prereq: Music 160G/161G or permission of instructor

Music 261G W 1C,3L .5
Choral Literature 2
Continuation of Music 260G
Prereq: Music 260G or consent of instructor

Music 262G F 2C,2L .5
Instrumental Literature
The study of the music written from the seventeenth century to the present for a variety of instrumental groups, such as chamber music, symphony, concertos.
Prereq: Music 150G/151G or consent of instructor

Music 266G F,W std .5
Music Studio
See Music 166G for course description.
Prereq: Music 166G and consent of Music Faculty

Music 273G F,S 3C .5
Traditional Folk Music
Countries to be discussed: Great Britain, Canada, the United States and the Antipodes. A series of lectures and discussions supplemented by records, tapes, and field recordings. Delineation of characteristic motifs in folk music. Various folk instruments will be used by the lecturer throughout the course: guitar, auto harp, hammer dulcimer, appalachian dulcimer, and five string banjo.

Music 300G Stratford Festival Seminar
Not offered 1977-78
Music301G  **Stratford Festival Seminar**
Continuation of Fine Arts Music300G
*Not offered 1977-78.*

Music351G  F  3C  .5  
**Ancient, Medieval and Renaissance Music**
The study of music from pre-Christian times to approximately 1600.
*Prereq: Music 150G/151G*

Music352G  W  3C  .5  
**Music of the Twentieth Century**
A study of representative musical compositions of the twentieth century and their relationship to social, literary and political movements.
*Prereq: Music 150G/151G or consent of instructor*

Music355G/356G  **Music of the Classical Period (ca. 1750-1820)**
*Not offered 1977-78*

Music350G  F  2C,1D  .5  
**Music of the Church**
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 150G/151G or consent of instructor*

Music361G  W  2C,1D  .5  
**Music of the Church**
Continuation of Music360G.
*Prereq: Music 360G or consent of instructor*

Music366G  F,W  std  .5  
**Music Studio**
See Music166G for course description.
*Prereq: Music 266G and consent of Music Faculty*

Music380G/381G  .5/.5  
**Directed Study in Music**
*Prereq: Advanced standing in music and consent of the instructor*

Music466G  F,W  std  .5  
**Music Studio**
See Music166G for course description.
*Prereq: Music 366G and consent of Music Faculty*
General Engineering
Undergraduate Course Descriptions

GenE010  F,W  1S  0
Orientation
Given by the Department of Co-ordination for students in Year 1 Engineering. Its purpose is to introduce the students to the various features of the co-operative programme.

GenE061  W  3C .5
History and Philosophy of Science
The major conceptual transformations in evolution of science and technology: Greek, modern classical, contemporary periods. Scientific technology as a determining characteristic of global civilization and some critical questions it poses. Not open to Year 1 students.

GenE062  F  3C .5
Introduction to Human Communication Systems
The processes involved in man-man, man-machine and mass communications will be discussed. Models of communication systems. The contributions and points of view of the various disciplines which make up the spectrum of communication studies today. Not open to Year 1 students.

GenE101  Topics from Scientific Thought
Not offered in 1977-78

GenE102  F,W,S  2C,1T .5
Introduction to the Sciences of Man
The course is intended to introduce engineering, mathematics and science undergraduates to some of the sciences of man (anthropology, sociology and psychology).

GenE103  F,W,S  2C,1T .5
Topics from the Arts and Humanities
The course will explore some of the major movements of thought which are shaping modern affairs and modern consciousness. The topics may vary but examples would be Marxism, racism, Freudianism, existentialism, the meaning of civilization, artistic expression and Christianity.

GenE114  W,S  4L .5
Applications of Mathematics to Engineering Problems
A laboratory and problems course giving practice in the mathematical formulation and solution of elementary engineering problems. Prereq: Math 110A and Math 114 or equivalent
Department of Geography

Associate Professor, Chairman of the Department
G. R. McBoyle, BSc, PhD (Aberdeen)

Professor, President of the University
B. C. Matthews, BSA (Toronto), AM (Missouri), PhD (Cornell)

Professor, Dean of Environmental Studies
J. G. Nelson, BA (McMaster), MA (Colorado), PhD (Johns Hopkins)

Associate Professor, Associate Chairman
L. H. Russwurm, BBA, MA (Western), PhD (Illinois)

Associate Professor, Associate Dean
(Environmental Studies Undergraduate Affairs)
A. G. McLellan, BSc, PhD (Glasgow)

Associate Professor, Graduate Officer
D. F. Walker, BSc (London), MA (Toronto), PhD (Toronto)

Assistant Professor, Undergraduate Officer
G. Wall, BA (Leeds), MA (Toronto), PhD (Hull)

Professors
A. Diem, BA (Wayne State), MA (Clark), PhD (Michigan)
D. K. Erb, BSc (Western), MA (Toronto), PhD (McGill)
R. M. Irving, BA, MA (Toronto), PhD (Minnesota)
R. R. Krueger, BBA, MA (Western), PhD (Indiana)
R. E. Preston, BA, MA (Washington), PhD (Clark),
(on Sabbatical Leave 1977-78)

Associate Professors
J. H. Bater, BA, MA (UBC), PhD (London)
R. A. Bullock, BA, MA (Belfast), PhD (London)
J. C. Day, BSc, MSc, PhD (Chicago)
J. S. Gardner, BSc (Alberta), MSC, PhD (McGill)
B. Hyma, BSc, MS (Madras), MS (Sheffield),
PhD (Pittsburgh)
A. B. Kesik, MA, PhD (UMCS – Lublin, Poland),
(on Sabbatical Leave 1977-78)
W. B. Mitchell, BA, MA (UBC), PhD (Liverpool)

Assistant Professors
T. E. Bunting, BA (York), MA (Western), PhD (Toronto),
(on Sabbatical Leave 1978)
L. T. Guelke, BSc (Cape Town), MA (York), PhD (Toronto)
R. Johnson, BA, MA (Windsor), PhD (Minnesota)
E. R. Officer, BA (UBC), MA (Wisconsin)

Lecturer
D. J. Dudycha, BA (WLU) MA (Waterloo)

Adjunct Lecturers
G. Brannon
D. I. McKenzie, BES (Waterloo)

Faculty members holding cross and/or joint
appointments as shown
* Geography, Planning
3 Renison College and Geography
4 Recreation and Geography

The following represents a grouping of the course
offerings of the Department of Geography according to
subject matter. This should act as an additional guide in
selecting courses. The course descriptions themselves
are found after this and are in numerical order.

Human Geography

General/Introductory
Geog 101 Introduction to Human Geography
Geog 202 Some Basic Topics of Economic and Urban Geography
Geog 203 Some Basic Topics of Cultural and Regional Geography

Cultural, Historical, Political
Geog 232 Geography of Population
Geog 330 Cultural Geography
Geog 331 Special Topics in Cultural Geography
Geog 332 Special Topics in the Geography of Population
Geog 341 Historical Geography of Canada 1
Geog 342 Historical Geography of Canada 2
Geog 345 Political Geography

Regional
Geog 125R Introduction to the Developing World
Geog 126R The Emerging "Third" World
Geog 204 Soviet Union
Geog 205 Africa
Geog 220 World Regional Geography
Geog 225R Urbanization in Newly Developing Countries
Geog 226R Population Growth and Resource Development in "Third World" Countries
Geog 127 Regional Problems of Europe
Geog 325R/326R Special Topics in the Study of Third World Development
Geog 127 Regional Problems of Europe
Geog 421 Europe and the Mediterranean
Geog 423 Central and Eastern Europe
Geog 321 Geographic Perspectives on Contemporary Problems of American Society
Geog 322 Geographical Study of Canada
Geog 323 Comparative Regional Problems
Geog 422 Canada
Geog 424 Soviet Union
Geog 425 Africa

**Resource Management**
Geog 356 Resource Management
Geog 357 Conservation and Resource Management
Geog 410 Recreation Geography
Geog 411 Resource Studies
Geog 413 Behavioural Studies
Geog 380/381 Environmental Studies Workshop
Geog 414 Resources Management Workshop

**Industrial**
Geog 311 Advanced Economic Geography 1
Geog 412 Advanced Economic Geography 2

**Rural**
Geog 315 Agricultural Geography
Geog 452 Problems of Rural Land Use

**Urban**
Geog 251 Urban Areas in North America
Geog 350 Regional Urban Systems 1
Geog 352 The Rural-Urban Fringe of Canadian Cities
Geog 450 Regional Urban Systems 2
Geog 349 The City as a System 1
Geog 449 The City as a System 2

**Miscellaneous**
Geog 475 Special Readings and Seminar on Selected Topics
Geog 476 Special Readings and Seminar on Selected Topics

**Physical Geography**

**General/Introductory**
Geog 102 Introduction to Physical Geography
Geog 200 Field Ecology
Geog 201 Some Basic Topics of Physical Geography

**Ecology**
Geog 451 Soils Geography
Geog 460 Land Dereliction and Rehabilitation

**Climatology**
Geog 301 Climatology
Geog 408 Special Topics in Climatology and Natural Hazards

**Geomorphology**
Geog 300 Geomorphology and the Southern Ontario Environment
Geog 302 Geomorphological Processes
Geog 303 Physical Basis and Geography of Water
Geog 400 Climatic and Periglacial Morphology
Geog 401 Glacial Geomorphology and Some Contemporary Applications
Geog 406 Tropical Geomorphology
Geog 407 Field and Lab Techniques in Geomorphology

**Techniques and Methodology**

**General**
Geog 252 Media Tools for Environmental Studies
Geog 253 Media Tools for Environmental Studies - Advanced Level

**Cartography**
Geog 260 Introduction to Cartography and Map Analysis
Geog 360 Preparation of Maps and Illustrations
Geog 403 Advanced Cartography 1
Geog 404 Advanced Cartography 2

**Remote Sensing**
Geog 275 Introductory Air Photo Analysis and Remote Sensing
Geog 375 Air Photo Interpretation and Remote Sensing 1
Geog 470 Air Photo Interpretation and Remote Sensing 2
Geog 471 Air Photo Interpretation and Remote Sensing 3

**Quantitative Analysis**
Geog 307 Social Survey Techniques
Geog 316 Multivariate Statistics
Geog 317 Nonparametric Statistics
Geog 318 Spatial Analysis
Geog 319 Regional Planning Techniques

**Independent Research Oriented**
Geog 110 Tutorial in Geography
Geog 390 Senior Honours Essay Research Proposal
Geog 391 Field Research
Geog 490 Senior Honours Research Essay
Nature and Philosophy of Geography
Geog 381 The Nature of Geography
Geog 481 Frontiers in Geography
Geog 482 Geography and Education

Note 1
Fields of interest with a small number of offerings are often augmented by offerings in other departments.

Note 2
There is obviously considerable overlap in terms of fields of interest between many of the above categories.

Undergraduate Course Descriptions

Geog 101 F,W 2C,2L .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 of man's cultural environment. The man-land theme, and the location analysis theme are emphasized throughout. No prerequisite.

Geog 102 F,W 2C,2L .5
Introduction to Physical Geography
An ecosystem approach to physical geography which emphasizes that man's natural environment is an integrated system of which man is a part. Selected aspects of weather-climate, water, soils, biota, and landforms are studied and the flow of energy, water and matter and the resultant effects on the subsystems of the natural environment are emphasized. No prerequisite.

Geog 110 F,W 2T .5
Tutorial in Geography
A tutorial for first year geography majors designed to promote close contact with a faculty member. Students will follow a personalized programme within the realm of human geography. Times and meetings will be arranged individually. No prerequisite.

Env St 111 Introduction to the Study of the Future
See Environmental Studies course description, page 294.

Geog 125R F,J 3C .5
Introduction to the Developing World
An introduction to problems of population growth, resource development, cultural diversity, and of industrial and urban growth in developing areas of the world. Contemporary problems of economic, cultural and demographic differences will be examined in selected regions of Asia and Africa. No prerequisite.

Geog 126 R W 3C .5
The Emerging “Third World”
The emergence of the “Third World” in international relationships. Background factors: the impact of occidental culture in colonial and post-colonial times; changes in technology, economic organization, rapid population growth, resource development problems, political unrest. The challenge to the wealthy, industrialized countries posed by the needs of the populations of Africa and Asia. No prerequisite.

Geog 127 W 2S .5
Regional Problems of Europe
An introduction to the Geography of Europe which examines agricultural, industrial and urban problems. Lectures, discussions and visual presentations based on field experience of instructors.

Env St 195 Introduction to Environmental Problems
See Environmental Studies course descriptions, page 294.

Env St 200 Field Ecology
See Environmental Studies course descriptions, page 294.

Geog 201 F 2C,2L .5
Some Basic Topics of Physical Geography
Further study of energy and matter flows in the atmosphere and on the land. Specific topics include global radiation balances, energy flux at the land-air interface, weather modification, urban climates, climate classification systems, the physical processes in the pollution of land, air and water, the dynamics and morphology of stream systems and glacial landform systems. Prerequisite: Geog 102

Geog 202 F,W 2C,2L .5
Some Basic Topics of Economic and Urban Geography
An analysis of the locational structure of economic activities. Basic concepts and tools are explained; these are used to analyse the location structure of primary, secondary and tertiary activities. Throughout, an attempt is made to evaluate the locational models under discussion by reference to case studies. The analysis is placed in the overall context of regional development. Prerequisite: A first-year human geography course

Geog 203 F 2C,2L .5
Some Basic Topics of Cultural and Regional Geography
The approach of the regional geographer is illustrated by reference to one or more world regions. Political, social and historical processes are studied as they affect man's perceptions of his environment and the identification of culture regions. Prerequisite: A first-year human geography course
Geog 204 F 3C .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.
No prereq.

Geog 205 F 3C .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.
No prereq.

Geog 220 Y 2C,2D 1.0
**World Regional Geography**
Study in depth of selected areas of the world's climatic regions, emphasizing characteristic problems as well as their physical, cultural and economic interrelationships. Utilization of natural resources, the effects of increasing population density, the occupation and utilization of urban and rural lands, and the effects of man's tools, techniques and institutions on the earth's surface.
No prereq.

Geog 225R F 3C .5
**Urbanization in Newly Developing Countries**
An analysis of the factors behind the rapid urbanization of selected areas in Asia, Africa and Latin America, with an examination of related problems of urban planning and development control policies.
Prereq: Any Faculty of Environmental Studies course

Geog 226R W 3C .5
**Population Growth and Resource Development in "Third World" Countries**
Some major problems of population explosion, food supply and economic development faced by the developing countries. The course also covers technological and ecological aspects of international agricultural development. Emphasis placed on case studies of selected countries from Tropical Africa, Asia, Tropical South America and the Caribbean region.
Prereq: Any Faculty of Environmental Studies course

Geog 232 F 2C,1L .5
**Geography of Population**
No prereq.

Geog 251 Urban Areas in North America
*Not offered 1977-78*

Env St 252 Media Tools for Environmental Studies
*See Environmental Studies course descriptions, page 294.*

Env St 253 Media Tools for Environmental Studies—Advanced Level
*See Environmental Studies course descriptions, page 294.*

Geog 260 F,W 2C,2L .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.
Prereq: Geog 102

Env St 271 Introduction to Quantitative Research Methods
*See Environmental Studies course descriptions, page 295.*

Env St 272 Computer Programming in Environmental Studies
*See Environmental Studies course descriptions, page 295.*

Geog 275 F,W 2C,2L .5
**Introductory Air Photo Analysis and Remote Sensing**
Basic techniques of handling air photos, viewing them stereoscopically (in 3D), identifying and describing features, making measurements and in general, their use in the broad field of geographic and environmental studies. Introduction to specialized types of air photos, satellite imagery and remote sensing techniques.
Lab fee $12. Prereq: Geog 102 and a first year human geography course

Geog 300 F 2C,4flab .5
**Geomorphology and the Southern Ontario Environment**
This course emphasizes field work and field trips in exploring the evolution of S. Ontario landforms. The identification of landforms, landform assemblages and their relationships. Selected techniques, e.g. surveying and levelling, particle size analysis, and till fabric analysis which help in the systematic collection and analysis of field data will be used. There will be a $15. charge per student for field trip expenses.
Prereq: Geog 201, or Earth 130 or consent of instructor
Course Descriptions
Geography

Geog 301  F     3C     .5
Climatology
Prereq: Geog 201

Geog 302  W     2C,2L     .5
Geomorphical Process
The impact of processes in landform development and modification will be analyzed. Techniques of measurement will be discussed particularly as they show the impact of changes under different climatic conditions and processes connected with glaciation and deglaciation, and eolian, karst, coastal and fluvial landforms.
Prereq: Geog 201 or Earth 130 or consent of instructor

Geog 303  W     2C,2L     .5
Physical Basis and the Geography of Water
The geography of water, including snow and ice. Specific topics include: the earth’s water balance and cycle, the oceans, lakes and swamps, snow cover, ground ice, glacier ice and streams. Attention is directed to the impact of water on the earth’s surface, the role of water in the earth’s system, and water as a resource and hazard. Some field work.
Prereq: Geog 201 or consent of instructor

Geog 307     2C,1D     .5
Social Survey Techniques
Social research and the planning process; interview and self administered surveys; questionnaire design; profile data; sampling; data processing; non-survey data collection techniques; practical applications. This course is the same as Plan 307.
Prereq: May be taken in 2nd or 3rd year

Geog 311  F,W     3C     .5
Advanced Econ Geog 1
Manufacturing and Transportation
Manufacturing and transportation in the context of area economic development, both at regional and urban scales. This course aims at deepening conceptual insights as well as fostering an appreciation of their relevance to the understanding of particular areas. Empirical focus is on Canada and the United Kingdom.
Prereq: Geog 202 or consent of instructor

Geog 315  F,W     3C     .5
Agricultural Geography
The study of agriculture as a system, and an analysis of the geographical dimensions of agricultural systems. Issues include the diffusion of innovations, regional evolution of agricultural structure and vertical integration. Structural problems in agriculture are emphasized through a comparative study of programmes of government intervention in agriculture in Canada and Europe. Some field trips.
Prereq: Geog 202 or consent of instructor

Geog 316 Multivariate Statistics
Not offered 1977-78

Geog 317  F     3C     .5
Nonparametric Statistics
The theory and application of nonparametric statistics, with particular emphasis upon social science problems. Same as Plan 317.
Prereq: Env St 271 or consent of instructor

Geog 318 Spatial Analysis
Not offered 1977-78

Geog 319     3S     .5
Regional Planning Techniques
Discussion, appraisal and application at the regional level of selected economic techniques—specifically, cost-benefit analysis, planning-programming-budgeting systems and input-output analysis. This course is the same as Plan 319.
Prereq: Econ 101 or consent of instructor

Geog 321 Geographical Perspectives on Contemporary Problems of the American Society
Not offered 1977-78

Geog 322  F     3C     .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: Consent of Instructor

Geog 323 Comparative Regional Problems
Not offered 1977-78
Special Topics in the Study of Third World Development
Emphasis on research methods and approaches to the study of geographic aspects of selected social and economic development problems. Regions of concentration will be mainly tropical Africa, South and South-East Asia, Caribbean and tropical Latin America. Among topics selected are population, agriculture and food, rural development, urbanization, resource development and regional planning.
Prereq: First or second year courses related to Third World studies.

Cultural Geography
Problems in the delimitation of cultural regions. A study of the diversity of man in his relations with his environment.
Prereq: A second year human geography course

Special Topics in Cultural Geography
A detailed investigation of selected issues in man's relations with the natural environment. Given as a seminar. Issues will be partially selected on the basis of the interests of participants.
Prereq: Geog 330 or consent of instructor

Special Topics in the Geography of Population
Not offered 1977-78

Historical Geography of Canada 1
The changing geographies of settlement and resource use from the Discoveries to the early nineteenth century.
Prereq: Geog 203 or consent of instructor

Historical Geography of Canada 2
The changing geographies of settlement and resource use in the nineteenth and early twentieth centuries.
Prereq: Geog 203 or consent of instructor

Political Geography
Not offered 1977-78

The City as a System 1
An examination of theories, models, and research procedures appropriate to the study of internal urban structure. The course focuses on the analysis of city-wide processes. Topics include urban land use, spatial economic processes, transportation and interaction, urban systems, individual spatial behaviour, decision-making (public and private), urban growth, and the processes of development and redevelopment.
Prereq: Geog 202 or 251 or consent of instructor

Regional Urban Systems 1
An examination of theories, models, and research procedures appropriate to the study of the external structure and function of urban centres and their role in the spatial economy. Focuses on the growth and support of urban centres and city systems, on relationships between aspects of urbanization and regional development, on the outward growth of cities, and on analytical techniques useful in studying such topics.
Prereq: Geog 202 or Geog 251 or consent of instructor

The Rural-Urban Fringe of Canadian Cities
Study of the processes underlying the natural, economic and cultural environments of the rural-urban fringe zone surrounding our cities. Particular emphasis will be placed on the use, ownership, development and management of land and the interrelationships between the resource base and urban demands on it.
Prereq: Geog 202

Resources Management
Theoretical and conceptual approaches to resources studies emphasizing behavioural and economic considerations; evaluation of management practices in fisheries, forestry, water and minerals; research techniques.
Prereq: Geog 202 or consent of instructor

Conservation and Resource Management
History of the conservation movement; ecological principles of conservation and resource management. Analysis, use and planning of recreational resources. The course is the same as Plan 357 and M Env 357.
Prereq: Env St 200

Environmental Pollution and its Control
See Environmental Studies course descriptions, page 295.

Preparation of Maps and Illustrations
Basic equipment, materials and techniques involved in the practical construction of maps and other forms of cartographic illustrations, including conventional drafting and plotting procedures, symbolization of data, and map editing consideration for reproduction.
Prereq: Geog 260
Geog 375  W  2C,2L  .5
Air Photo Interpretation and Remote Sensing 1
The principles of air photo interpretation via indepth analysis of elements of the air photo including rock types, landforms, drainage patterns, erosion characteristics, tonal variations, boundary characteristics, vegetation characteristics and patterns, and man-made features. Examples drawn from geology, geography and vegetation mapping. This course is a prerequisite for Geog 470.
Lab fee $12. Prereq: Geog 275 and Geog 201 or Earth 130

Env St 380/381 Environmental Studies Workshop
See Environmental Studies course descriptions, page 295.

Geog 381  F, W  2S  .5
The Nature of Geography
The past traditions in geography. Modern trends in geographical research and teaching.
Prereq: Any three Geog credits

Geog 390  W  .5
Senior Honours Essay Research Proposal
Participants are responsible for developing a research proposal under the supervision of an appropriate faculty member. Normally taken in the Winter term of the third year.
Prereq: Honours Geography students only

Geog 391  F  2S  .5
Field Research
One week field camp session during which a specific area will be analysed from a geographic point of view. Students will be expected to undertake individual or group analysis of specific problems and must present the results in a written report.
Prereq: Third Year Hon Geog students
Estimated cost to student: Between $60-$75

Env St 400 Environmental Law
See Environmental Studies course descriptions, page 295.

Geog 400 Climatic and Periglacial Morphology
Not offered 1977-78

Geog 401  F  3S  .5
Glacial Geomorphology and some Contemporary Applications
Advanced study of the total effect of glaciation. Glacial and fluvio-glacial deposits and depositional conditions will be analysed. Special attention on the environmental influences of glaciation and on practical applications of glacial geomorphologists' techniques and information.
Prereq: One of Geog 300, Geog 302 or Earth 342

Geog 402  F  3S  .5
Advanced Cartography 1
Advanced study of numerical map analysis and computer mapping techniques.
Prereq: Geog 260, or 271

Geog 403  F  3C  .5
Advanced Cartography 2
Advanced study of basic techniques of map production and the theory of cartographic communication and map design. Technical aspects include photo mechanics, scribing, process photography, typography, proofing and printing processes. Theoretical topics include the map as a communications system, advanced map design and principles of information selection and generalization.
Prereq: Geog 380

Geog 404  F  3C  .5
Geog 406 Tropical Geomorphology
Not offered 1977-78

Geog 407 Field and Lab Techniques in Geomorphology
Not offered 1977-78

Geog 408 Special Topics in Climatology and Natural Hazards
Not offered 1977-78

Geog 410  F  3C  .5
Recreation Geography
The environmental implications of existing and potential recreational demands. Recreational travel, site capability, economic and ecological impact models will be considered as well as the behavioural aspects of amenity resources.
Prereq: Geog 356

Env St 411 Alternative Future Environments 1
See Environmental Studies course descriptions, page 295.

Geog 411  W  3C  .5
Resource Studies
Study of natural resource problems, with particular attention upon the role of foreign investment and the global corporation in developing resources in Canada and other selected countries.
Prereq: Geog 356 or Geog 410

Env St 412 Alternative Future Environments 2
See Environmental Studies course descriptions, page 295.
Geog 412  W  3C  .5  
**Industrial Geography**

A companion course to Geog 311. The focus is on firms and industries. Emphasis will be placed on decision-making, multinational corporations, technological change, and analyses of the locational patterns of specific industries.

*Prereq: Geog 311*

Geog 413  W  2C  .5  
**Behavioural Studies**

Studies of the behaviour of individuals, groups and organizations in interaction with their environment. Emphasis will be placed on environmental perception and decision-making.

*Prereq: One of Geog 356, 311, or 357*

Geog 414  W  2S  .5  
**Resources Management Workshop**

Application of theory, methodology and techniques to research projects which focus upon natural resource management problems. Emphasizing social and economic considerations, research projects will utilize individual and group approaches.

*Prereq: Geog 356 and consent of instructor*

Env St 417  **Land Use History and Landscape Change 1**

See Environmental Studies course descriptions, page 295.

Env St 418  **Land Use History and Landscape Change 2**

See Environmental Studies course descriptions, page 295.

Geog 422  W  2S  .5  
**Canada**

Seminar on the geographical analysis of selected Canadian development problems. Emphasis on topics of continuing Canadian concern.

*Prereq: Geog 322 or Plan 222*

Geog 423  Y  3C  1.0  
**Central and Eastern Europe**

Detailed study of physical, cultural, economic, and political geography of Central and Eastern Europe. Geographical aspects of agricultural problems, industrialization, distribution of trade, economic planning, and relations with the Soviet Union and the West.

*Prereq: Geog 127 or 220*

Geog 424  W  3C  .5  
**Soviet Union**

Advanced study of selected aspects of the geography of the Soviet Union. A degree of flexibility in the course allows some emphasis on topics of particular interest to the students registered in it.

*Prereq: Geog 204*

Geog 425  W  3C  .5  
**Africa**

Examination of selected aspects of the geography of a major region in Africa with particular reference to problems of development. The region will normally be East Africa; a degree of flexibility will facilitate the selection of topics related to the interests of participants.

*Prereq: Geog 205*

Geog 430  S  1.0  
**Field Research in Regional Geography**

A detailed analysis of a selected region with major emphasis upon a field examination of the region (2-3 weeks duration) in spring.

*Prereq: Fourth year honors geography students or consent of instructor*

Switzerland, May 1978

Geog 449  **The City as System 2**

Not offered 1977-78

Geog 450  W  3C  .5  
**Regional Urban Systems 2**

A continuation of Geog 350 with an emphasis on student projects.

*Prereq: Geog 350*

Geog 451  F  3C  .5  
**Soils Geography**

An analysis of the factors affecting soil development and classification. Techniques of soil survey and land classification.

*Prereq: Env St 200*

Geog 452  F  3C  .5  
**Problems of Rural Land Use**

The nature of rural land use problems, and a critical evaluation of the methods of rural land use planning. Emphasis placed on two types of geographical areas: metropolitan areas and problems of land use competition, and open space planning; and underdeveloped or depressed rural regions and problems of alternative employment opportunities. Methods of analysis and decision making.

*Prereq: Geog 315*

Geog 460  W  3C  1.0  
**Land Dereliction and Rehabilitation**

Examination of the reasons for land dereliction, its processes, and effects. Analysis of rehabilitation techniques, includes principles of landscape architecture and optimizing ecological considerations and use of post operation areas. Students examine an area to prepare an objective and acceptable proposal in the form of a report of methods of operations and post operation rehabilitation. A small charge for field trip expenses of $15 to $20.

*Prereq: Consent of instructor*
Geog 470  F  3C  .5
**Air Photo Interpretation and Remote Sensing 2**
Advanced air photo interpretation and its application in geomorphology, geology, resources inventory, engineering soils, hydrology, and pre-planning studies (terrain analysis). Projects in specific fields of interest form a significant part of the course.
Lab fee $12. Prereq: Geog 375 and Geog 300 or 302

Geog 471  Air Photo Interpretation and Remote Sensing 3
Not offered 1977-78

Geog 475  F,W  2S  .5
**Special Reading and Seminar on Selected Topics**
A brief outline is to be filed with the Chairman or UG officer.
Prereq: Hon Geog students and consent of instructor

Geog 476  Y  1.0
**Special Readings and Seminar on Selected Topics**
A brief outline is to be filed with the Chairman or UG officer.
Prereq: 3 full credits in Geog and consent of instructor

Geog 481  Frontiers in Geography
Not offered 1977-78

Geog 482  W  3C  .5
**Geography and Education**
The foci of this course are geographical organizational concepts, educational principles and theory, and practice.
Prereq: In last year of Honours or General Geography programme and consent of instructor

Geog 490  Y  3S  1.0
**Senior Honours Research Essay**
Prereq: Geog 390
Department of Germanic and Slavic Languages and Literatures

Associate Professor, Chairman of the Department
M. Richter, Staatsexament (Berlin and Bonn), MA, PhD (Toronto)

Professor, Associate Chairman (German)
S. Hoefert, BA, MA, PhD (Toronto)

Associate Professor, Associate Chairman (Slavic)
A. Zweers, Doctorandus (Amsterdam), litt Dr (Groningen)

Professors
J. W. Dyck, AB (Bethel), MA (Missouri), PhD (Michigan)
E. Heier, BA, MA (UBC), PhD (Michigan)
I. Levitsky, AB (Rochester), MA (Buffalo), PhD (Duke)

Visiting Professor
H. Boeschenstein, Dr. phil. (Rostock), FRSC

Associate Professors
G. Brude-Firnau, Staatsexamen (Berlin), PhD (Yale)
A. Donskw, BA, MA (UBC), Dr. phil. (Helsinki)
M. Kuxdorf, RA, MA (Waterloo), PhD (Alberta)
H. W. Panthe, BA (Waterloo), MA (Cincinnati), PhD (Waterloo)
W. Shelest, MA (Ottawa), Dr. phil. (Münchener UFU)
J. Whiton, BA, MA, PhD (Minnesota)

Assistant Professors
F. Jakobsh, BA, MA (Manitoba), PhD (Waterloo)
D. G. John, BA, MA, PhD (Toronto)

Visiting Assistant Professor
F. O. Futterknecht, Dr. phil. (Mannheim)

Lecturers
S. Dyck (Mrs.), BA (London, Mphil (Waterloo)) (part time)
H. Marsden (Mrs.), BA (Randolph-Macon), MA (Waterloo) (part time)
A. Newman (Mrs.), MA (Poznan, Poland) (part time)
T. Sommer (Miss), BA, MA (Waterloo)
A. Strack (Miss), Staatsexamen (Tübingen and Berlin)
I. Wynnckyj (Mrs.), BSc (McGill), MA (Waterloo) (part time)

Undergraduate Course Descriptions

German

Note
During the first two years German courses are divided into two streams which allow for sequential development.

The two streams (A and B) are arranged according to a student's background in the language.

Stream A
Students with little or no knowledge of German
First Year
German 101/102, or German 111/112
Second Year
German 211/212, or German 231/232

Stream B
Students with at least two years of High School German (or equivalent)
First Year
German 101/102, or German 111/112
Second Year
German 211/212, or German 231/232

In third year both streams merge, although Stream A students may take Stream B courses at the 200 level.

Waterloo in Germany Programme
The Department offers a programme in German language and literature at the University of Mannheim on the Rhine. The programme is open to third and fourth year students normally qualified to enrol in German courses at this level. In exceptional cases, second year students will also be considered. Students who would like to begin their studies in Mannheim in the Winter Semester (Oct. 15 to Feb. 15) must apply by April 1. The application deadline for those who would like to begin their studies in the Summer Semester (April 15 to July 15) is Feb. 1. Applications should be submitted to: "Waterloo in Germany" Department of Germanic and Slavic Languages and Literatures, University of Waterloo, Waterloo/Ontario.

Ger 10 Y 3C 1.0

Reading and Translation
This course is designed to assist graduate students in acquiring a reading knowledge of German. Usage and structure of German scientific writings. Translation in the fields of specialization.
Open to graduate students of all departments
Ger 101  F,W,J  3C,1L .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. One section, Ger 101A, offers more intensive oral practice with an additional language lab hour per week. 
Prereq: None; not open to students with Ontario High School Grade 13 German or equivalent, nor to students who have credit for Ger 105 or 111.

Ger 102  F,W,A  3C,1L .5  
First Year German  
As Ger 101  
Prereq: Ger 101

Ger 105  F  3C .5  
German for Reading Knowledge  
The elements of German grammar with practice in pronunciation. Selected readings from the humanities and social sciences. This course prepares the student to read German independently with the aid of a dictionary. It can be used as a prerequisite for Ger 201 only with special permission.  
Prereq: None

Ger 106  W  3C .5  
German for Reading Knowledge  
As Ger 105  
Prereq: Ger 105

Ger 111  F,W,S  3C .5  
First Year Scientific German  
For students with little or no knowledge of German. The basic elements of German grammar and pronunciation with an emphasis on reading and translation of elementary scientific literature from various fields. 
Prereq: None; not open to students with Ontario High School Grade 13 German or equivalent, nor to students who have credit for Ger 101 or 105.

Ger 112  F,W,S  3C .5  
First Year Scientific German  
As Ger 111.  
Prereq: Ger 111

Ger 121  F  3C .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, with attention to themes such as society and the dropout, the search for the self, confronting the absurd, and the question of collective responsibility.  
Prereq: At least 2 years of High School German, or consent of instructor

Ger 122  W  3C .5  
Studies in German Literature with Language Practice  
As Ger 121.  
Prereq: Ger 121

Ger 151  F  3C .5  
German Conversation and Grammar Review  
Conversation on topics of everyday life as well as on political, social, and cultural aspects of the German-speaking countries: West and East Germany, Austria, and Switzerland. Comprehensive grammar review, vocabulary building, written practice. Language lab is recommended.  
Prereq: At least 2 years of High School German, or consent of instructor

Ger 152  W  3C .5  
German Conversation and Grammar Review  
As Ger 151  
Prereq: Ger 151

Ger 201  F  3C .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. Optional Language Lab.  
Prereq: Ger 102 or consent of instructor

Ger 202  W  3C .5  
Second Year German  
As Ger 201  
Prereq: Ger 201

Ger 211  F  3C .5  
Intermediate Scientific German  
Grammar review and more advanced study of German structure and idiom. Reading and translating of scientific writings for vocabulary building and mastery of difficulties peculiar to technical style. Reading material is selected according to the field of the individual student.  
Prereq: Ger 106, 112 or consent of instructor
**Course Descriptions**

Germanic and Slavic Languages and Literatures

**Ger 212** W 3C .5
**Intermediate Scientific German**
As Ger 211
Prereq: Ger 211

**Ger 231** F 3C .5
**German Through Contemporary Literature**
Reading of selected contemporary texts with the goal of vocabulary building and the improvement of reading and comprehension. This course is mainly for students with only one year of German.
Prereq: Ger 102

**Ger 232** W 3C .5
**German Through Contemporary Literature**
As Ger 231
Prereq: Ger 237

**Ger 251** F 3C .5
**German Conversation and Composition**
This course offers extensive practice in both the spoken and written language. It provides vocabulary building, grammar review, and exercises in pronunciation and comprehension. Optional Language Lab.
Prereq: Ger 122, 152 or consent of instructor

**Ger 252** W 3C .5
**German Conversation and Composition**
As Ger 251
Prereq: Ger 122, 152 or consent of instructor

**Ger 271** F 3C .5
**German Thought and Culture**
A survey of cultural currents to the time of Enlightenment. Lectures will focus on major developments in literature, philosophy, religion, art, architecture, and music as seen against the historical background of the German speaking peoples. Taught in English.
Prereq: None

**Ger 272** W 3C .5
**German Thought and Culture**
A survey of cultural events from Goethe to the present. Lectures will focus on major developments in literature, philosophy, religion, art, architecture, and music as seen against the historical background of the German speaking peoples. Taught in English.
Prereq: None

**Ger 275** F 3C .5
**German Culture in the 20th Century**
Not offered 1977-78

**Ger 276** W 3C .5
**German Culture in the 20th Century**
Not offered 1977-78

**Ger 281** F 3C .5
**Post-War Literature**
Reading and interpretation of major works since 1945 in prose, drama and poetry. Main authors: Brecht, Borchert, Böll, Frisch, Dürrenmatt, Grass, Eich.
Prereq: Ger 122, 152 or consent of instructor
Students with Ger 231 are ineligible

**Ger 282** W 3C .5
**Post-War Literature**
As Ger 281
Prereq: Ger 281

**Ger 291** F 3C .5
**Survey of German Literature**
Introduction to the major periods of German literature.
Reading and interpretation of representative texts.
Prereq: Ger 122, 152, or 202

**Ger 292** W 3C .5
**Survey of German Literature**
As Ger 291
Prereq: Ger 291

**Ger 341** F 3C .5
**The Age of Goethe (Storm and Stress, Classicism)**
Reading, interpretation, and critical analysis of representative works (Goethe, Schiller, Hölderlin, etc.).
Prereq: Second year standing

**Ger 342** W 3C .5
**The Age of Goethe (Romanticism)**
Reading, interpretation, and critical analysis of representative works (Novalis, Tieck, Brentano, etc.).
Prereq: Second year standing

**Ger 343** F 3C .5
**Intermediate Conversation and Composition**
This course is a continuation of Ger 202. It offers conversation and composition on contemporary topics, vocabulary building, and exercises in grammar and stylistics on the intermediate level.
Prereq: Ger 202 or consent of instructor
Not open to students with Ger 252 or 352 nor students in Honours German.

**Ger 344** W 3C .5
**Intermediate Conversation and Composition**
As Ger 343
Prereq: Ger 343

**Ger 351** F 3C .5
**Intermediate Conversation and Composition**
Conversation on modern topics. Exercises in advanced grammar, stylistics, and composition.
Prereq: Ger 202 or 252
Course Descriptions
Germanic and Slavic Languages and Literatures

Ger352 W 3C .5
Intermediate Conversation and Composition
As Ger351.
Prereq: Ger351

Ger355 F 3C .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 Dürrenmatt. Taught in English.
Prereq: Open to students from all departments: not normally to first year students.
This course is complemented in the Winter term by Russ 356.

Ger361 F 3C .5
Young Germany and Biedermeier
Reading, interpretation, and critical analysis of prescribed prose, drama and poetry (Grillparzer, Mörke, Stifter, Goethe, etc.).
Prereq: Second year standing
Offered in alternate years

Ger362 W 3C .5
Poetic Realism
Reading, interpretation, and critical analysis of prescribed prose, drama and poetry (Storm, Keller, Ludwig, Hebbel, Raabe, Fontane, etc.).
Prereq: Second year standing
Offered in alternate years

Ger371 F 3C .5
Modern German Literature
Reading, interpretation, and critical analysis of prescribed texts relating to the "Moderne" and various literary movements around the turn of the century.
Prereq: Second year standing

Ger372 W 3C .5
Modern German Literature
Reading, interpretation, and critical analysis of prescribed texts from the early 20th century to the end of World War II (Katka, Brecht, etc.).
Prereq: Second year standing

Ger391 F 3C .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).
Prereq: None

Ger392 W 3C .5
Masterpieces of German Literature in Translation
As Ger391.
Prereq: None

Ger451 F 3C .5
Advanced Conversation, Grammar and Composition
This course is conducted in German and provides intensive practice in spoken and written German on the advanced level.
Prereq: Ger352 or consent of instructor

Ger452 W 3C .5
Advanced Conversation, Grammar and Composition
As Ger451.
Prereq: Ger451

Ger461 F 3C .5
Introduction to the History of the German Language with Readings in Middle High German
Prereq: Second year standing
Offered in alternate years

Ger462 W 3C .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.
Prereq: Ger461
Offered in alternate years

Ger471 German Poetry
Not offered 1977-78

Ger472 German Poetry
Not offered 1977-78

Ger481 F 3C .5
Humanism/Reformation
Reading, interpretation, and critical analysis of prescribed texts (Erasmus, Luther, Sachs, Bidermann, etc.).
Prereq: Second year standing
Offered in alternate years

Ger482 W 3C .5
Baroque and Enlightenment
Reading, interpretation, and critical analysis of prescribed texts (Opitz, Gryphius, Grimmelshausen, Hofmannswaldau, Angelus Silesius, Hailer, Klopstock, Lessing, Wieland, etc.).
Prereq: Second year standing
Offered in alternate years

Ger495-498 F,W,S,M R * each .5
Reading Courses in Approved Topics
Prereq: Fourth year students only
Russian Workshop
"Total Immersion" Russian Language Workshop. The programme consists of 2 sessions (12 days each) at the Russian Language Seminar in Dyuny (near Leningrad). Instruction is given daily for four hours by Russian professors on different levels according to the proficiency of the students.

Credits: 1 and 1/4 (for students who completed:
  a) first year Russian: 193, 194, 195;
  b) second year Russian: 293, 294, 295;
  c) third year Russian: 393, 394, 395;
  d) fourth year Russian: 493, 494, 495.)

Students can receive up to six half credits prior to graduation.
Prereq: Russ 102 or equivalent

Russ 101 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 101
Prereq: Russ 201 or equivalent

Russ 251 F 3C 0.5
Conversation, Composition, Grammar and Phonetics
The course is conducted largely in Russian and provides intensive practice in spoken Russian. Vocabulary building, comprehension, pronunciation and intonation are stressed.
Prereq: Russ 102, 112 or equivalent

Russ 252 W 3C 0.5
Conversation, Composition, Grammar and Phonetics
As Russ 251.
Prereq: Russ 251 or equivalent

Russ 261 F 3C 0.5
Introduction to Russian Literary Movements
Reading of representative works from Russian Classicism, Romanticism, 19th Century Realism, and various periods of 20th century Russian literature.
Prereq: Russ 102 or permission of instructor

Russ 262 W 3C 0.5
Introduction to Russian Literary Movements
As 261.
Prereq: Russ 261

Russ 271 F 3C 0.5
Russian Thought and Culture
A survey of cultural history from 862 to 1861. Lectures will focus on major developments in literature, religion, philosophy, art, architecture, and music as seen against the background of Russia's historical past. Discussion will be devoted primarily to works of Russian literature. This course is taught in English.
Russ 272 W 3C 0.5
Russian Thought and Culture
A survey of cultural history from 1861 to the present. Lectures will focus on major developments in literature, philosophy, art, and music as seen against the background of Russia's historical past. Discussion will be devoted primarily to works of Russian literature. This course is taught in English.

Note
Arts students can take Russ 271 and 272 in their second or subsequent years; students for other faculties, in any year (Chapter 8 for course requirements in the Faculty of Arts).

Russ 275 F.W 3C 0.5
Literature and Cinema in the USSR
A survey of selected Soviet films that are adaptations of significant literary works or illustrate important cultural events or movements. Among the films studied will be: War and Peace (Bondarchuk), The Quiet Don (Gerasimov), Uncle Vanya (Konchalovsky), My Universities (Donskoi). This course is taught in English. Open to all students. This course carries Aiii credit, not Aii credit.

Russ 281 F 3C 0.5
Russian Short Story
A study of the form and a detailed examination of Russian short stories by major representative writers. Prereq: Russ 102 or permission of instructor

Russ 282 W 3C 0.5
Russian Short Story
As Russ 281. Prereq: Russ 281

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. Prereq: Russ 102 or permission of instructor

Russ 342 W 3C 0.5
Russian Drama
As Russ 341. Prereq: Russ 341

Russ 352 W 3C 0.5
Intermediate Conversation and Composition
As Russ 351. Prereq: Russ 351

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, Mayakovksy, and Pogodin. The course is conducted entirely in English. Fall term: See Ger 355. Open to students from all departments. Not normally open to first year students.

Russ 361 The Peoples of the Soviet Union
Not offered 1977-78

Russ 381 The Peoples of the Soviet Union
Not offered 1977-78

Russ 391 F 3C 0.5
Great Russian Novels
Reading and interpretation of 19th century novels selected from the works of Pushkin, Lermontov, Gogol, Turgenev, and Tolstoy. Lectures on social and intellectual background. Conducted in English. Extra work in Russian required of Russian majors only. Open to all students

Russ 392 W 3C 0.5
Great Russian Novels
Reading and interpretation of 19th and 20th century novels selected from the works of Dostoevsky, Gorky, Pasternak, Solzhenitsyn, and Zamiatin. Lectures on social and intellectual background. Conducted in English. Extra work in Russian required of Russian majors only. Open to all students

Russ 441 East Slavic Epic Tradition
Not offered 1977-78

Russ 442 Russian Epic Tradition
Not offered 1977-78
Russ451 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: Russ352 or equivalent

Russ452 W 3C 0.5
Advanced Conversation, Grammar and Composition
As Russ451.

Russ461 F 3C 0.5
Twentieth Century Russian Literature
Reading, interpretation, and critical analysis of selected fiction and drama (Andreev, Bunin, Gorky, Kataev, Sholokhov, A.N. Tolstoy).
Prereq: Russ102

Russ462 W 3C 0.5
Twentieth Century Russian Literature
Reading, interpretation, and critical analysis of selected fiction and drama (Arbusov, Bulgakov, Erenburg, Nabokov, Pasternak, Solzhenitsyn).
Prereq: Russ461

Russ481 F 3C 0.5
Russian Poetry
A study of themes and forms of representative authors of Classicism, Romanticism (Lomonosov, Derzhavin, Pushkin, Lermontov, Nekrasov, Fet, Tiuchev, etc.).
Prereq: Russ102

Russ482 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: Russ102

Russ485 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.
Prereq: Russ102

Russ486 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.
Prereq: Russ102

Russ496-498 F, W, S 0.5
Reading Courses in Approved Topics
Open to fourth year students only.
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. The instruction is in English.
Open to all university students.

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: Polish 102 or equivalent

Polish 202  W  3C  0.5
Intermediate Polish
As Polish 201
Prereq: Polish 201 or equivalent

Ukrainian

Ukrainian 101  F  3C,1L  0.5
Beginners Ukrainian
For students with no prior knowledge of Ukrainian. The basic elements of Ukrainian grammar and composition with emphasis on oral practice and pronunciation.
Introduction to aspects of Ukrainian culture.
Open to undergraduate students of all departments; recommended to graduate students of Russian as a second Slavic language.

Ukrainian 102  W  3C,1L  0.5
As Ukrainian 101
Prereq: Ukran 101 or equivalent

Ukrainian 151  F  3C,1L  0.5
Ukrainian Grammar and Conversation
For students with some knowledge of spoken Ukrainian but no previous formal training. The main objective is to achieve correct language usage, oral and written. The course emphasizes: grammar, syntax, reading of texts from literature and press, and the cultural background of the Ukrainian language and idiom.
Open to students of all departments

Ukrainian 152  W  3C,1L  0.5
Ukrainian Grammar and Conversation
As Ukrainian 151
Prereq: Ukran 151 or equivalent

Ukrainian 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

Ukrainian 202  W  3C,1L  0.5
Intermediate Ukrainian
As Ukrainian 201.
Prereq: Ukran 201 or permission of instructor

Ukrainian 301  F  3C  0.5
Introduction to Ukrainian Literature
Reading and critical interpretation of texts chosen from the works of Skovoroda, Kotliarovsky, Shevchenko, Franko, L. Ukrainka and others.
Prereq: Ukran 202 or permission of instructor
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 (W. Symonenko,
L. Kostenko, V. Korotych, and others).
Prereq: Ukran 301 or permission of the instructor

Ukran 401 Ukrainian Romanticism
Not offered 1977-78

Ukran 402 Ukrainian Romanticism
Not offered 1977-78
Department of History

Professor, Chairman of the Department—on leave
H. MacKinnon, BA (Montreal), PhL, STL (Gregorian),
MA (Toronto), DPhil (Oxford)

Assistant Professor, Associate Chairman
J. O. Stubbs, BA (Toronto), MScEcon (London),
DPhil (Oxford)

Associate Professor, Acting Chairman
K. R. Davis, BA (Toronto), MA (Wheaton), PhD (Michigan)

Professors
R. W. Beachey, BA (Queen’s), PhD (Edinburgh)
P. G. Cornell, ED, MA, PhD (Toronto)
M. J. Craton, BA (London), MA, PhD (McMaster), FRHistS
P. Keresztes’, MA (Toronto), PhD (Graz)
W. Klaassen, BA (McMaster), DPhil (Oxford) G
D. C. Masters, BA, MA (Toronto), DPhil (Oxford)
(part time)
J. F. H. New, BA, MA (Melbourne), PhD (Toronto),
FRHistS
G. M. Ostrander, BA (Columbia),
MA, PhD (California – Berkeley)

Adjunct Professors (WLU and Guelph)
B. M. Gough, BEd (UBC), MA (Montana), PhD (London)
W. Sanford Reid, PhD (Penn.), FRHistS
A. J. Siirala, ThCand (Helsinki), ThLic (Lund), ThD (Helsinki)
P. Stingelin, BA (Basel), PhD (Zurich)

Associate Professors
D. N. Baker, BA (UBC), AM, PhD (Sanford)
M. T. Cherniavsky, MA (Oxford)
D. A. Davies, BA, PhD (Washington)
Recipient of the Distinguished Teacher Award
K. D. Eagles, BA (Cambridge), MA, PhD (Washington)
F. H. Epp, BA (Bethel College), MA, PhD (Minnesota),
LLD (Brandon) G
P. J. Harrigan, BA (Detroit), AM, PhD (Michigan)
L. A. Johnson², BA (Waterloo), MA, MPhil (Toronto)
R. C. MacGillivray, BA (Queen's), AM, PhD (Harvard)
E. P. Patterson, BA (Baylor), MA, PhD (Washington)
PhD (Washington)

Assistant Professors
J. R. English, BA (Waterloo), AM, PhD (Harvard)
R. W. Guisso, BA (Toronto), DPhil (Oxford)
D. J. Horton, BA (Waterloo Lu.), MA (Waterloo),
PhD (McGill)
S. K. Johannesen, BA (Evangel College),
MA, PhD (Missouri)
K. M. McLaughlin, BA (Waterloo), MA (Dalhousie),
PhD (Toronto) J
W. O. Packull, BA (Guelph), MA (Waterloo),
PhD (Queen’s) R.
J. W. Walker, BA (Toronto), MA (Waterloo),
PhD (Dalhousie)
D. E. Wright, BA (Cambridge), MA, PhD (McMaster)

Faculty member holds cross-appointment as shown
¹ Classics
² Sociology

Bachelor of Arts

a) General Programme
Students majoring in history should consult the General Programme requirements described in Chapter 7. They will normally choose one course from the Introductory and one course from the Level 2 Programme course listed below. In their third year they must also take at least one history course from the Level 3 listings (or History 349, or from the Senior Seminar listings, if permitted by the instructor). Two additional history courses must be chosen from an approved Departmental list. The exact programme for each student will be worked out in consultation with a departmental advisor.

b) Honours Programme
Students taking the Honours programme in History should consult the Honours Programme requirements in Chapter 7. The exact programme for each student will be worked out in consultation with a departmental advisor.
Undergraduate Courses

Note 1
The Department offers two categories of courses, Programme and Non-Programme. The Programme courses are divided into four basic categories to allow for sequential development. The four categories are as follows:

Level 1: Introductory (For General and Programme courses Honours credit)
Level 2: Foundation courses (For General & Honours credit)
Level 3: Specialized courses (For Honours credit)
Level 4: Senior seminars (For Honours credit)

Other, non-programme courses are offered at first and second year levels primarily as a service to other faculties and other disciplines.

Note 2
General students are reminded that they must take at least one 300 Level course or Hist 349—or a Senior Seminar, if granted permission—in order to complete their major. A student cannot take both a Non-Programme and a corresponding Honours course or second year course for credit: e.g., Hist 123 or 223/224, and 265; 227/228 and 266.

Note 3
In Hist 123, 265, 295, 380, 383 and 399, students should use these numbers when registering for the full year. If registering for a half course only, use the alternative numbers: for example, 265A (Fall), 265B (Winter) etc.

Note 4
The G, P, R, J, suffixes indicate administered by one of the Colleges: Conrad Grebel (G), St. Paul’s (P), Renison (R), St. Jerome’s (J).

Note 5
In both undergraduate and graduate courses an instructor may grant a grade of Incomplete for a certain time in special cases, such as illness. If all the required work is not completed in the specific period, a grade is allotted. Unless a major portion of this work has been submitted this grade is normally an F. All incomplete grades are automatically turned into Fs after a lapse of seven months for full undergraduate courses, four months for graduate courses.

1 Non-Programme Courses

These are courses designed especially for students in other faculties and other disciplines in Arts. Only within stated limits can they be used for credit towards a History major (cf. General and Honours programmes, pp 75). No prerequisites. Not normally for Honours History credit.

Hist 105 W .5
The Meaning of Civilization
A survey of western civilization based on lectures, Kenneth Clark’s film series, “Civilization”, and on the reading of selected great books, including works by Marx, Freud and Mill. The focus of discussion will be on the nature, movement and costs of civilization itself.
Instructor: Johannesen

Hist 123 Y 1.0
Major Themes in Canadian History
This course examines the development of social and economic class, race and cultural relations, growth and underdevelopment, imperialism and its consequences, and the evolving Canadian state.
Instructor: Johnson

Hist 123A F .5
Major Themes in Canadian History 1
(Part 1 of Hist 123).

Hist 123B W .5
Major Themes in Canadian History 2
(Part 2 of Hist 123).

Hist 130 F,WS .5
The Modern World in Historical Perspective
This course will introduce students, through the interrelationships and interaction of selected themes, to the contemporary history of Europe, North America, and the Far East. Its format includes two interpretive lectures per week plus major films on twentieth century crises and optional discussion groups.
Instructors: Wynne, Eagles

Hist 201 Expansion of Europe from the 15th to the 18th Century
Not offered 1977-78

Hist 202 Expansion of Europe in the 19th and 20th Centuries
Not offered 1977-78

Hist 204A-204L
Themes of History
History through thematic perspectives.

Hist 204A Aborigines and Empires
Not offered 1977-78
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hist204B</td>
<td>0.5</td>
<td>Empires and Missionaries</td>
<td>A survey of missionaries as an aspect of imperialism since 1500. Native responses to evangelization will be studied. Some comparisons will be made with indigenous response to Christianity in pre-modern times. Instructor: Patterson</td>
</tr>
<tr>
<td>Hist204C</td>
<td>0.5</td>
<td>Canadian Urban History</td>
<td>An historical examination of the urbanization process, the social, political and economic factors that shaped the Canadian city, and the relationship between selected metropolitan and hinterland areas. Instructor: Johnson</td>
</tr>
<tr>
<td>Hist204D</td>
<td>0.5</td>
<td>War and Society in the Twentieth Century</td>
<td>A historical examination of the effects of war on Western European societies in the twentieth century. The effects of war on politics, economics, social structure and the arts will be some of the themes investigated. Instructor: Stubbs</td>
</tr>
<tr>
<td>Hist204E</td>
<td>0.5</td>
<td>The History of Education in Ontario, Part 1</td>
<td>An historical investigation of Ontario's educational system from its origins to the present. The course will emphasize the educational philosophies and practices of leading innovators such as Strachan, Ryerson, and Robarts, and the corresponding changes in structure and curriculum. Instructor: Horton</td>
</tr>
<tr>
<td>Hist204F</td>
<td>0.5</td>
<td>The History of Education in Ontario, Part 2</td>
<td>Not offered in 1977-78</td>
</tr>
<tr>
<td>Hist204G</td>
<td>0.5</td>
<td>The Individual and the Family in History</td>
<td>A survey of the changes in the quality and structure of life with special emphasis on love, marriage and the family in the West since the sixteenth century. Instructor: Johannesen</td>
</tr>
<tr>
<td>Hist204H</td>
<td>0.5</td>
<td>French Canadian Personalities of the Nineteenth and Twentieth Centuries</td>
<td>A biographically oriented study of significant French-Canadian figures—Papineau, Tardivel, Bourassa, St. Laurent, Cardinal Leger, Lesage—emphasizing their contributions to Canadian history. Instructor: Horton</td>
</tr>
<tr>
<td>Hist204I</td>
<td>0.5</td>
<td>Renaissance Italy</td>
<td>A study, against a social and political background, of creative achievements in the age of Machiavelli, Leonardo da Vinci, the Borgias. Instructor: Cherniavsky</td>
</tr>
<tr>
<td>Hist204J</td>
<td>0.5</td>
<td>British History to 1603</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, cultural and social as well as political and institutional development will be examined. Instructor: Cherniavsky</td>
</tr>
<tr>
<td>Hist211</td>
<td>0.5</td>
<td>British History since 1603</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. Instructor: Wright</td>
</tr>
<tr>
<td>Hist214A</td>
<td>0.5</td>
<td>Ireland since 1509: Part 1</td>
<td>Not offered 1977-78</td>
</tr>
<tr>
<td>Hist214B</td>
<td>0.5</td>
<td>Ireland since 1509: Part 2</td>
<td>Not offered 1977-78</td>
</tr>
<tr>
<td>Hist223</td>
<td>0.5</td>
<td>Canadian History to 1667</td>
<td>Not offered 1977-78</td>
</tr>
<tr>
<td>Hist224</td>
<td>0.5</td>
<td>Canadian History since 1667</td>
<td>Not offered 1977-78</td>
</tr>
<tr>
<td>Hist225</td>
<td>1.0</td>
<td>Canadian Culture and Society</td>
<td>This course will take the form of an inquiry into the nature of the Canadian experience. The social, political, and cultural evolution of Canada from New France to the present will be the major areas of discussion. Instructor: McLaughlin Offered at St. Jerome's College</td>
</tr>
<tr>
<td>Hist225A</td>
<td>0.5</td>
<td>Canadian Culture and Society 1</td>
<td>(Part 1 of 225). Offered at St. Jerome's College</td>
</tr>
<tr>
<td>Hist225B</td>
<td>0.5</td>
<td>Canadian Culture and Society 2</td>
<td>(Part 2 of 225). Offered at St. Jerome's College</td>
</tr>
<tr>
<td>Hist227</td>
<td>0.5</td>
<td>The History of Selected Racial and Regional Minorities in North America, Part 2</td>
<td>An examination of the historical dynamics of the Black community in North America, especially Canada. The Black experience in Canada will illustrate the place of &quot;visible minorities&quot; in Canadian society. Instructor: Walker</td>
</tr>
</tbody>
</table>
Course Descriptions

History

Hist 228 F .5
The History of Selected Racial and Regional Minorities in North America, Part 1
An examination of the emergence of minority assertiveness and the position of minorities in modern Canadian society.
Instructor: Patterson

Hist 228G (RS 227G) F 2C,1D .5
History of Christianity 1
The development of Western and Eastern Christianity to the end of the medieval period.
Instructor: Klaassen

Hist 235G (RS 227) F .5
The History of Selected Racial and Regional Minorities in North America, Part 1
An examination of the emergence of minority assertiveness and the position of minorities in modern Canadian society.
Instructor: Patterson

Hist 235G (RS 227G) F 2C,1D .5
History of Christianity 1
The development of Western and Eastern Christianity to the end of the medieval period.
Instructor: Klaassen

Hist 235G (RS 227G) F 2C,1D .5
History of Christianity 1
The development of Western and Eastern Christianity to the end of the medieval period.
Instructor: Klaassen

Hist 236G (RS 228G) W 2C,1D .5
History of Christianity 2
Roman Catholicism, Eastern Orthodoxy and Protestantism from the Reformation to the present.
Instructor: Klaassen

2 Programme Courses

These courses are designed primarily for General and Honours History majors and other students in the Faculty of Arts, but are open also to all students (in some cases, a prerequisite or permission of the instructor is required).

Level 1 Introductory Courses

Hist 101 Y 1.0
Crisis and Change in Western Civilization
Through lectures and small tutorials, this course will examine the major transformations experienced by the western world and introduce students to historical controversy and methodology. It is recommended for future honours history students as well as for students in other areas seeking an overview of the dynamics of Western Civilization.
Instructors: Davis, Davies

Hist 101B W .5
Crisis and Change in Western Civilization, 2
(Second half of 101).

Hist 101R F 3C .5
Major Themes of Western Civilization 1
An introduction to the historical development of European civilization from Graeco-Roman and Judaeo-Christian origins to the emergence of sovereign states.
Instructor: Packull

Hist 102R W 3C .5
Major Themes of Western Civilization 2
An introduction to the historical development of Western history from the Reformation to the present. The course will survey the economic, social and intellectual trends during the period.
Instructor: Packull

Hist 103 F,.5
The Emergence of the Third World
Surveys the history of the social, political and economic changes which have led to the creation of new nations and the resurgence of old nations and peoples in Asia, Africa and the New World.
Instructor: Walker

Hist 104 W .5
The Emergence of the Third World
Surveys the history of the social, political and economic changes which have led to the creation of new nations and the resurgence of old nations and peoples in Asia, Africa and the New World. A continuation of 103.
Instructors: Walker, Craton, Guisso

Hist 120 Y 1.0
An Introduction to Western Intellectual History
A foray into intellectual history, this course will explore seminal visions of the human predicament and its solution advanced by Western thinkers over the past 2,500 years. Designed for students willing to be challenged intellectually, this is a course without lectures, but with continuous reading and discussions in small seminars.
Instructor: New

Hist 125A The Ancient World
Not offered 1977-78

Hist 125B The Medieval World
Not offered 1977-78
Hist 125C | F | .5
---|---|---
**Early Modern Europe**
This course will survey the chief features of early modern European society. Topics will include the Renaissance and Reformation, the expansion of Europe, Old Regime society, the scientific revolution and the Enlightenment.
*Instructors: Smith, Davis*
*Offered at St. Jerome's College*

Hist 125D | W | .5
---|---|---
**Modern Europe**
A survey of selected topics to illustrate the chief features of modern European history. Topics will include the French Revolution, the Industrial Revolution, liberalism, nationalism, and socialism, industrial society and the New Imperialism, the World Wars and their aftermaths.
*Instructors: Smith, Baker*
*Offered at St. Jerome's College*

**Level 2: Foundation Courses**

*3 hours. Lectures and tutorials. These are General and Honours courses and are open to students in other disciplines. No prerequisites.*

Hist 250 | Y | 1.0
---|---|---
**History as an Intellectual Discipline**
The course focuses on three aspects of historical study: the history of history in the Western tradition; philosophical questions raised by the study of history; and the historian's use of social scientific assumptions and methods.
*Highly recommended for all Honours History students.*
*Instructor: New*

Hist 251A, B, C, D
**Special Topics**
Courses to be mounted for one year only.

Hist 251A | Y | 1.0
---|---|---
**Twentieth Century America: Change and Conflict**
This course will consist of an analysis of six or seven key issues in 20th-century American History, drawn in connected fashion from domestic and foreign politics. The emphasis will be on the ideas and the politics of change and conflict in modern America.
*Instructor: Eagles*
*Offered at St. Jerome's College*

Hist 255 | Y | 1.0
---|---|---
**Ancient Civilization**
*Not offered 1977-78*
(Cf. CCiv 251/252 which is an acceptable alternative for History credit; but Hist 255 and CCiv 251/252 may not both be taken for credit.)

Hist 258 | Y | 1.0
---|---|---
**History of Medieval Europe**
The political, cultural, economic and ecclesiastical development of Europe from 300 to 1300.
*Instructor: Wahl*
*Offered at St. Jerome's College*

Hist 260 | Y | 1.0
---|---|---
**Europe in Renaissance and Revolution**
This course will focus on Europe in transition (1300-1600) and emphasize those political, intellectual, social and economic changes most significant to the emergence of modern Europe.
*Instructor: Davis*

Hist 263 | F | .5
---|---|---
**Europe in the Nineteenth Century**
A study of Europe from the French Revolution to approximately 1900 with particular emphasis on the social forces that affected European society and the historical role of institutions in European society.
*Instructor: Wynne*

Hist 264 | W | .5
---|---|---
**Europe in the Twentieth Century**
The course will stress a close examination of those issues both domestic and international, which constitute the distinctive features and trends of twentieth century Europe.
*Instructor: Baker*

Hist 265 | Y | 1.0
---|---|---
**Canadian History**
History 265 is a survey of Canadian history from New France to the present. It is thematic rather than strictly chronological, examining the major social, intellectual and political events in the development of the Canadian nation and the Canadian people.
*Instructors: Cornell, McLaughlin*
*Also offered at St. Jerome's College*

Hist 265A | F | .6
---|---|---
**Canadian History 1**
(The first half of 265)
*Also offered at St. Jerome's College*

Hist 265B | W | .5
---|---|---
**Canadian History 2**
(The second half of 265).
*Also offered at St. Jerome's College*
Course Descriptions

History

Hist266 Y 1.0
The History of Selected Racial and Regional Minorities in North America
An examination of the formative years of the Afro-Canadian, Afro-American and Native Indian communities and of the emergence of minority assertiveness and the position of minorities in modern Canadian society.
Instructors: Walker, Patterson
(This is the Honours section of Hist227/228. Students may not take both Hist227/228 and Hist266 for credit.)

Hist267A F 2C,1D .5
Canadian Minorities 1
A comparative study of minorities, whose development in Canada was conditioned by political conflict, especially in time of war. Included are Doukhobors, Germans, Japanese, Hutterites, Mennonites, Quakers, and Jehovah's Witnesses.
Instructor: Epp

Hist267B W 2C,1D .5
Canadian Minorities 2
A comparative study of immigrant minorities, whose Canadian experience involved cultural conflicts: discrimination in education, distorted imagery in the mass media, linguistic coercion, etc. Groups include: Arabs, Chinese, Italians, Jews, Poles, Portuguese, Ukrainians, etc.
Instructor: Epp

Hist268A F 2C,1D .5
Mennonite History 1 (1525-1920)
Origins and development in Switzerland, Germany, and the Netherlands. Migrations to, and settlements in Prussia, Russia, and North America. Topics include church-state relations, community formation, separation and assimilation, and conflicts in the Great War.
Instructor: Epp

Hist268B W 2C,1D .5
Mennonite History 2 (1920-1975)
The world-wide Mennonite struggle for survival and meaningful identity in such settings as Communist Russia and Nazi Germany. Other topics: migrations to Latin America, assimilation in North America, new communities in Africa and Asia.
Instructor: Epp

Hist269R Y 3C 1.0
History of Modern Revolutions
A comparative study of the French Revolution, the Russian Revolution, the World War I German Revolution, Fascism and Nazism, the Chinese Communist Revolution. Special attention will be given to revolutionary theories and the social changes which accompany revolutions.

Hist277 Y 1.0
British Empire and Commonwealth History
A topical rather than chronological treatment, divided into halves on the broad themes "The British Influence" and "The Colonial Identity". In the first term there will be sections on the institutional framework, imperial biographies and communications; in the second, sections on native peoples, colonial economics and history of the Commonwealth.
Instructor: Craton
Not open to students who have taken Hist213

Hist282 Y 1.0
East Asian History
Chinese history from the Shang dynasty to the Opium War emphasizing the formation of a distinctive value system in the Chou; the creation of a unified and durable polity in the Han, the evolution of Confucianism, Taoism and Buddhism in their social context; the family system, the position of women, science and technology, poetry and the visual arts.
Instructor: Guisso

Hist284 F .5
Latin America, Colonial Period
Study of the transfer of Iberian civilization from the Old World to the New emphasizing social history. Topics will include the destruction of native cultures, forced labour and slavery, colonial institutions, race mixture, 18th-century mercantilism, and the achievement of independence by the colonies.
Instructor: Smith
Offered at St. Jerome's College

Hist285 W .5
Latin America, National Period
The central themes of the course are the persistence of colonialism in the economy, political system and societal makeup, and gradual fragmentation of the region as nationalism and industrialization begin to break down colonial forms. The period covered is independence (ca. 1825) to the present.
Instructor: Smith
Offered at St. Jerome's College
Hist 291 Y 1.0
Colonial and Independent Africa
An African history survey course from ancient times, through the Colonial period, and to the present, with particular attention to the African response to European control and to contemporary issues in independent Africa.
Instructor: Beachey

Hist 295 F, W 1.0
History of the United States
A survey of American society, politics and thought, and of the relations of the United States with the outside world from 1776 to the present.
Instructors: Johannesen, Eagles

Hist 295A F .5
History of the United States, 1776-1865 (Part 1 of 295).

Hist 295B W .5
History of the United States, since 1865 (Part 2 of 295).

Level 3 Specialized courses
3 hours. Lectures and seminars. The following courses are open to all students above the first year level. In every case the prerequisite is an Introductory or Foundation course appropriate to the subject, or the permission of the instructor. These courses grant Honours credit. General students taking these courses will therefore be expected to work at Honours-level standard.

Hist 340 Y 1.0
Roman History to 377 A.D.
A study of Roman history with particular emphasis on the social and constitutional crises of the republic and the legal and governmental institutions of the empire.
Instructor: Wahl

Hist 343G Mystical and Utopian Movements from the 12th to the 17th Century: 1
Not offered in 1977-78

Hist 344G Mystical and Utopian Movements from the 12th to the 17th Century: 2
Not offered in 1977-78

Hist 347G F .5
Radical Reformation 1 (also RS 321)
A study of spokesmen for radical reform of the church, including Andreas Carstadt, Thomas Munzer, Caspar Schwenckfeld, Sebastian Franck and Michael Servetus. Alternates with History 343G
Instructor: Klaassen

Hist 348G W .5
Radical Reformation 2 (also RS 322)
A study of Anabaptism and its place in the history of the Christian church and of the Reformation period.
Alternates with History 344G
Instructor: Klaassen

Hist 349 History as an Avocation
Not offered 1977-78

Hist 351A, B, C, D
Special Subjects
Seminars and lectures in special fields. (See current department brochure for further information).

Hist 351C F .5
The Black Revolution in the 20th Century
The historical development of black revolution in Africa, the United States and Canada, tracing the unique experiences of each, the international dimensions of opposition to white racism and the assertion of black independence and identity.
Instructor: Walker

Hist 351D W .5
Mao Tsetung and the History of the Chinese Revolution
A study in depth of the historical development of the Chinese revolution from the foundation of the C.C.P. in 1921 to the present. Special attention is placed on the role of Mao Tsetung.
Instructor: Guisso

Hist 352 The United States in World Affairs
Not offered 1977-78

Hist 353 Medieval Church History from 312-1449
Not offered 1977-78

Hist 355 F .5
Russian History 1613-1825
The course will focus on selected themes in the development of the Russian state and society from the beginning of Romanov rule to the middle of the nineteenth century.
Instructor: Davies

Hist 356 W .5
Russian History Since 1825
The course will focus on selected themes in Russia's development in the nineteenth and twentieth centuries, including the Soviet Period.
Instructor: Davies
Hist 357 F .5
German History 1648-1890
From the Great Elector to William II—The growth of Prussia from scattered domains to the dominating element of a modern nation state.
Instructor: Wynne

Hist 358 W .5
German History 1890-1950
The German Odyssey from the splendour of William II to the defeat of Hitler and the creation of two Germanies.
Instructor: Wynne

Hist 359 France in Revolution 1780-1870
Not offered 1977-78

Hist 360 W .5
French History Since 1870
A study of France from 1870 to the present with particular emphasis on the political and intellectual forces that affected French society.
Instructor: Baker

Hist 361 Y 1.0
English History 1485-1680
A study of achievements and crises in the Tudor and early Stuart periods.
Instructor: New

Hist 362 Y 1.0
British History Since 1760
A study of society, politics and thought in the world’s first industrialized state.
Instructor: Wright
Offered at St. Jerome’s College

Hist 363 Y 1.0
Medieval English History
A study of government, church and society
Instructor: Cherniavsky

Hist 364R F 3C .5
The Enlightenment, 1: Europe in Ferment
An examination of the 17th century background for the enlightenment era, especially the economic, political, social, and intellectual ferment of the period. The study will focus on continental Europe.

Hist 365R W 3C .5
The Enlightenment, 2: Europe in the 18th Century
This term will focus on the Enlightenment itself, its religious and political implications, and the practice of Enlightened Despotism in France, Prussia, Austria, and Russia.

Hist 366 European Intellectual History
Not offered 1977-78

Hist 368 Y 1.0
International History Since 1870
A study of the international relations of the European states from the Franco Prussian War to the Cold War. Particular emphasis will be placed on an examination of the origins and consequences of the two World Wars.
Instructor: Stubbs

Hist 370 Y 1.0
West Indian History
A study of the circum-Caribbean region from aboriginal times including European imperialism, the history of plantations, slavery and slave society, independence movements, and the problems posed by modernisation, underdevelopment and neo-colonialism.
Instructor: Craton

Hist 372 Y 1.0
East African History
The historical development of East Africa from its partition among the European powers to the present, emphasizing the slave trade, colonial administration, nationalism and current problems in Uganda, Kenya, Tanzania and Zanzibar.
Instructor: Beachey

Hist 374G F .5
The Middle East Conflict
A survey of regional, religious and imperial rivalries from ancient to modern times, with emphasis on the 20th century and the Arab-Israeli conflict.
Instructor: Epp.

Hist 375 History of China
Not offered 1977-78

Hist 380 Canada 1867-1967
Not offered 1977-78

Hist 380A Canada, 1867-1914
Part 1 of 380.
Not offered 1977-78

Hist 380B Canada Since 1914
Part 2 of 380.
Not offered 1977-78

Hist 381 Studies in the History of Canadian Regionalism
Not offered 1977-78

Hist 381A Studies in the History of Canadian Regionalism, 1 (before 1867)
Part 1 of 381.
Not offered 1977-78
Hist 381B Studies in the History of Canadian Regionalism, 2 (since 1867)  
(Part 2 of 381).  
Not offered in 1977-78

Hist 382 Canadian Intellectual History  
Not offered 1977-78

Hist 383 Y 1.0  
History of French Canada  
The course will emphasize social and economic issues in the development of French Canada and the emergence of modern Quebec.  
Instructor: Horton

Hist 383A F .5  
History of French Canada to 1867  
The course will emphasize social and economic issues in the development of French Canada to Confederation.  
(The first half of 383, for students taking only the Fall term.)

Hist 383B W .5  
History of French Canada Since 1867  
The course will treat the emergence of modern Quebec, with special emphasis on social and economic issues.  
(The second half of 383, for students taking only the Winter term.)

Hist 386 F .5  
Ontario History to Confederation  
The course will examine the growth of Ontario from a pioneer settlement, with particular emphasis on economic, social, political and cultural aspects of change. An emphasis will be placed on the sources and method of local historical research.  
Instructor: Johnson

Hist 387 W .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 be placed on the sources and methods of local historical research.  
Instructor: Johnson

Hist 388 Y 1.0  
History of Canadian American Relations  
An examination of the history of relations between the two countries. Topics of a political, economic, social, and cultural nature will be studied.  
Instructor: English

Hist 389 Canada in World Affairs: The Twentieth Century  
Not offered 1977-78

Hist 390 Y 1.0  
History of North American Indians  
An examination of the main themes in the history of the Indians of Canada since 1600. Some attention will also be given to the Indians of the United States comparing their history with that of the Canadian Indians.  
Instructor: Patterson

Hist 391 Migrations to Canada and the United States since 1815  
Not offered 1977-78

Hist 392 Y 1.0  
The Foundations of American Civilization  
An historical-critical investigation of Puritanism and the Evangelical tradition; problems in economic and social change; and in literary and material culture.  
Instructor: Johannisens

Hist 394 Twentieth Century Latin America  
Not offered 1977-78

Hist 395 Y 1.0  
Law in the Ancient World  
An historical survey of the laws of the Ancient Near East, Greece and Rome. This course will attempt to give the student an appreciation of law through a study of its early history, and to examine the ancient world from a distinctive point of view.  
Alternates with Hist 397
Instructor: Wahl  
Offered at St. Jerome's College

Hist 397 The Origins of the Common Law  
Not offered 1977-78

Hist 399 Y 1.0  
Directed Studies in Special Topics  
Study in a limited field under tutorial guidance. A high standard of written work will be expected.  
Also offered at St. Jerome's College

Hist 399A F .5  
Directed Studies in Special Topics  
Study in a limited field under tutorial guidance. A high standard of written work will be expected.  
Also offered at St. Jerome's College

Hist 399B W .5  
Directed Studies in Special Topics  
Study in a limited field under tutorial guidance. A high standard of written work will be expected.  
Also offered at St. Jerome's College.
Level 4: Senior Seminars

3 hours. Seminars and consultations. These seminars are designed for fourth year students who have taken relevant Level 2 or Level 3 courses, their equivalent elsewhere, or related courses in other disciplines. In all cases the instructor's permission is required.

The following seminars will not be offered in 1977-78: Hist 401, Hist 410, Hist 411, Hist 413, Hist 414, Hist 423, Hist 426, Hist 427, Hist 450.

Hist 400 Roman History: Keresztes
Hist 401 Medieval History; MacKinnon
Hist 405 The Intellectual History of the Renaissance and Reformation; Davis
Hist 410 Early Modern English History; New
Hist 411 English History from the 17th to the 19th Century; MacGillivray
Hist 412 19th and 20th Century British History: Wright
Hist 413 Modern French History; Harrigan
Hist 414 Modern European Intellectual History; Barr, Harrigan
Hist 415 Modern German History; Wynne
Hist 418 Russian History since 1861: Davies
Hist 420 Canada in the 19th Century: McLaughlin

Offered at St. Jerome's College

Hist 421 Ontario History; Cornell
Hist 423 Modern Quebec; Horton
Hist 425 20th Century Canadian History; English
Hist 426 Colonial American History; Johannesen
Hist 427 19th Century United States History; Ostrander
Hist 428 Modern American History; Eagles
Hist 429 Modern Latin American History; Smith

Offered at St. Jerome's College

Hist 430 British Imperial and Colonial History; Craton
Hist 432 African History; Beachey
Hist 435 The History of Native Response to Colonial Rule; Patterson
Hist 436 Black History in North America; Walker
Hist 440 Far East; Guisso
Hist 450 Marxism and Canadian History; Johnson
Hist 453 20th Century International History; Stubbs

Other Senior Courses†

These courses are limited to senior Honours students

Hist 465 Y 1.0
The History and Theory of Historical Writing
3 hours. Lectures and seminars. (For Make-up year students only)

Hist 491 Y 1.0
Directed Studies in Special Topics
Senior students only
Also offered at St. Jerome's College
†Not counted as Senior Seminars
Human Relations and Counselling Studies

Undergraduate Course Descriptions

Information concerning which of the following courses will be offered during the 1977-78 academic year may be obtained from the Faculty of Arts' Undergraduate Office.

HRCS 100 3C .5
Human Relations in Contemporary Life
An exploratory introduction to the field of human relations with emphasis upon contemporary life and conditions. A survey of principles of human relations as they relate to such contemporary topics as family life, human potential and development, the meaning of work, education, technology, and social change.

HRCS 120 3C .5
Concepts of the Person and Human Nature
Models and conceptions of the nature of man. A study of approaches to understanding human nature in its social context.

HRCS 201 3C .5
Counselling Process and Personal Facilitation
An introduction to theory, method, and resource development in personal counselling.

HRCS 202 3C .5
Counselling Process and Personal Facilitation 2
A continuation of 201
Prereq: HRCS 201

HRCS 220 3C .5
Small Group Processes
Study of intensive group experience, process patterns and effects – with special reference to groups intended to facilitate personal and relational learning. Class sections will be small to permit direct learning from experience and observation as well as from discussion, research and writing in the field.
Prereq: Consent of instructor

HRCS 230 3C .5
Human Relations Counselling and Organizational Processes
Organizations as systems of human relations. Case-studies, for example, industrial, educational, and human service organizations, with comparison of differing systems. Human relations analysis of organizations and the concept of intrinsically beneficial systems. Counsellors and change-agents as organizational “helpers.”
Prereq: Psych 253, or consent of instructor

HRCS 252 3C .5
Models of Human Community
Prereq: Consent of Instructor

HRCS 373 3C .5
The Politics of Modern Humanism
A broad attempt to delineate and understand the origins of contemporary humanism with special emphasis on the institutions and philosophy of humanism in Canada. By way of an examination of the humanistic perspective, readings will be selected from among the following: Freud, Fromm, Maslow and Szasz.

HRCS 282 3C 5
The Personal Dimensions of Inequality
An in-depth interdisciplinary analysis of the personal dimensions and consequences of social systems and relations which create, maintain and exacerbate inequalities that hinder and cripple existential growth and human development.

HRCS 300 3C .5
Psychohistory and Personal Identity
An examination of how the creation of personal meaning and identity is affected by authoritarianism and movements for social liberation. Exploration of the personal impact of encounters with authoritarian systems and libertarian movements. Readings from some of the following: Bettelheim, Coles, Erikson, Fanon, Keniston, Lifton, Marcuse, Reich, and Vallieres.
Prereq: Consent of instructor

HRCS 320 3C .5
The Self-Analysis Group
The primary focus will be on understanding covert processes which operate in groups and which may facilitate or hinder functioning of innovative change and development. The course is designed to provide the participants with opportunities to experience directly and to analyze the effects of authority upon themselves and others.
Prereq: HRCS 201 and consent of instructor
HRCS328  3C  .5
Self Change
A study of such methods of self change as: meditation, contemplation, relaxation, self-analysis, dream work, behavioral self control, and bio-feedback. A survey of theories of self change in personal counselling, and the interaction between self change and social change.  
Prereq: HRCS 120, 201 or consent of instructor

HRCS355  3C  .5
Experiential Foundations of Counselling Studies
An examination of the work of Gendlin, Perls, Binswanger, May, Rogers, Boss, Whitaker and other contributors to experiential foundations of counselling. Dyadic and group counselling theory and practice from such experiential approaches as Gestalt, existentialism, and Daseins-analysis.  
Prereq: HRCS 120, 201 or consent of instructor
Department of Kinesiology

Professor, Chairman of Department
N. J. Ashton, BSc (McGill), MS (Michigan)

Professor, Dean of the Faculty of Human Kinetics and Leisure Studies
G. S. Kenyon¹, BPE (UBC), MS (Indiana), PhD (NYU)

Assistant Professor, Associate Dean of Undergraduate Affairs of the Faculty of Human Kinetics and Leisure Studies
W. N. Widmeyer, BA (Western Ontario), BPE (McMaster), MA (California), PhD (Illinois)

Assistant Professor, Associate Dean of Graduate Affairs of the Faculty of Human Kinetics and Leisure Studies
B. D. McPherson¹, BA, MA (Western Ontario), PhD (Wisconsin)

Assistant Professor, Associate Chairman Undergraduate Affairs
H. J. Bishop, BSc, BPE (Waterloo), MSc (Western Illinois), PhD (Minnesota)

Assistant Professor, Associate Chairman Graduate Affairs
K. C. Hayes, Dip, PE (St. Lukes College), MSc, PhD (Massachusetts)

Professors
J. Loy, BS (Lewis & Clark College), MA (Iowa), PhD (Wisconsin)
D. A. Winter, BSc, MSc (Queen’s), PhD (Dalhousie)

Associate Professors
J. A. Best BA (Queen’s), PhD (Waterloo)
H. J. Green, BA, BPHE (Queen’s), MA (Alberta), PhD (Wisconsin)
D. Hayes, BSc, BPE, MSc, DPE (Springfield)
M. E. Houston, BSc (Toronto), PhD (Waterloo)
R. G. Marteniuk², BPE, MA (Alberta), EdD (Berkley)
D. A. Ranney, BA (Toronto), MD (Toronto), FRCS (England)

Assistant Professors
F. Allard⁴, BA, BPE, PhD (Waterloo)
D. Gill, BS (Suny Courtland), MS, PhD (Illinois)
H. W. Gruchow, BSc, MSc, PhD (Wisconsin)
R. Love, BA, MA, PhD (Houston)
R. W. Norman, BA, BPE (McMaster), MSc (Alberta), PhD (Penn State)
C. H. Pierce, BA (Grinnell), MA (Depauw), PhD (Kansas)
E. Roy, BSc (Waterloo), MPE (UBC), PhD (Waterloo)
R. P. Schlegel, BA (Western Ontario), MSc (Illinois), PhD (Ohio State)
M. T. Sharratt, BA, MA (Western Ontario), PhD (Wisconsin)
W. E. Sime, BSc, MSc (George Williams), PhD (Pittsburgh)
J. A. Thomson, BA, MSc (McMaster), PhD (Waterloo)
I. D. Williams, MS, PhD (Illinois)

Lecturers
R. Graham⁴, BA, MA (Western Ontario)
R. Hughson, BSc (Western Ont), MSc (British Columbia)
(Part Time)
N. Theberge¹, BA (Massachusetts), MA (Boston)

Adjunct Associate Professors
E. English, MBA (UCLA), MD (Toronto), FRCS (Canada)
J. A. Israel, MD (Toronto), FRCS (Canada)

Adjunct Assistant Professor
D. Rainham, MD, BB, BCh (Wales)

Faculty member holds cross appointments as shown
¹ Sociology
² Psychology
³ Systems Design
⁴ Psychology
⁵ Recreation
Undergraduate Course Descriptions

Courses in Kinesiology and Health Studies are offered within the Department of Kinesiology. Descriptions of courses in Health Studies follow those for Kinesiology. For details of both programmes see Chapter 10.

Kinesiology

Kin 102 F 3C,1T .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 W 3C,1T .5
Psycho-Social Basis of Kinesiology
An introduction to the study of human physical activity from psychological, sociological, anthropological and historical perspectives.

Kin 116 W 3L .5
General and Organic Chemistry
An introduction to fundamentals in general and organic chemistry.

Kin 171 History of Sport and Physical Activity
Not offered 1977-78

Kin 200 F 3C,2L .5
Human Anatomy
A study of the human anatomical systems and their integration. Particular emphasis is placed on the skeletal, articular and muscular systems.
Prereq: Kin students or permission of instructor
Kin 200D is for Dance students only

Kin 205 W 3C,3L .5
Physiology of Exercise
An examination of the transient and persistent effects of exercise on physiological functions. Topics include muscular and cardio-respiratory function and the effects of varying environments upon their performance.
Prereq: Honours Dance students only

Kin 222 F 3C,2L .5
Statistical Techniques Applied to Kinesiology
An introduction to descriptive and inferential statistics and the interpretation of data. A major consideration of the course is the use of statistics in the solution of problems in Kinesiology.
Prereq: Kin students only

Kin 280 W,S 3C .5
Administration
A study of the principles underlying general administrative behaviour with an emphasis upon understanding the role and mechanics of decision making. Case study analysis and practical project work are utilized to foster the development of the student's administrative technique.

Kin 300 F 3C,2L .5
Physiology of Physical Activity (Part 1)
A study of the effects of physical activity on the muscular, circulatory and respiratory systems and the mechanisms through which the body adapts to activity and environment.
Prereq: Biol 303, 304

Kin 317 F 3C .5
Human Biochemistry
An elementary course in human biochemistry including the metabolism and function of proteins, carbohydrates, lipids, and hormones. Emphasis is placed on the application of biochemical principles to human movement.
Prereq: Kin 116 or equivalent

Kin 321 W,S 3C,2L .5
Introduction to the Biochemistry of Human Movement
Anatomical, neural and mechanical considerations in the qualitative and quantitative analysis of human movement are examined. Concepts related to the biostatics and biodynamics of linked segment models of human motion are introduced.
Prereq: Phys 103, Kin 200 and 222

Kin 330 F,S 3C .5
Research Design
An introduction to the basic principles of scientific inquiry in Kinesiology. A systematic treatment of the logic and practice of methods and techniques employed in research related to physical activity with an examination of design, sampling, data gathering and analysis.
Prereq: Kinesiology students only

Kin 335 W,S 3C,2L .5
Evaluation of Human Motor Performance
The nature and methodology of assessment is reviewed from theoretical and empirical perspectives. Taxonomies of motor performance are examined and principles developed for the measurement of specific construction in field and laboratory situations.
Prereq: Kin 222
Kin340  F,W  3C,2L  .5
An Introduction to Sports Medicine
An introductory course to the area of sports medicine, including the prevention, care and rehabilitation of common sports injuries. Considerable attention is directed towards the mechanisms of traumatic injuries as well as the management in the acute, intermediate and advanced stages of injury care.
Prereq: Kin 200, 3rd and 4th year students only

Kin341  W  3C,2L  .5
Selected Topics in Sports Medicine
A course for those students wishing additional study in the area of athletic medicine. Topics to be presented include trauma to the head and vertebral column, internal injuries, heat problems and the medical and non-medical use of drugs in sport.
Prereq: Kin 340, 300, 317

Kin346  W  3C  .5
Nutrition (Health Studies 346)
An elementary course in nutrition with special emphasis on diet for sport and certain physiological conditions.
Prereq: Kin 317 or equivalent

Kin352  F  3C  .5
Aging, the Aged and Leisure: A Sociological and Social Psychological Perspective (Sociology 373)
Employing a sociological and psychological frame of reference, the process and problems of aging are analyzed. Special emphasis is given to the problem of leisure time in the later years of life.
Prereq: Soc 101 and one other Soc course
Offered every year

Kin353  F  3C  .5
Personality and Motivation in Physical Activity
(formerly 451)
An application of major psychological theories to the central problems of sport and physical activity. Current research in the area is examined. Major emphasis is placed upon gaining an insight into those psychological factors influencing performance and behaviour of the sport participant.
Prereq: Psych 101 and one other Psych course

Kin354  W,S  3C  .5
Group Processes in Physical Activity
(formerly Kin 455)
An examination of the social influences and group processes which occur within sport teams. Topics include conformity, the influence of onlookers and co-actors, leadership, group structure, and cohesion.
Prereq: 2 term courses in Psych, or consent of instructor

Kin355  W  3C,2L  .5
Motor Learning
An introduction to the concepts and theories of learning motor skills. Laboratory sessions enable the student to participate in a variety of commonly used experimental procedures which relate to concepts and theories presented in lectures.
Prereq: Kin 222

Kin356  W,S  2C,1T  .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 355 or instructor’s consent

Kin401  W,S  3C,2L  .5
Physiology of Physical Activity (Part 2)
A study of the metabolic and environmental aspects of exercise, fatigue, training, and physical fitness. Work capacity in relation to age and sex is examined.
Prereq: Kin 300 and 317

Kin402  F,S  3C  .5
Hydrostatic, 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

Kin405  W  3C,2L  .5
Applied Kinesiology
Principles of physiology and movement analysis as they apply to the development of maximal human motor performance are examined. Consideration is given to the effects of environmental, psychological and social factors on such development.
Prereq: Kin 300 and 321

Kin410  F,S  3C  .5
Growth, Development and Aging
(Health Studies 410)
The changing capacities and interest of man are studied as he grows and develops. The contribution of physical activity to growth, and physical, psychological development is examined.
Prereq: Kin 200 and Biol 203
Kin 420 F 3C .5
Kinesiological Considerations in Equipment Evaluation
The principles of evaluation and design of equipment for human use are studied from a kinesiological perspective.
Prereq: Kin 321 and 340

Kin 422 W 3C .5
Administration of Facilities
A study of the problems involved in the planning and maintenance of various athletic plants used by schools and recreation agencies and the selection and care of the equipment and supplies used with these facilities.

Kin 425 F 3C,2L .5
Biomechanics of Human Movement
The quantitative analysis of human movement from a biomechanical perspective, including some neural control processes. Static, kinematic and kinetic analyses of single and multi-segment models of a variety of human movement forms are conducted.
Prereq: Kin 321

Kin 426 W 3C,2L .5
Biophysical Signal Processing and Control Systems
Basic electricity and electronics for the student with a biophysical background. Application of signal processing techniques to biophysical signals encountered by kinesiology students. Modelling of biophysical systems, control systems associated with human movement and performance.
Prereq: Kin 321, Kin 300, Kin 355 or permission of instructor

Kin 431/432 F,W,S .5 each
Research Project
An independent research project on an approved topic, supervised by a faculty member. Required of all students enrolled in Honours and General programmes in Kinesiology.
Kin 431 includes an approved design and the completion of the first segment of the paper.
Prereq: Depending upon the topic selected, the student is required to achieve at least 60% in appropriate courses. Details are available in the Departmental office.
Kin 432 includes the completion of the project begun in Kin 431.
Prereq: Kin 431

Kin 442 W 2C,2L .5
Adapted Physical Activities
The study of individual problems and their implications for the Kinesiologist. Body mechanic problems orthopaedic disabilities, neurological disabilities, heart disturbances and respiratory problems are discussed in depth.
Prereq: Kin 300

Kin 452 W, S 3C .5
Sport in Society (Recreation 303 Sociology 374)
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 Soc course

Kin 453 W 1C,2S .5
The Psychology of Sport and Physical Activity
This course focuses on the effects of participating in physical activity programmes upon the socio-psychological adjustment of the individual. Emphasis is given to the uniqueness of the individual personality and how a person reacts to different situations.
Prereq: Kin 353

Kin 456 W 3C .5
Cognitive Dysfunction and Motor Skill
An examination of issues related to understanding of the cerebral organization of motor skill. Discussion of how certain movement disorders are a reflection of disturbances at different stages in the sequence of information processing.
Prereq: One of Psych 206, 207 or Kin 356
Cross-listed as Psych 307

Kin 470 W,S 3C .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 Kinesiology students

Kin 472 F,W,S .5
Directed Study in Special Topics
For the student who desires to pursue a particular topic in depth through guided independent research and/or reading. A faculty member must approve a student's project prior to registration. May be repeated in subsequent terms.
Prereq: Consent of department

Kin 480 F,W,S .5
Coaching Foundations
A study of basic principles and philosophies of coaching today. Emphasis is placed upon the application of kinesiological principles of performance as well as social, organizational and resource problems pertinent to each of several sport sections.
The specific sections offered are: Kin 481T - Volleyball, Kin 482T - Basketball, Kin 483T - Gymnastics, Kin 484T - Racquets, Kin 485T - Football, Kin 486T - Ice Hockey, Kin 487T - Field Hockey, Kin 488T - Aquatics, Kin 489T - Track and Field. Students must complete a minimum of three (3) sport sections before credit is given.
Prereq: Third or fourth year Kin students

Courses not offered in 1977-78
Kin 171 History of Sport and Physical Activity
Physical Activities Courses

All physical activity courses are elective and non-credit and available only to students enrolled in Kinesiology. Students should consult with a faculty advisor concerning the applicability of these courses for entry into careers such as teaching. The following activity courses are offered if there are sufficient requests:

- Kin 180  Elem. Basketball, W,S
- Kin 183  Elem. Gymnastics, F,W
- Kin 187  Beginner Swimming, F
- Kin 188  Elem. Aquatics, F,W
- Kin 281  Elem. Volleyball, F
- Kin 282  Elem. Lacrosse, W
- Kin 283  Int. Gymnastics (M),W
- Kin 284  Int. Gymnastics (W),W
- Kin 285  Elem. Football, F,S
- Kin 286  Elem. Badminton, W
- Kin 287  Elem. Soccer, F
  (even years)
- Kin 288  Elem. Wrestling, W
- Kin 289  Elem. Rugby, F
  (even years)
- Kin 381  Elem. Tennis, F,S
- Kin 382  Elem. Squash, W,F
- Kin 383  Elem. Golf, F,S
- Kin 384  Elem. Handball/Paddleball, W
- Kin 385  Elem. Field Hockey, F,S
- Kin 386  Elem. Ice Hockey, W
- Kin 387  Elem. Curling, W
- Kin 388  Int. Aquatics, W
- Kin 389  Elem. Track & Field, F,S
- Kin 389A Outdoor Skills Camp, F
- Kin 481  Adv. Volleyball, W
- Kin 482  Adv. Basketball, F,S
- Kin 483  Adv. Gymnastics, W
- Kin 484  Adv. Racquets, W
- Kin 485  Adv. Football, W,S
- Kin 486  Adv. Ice Hockey, W
- Kin 487  Adv. Field Hockey, F,S
- Kin 488  Adv. Aquatics, W
- Kin 489  Adv. Track & Field, F,S
- Kin 489A Ski School, W

Health Studies

- Health 140  F  3C,1T  .5
  Foundations of Health Studies 1
  A survey course directed towards the health of man—conception through youth. Topics include conception (prediction, control, genetic), early growth and development, puberty and adolescence, fitness, nutrition, consumer behaviour, and lifestyle determination.
  Health Studies students enroll in Health 141a (same as Health 141 but includes 1 hr. tutorial)

- Health 141  W  3C,1T  .5
  Foundations of Health Studies 2
  A survey course directed towards the health of man—middle age through death. Topics include family planning, cancer, cardiovascular and systemic diseases, transplants, accidents, fitness, aging and death.
  Health Studies students enroll in Health 141a (same as Health 141 but includes 1 hr. tutorial)

- Health 240  F  3C  .5
  Man Adapting
  A study of human biological variation in relation to various physical, biological, and social environmental influences, with emphasis on the relevance of these factors to health and disease.

- Health 241  W  3C  .5
  Epidemiology
  An introduction to the study of factors governing the occurrence of diseases in human populations, using selected diseases to illustrate methods of transmission and identification of risk factors.

- Health 302  F  2C  .5
  An Introduction to Biomathematics (Mathematics 302)
  Course material has been selected with particular reference to some of the fundamentals of medical science including macromolecular processes, environmental health, genetics and genetic engineering, aging processes and theories and quantitative models which describe events in these areas. Topics include types of distributions, data processing and simple differential equations as they relate to biological phenomena.
  Prereq: Kin 116 or first year Chemistry or consent of instructor

- Health 303  W  2C  .5
  An Introduction to Biomathematics (Mathematics 302)
  A continuation of Health 302
  Prereq: Health 302
Helth 345  W, S  3C  .5
Community Health
A course designed to help students investigate the concept and functioning of community health.
Prereq: Helth 140, 141, or consent of instructor

Helth 346  W, S  3C  .5
Nutrition
An elementary course in nutrition with special emphasis on diet for sport and certain physiological conditions.
Prereq: Kin 317 or equivalent

Helth 348  W, S  3C  .5
Social Psychology of Health Behavior
The study and application of basic social psychological processes in relation to selected health-related behaviors (e.g., family planning, overeating, smoking, non-medical drug use, cardiovascular risk factors, patient compliance, medical care utilization).
Prereq: Helth 140, 141

Helth 349  F, S  3C  .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 the treatment of socially significant behaviours including health behavior problems.
Prereq: Helth 140, Psych 101 or consent of instructor

Helth 410  F, S  3C  .5
Growth, Development and Aging (Kin 410)
The changing capacities and interests of man are studied as he grows and develops. The contribution of physical activity to growth, and physical, psychological and sociological development is examined.
Prereq: Helth 200 and Biol 203

Helth 431  F, W, S  .5
Research Project
An independent research project on an approved topic, supervised by a faculty member. Includes an approved design and completion of the first three chapters of the paper.
Prereq: Approval of supervisor

Helth 432  F, W, S  .5
Research Project
An independent research project on an approved topic, supervised by a faculty member. Includes data collection, data analysis and presentation of results of thesis form.
Prereq: Completion of Helth 431

Helth 440  F  3C  .5
Marriage and Family
An exploration of societal and psychological phenomena related to human sexuality, marriage and family through the study of sex-role socialization, family structure, mate selection, marital roles, marital conflict and its resolution, family planning and alternatives to marriage and family.
Prereq: Soc 101 and Psych 101 or consent of instructor

Helth 442  W  3C  .5
Epidemiology of Chronic Diseases
An investigation of the epidemiology of selected "non-infectious" diseases. Specific disease emphasized will vary from year to year (e.g., cardiovascular diseases, malignant neoplasms at various sites; chronic diseases of respiratory and digestive systems). The course emphasizes identification of risk factors and methodology.
Prereq: A grade of "B" in Helth 241 or consent of instructor

Helth 445  W  3C  .5
Seminar in Health Behaviour
A study of current issues pertaining to health and health behaviour. Topics include pertinent research in the field of health which have significant values to the individual, family and community, as well as a study of the problem areas in health behaviour.
Prereq: Helth 348, 349

Helth 472  F, W, S  .5
Independent Study
For the student who desires to pursue a particular topic in depth through guided independent research and/or reading. A faculty member must approve a student's project prior to registration. May be repeated in subsequent terms.
Prereq: Consult with Department
Department of Management Sciences

Professor, Chairman of the Department
S. D. Saleh, BA (Cairo), MA, PhD (Case Western Reserve).

Professor, Associate Chairman and Graduate Officer
S. S. Sengupta, MA, DPhil (Calcutta)

Professors
D. J. Clough, BASc, MBA (Toronto), PEng
D. W. Conrath, BA (Stanford), MS (Carnegie Tech.), MA, PhD (U.C., Berkeley)
R. F. Love, BASc (Toronto), MBA (Western Ontario), PhD (U.C., Berkeley) (Visiting)
E. A. Silver, BEng (McGill), ScD (M.I.T.), PEng
P. M. Reilly¹, BASc (Toronto), DIC PhD (London), FSS, PEng

Associate Professors
I. Bernhardt, BA (N.Y.U.), PhD (U.C., Berkeley)
F. E. Burke, BA (London), PEng
M. J. Magazine, BS (CCNY), MS (NYU), MEng, PhD (Florida)
J. B. Moore, BASc (Toronto), MMath, PhD (Waterloo)

Assistant Professors
J. T. Janz, BA (Winnipeg), PhD (Minnesota)
B. S. Jung, BS (Seoul), MAsc (Waterloo), MBA, PhD (Toronto)
R. G. Vickson, BSc (UBC), PhD (MIT)

Adjunct Professor
M. Saltsman, MP

Faculty Members holding cross appointments as shown.
¹ Department of Chemical Engineering

Undergraduate Course Descriptions

MSci21  F,W  3C .5
Applied Probability and Statistics

MSci23  F,W,S  2C,1T .5
Engineering and Managerial Economics
Economics of the firm with emphasis on managerial decisions. Price and output decisions. Choosing among alternative production processes and input combinations. Evaluating make-or-buy decisions, equipment service life, and new products. Analytical tools include marginal analysis, linear programming, and capital budgeting techniques.

MSci31  F,W  2C,1T .5
Industrial Statistics and Design of Experiments
Prereq: MSci21 or equivalent

MSci43  F,W  2C,1T .5
Economics of Enterprise and Benefit Cost Analysis
Applications of models of household and enterprise behaviour. Seller strategy in consumer and industrial markets. Valuation of nonmarket goods. Examples include use of buyer behaviour data to determine market segments and evaluation of a public investment.
Prereq: MSci23 or equivalent

MSci44  F,S  3C .5
Industrial Psychology

MSci46  F,W,S  2C,1T .5
Optimization Models for Policy Analysis
MSci 47  F,W,S  2C,1T  .5
Stochastic Models of Industrial Operations
Classification of stochastic processes. Recurrent events including birth and death processes, and branching processes. Waiting line models and applications. Markov processes and decision problems. Applications include inventory control, reliability, equipment replacement, maintenance, design of service facilities, etc.
Prereq: MSci 21, or equivalent, and MSci 46

MSci 53  F,W  3C  .5
Decision Theory and Organization
Group interactions and the problems of industrial macro-organizations. Discussion of organizational decision-making and control process, with particular emphasis on the relevant theories of structural relations of organizations.

MSci 404  F,S  3C  .5
Organizational Behaviour
Presents a systematic approach to the study of human behaviour in organizations. It synthesizes different concepts and findings from the behavioural sciences and shows their applications to business.

MSci 406  F,W,S  2C,1T  .5
Managerial Economics
Designed to give an appreciation of the usefulness of basic concepts from economics in managerial decision making. Topics include costs (as foregone opportunities and in accounting terms), production as a process in time relating costs to benefits.

MSci 406  F,W,S  2C,1T  .5
Managerial Decision Making 1

MSci 407  F,W,S  2C,1T  .5
Managerial Decision Making 2
Prereq: MSci 406, or equivalent
Department of Man-Environment Studies

Associate Professor, Chairman
G. B. Priddle¹, BA (Western), MA, PhD (Clark)

Assistant Professor, Undergraduate Officer
G. O. Michalenko, BA, PhD (Saskatchewan)

Professor
G. R. Francis, BA (Toronto), BA (McGill), MA (UBC), PhD (Michigan)

Associate Professors
E. J. Farkas, BSE (Princeton), ScD (M.I.T.)
D. W. Fischer, BS (Trinity), MS (Michigan State), PhD (Colorado State)
R. F. Keith, BSA (Guelph), MA, PhD (Michigan State)
A. T. O'Brien, BS (Marymount), PhD (Fordham)

Assistant Professors
C. E. De'Atth², BA (Auckland), ASOPA Cert (Sydney), MED, PhD (Pittsburgh)
S. K. Gupta, BSc, MSc (Punjab), MA, PhD (Toronto)
S. C. Lerner, BA (Ohio State), MA (Columbia)
A. V. Morgan³, BA (Leicester), MA (Calgary), PhD (Waterloo)
T. Mcl. Semple, BA (Western Ontario), MA, PhD (Waterloo)
D. L. Wahlsten⁴, BA (Alma College), PhD (California, Irvine)

Lecturers
J. E. Robinson, BSc (Waterloo) (part time)
C. S. Farkas, BSc (Delaware), MED (Tufts Univ.)

Instructor
J. C. Boyer, BES, MA (Waterloo)

Faculty members holding cross/and/or joint appointment(s) as shown
1 Geography, Planning and School of Landscape Architecture, Univ. of Guelph
2 Man-Environment Studies and Anthropology
3 Man-Environment Studies and Earth Sciences
4 Psychology and Man-Environment Studies

Undergraduate Course Descriptions

EnvSt111 Introduction to the Study of The Future
See Environmental Studies course descriptions, page 294.

M Env120 Y 3C 1.0
Environmental Issues and the Natural Sciences
Survey and analyses of selected environmental issues drawing upon concepts and theories from the natural and life sciences. Content of course closely integrated with M Env 130 and organized into thematic units dealing with human and community studies, resource and environmental management, technology and society inter-relationships.
Prereq: Honours Man-Environment Studies
To be taken concurrently with M Env 130

M Env130 Y 3C 1.0
Environmental Issues and the Social Sciences
Survey and analyses of selected environmental issues drawing upon concepts and theories from the social sciences and humanities. Content of course closely integrated with M Env 120 and organized into same thematic units.
Prereq: Honours Man-Environment Studies
To be taken concurrently with M Env 120

M Env150 Y 3C 1.0
Environmental Issues: Methods & Techniques
Series of concurrent six week workshops to introduce methods and techniques appropriate for investigating different environmental problems. Students to select any four from a series of workshops such as field studies, laboratory analyses, questionnaire design, survey research, small group dynamics and participant observation of social interactions.
Prereq: Honours Man-Environment Studies

M Env190 Y 4S,1wkshp 1.0
Seminar-Workshop
Faculty-supervised individual or small group investigation of selected environmental issues to help develop skills for defining and resolving problem situations. Related or different topics may be selected for the fall and winter terms.
Prereq: Honours Man-Environment Studies

Env St195 Introduction to Environmental Problems
See Environmental Studies course descriptions, page 294.

Env St200 Field Ecology
See Environmental Studies course descriptions, page 294.
Course Descriptions
Man-Environment Studies

M Env 230 W 3C .5
Interpreting Man-Environment Interrelationships
Review and comparison of different analytical approaches and modes of reasoning appropriate for understanding man-environment interrelationships including systems reasoning, the scientific method of enquiry, models of Man, anticipation of futures, and subjective modes of knowing.
Prereq: Honours Man-Environment Studies

M Env 240 Small Groups and the Environment
Not offered 1977-78

M Env 241 W 3C .5
Social Change
An analysis of major theories of social change, the sources and patterns of change processes, with emphasis on the environmental context.
No prereq

M Env 247 F 3C .5
Urban Anthropology
Approaches to the study of urban centres as undertaken by anthropologists. Selected topics such as urban social networks, the urbanization of non-western societies, and the culture of poverty will be pursued.
Prereq: Anth 102 or permission of instructor

Env St 252 Media Tools for Environmental Studies
See Environmental Studies course descriptions, page 294.

Env St 253 Media Tools for Environmental Studies - Advanced Level
See Environmental Studies course descriptions, page 294.

M Env 260 F 3C .5
Visual Perception and Communication
A study of man's perception of his environment, as influenced and represented by mass media. A special emphasis will be placed on visual education and the role of media in Canada in the development of children's perceptions.
No prereq

Env St 271 Introduction to Quantitative Research Methods
See Environmental Studies course descriptions, page 295.

Env St 272 Computer Programming in Environmental Studies
See Environmental Studies course descriptions, page 295.

M Env 275 F,W 2R .5
Special Readings
May be used by students who transfer into Man-Environment Studies at second year level. Background reading and study in consultation with faculty.
Prereq: Consent of instructor

M Env 290 Y 6S wkshp 1.0
Seminar-Workshop
Individual or small group investigation of selected environmental issues. Topics chosen to reflect a "futures studies" orientation.
Prereq: Honours Man-Environment Studies

M Env 310 F 4C .5
Psychological Man
The psychological correlates of the different environments in which man develops and continues in adult life. The emphasis will be on individual differences assessed by empirical techniques and objective criteria derived from the physical and cultural environment.
No prereq

M Env 320 W 3C .5
Environmental Economics
Principal economic concepts and their environmental implications. Examination of the economic approach to environmental quality. Introduction to social benefit-cost analysis as applied to environmental problems.
Prereq: Honours Man-Environment Studies or Introductory Economics course or consent of instructor
Cross-listed as Econ 355

M Env 330 Psycho-Social Aspects of Environmental Design
Not offered 1977-78

M Env 331 Environmental Issues in a Global Perspective
Not offered 1977-78

M Env 335 F 2C .5
Anthropology and Education
A seminar on certain theories of socialization, acculturation, and enculturation. These theories will be related to what in the west is usually categorized as "education". There will also be some emphasis on understanding how field work should be done in educational settings. Students should be prepared to do some field work themselves.

M Env 340 F,W 3C .5
Special Topics in Environmental Science
Application of the natural or life science disciplines to selected problems of environmental importance. Emphasis is placed on the scientific principles and concepts used for analyzing problems in detail. Dependent on student demand and faculty availability.
Prereq: Honours Man-Environment Studies
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEnv350 W 2C .5</td>
<td></td>
<td>Community Action on Environmental Problems&lt;br&gt;The citizen's role in the solution of environmental problems. The work of various community groups is examined and evaluated. Students take part in one group project to experience the process at first hand.</td>
</tr>
<tr>
<td>MEnv351 W 3S .5</td>
<td></td>
<td>Organization and Environmental Management&lt;br&gt;Analysis of selected governmental or other organizations performing important functions of policy issues and goals. Programme planning, budgeting, and delivery processes. Role of different specialists and &quot;generalists&quot;, nature and extent of public participation.</td>
</tr>
<tr>
<td>MEnv356 W 3C .5</td>
<td></td>
<td>Canadian Non-Renewable Resources&lt;br&gt;An introduction to mineral resources and the state of reserves of selected minerals. Geological factors affecting the occurrence of economic minerals and rocks, concentrating upon energy supplies, metallic and non-metallic minerals. The historical development of certain extractive industries will be discussed together with the political and social implications of economic development.</td>
</tr>
<tr>
<td>MEnv357 W 3C .5</td>
<td></td>
<td>Conservation and Resource Management&lt;br&gt;History of the conservation movement; ecological principles of conservation and resource management. Analysis, use and planning of recreational resources. This course is the same as Geog 357 and Plan 357. &lt;br&gt;Prereq: Env St 200</td>
</tr>
<tr>
<td>Env St 358 Environmental Pollution and its Control</td>
<td></td>
<td>See Environmental Studies course descriptions, page 295</td>
</tr>
<tr>
<td>MEnv360 F 3C .5</td>
<td></td>
<td>Man and Nature&lt;br&gt;A brief study of various cultural beliefs and attitudes towards &quot;Nature and Environment&quot; in different periods of history and in different societies. Such concepts as &quot;Natural order&quot;, Biological Rhythms, and Man's relationship to nature will be explored. &lt;br&gt;Prereq: Consent of instructor</td>
</tr>
<tr>
<td>MEnv361 W 3C .5</td>
<td></td>
<td>Contemporary Media of Communication and Human Environment&lt;br&gt;A study of history of media and their role in the cultural evolution of man. An exploration of the influence of mass media in literate and non-literate societies will be made, with special reference to social and political changes. &lt;br&gt;Prereq: MEnv 260 or the consent of instructor</td>
</tr>
<tr>
<td>MEnv 375 F,W 2R .5</td>
<td></td>
<td>Special Readings or Seminar on Selected Topics&lt;br&gt;Prereq: Consent of instructor</td>
</tr>
<tr>
<td>Env St 380/381 Environmental Studies Workshop</td>
<td></td>
<td>See Environmental Studies course descriptions, page 295.</td>
</tr>
<tr>
<td>MEnv 390 Y 4,8S, wkshp 1.0/2.0</td>
<td></td>
<td>Seminar-Workshop&lt;br&gt;390A (1 course credit)&lt;br&gt;390B (2 course credits)&lt;br&gt;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. Extra credit only by consent of faculty. &lt;br&gt;Prereq: Honours Man-Environment Studies</td>
</tr>
<tr>
<td>Env St 400 Environmental Law</td>
<td></td>
<td>See Environmental Studies course descriptions, page 000.</td>
</tr>
<tr>
<td>MEnv 410 Y 3S 1.0</td>
<td></td>
<td>Honours Seminar: Environmental Management&lt;br&gt;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 programmes. Dependent on student demand and faculty availability. &lt;br&gt;Prereq: Hon. Man-Environment Studies or instructor consent</td>
</tr>
<tr>
<td>Env St 411 Alternative Future Environments 1</td>
<td></td>
<td>See Environmental Studies course descriptions, page 295.</td>
</tr>
<tr>
<td>Env St 412 Alternative Future Environments 2</td>
<td></td>
<td>See Environmental Studies course descriptions, page 295.</td>
</tr>
<tr>
<td>Env St 417 Land Use History and Landscape Change 1</td>
<td></td>
<td>See Environmental Studies course descriptions, page 295.</td>
</tr>
<tr>
<td>Env St 418 Land Use History and Landscape Change 2</td>
<td></td>
<td>See Environmental Studies course descriptions, page 295.</td>
</tr>
<tr>
<td>MEnv 431 W,S 2C 1.0</td>
<td></td>
<td>Comparative Approaches to Environmental Management&lt;br&gt;Environmental programmes of other nation states compared to Canadian approaches. Case studies from U.S., British and European situations, and other countries. Course meets on campus during Winter term and in the field in other countries during Spring term. Spring term limited to a period of 6-8 weeks. Laboratory</td>
</tr>
</tbody>
</table>
fee varies with field observation. Dependent on student demand and faculty availability.

Prereq: Honours Man-Environment Studies and consent of instructor; non-majors, consent of instructor

M Env 445 Y 3C 1.0

Technology Assessment and Policy Analysis
The focus of this course is upon technology assessment processes and systems with particular attention to actors, information, decisions, strategies, issues and policy analysis. In the context of technological developments, policy statements and policy-making structures and processes will be examined. Dependent on student demand and faculty availability.

Prereq: Honours Man-Environment Studies fourth year or consent of instructor

M Env 450 Y 2S 1.0

Honours Seminar: Environmental Design
Major psycho-social problems related to design and use of urban, rural and wilderness environments. Integration of psycho-social information with economics and environmental information in the design process. Dependent on student demand and faculty availability.

Prereq: Honours Man-Environment Studies or instructor consent

M Env 470 Y 3C 1.0

Environmental Teaching and Learning
Examination of physical and social environments which induce particular kinds of learning. Practical training and experience in project development and co-ordination, leadership and group facilitation processes.

Prereq: Third and fourth year Honours Man-Environment Studies and consent of instructor

M Env 475 F, W 2R .5

Special Readings or Seminar on Selected Topics
Prereq: Consent of instructor

M Env 476 Y 2R 1.0

Special Readings or Seminar on Selected Topics
Prereq: Consent of instructor

M Env 480 Y 3S 1.0

Honours Seminar: Special Topics
Topics will be selected from areas of special interest and experience of individual faculty members, reflecting current research or other academically related activities. Topics will change from year to year. Dependent on student demand and faculty availability.

Prereq: Honours Man-Environment Studies

M Env 490 Y 4.8,12C 1.0/2.0/3.0

Senior Honours Assignment
490A (1 course credit)
490B (2 course credits)
490C (3 course credits)

A project of sufficient scope to demonstrate mastery of problem solving and communication skills on a selected problem or issue concerning man-environment interrelationships. Variable credit only by consent of faculty.

Prereq: Honours Man-Environment Studies
Faculty of Mathematics

Dean of the Faculty of Mathematics
W. F. Forbes, PhD, DSc (London), DIC

Associate Deans, Undergraduate Studies
K. D. Fryer, BA (Western), PhD (Toronto)
P. J. Ponzo, MA (Toronto), PhD (Illinois)

Associate Dean, Graduate Studies
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Assistant to the Dean
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Director of First Year Studies
P. C. Brillinger, BA (McMaster), MA (Waterloo)

Director, Mathematics Computing Facility
W. M. Gentleman, BSc (McGill), PhD (Princeton)

Assistant Professor
K. S. Brown, BM (Waterloo)

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Z. Dvoracek, MS, RNDr (Charles University, Prague), PhD (Czechoslovak Academy of Sciences, Prague)
R. G. Scoins, MMath (Waterloo)

Adjunct Professor
R. E. Woosley, PhD (Texas)

Department of Applied Mathematics

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C. F. A. Beaumont, BA (McMaster), MA (Toronto)

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P. J. Ponzo, MA (Toronto), PhD (Illinois)

Professors
J. Cizek1, RNDr (Charles University, Prague),
CSc (Czechoslovak Academy of Sciences, Prague)
H. F. Davis, PhD (MIT)
B. Forte2, PhD (Pisa), HabiliDSc (Rome)
F. O. Goodman, BSc (London), PhD (London),
DSc (London), FInstP
M. S. Klamkin, BChE (Cooper Union), MS (Brooklyn)
(Leave of Absence)
M. A. McKiernan3, MA (Loyola), PhD (IIT)
J. Paldus1, RNDr (Charles University, Prague),
CSc (Czechoslovak Academy of Sciences, Prague)
D. G. Wertheim, BA (McMaster), PhD (Toronto)

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S. G. Davison, PhD (Manchester)
J. Froese, BA (Manitoba), MA (Queen’s), PhD (UBC)
J. A. George4, MSc (Alberta), PhD (Stanford)
W. H. Hui, BSc (Peking), PhD (Southampton)
G. J. Lastman, MA (UBC), PhD (Texas)
F. R. McCourt5, BSc, PhD (UBC)
J. Wainwright, BSc (Natal), PhD (South Africa)
Recipient of the Distinguished Teacher Award
R. A. Wentzell, BSc (Acadia), PhD (Western)

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G. W. Horndeski, BSc (Washington), PhD (Waterloo)
S. P. Lipshitz, BScHon (Natal), MSc (South Africa),
PhD (Witwatersrand)
R. G. McLennan, MSc (Queen’s), PhD (Cantab.)
M. E. Snyder, BSc (Western), MSc (Waterloo)

Lecturer
B. J. Marshman, PhD (Waterloo)

Research Associate
J. Hamilton, BSc, PhD (Southampton)

Postdoctoral Fellows
J. Downing, BSc (North Texas State), PhD (Utah)
N. Tariq, BSc (Special) in Mathematics, MSc in
Mathematics (London), PhD (New Brunswick)
A. J. Thakkar, BSc, PhD (Queen’s)
Adjunct Professors
D. J. Henderson, BS (U.B.C.), PhD (Utah), FInstP
D. Lovelock, PhD, DSc (Natal)
H. Rund, PhD (Cape Town), Habilitation (Freiburg)

Visiting Research Professor
M. L. Glasser, PhD (Carnegie-Mellon)

Faculty Members holding cross-appointments as shown
1 Applied Mathematics and Chemistry
2 Applied Mathematics and Statistics and Computer Science
3 Pure Mathematics and Applied Mathematics
4 Computer Science and Applied Mathematics

Department of Combinatorics and Optimization

Professor and Chairman of the Department
R. C. Mullin, BA (Western), PhD (Waterloo)

Professor and Associate Chairman of the Department
D. H. Younger, PhD (Columbia)

Professor and Associate Dean of the Faculty of Mathematics
K. D. Fryer, BA (Western), PhD (Toronto)

Distinguished Professor
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Professors
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P. L. Hammer, PhDMath (Bucharest)
R. C. Read, MA (Cantab.), PhD (London)

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J. A. Bondy, DPhil (Oxon.)
R. N. Burns, BSc (Toronto), PhD (Waterloo)
C. E. Haff, BS (Stanford), PhD (Waterloo)
R. A. Honsberger, BA (Toronto), MA (Waterloo)
D. M. Jackson, PhD (Cantab.)
U. S. R. Murty, MA (Osmania), PhD (Indian Stat. Inst.)
H. Shank, MSc (Chicago), PhD (Cornell)

Assistant Professors
A. R. Conn, BSc (Imperial College), MSc (Manitoba),
PhD (Waterloo)
L. J. Cummings’, PhD (U.R.C.)
G. B. Faulkner, BASc (Toronto), PhD (Waterloo)
L. B. Richmond, MSc (Manitoba), PhD (Alberta)
P. Sheellenberg, PhD (Waterloo)
S. A. Vanstone”, PhD (Waterloo)

Lecturers
E. Anderson, BA (McMaster)
R. G. Dunkley, BA (Western)

Adjunct Professors
P. Erdős, PhD (Budapest), DSc (Manchester)
E. L. Johnson, BS (Georgia Tech.), PhD (U.C. Berkeley)
C. St. J. A. Nash-Williams, PhD (Cantab.), FRSE
R. G. Stanton, BA (Western), PhD (Toronto)

Adjunct Lecturer
C. Charalambous, BSc (Surrey), PhD (McMaster)

Faculty Members holding cross-appointments as shown
1 Pure Mathematics and Combinatorics and Optimization
2 St. Jerome’s and Combinatorics and Optimization
Department of Computer Science

Professor and Chairman of the Department
J. D. Lawson, BASc (Toronto), PhD (Waterloo), FIMA

Associate Professor and Associate Chairman for Graduate Studies
J. I. Munro, BA (New Brunswick), MSc (UBC), PhD (Toronto)

Associate Professor and Associate Chairman for Undergraduate Studies
J. A. George*, MSc (Alberta), PhD (Stanford)

Professor and Associate Dean of Graduate Studies
D. D. Cowan, BASc (Toronto), PhD (Waterloo)

Professor and Director, Mathematics Computing Facility
W. M. Gentleman³, BSc (McGill), PhD (Princeton)

Assistant Professor and Director of First Year Studies in the Faculty of Mathematics
P. C. Brillinger, BA (McMaster), MA (Waterloo)

Professors
J. A. Brzozowski, MASc (Toronto), PhD (Princeton)
B. Forte¹, PhD (Pisa), Habilitation (Rome)
J. W. Graham, MA (Toronto)
C. G. Manning, MSc (Waterloo), PhD (Illinois)
T. Pietrzykowski, MA (Warsaw), PhD (Polish Acad. Sci.)

Research Professor
G. M. L. Gladwell³, BSc, PhD, DSc (London)

Associate Professors
E. A. Ashcroft, BA (Cantab.), PhD (Imperial College)
K. Culik, MSc, RNDr (Prague), PhD (Czechoslovak Acad. Sci.) (Sabbatical Leave, 1976-77)
D. E. Morgan, BSc (Rose Polytechnic Inst.), MS (Michigan), PhD (Waterloo), (Sabbatical Leave, 1977-78)
J. I. Morris, BSc (Leicester), PhD (St. Andrews)
R. B. Simpson, MASc (Toronto), PhD (Maryland)

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K. S. Booth, BS (Calif. Inst. Tech.), PhD (U.C. Berkeley)
V. A. Dyck, MMath (Waterloo)
M. van Emden, MEngMath (Technische Hogeschool, Delft.), PhD (Amsterdam)
K. O. Geddes, BA (Saskatchewan), MSc, PhD (Toronto)
J. F. Gentleman*, MS (Chicago), PhD (Waterloo)
M. Hennessy, BSc (National U. of Ireland), MA (Dublin), PhD (Waterloo)
M. I. Irland, MS (Illinois), PhD (Waterloo)
B. Jölliffe, BSc (U.B.C.), PhD (Waterloo)
T. S. E. Maibaum, BSc (Toronto), PhD (London)
J. Majithia*, BSc (London), MEng, PhD (McMaster)
M. Malcolm, BSc, MEng (Denver), MS, PhD (Stanford)
S. L. Osborn, PhD (Waterloo)
R. W. Peebles, BSc (McGill), PhD (Pennsylvania)
L. D. Rogers, BSc (McGill), PhD (Waterloo) (Leave of Absence, 1976-77)
G. Sager, PhD (Washington)
J. A. Smith, PhD (Waterloo), PEng
F. W. Tompa, ScM (Brown), PhD (Toronto)
J. H. Vellinga, BA (Western), MA (Waterloo) (part-time)
J. W. Welch, BSc (McGill), PhD (Waterloo)
J. W. N. Wong, PhD (U.C. Los Angeles)

Research Assistant Professor
E. J. H. Chang, BSc (Manitoba), MD (UBC), MMath (Waterloo) (Leave of Absence, 1976-77)

Adjunct Professor and Director of Computing Centre
P. H. Dirksen, MA (Waterloo)

Adjunct Professors
P. C. Fischer, MBA (Michigan), PhD (MIT), FSA
S. C. Johnson, BA (Haverford College, Pa.), PhD (Columbia)
J. G. Linders, MASc (Toronto), PhD (Imperial College)

Faculty Members holding cross-appointments as shown
¹ Applied Mathematics and Statistics and Computer Science
² Computer Science and Statistics
³ Civil Engineering and Computer Science
⁴ Computer Science and Applied Mathematics
⁵ Statistics and Computer Science
⁶ Electrical Engineering and Computer Science
Department of Pure Mathematics

Professor and Chairman of the Department
R. A. Staal, PhD (Toronto)

Distinguished Professor
J. Aczel, PhD (Budapest), Habil.Dsc (Hungarian Acad. Sci.), FRSC

Professors
H. H. Crapo, AB (Michigan), PhD (M.I.T.)
G. E. Cross, MA (Dalhousie), PhD (U.B.C.)
D. Z. Djokovic, PhD (Belgrad)
H. Haruki, PhD (Osaka)
P. Hoffman, BA (Toronto), MA (Loyola), PhD (I.I.T.)
J. W. Tucker, BSc (London), PhD (London)

Associate Professors
J. G. Anderson, MSC (Durham), PhD (Newcastle)
J. A. Baker, MA (Saskatchewan), PhD (Waterloo)
S. Burris, PhD (Oklahoma)
Y. Chen, MA (Frankfurt), PhD (Bochum) (part-time)
L. J. Cummings, PhD (U.B.C.)
G. Dankert, DipMath (T. H. Hanover), PhD (Cologne)
W. J. Gibert, MA (Cantab.), DPhil (Oxun.,)
D. A. Higgs, BScHons (Witwatersrand), MA (Cantab.), PhD (McMaster)
P. L. Kannappan, BScHons (Annamalai), PhD (Washington)
A. Kerr-Lawson, BA (Toronto), MA (Chicago), PhD (McMaster)
D. Mowat, PhD (Waterloo)
C. T. Ng, BSc (Chinese Univ.), PhD (Waterloo)
F. C. Y. Tang, DSc (Hong Kong), MS (South Carolina), PhD (Illinois)
P. de Witte, MScTheorPhys (Ghent), MScMath, PhD (Brussels)

Assistant Professors
L. J. Dickcy, MA (Arizona), PhD (Wisconsin)
J. W. Lawrence, MSc (McGill), PhD (Carleton)
J. Malzan, PhD (Toronto)
E. M. Moskal, BA (Toronto), PhD (Illinois)
K. A. Rowe, BSc (Toronto), MS (Wisconsin), PhD (Illinois)
F. Zorzitto, MSc (Windsor), PhD (Queen’s)

Research Assistant
W. Komornicki, PhD (Chicago)

Faculty Members holding cross-appointments as shown
1 Pure Mathematics and Applied Mathematics
2 Pure Mathematics and Philosophy
3 Pure Mathematics and Combinatorics and Optimization
4 St. Jerome’s and Pure Mathematics

Department of Statistics

Professor and Chairman of the Department
J. G. Kalbfleisch, BSc (Toronto), MA, PhD (Waterloo)

Professor and Dean of the Faculty of Mathematics
W. F. Forbes, PhD, DSc (London), DIC

Professor and Director, Mathematics Computing Facility
W. M. Gentleman, BSc (McGill), PhD (Princeton)

Associate Professor and Associate Chairman of the Department
J. F. Lawless, BSc, MSc, PhD (Waterloo)

Associate Professor and Associate Chairman of the Department
J. C. Young, BASc (Toronto), MSc (Waterloo), PhD (Edinburgh)

Professors
H. M. Atrubin, BA (Manitoba), FSA, FCIA (part-time)
G. A. Barnard, MA, DSc (Cambridge) (part-time)
B. Forte, PhD (Pisa), HabilDsc (Rome)
V. P. Godambe, MSc (Bombay), PhD (London)
F. M. Reilly, BASc (Toronto), DIC, PhD (London), FSS
D. A. Sprott, BA, MA, PhD (Toronto)
M. D. Vogel-Sprott, BA (McMaster), PhD (Toronto)

Associate Professors
W. H. Aitken, BA (Toronto), FSA, FAAA, FCIA
G. W. Bennett, BSc, BA, PhD (Adelaide)
M. A. Bennett, BA (Nottingham), FSA, FCIA
W. H. Cherry, BSc, PhD (Melbourne)
J. D. Kalbfleisch, BSc, MM, PhD (Waterloo)
W. S. Rickert, BSc, PhD (Waterloo)
K. R. Shah, BA (Bombay), PhD (Indian Stat. Inst.)
M. E. Thompson, BSc (Toronto), MSc, PhD (Illinois)
R. V. Thysell, BSc (Montana), PhD (Iowa)
J. B. Whitney, BA, MA (Western), PhD (Toronto)

Assistant Professors
A. Brender, BSc (McGill), MA, PhD (U.C. Berkeley)
K. S. Brown, BMath, PhD (Waterloo)
J. F. Gentleman, BA, MS (Chicago), PhD (Waterloo)
R. J. MacKay, BSc (Waterloo), MSc, PhD (Toronto)
D. F. Matthews, BA, MA (Western), PhD (London), DIC
C. Minder, Dipl. Math (Basel), PhD (Waterloo)
J. C. Robinson, MAsc, PEng, PhD (Waterloo)

Research Assistant Professor
S. Esterby, BA (Queen’s), PhD (Waterloo)
Lecturers
R. L. Brown, BMath (Waterloo), ASA
F. G. Reynolds, BSc, MSc (Manitoba), FSA, FCIA
C. Springer, BSc, MSc (McGill)

Adjunct Professors
S. N. Afriat, MA (Cambridge), DPhil (Oxford)
I. P. Fellegi, PhD (Carleton)
A. Finch, PhD, DSc (London), DIC
R. C. Frecker, RSc (Memorial), MD (Dalhousie)
J. Gani, BSc, DIC (London), PhD (ANU), DSc (London), FAA
L. P. Lefkovitch, BSc (London)

Faculty Members holding cross-appointments as shown
1. Applied Mathematics and Statistics and Computer Science
2. Computer Science and Statistics
3. Chemical Engineering and Statistics
4. Statistics and Psychology
5. Psychology and Statistics
6. Statistics and Computer Science

Course Descriptions
Mathematics

Strategy Board Members
University of Waterloo Faculty of Mathematics

R. S. Aberg
General Manager
Corporate Planning
Shell Canada Limited

M. W. Bainbridge
Director
Post-Secondary Recruitment Programme
Public Service Canada

E. G. Burton
President
Simpsons Limited

R. G. Clifford
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Central Region
IBM Canada Limited

B. Graham
Partner
Coopers and Lybrand

J. V. Masterman
Vice President (Operations)
Mutual Life Assurance Co. of Canada

E. L. Pursey
Vice President and Comptroller
Canadian Imperial Bank of Commerce

Dr. C. D. Sadleir
Manager
Information Systems
Reed Paper Ltd.

G. F. Sekely
Director
Information Systems
Canadian Pacific Limited

H. J. M. Watson
Assistant Comptroller
Management Information Services
The Steel Company of Canada Ltd.

R. P. Wismer
Manager
Systems Development
Noranda Mines Limited

Dr. D. T. Wright
Deputy Provincial Secretary
Secretariat for Social Development
Province of Ontario

The University of Waterloo Strategy Board was established to provide liaison between the Faculty of Mathematics and knowledgeable representatives from key sectors of the economy. Board meetings are normally held twice a year.
Mathematics Undergraduate Course Descriptions

Note
Course descriptions are given under the new course numbers introduced in 1976.

Math 120a  F,W,S  3C,1T .5
Calculus
Functions and limits, differentiation of algebraic and trigonometric functions, applications of the derivative, the differential, Riemann sums, the first and second fundamental theorems of the integral calculus.

Note
Math 120a is not open to Honours Mathematics students.

Math 120b  F,W,S  3C,1T .5
Calculus
Differentiation and integration of exponential and logarithmic functions, techniques of integration, applications of integration, indeterminate forms, sequences, convergence of series, power series.

Note
Math 120b is not open to Honours Mathematics students.

Math 124a  F,W,S  3C,1T .5
Algebra and Geometry
Elementary number theory, mathematical induction, binomial theorem, monotone sequences, inequalities, complex numbers, elementary functions of a complex variable, polynomials and polynomial equations.

Note
Math 124a is not open to Honours Mathematics students.

Math 124b  F,W,S  3C,1T .5
Algebra and Geometry
Determinants and matrices, vectors in two and three space, quadratic surfaces, systems of equations, elementary linear transformations.

Note
Math 124b is not open to Honours Mathematics students.

Math 130a  F  3C,1T .5
Calculus
Functions and limits, the derivative, differentiation of algebraic and other functions, applications of the derivative, the integral, applications of the integral. Also offered at St. Jerome's College

Math 130b  W,S  3C,1T .5
Calculus
Techniques of integration, convergence of series, power series. Some elementary differential equations. Also offered at St. Jerome's College

Math 134a  F  3C,1T .5
Algebra and Geometry
Integers and diophantine equations, congruences, induction and the binomial theorem, rational and real numbers, inequalities, complex numbers, polynomial equations. Also offered at St. Jerome's College

Math 134b  W,S  3C,1T .5
Algebra and Geometry
In 2 and 3 dimensions: vectors, lines and planes, linear transformations, matrices, determinants, circles and spheres, geometry of the triangle, quadratic surfaces, inequalities. Also offered at St. Jerome's College

Math 220a  F,W,S  3C,1T .5
Advanced Calculus
Differential Calculus for functions of several variables.

Note
Math 220a is not open to Honours Mathematics students.

Math 220b  F,W,S  3C,1T .5
Advanced Calculus
Double integrals, triple integrals; Line integrals and Green's Theorem; Ordinary differential equations.

Note
Math 220b is not open to Honours Mathematics students.

Math 221a  F,W,S  3C .5
Linear Algebra
A selection of topics from: vector spaces, linear maps, matrix theory, inner products, bilinear and quadratic forms, and applications.

Note
Math 221a is not open to Honours Mathematics students.

Math 221b  F,W,S  3C .5
Linear Algebra
A continuation of Math 221a.

Note
Math 221b is not open to Honours Mathematics students.

Math 230a  F,W  3C,1T .5
Advanced Calculus
Differential calculus of functions of several variables: limits and continuity, partial derivatives, differentiability, chain rule, Taylor's formula, extreme values, mappings and Jacobians. Integral calculus of functions of several variables: multiple integrals, iterated integrals, change of variables, applications to area and volume calculations. Also offered at St. Jerome's College
Course Descriptions
Mathematics

Math 230b F,W,S 3C,1T .5
Advanced Calculus
Line integrals, Green's theorem and path independence, sequences and series of functions; uniform convergence and power series. Introduction to ordinary differential equations: first and second order linear equations, power series solutions, applications.
Also offered at St. Jerome's College

Math 231a F,W 3C .5
Linear Algebra
A selection of topics from: vector spaces, systems of linear equations, transformations, matrices, inner products, determinants, invariant subspaces, canonical forms, bilinear forms, quadratic forms, and applications.
Also offered at St. Jerome's College

Math 231b F,W,S 3C .5
Linear Algebra
A continuation of Math 231a.

Math 232b F,W 3C .5
An Introduction to Complex Variable Theory
Complex numbers; continuity, differentiability, analyticity of functions; the Cauchy-Riemann equations; solutions of Laplace's equation; conformal mapping by elementary functions, and applications; the Cauchy and allied theorems; Taylor and Laurent expansions; uniform convergence and power series; the residue calculus, and applications. The emphasis will be on applications.
Note
Math 232b is not open to Honours Mathematics students.

Math 321a F,W,S 2C,1T .5
Modern Algebra
Groups, monoids and Boolean algebras with selected applications.

Math 321b F,W 2C,1T .5
Modern Algebra
Rings and fields with selected applications.

Math 322a F,W,S 3C .5
Introduction to Real Analysis
Elementary properties of the real number system including the completeness property and its relation to the concepts of limit, continuity and differentiability; mean value theorem; Riemann integration and the integrability of continuous and monotonic functions; uniform convergence, uniform continuity and their relation to the above. The emphasis will be on applications.
Note
Math 322a is not open to Honours Mathematics students.

Math 322b F,W 3C .5
An Introduction to Complex Variable Theory
Complex numbers; continuity, differentiability, analyticity of functions; the Cauchy-Riemann equations; solutions of Laplace's equation; conformal mapping by elementary functions, and applications; the Cauchy and allied theorems; Taylor and Laurent expansions; uniform convergence and power series; the residue calculus, and applications. The emphasis will be on applications.
Note
Math 322b is not open to Honours Mathematics students.

Math 331a F,W,S 2C,1T .5
Modern Algebra
Groups, monoids and Boolean algebras with selected applications.

Math 331b F,W 2C,1T .5
Modern Algebra
Rings and fields with selected applications.

Math 332a F,W,S 3C .5
Real Variables

Math 332b F,W 3C .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.

Math 380a F 2C,1T .5
Introduction to Information Theory with Applications

Math 380b W 2C,1T .5
Information Theory with Applications
Measures of expected conditional information. Maximizing expected conditional information. Applications to communication theory and programming. Basics in questionnaire theory.
Department of Applied Mathematics
Undergraduate Course Descriptions

Note
Course descriptions are given under the new course numbers introduced in 1976.

AM230, 240, 330, 340, 430, 440 is a sequence of courses designed to illustrate the representation of a real situation by a mathematical model. The mathematical techniques necessary to formulate the model and to discuss its behaviour are developed as required. Examples will be taken from diverse fields since one of the aims of each course is to formulate models to describe unfamiliar situations.

AM230 F 2C, 1T .5
Applications of Mathematics
Ordinary differential equations will be applied to models drawn from biology, economics, physiology and physics. Prereq: Math 120, 130 or consent of instructor

Note
AM230 is not open to Honours Mathematics students. Credit will be given for only one of AM230, 260.

AM240 W 2C, 1T .5
Applications of Mathematics
Other examples from biology, ecology, economics, physiology and physics will be discussed using sets of differential equations. Prereq: AM 230 or Math 220

Note
AM240 is not open to Honours Mathematics students. Credit will be given for only one of AM240, 270.

AM260 F 2C .5
Mathematical Modelling
Mathematical models for problems in the physical and biological sciences. Typical problems chosen from ecology, special relativity, spread of epidemics, rumours and tumors. Solutions to problems will be obtained primarily by differential equations. Prereq: Math 130

AM270 W 2C .5
Mathematical Modelling
Further mathematical models from various disciplines. An introduction to Newtonian mechanics will also be included in the course. Prereq: AM 260 or consent of instructor

AM330 F 2C .5
Applications of Mathematics
Partial differential equations are applied to diffusion processes, blood flow and wave phenomena. Prereq: Math 220 or equivalent, or consent of instructor

AM340 W 2C .5
Applications of Mathematics
Laplace transforms are applied to problems in ecology, physiology and other fields. Prereq: Math 220 or equivalent, or consent of instructor

AM362 F 2C, 1T .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. Prereq: Math 230, or consent of instructor

AM365 W 2C, 1T .5
Introduction to Continuum Mechanics

AM371 F 2C, 1T .5
Partial Differential Equations of Applied Mathematics 1
Introduction to partial differential equations with motivating examples; linear first-order equations, derivation of equations for wave motion, vibrating membrane and heat flow, separation of variables, cylindrical and spherical co-ordinates, Bessel and Legendre functions, Fourier analysis, introduction to vector analysis. Prereq: AM 260, 270, Math 230, or consent of instructor

AM372 W 2C, 1T .5
Introduction to General Relativity
Flat space-time and Lorentz transformations, relativistic mechanics and collision phenomena. Maxwell's equations; curved space-time and the Einstein field equations, the Schwarzschild solution and some experimental tests of general relativity, the weak field limit; introduction to black holes; introduction to cosmology. Prereq: AM 362 or consent of instructor
Course Descriptions
Applied Mathematics

AM 381 F 2C,1T .5
Ordinary Differential Equations 1
Existence and uniqueness theorems, second and higher order equations, series solutions and Special Functions, Laplace transforms. Application to Mathematical Physics.
Prereq: Math 230

AM 382 F 2C,1T .5
Calculus of Variations
Prereq: Math 230, or consent of instructor

AM 391 W 2C,1T .5
Ordinary Differential Equations 2
Prereq: AM 381

AM 395 W 2C,1T .5
Mechanics
Prereq: Math 230, AM 382, or consent of instructor

AM 389 F .5
Reading Course

AM 399 W .5
Reading Course

AM 430 F 2C .5
Applications of Mathematics
Integral equations and integral transforms will be applied to systems with memory.
Prereq: Consent of instructor

AM 440 W 2C .5
Applications of Mathematics
As a project, students will develop a mathematical model and interpret its behaviour.
Prereq: Consent of instructor

AM 461 Y 2C 1.0
Non-Linear Differential Equations
Non-linear mechanics, stability, quasi-linear and strongly non-linear systems, linear periodic systems, non-linear integral equations.
Prereq: AM 381/391, or consent of instructor

AM 462 F 2C .5
Measure and Integration
The theory of measure and the Lebesque integral.

AM 463 F 2C,1T .5
Introduction to Differentiable Manifolds
Differentiable manifolds, vector fields, linear connections, tensor fields, differential forms, and the structure equations.
Prereq: AM 362, or consent of instructor

AM 465 Y 2C 1
Quantum Mechanics
Prereq: Math 231, AM 371, or consent of instructor

AM 466 F 3C .5
Fluid Mechanics
Fundamental equations of inviscid fluids, compressibility, vorticity; two and three-dimensional irrotational, incompressible flow, Blasius' theorem, Joukowski hypothesis.
Prereq: AM 365

AM 468 F 2C .5
Topics in Applied Mathematics
A selection of topics given by members of the Applied Mathematics Department. Typical topics are: elasticity, fluid mechanics, electromagnetic theory, statistical mechanics, perturbation theory, calculus of variations, partial differential equations, distribution theory.
Prereq: Consent of instructor

AM 472 W 2C .5
Linear Operators
Linear operators in Hilbert spaces. Compact operators. Introduction to functional analysis.

AM 473 W 2C .5
Selected Topics in Applied Differential Geometry
Prereq: AM 362, or consent of instructor
AM 476 W 3C .5
Fluid Dynamics
Shock wave theory, supersonic flow around a corner, Prandtl-Meyer flow. Dynamics of real fluids, Navier-Stokes equations, exact solutions, Stokes and Oseen flow; introduction to boundary layer theory.
Prereq: AM 466

AM 478 W 2C .5
Topics in Applied Mathematics
Same as IN 468.
Prereq: Consent of instructor

AM 481 Y 2C 1
Partial Differential Equations of Applied Mathematics 2
Second-order partial differential equations and characteristics, d'Alembert's solution of the wave equation, concepts of distributions, construction of Green's functions, Fourier integral theorem, integral transforms, integral equations, variational properties of eigenvalues and eigenfunctions, special functions, asymptotic series. All these methods are applied to physical problems.
Prereq: Consent of instructor

AM 485 F 2C .5
Electromagnetism
Applications of the Maxwell equations. Reflection and refraction, introduction to wave guides and antennae.
Prereq: Consent of instructor.

AM 486 F 2C .5
Statistical Mechanics
Applications of probability theory to theoretical Physics.

AM 488 F 2C .5
Control Theory
Prereq: Consent of instructor

AM 489 F 2R .5
Reading Course

AM 495 W 2C,1T .5
Elasticity
Basic equations of elasticity for homogeneous isotropic bodies; bending of beams; plane elastic waves; Rayleigh surface waves, Love waves. Solution of problems by potentials, variational methods and Saint Venants' principle.
Prereq: AM 365

AM 499 W 2R .5
Reading Course

Course Descriptions
Combinatorics and Optimization

Department of Combinatorics and Optimization
Undergraduate Course Descriptions

Note
Course descriptions are given under the new course numbers introduced in 1976

C & O 239a, F 2C,2T .5
An Introduction to Combinatorics
Prereq: Math 124/134

C & O 239b W,S 2C,2T .5
An Introduction to Optimization
Prereq: Math 124/134; 239a is Not a prerequisite.

C & O 249b W 2C,1T .5
Introduction to Combinatorics and Optimization
An introductory study of selected topics of fundamental importance in both combinatorics and optimization. The numerous applications of linear algebra principles make this course complementary to a formal course in linear algebra.
Coreq: Math 231

C & O 330a F,S 2C .5
Mathematical Discovery and Invention 1
A study of about 100 challenging problems taken from many areas of elementary mathematics - number theory, combinatorics, geometry, probability, logic.
Also offered at St. Jerome's College

C & O 330b W 2C .5
Mathematical Discovery and Invention 2
A study of about 100 challenging problems taken from many areas of elementary mathematics - number theory, combinatorics, geometry, probability, logic.
Prereq: None. C & O 330a is Not a prerequisite to C & O 330b.
Also offered at St. Jerome's College

C & O 337 F,W 2C 1.0
Combinatorial Geometry
A study of combinatorial properties of plane figures, covering problems, addition of figures, maxima and minima problems, curves of constant breadth and delta-curves.
Offered at St. Jerome's College
C&O 351a  F,S  2C .5
Introduction to Graph Theory and Combinatorics 1
A study of the basic concepts and problems of graph theory: connection, minimum path problems; bipartite graphs, the marriage problem; l-factors of arbitrary graphs; planar graphs.

C&O 351b  W  2C .5
Introduction to Graph Theory and Combinatorics 2
Hamiltonian circuits in a graph, four colour problem, other colouring problems; directed graphs, balanced orientations; an introduction to the theory of enumeration, with applications to counting graphs and other combinatorial objects.
Prereq: C&O 351a recommended

C&O 352a  F,W,S  3C .5
Fundamentals of Optimization 1
Optimization techniques common to a wide variety of operations research and engineering problems, and of fundamental theoretical interest. Linear programming, simplex method, duality and complementary slackness, sensitivity analysis, integer programming, games.
Prereq: Math 231/221 and Math 230/220

C&O 352b  F,W  3C .5
Fundamentals of Optimization 2
Network programming, optimal paths, trees, transportation problems, k-th best policies. Applications to PERT, CPM, dynamic programming, equipment replacement, knapsack problems, optimal man-job assignments, warehousing problems. Continuous optimization techniques, Lagrange multipliers. Applications to inventory theory, capital budgeting, regression analysis.
Prereq: C&O 352a

C&O 353a  F,S  2C .5
Modelling and Optimization
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.

C&O 353b  F  2C,1T .5
Introduction to Combinatorial Design
Topics covered include orthogonal latin squares, finite projective planes, balanced incomplete block designs, Hadamard matrices and Room squares.
Prereq: Math 231

C&O 356a  F  2C,1T .5
Combinatorial Analysis
Basic enumeration principles, emphasizing the combinatorial significance of generating functions. Topics to include the principle of inclusion-exclusion, Polya theory, the Lagrange theorem, and vector spaces over finite fields. Applications to a variety of combinatorial problems.
Prereq: Math 231
Coreq: Math 331a

C&O 357a  F,S  2C .5
Optimizational Combinatorics 1
Prereq: C&O 352a or consent of instructor

C&O 357b  W  2C .5
Optimizational Combinatorics 2
Prereq: C&O 357a or consent of instructor

C&O 360a  F  2C,1T .5
Combinatorial Applications of Computer 1
General topics: methods of data storage for combinational problems, representation of sets, etc. Algorithms for permutations, combinations, partitions, etc. The use of generating functions, and methods of handling them on a computer. Enumeration problems: Polya’s theorem and variations. Applications.
Prereq: At least one computer programming language. Math 321/331

C&O 360b  W  2C .5
Combinatorial Applications of Computers 2
Prereq: At least one computer programming language. Math 331, C&O 357a.
Course Descriptions
Combinatorics and Optimization

C&O 446a F 2C .5
History of Mathematics 1
A study of selected topics from Greek geometry. Some related work of post-renaissance scholars is included. Topics include: famous construction problems, pythagorean arithmetic, regular solids, four discoveries of Archimedes, the problem of Apollonius; selected works of Archimedes, Euclid, Apollonius, Euler, Steiner. Prereq: No formal prerequisites are demanded.

C&O 446b W 2C .5
History of Mathematics 2
A study of selected topics from post-renaissance mathematics. Topics include material on prime numbers, Fermat's Last Theorem, the Gaussian Integers, the Fibonacci Sequence, other topics for elementary number theory, a collection of outstanding problems in geometry (Fagnano, Seiner-Lehmus, Morley). Prereq: No formal prerequisites are demanded.

C&O 450a F 2C .5
Linear and Quadratic Programming A

C&O 450b W 2C .5
Linear and Quadratic Programming B
Algorithms. Conjugate directions, the basic projection algorithm for quadratic programming. The Simplex method for linear programming as a special case. Numerically effective modifications of the projection method. Parametric cost and/or right hand side algorithms.

The course is designed to be of particular interest to engineers, management scientists, economists, statisticians and operations researchers. Prereq: C&O 450a

C&O 451a F 2C .5
Nonlinear Optimization 1
Recent algorithms for constrained and unconstrained optimization problems will be presented. Topics will include Newton, quasi-Newton, conjugate gradient, feasible direction, and penalty algorithms. Recommended for students interested in operations research, industrial engineering, computer science and for those wishing to pursue graduate courses in mathematical programming.

C&O 451b W 2C .5
Nonlinear Optimization 2
Nonlinear Programming: convergence conditions and convergence rates for some unconstrained optimization methods, introduction to the Kuhn-Tucker conditions and duality theory for nonlinear programmes, optimality conditions for a quadratic programme. Prereq: C&O 451a or consent of the instructor

C&O 452a F 2C .5
Linear and Integer Programming (Theory, Applications and Related Topics) 1
Convex sets, geometric motivation for the Simplex Algorithm, Simplex Algorithm, Revised Simplex Algorithm, Degeneracy. Post-optimal analysis (parametric programming, sensitivity analysis, etc.). Applications, Duality Theory, Dual Simplex Algorithm. Prereq: Linear Algebra and Elementary FORTRAN or consent of instructor

C&O 452b W 2C .5
Linear and Integer Programming (Theory, Applications and Related Topics) 2
Primal Dual Algorithms. Transportation Problem. Decomposition of large systems. Formulation of integer, mixed integer, and discrete programming problems. Methods of solution (cutting plane methods, implicit enumeration, branch-and-bound, etc.). Partitioning methods. Applications, computerized methods of solution. Prereq: C&O 452a or 352a or consent of instructor

C&O 453a F.S 2C .5
Queueing Theory
Queueing models are analyzed, including, single channel queues of infinite and finite capacity; infinite and finite customer populations. Multi-server queues in series or parallel with homogeneous and heterogeneous servers. Models incorporating customer behavior including balking, reneging and jockeying. Prereq: Introductory Probability

C&O 454a F.S 2C .5
Game Theory 1
A mathematically-oriented course on the basis of game theory, with applications to economics, bargaining, and strategy. Classification of games: solution of matrix games and their relationship to linear programming; infinite zero-sum games; utility theory; bimatrix games and the bargaining problem Prereq: Math 231 and basic probability theory

C&O 454b W 2C .5
Game Theory 2
N-person games; Shapley value; metagames. Prereq: C&O 454a
Course Descriptions
Combinatorics and Optimization

C & O 455a F 2C .5
Mathematical Programming 1
Dynamic Programming—deterministic decision process problems; monotonic path problems, equipment replacement, single and multi-dimensional resource allocation, reduction of dimension by use of Lagrange multipliers, optimal reliability, shortest path problems, cargo loading problem, the travelling salesman problem, introduction to optimal control, an aggregate scheduling problem of inventory.
Prereq: C & O 352a or consent of instructor

C & O 455b W 2C .5
Mathematical Programming 2
Dynamic Programming—stochastic decision process problems; stopping time problem, time delay, certainty equivalence, stochastic path problems, series and parallel feedback control, discrete time variational problems, irregular problems.
Prereq: C & O 455a

C & O 456a W,S 2C,1T .5
Scheduling
Single machine job shops, parallel machines, flow-shop scheduling, the general m/n job shop. Capital budgeting, distribution problems occurring in scheduling trucks, trains, and in warehouse movements.

C & O 456b F 2C .5
Boolean Methods in Discrete Optimization

C & O 457a Information Retrieval 1
Not offered 1977-78

C & O 457b Information Retrieval 2
Not offered 1977-78

C & O 458a F 2C .5
Graph Theory 1
Topics in graph theory. These may include symmetry in graphs, planarity, bipartite graphs, minimax theorems, directed graphs, enumeration, algorithms, colouring problems, matrices and graphs.
Recommended for students who have taken a course in graph theory and wish to study additional topics not normally covered in an introductory course.
Prereq: C & O 351a or consent of instructor

C & O 458b W 2C .5
Graph Theory 2
Continuation of topics covered in 458a.
Prereq: C & O 458a

C & O 459a Algebraic Graph Theory 1
Not offered 1977-78

C & O 459b Algebraic Graph Theory 2
Not offered 1977-78

C & O 460a W 2C .5
Enumerative Mathematics
Enumerative Mathematics, Combinatorial identities, generating functions, counting of labelled and unlabelled objects, theorems of Polya, Redfield-Read, and de Bruijn, permanents, combinatorial decompositions.
Recommended as a useful preliminary for Math 785 "Planar graphs" and Math 792 "Enumerative combinatorial theory".
Prereq: A knowledge of elementary group theory (Math 331)

C & O 460b F 2C .5
Combinatorial Design
This is a continuation of C & O 360a. Topics covered include error correcting codes, resolvable designs, affine designs, weighing matrices, and their interaction.
Prereq: C & O 360a or consent of instructor
Note
Course descriptions are given under the new department course number introduced in 1976. More detailed course descriptions and course outlines are available upon request from the Computer Science Department.

CS 112  F,W  2C,1T .5
Introduction to Solving Business Problems by Computer
Emphasis on the solution of mathematical problems in business. Concept and properties of an algorithm. Language and notation for describing algorithms. Analysis of problems, development of models and algorithms; implementation in procedure-oriented languages (FORTRAN IV and/or BASIC); execution of these programs using several systems.
Prereq: none

Note
Credit will only be granted for one of CS 114, CS 117 or CS 150.
CS 114 cannot be counted for credit toward a BMath degree.

CS 113  W  3C .5
Modelling & Simulation for Business Applications
An introduction to the techniques of modelling, simulation and analysis of business systems. Simulation is developed as an effective tool for studying various types of business system environments. Students will be required to develop and run simulation models using both GPSS and DYNAMO programming languages.
Prereq: CS 112 or the equivalent. An introductory statistics course

Note
CS 113 cannot be counted for credit toward a BMath degree.

CS 114  W  2C .5
The Computing Process
For students who must have an understanding of the terminology, hardware (computing machinery), software (computer programmes), and financial and management aspects of the computing process. Topics include: development of computing machinery and programming languages; methods of job processing; development and maintenance of application programmes; organization and management of a computer installation; uses of specialized applications packages.
Prereq: CS 112 or the equivalent

Note
Credit will only be granted for one of CS 114, CS 117 or CS 150.
CS 114 cannot be counted for credit toward a BMath degree.

CS 115  F,W  2C,2T .5
Introduction to File Processing
Introduction to file processing techniques such as file maintenance, sorting and report generation. Language and notation for describing such algorithms. Analysis of problems dealing with files, and development of algorithms for their solution. Introduction to procedure-oriented languages (usually COBOL) for solving such problems.
Prereq: CS 112 or the equivalent

Note
Credit will only be granted for one of CS 115 or CS 180.
CS 115 cannot be counted for credit toward a BMath degree.

CS 116  F  2C,1T .5
Introduction to Computers
This course provides students in programmes of study which do not emphasize mathematics with an appreciation of the capabilities and limitations of machine computing and a reasonable capability for programming in one or more programming languages. Topics will include: concept of an algorithm, representation of information, programming in a higher level language, concept of a compiler.
Prereq: none

Note
Credit will only be granted for one of CS 112, CS 116, CS 118 or CS 140.
CS 116 cannot be counted for credit toward a BMath General or Honours degree.

CS 117  W  2C,1T .5
Applications and Implications of Computers
A continuation of the concepts introduced in CS 116 – the applications of computers to several fields and the impact (past, present and future) of computing on society.
Prereq: CS 116 or the equivalent

Note
Credit will only be granted for one of CS 114, CS 117 or CS 150.
CS 117 cannot be counted as a credit toward a BMath General or Honours degree.
CS 118  F,W,S  2C,2T .5
Introduction to Scientific Problem Solving by Computer
An introduction to the analysis of scientific problems, development of mathematical models and algorithms for their solution; implementation in a procedure-oriented language (normally FORTRAN IV). Topics discussed are: solution of equations, computation of integrals, graph plotting, and simulation.
Prereg: Year 5 mathematics is recommended.

Note
Credit will only be granted for one of CS 112, CS 116, CS 118 or CS 140.

CS 140  F,W,S  3C,2T .5
Introduction to Mathematical Problem Solving by Computer
An introduction to the analysis of mathematical problems, development of mathematical models and algorithms for their solution; implementation in a procedure-oriented language (normally FORTRAN IV). Topics discussed are: solution of equations, computation of integrals, graph plotting, and simulation.
Prereg: Year 5 mathematics is recommended

Note
Credit will only be granted for one of CS 112, CS 116, CS 118 or CS 140.

CS 150  F,W,S  2C,2T .5
Introduction to Computer Science—Characteristics of Computers
Introduction to machine and assembly language programming and basic machine architecture. Addressing modes, indexing and indirection. Subroutine linkage and macro instructions. Characteristics of peripheral devices. A survey of software which assists user programmes: assemblers, compilers, loaders, input-output routines, operating systems.
Prereg: CS 116 or CS 118 or CS 140 or CS 180

Note
Credit will only be granted for one of CS 114, CS 117 or CS 150.

CS 180  F,W  2C,2T .5
Introduction to File Processing
Introduction to the use of computers. Concept of an algorithm. Language and notation for describing algorithms. Analysis and solution of problems dealing with files. Introduction to a procedure-oriented language (usually COBOL). The preparation and debugging of programmes in such a language. Topics include: file processing and maintenance, sorting, report generation and file design.
Prereg: Year 5 mathematics is recommended.

Course Descriptions
Computer Science

Note
Credit will only be granted for one of CS 115 or CS 180.

CS 210  F  3C .5
Introduction to Numerical Computing
A survey of numerical procedures with emphasis upon computer implementation using the FORTRAN IV programming language. Topics include: interpolation, curve fitting, solution of non-linear equations, numerical integration, numerical solution of ordinary and partial differential equations, matrix algebra and solution of systems of linear equations.
Prereg: At least one course in calculus, algebra and computer science.

Note
Students in honours mathematics will not be given credit for this course.

CS 240  F,W,S  2C,2T .5
Principles of Programming Languages and Data Structures
This course covers a number of basic principles of programming languages and data structures. The emphasis will be on fundamental concepts, including block structure, recursion, text processing, and pattern matching, with motivation for programming languages arising from practical examples. ALGOL and SNOBOL will normally be the languages used.
Prereg: CS 140 or CS 180 or the equivalent. CS 150 is recommended

CS 330  F,W,S  2C .5
Computer Applications in Business
A discussion of algorithms for the storage and retrieval of information using storage media such as discs and tapes. The techniques developed are applied to a number of general business applications such as billing, inventory control and general ledger accounting. Good systems design and programming practices will be stressed throughout the course.
Prereg: CS 180

Note
Credit will only be granted for either CS 340 or for courses in the CS 330/331 sequence.

CS 331  F,W  2C .5
Computer Applications in Business
A continuation of the topics presented in CS 330.
Prereg: CS 330
Note
Credit will only be granted for either CS340 or for courses in the CS330/331 sequence.

CS 340  F,W,S  3C .5
Data Structures
The study of data structures in a language independent setting. Levels of data description and their role in design of data structures. The effects of secondary store. Introduction to the analysis of algorithms. Topics include: primitive data types; sequences; designing representation-independent data structures; tuples; arrays and tables; trees and forests; sets.
Prereq: CS 240

Note
Credit will only be granted for either CS340 or for courses in the CS330/331 sequence.

CS 342  F,W,S  3C .5
Machine Structures
The intent is to give a basic understanding of what goes on inside a computer, of machine architecture, and of some fundamental operating system services. Topics include: introduction to an actual computer; representation of data; memory; central processor; addressing schemes; input/output; linking and loading.
Prereq: CS 240

CS 360  F,W,S  3C .5
Introduction to the Theory of Computing
Models of computers including finite automata and Turing machines. Basics of formal languages. Relations between machine models and formal languages with applications to syntax of programming languages. Unsolvable problems and their relevance to the semantics of programming. Concepts of computational complexity including algorithm optimality.
Prereq: CS 240

CS 369  F,W,S  3C .5
Digital Networks
Prereq: CS 150

CS 370  F,W,S  2C,2T .5
Introduction to Scientific Computation: Numerical Algebra
Pitfalls in computation; solution of linear algebraic equations; finding zeros of a single nonlinear equation and systems of nonlinear equations; the algebraic eigenvalue problem. The emphasis is on exposure to modern computer techniques for solving mathematical problems. Heavy use of mathematical subroutine libraries is anticipated.
Prereq: Knowledge of a high level programming language, preferably FORTRAN; Math 220a/b or 230a/b and Math 221a/b or 231a/b.

CS 371  F,W  2C,2T .5
Introduction to Scientific Computation: Numerical Approximation
Polynomial interpolation; least squares and minimax approximation; numerical integration and differentiation; numerical solution of initial value problems and boundary value problems. As in CS 370, the intent is to expose students to modern computer techniques for solving mathematical problems.
Prereq: Knowledge of a high level programming language, preferably FORTRAN; Math 220a/b or 230a/b and Math 221a/b or 231a/b

CS 446  F,W,S  3C .5
Scientific Applications Software
Practical computing problems encountered in scientific applications; an overview of batch operating systems; the importance of loaders and overlays; check points, post mortems and operating system services; FORTRAN as a programming language; current programming techniques; design and use of program libraries and human engineering of input and output; magnetic tapes and bulk storage.
Prereq: CS 340

CS 450  F,S  3C .5
Computer Architecture
This course is intended to prepare the student to choose a suitable computer for a given application. Review of combinational and sequential logic circuits. Discussion of "building blocks"—central processing units, stores, input/output systems, and bus structures. Case studies of machines.
Prereq: CS 342 and CS 369

CS 452  F,W,S  3C .5
Real Time Applications of Minicomputers
This course is intended to give students experience with mini-computers and their applications to process control, data acquisition and communication. A major part of the course involves hands-on experience.
Prereq: CS 340 and CS 342
Course Descriptions
Computer Science

CS 454  F,W,S  3C  .5
Principles of Operating Systems
Basic concepts of computer hardware; program translation; program loading and linking; co-operating sequential processes—computational and data structures, critical section problem, process synchronization primitives, parallel programming; introduction to multiprogramming; operating system nucleus; file systems; reliability; protection; system performance, measurement and evaluation.
Prereq: CS 340 and CS 342

CS 456  W  3C  .5
Data Communications
This course is intended to introduce students to the basic concepts of data communications, the computer communication interface, and new telecommunications services. Topics include: basic queuing theory, data communications and the telephone network, computer architecture for data communications, protocols, error handling, multiplexing and switching, and packet switching networks.

CS 462  F,S  3C  .5
Formal Languages and Parsing
Prereq: CS 360

CS 464  W  3C  .5
Computability and Recursive Function Theory
Models of the computational process as reflected by computers, linguistic systems, functional specifications, transformational systems, formal logic, etc. Equivalence of these models. Computational complexity for specific models and abstracts fitting all models. Formal reducibilities between computational problems, and the complexity of these reducibilities.
Prereq: CS 360

CS 466  W  3C  .5
Algorithm Design and Analysis
Design of good algorithms and analysis of the resources they consume. Lower bounds on the resource requirements of algorithms to compute certain functions. Problems from the following areas are discussed in this light: sorting and order statistics, data structures, arithmetic computations, the NP-complete problems.
Prereq: CS 340. CS 360 is recommended.

CS 468  W  3C  .5
Programme Verification
Methods of programme verification. Implications for structured programming, inductive reasoning about recursive programmes and recursively defined data structures.
Prereq: CS 360

CS 472  W  3C  .5
Numerical Linear Algebra
Prereq: CS 370

CS 474  F  3C  .5
Numerical Approximation
Prereq: CS 371 and Math 332b

CS 476  F  3C  .5
Numerical Solution of Differential and Integral Equations
Prereq: Consent of the instructor

CS 478  W  3C  .5
Numerical Solution of Partial Differential Equations
Prereq: Consent of the instructor

CS 482  W  3C  .5
Business Systems Analysis
Prereq: CS 330 and CS 331, or CS 340 and fourth year standing.
Simulation
Simulation techniques are used to study systems which do not lend themselves to analysis. Introduction to simulation; random number generators; stochastic processes; modelling; simulation programming languages; the GPSS language. 
Prereq: Stat 220 or Stat 230 and CS 330 and CS 331, or CS 340 and fourth year standing.

Introduction to Pure Mathematics
Course descriptions are given under the new departmental course numbers introduced in 1976.

Introduction to Pure Mathematics
Examples and results in modern geometry, number theory and analysis; the historical sources of modern mathematics.

Algebra
Fundamentals of group, ring, field theory, and other algebraic structures. 
Coreq: Math 231

Real Analysis 1
Theory of functions of real variables. The notions of compactness, connectedness, and uniformity are used in a study of continuity, differentiation, and integration. 
Prereq: Math 230

Complex Analysis 1
Analysis of complex numbers; fundamental theorems of holomorphic functions; meromorphic functions. 
Prereq: Math 230

Euclidean Geometry
Concurrent lines, collinear points, the Euler line, the Simson line, the nine-point circle. Cross ratio, projection, harmonic range, the quadrilateral and the quadrangle. Properties of circles.

Projective Geometry
Projective spaces over fields, collineations and correlations, quadric curves and surfaces. References to non-euclidean geometries. 
Prereq: Math 231

Geometry of the Complex Numbers
The plane of complex numbers. The group of circle-preserving mappings and its subgroups. Connections with non-euclidean geometries (Laguerre, Minkowski). 
Prereq: Math 231
P Math 365/AM 362 F 2C,1T .5
Elementary Differential Geometry and Tensor Analysis
Curves in Euclidean 3-space (E^3) and the Serret-Frenet formulae; surfaces in E^3 and their intrinsic geometry. 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.
Prereq: Math 230, or consent of instructor

P Math 367 F 3C .5
Topology
Intuitive set theory, metric spaces, point set topology.

P Math 399
Readings in Pure Math

P Math 430 F,W,S 2C .5
Introduction to Mathematical Logic
An introduction to the logic of sentences and predicates with some emphasis on familiar algebraic structures. At first informal, then leading to a formal axiomatic treatment with proofs of consistency and completeness.
Prereq: Consent of instructor

P Math 432 Y 2C 1
Mathematical Logic
First order languages and theories. A treatment of at least one of the following: set theory, model theory, undecidability. This course is more specialized and at a more advanced level than P Math 430.

P Math 441a F 2C .5
Theory of Numbers 1
Multiplicative-algebraic theory of numbers. Foundations of natural number theory. Elements of additive-combinatorial number theory.
Coreq: Math 331 or P Math 341

P Math 441b W 2C .5
Theory of Numbers 2
Continuation of Theory of Numbers 1
Prereq: P Math 441a

P Math 443 F 2C 5
Linear Algebra 2
Continuation of linear algebra. Main topics: representations of endomorphisms, structure of bilinear forms, multilinear products.
Prereq: Math 331 or P Math 341

P Math 444a F 2C .5
Lattice Theory 1
Ordered sets, lattices, and Galois connections. Applications in algebra, geometry and logic.
Prereq: Consent of instructor

P Math 444b W 2C .5
Lattice Theory 2
Continuation of Lattice Theory 1
Prereq: P Math 444a

P Math 445a 2C .5
Ring Theory 1
Continuation of the theory of rings and modules.
Prereq: P Math 331 or P Math 341

P Math 445b 2C .5
Ring Theory 2
Continuation of Ring Theory 1
Prereq: P Math 445a

P Math 446a F 2C .5
Group Theory 1
Permutations, Cayley Theorem, Sylow Theorem, Jordan-Holer Theorem, nilpotent and solvable groups, direct and semidirect products, free groups.
Coreq: Math 331 or P Math 341

P Math 446b W 2C .5
Group Theory 2
Continuation of Group Theory 1
Prereq: P Math 446a

P Math 447a 2C .5
Field Theory 1
Field extensions and Galois theory.
Prereq: Math 331 or P Math 341

P Math 447b 2C .5
Field Theory 2
Continuation of Field Theory 1
Prereq: P Math 447a

P Math 451a F 2C .5
Real Analysis 2a
An introduction to integration and measure theory with emphasis on the real line.
Prereq: Math 332a or P Math 351

P Math 451b W 2C .5
Real Analysis 2b
Continuation of Real Analysis 2a.
Prereq: P Math 451a

P Math 452a F 2C .5
Complex Analysis 2a
Further properties of holomorphic and meromorphic functions. Riemann surfaces.
Prereq: Math 332b or P Math 352

P Math 452b W 2C .5
Complex Analysis 2b
Continuation of Complex Analysis 2a
Prereq: P Math 452a
P Math 461  W  2C .5
Finite Geometries
Finite incidence structures. Designs. Finite projective
and affine planes.
Coreq: P Math 362

P Math 462 Foundations of Geometry
Not offered 1977-78

P Math 463/AM 463  F  2C,1T .5
Introduction to Differentiable Manifolds
Differentiable manifolds, vector fields, linear
connections, tensor fields, differential forms and
structure equations.
Prereq: P Math 365/AM 362 or consent of instructor

P Math 464  W  2C .5
Algebraic Geometry
An introduction to the theory of algebraic varieties.
Special topics such as the Theorem of Riemann-Roch
Prereq: Math 331 or P Math 341

P Math 465  W  2C,1T .5
Introduction to Riemannian Manifolds
Linear connections and Riemannian structures,
geodesics and variations of geodesics, differential forms,
integration theory and Stokes' theorem.
Prereq: P Math 463/AM 463, or consent of instructor

P Math 466 Combinatorial Topology
Not offered 1977-78

P Math 467  W  2C .5
Topology 2
Continuation of general topology; selected topics from
other branches of topology.
Prereq: P Math 367

P Math 470  Y  2C 1
Functional Equations
Cauchy's, Pexider's, and similar equations. Equations for
polynomials and for trigonometric functions. Reduction
to differential equations. General methods and theorems.
Iteration. Applications. Further topics, such as equations
for functions of several variables, or equations for analytic
functions, or equations on algebraic structures.

P Math 499
Readings in Pure Math

Department of Statistics
Undergraduate Course Descriptions

Note
Course descriptions are given under the new
departmental course numbers introduced in 1976.

Stat 202  F  2C,1L .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.

Note
Stat 202 is for Science students only.

Stat 204  F  2C,1L .5
Statistics for the Physical Sciences 1
Descriptive statistics. Probability, random variables,
discrete and continuous distributions. Estimation and
hypothesis testing, goodness of fit.

Note
Stat 204 is for Science students only.

Stat 205  W  2C,1L .5
Statistics for the Physical Sciences 2
Linear regression. Introduction to the design of
experiments. Completely randomized and randomized
block designs. Analysis of variance. Nonparametric
statistics.
Prereq: Stat 202 or 204

Note
Stat 205 is for Science students only.

Stat 210  F,W  3C,1T .5
Applied Probability and Statistics
Laws of probability. Discrete and continuous random
variables. Uniform, binomial, Poisson, normal
distributions. Sampling from a normal population.
Student-t, chi-square, F distributions. Estimation and
hypothesis testing. Simple linear regression.

Note
This course is for students in Mechanical Engineering,
and is cross listed in Management Sciences as M Sci 21.

Stat 220  F,W,S  3C,1T .5
Introduction to Statistical Methods
Descriptive statistics, graphical methods, model fitting:
correlation, regression and the method of least squares.
Probability theory; discrete and continuous random
variables.
Prereq: Math 210 or Math 130, one of CS 116, CS 118,
CS 140.
Course Descriptions
Statistics

Stat 220 is not open to Honours Mathematics students. Credit will be given for only one of Stat 220, 230.

Stat 221 F, W, S 3C, 1T .5
Introduction to Statistical Methods 2
Tests of significance, maximum likelihood estimation and large sample theory; estimation and testing in the normal distribution.
Prereq: Stat 220 or 230

Stat 221 is not open to Honours Mathematics students. Credit will be given for only one of Stat 221, 231.

Stat 230 F, W, S 3C, 1T .5
Probability
The laws of probability, discrete and continuous random variables, expectation, central limit theorem.
Prereq: Math 120 or Math 130

Credit will be given for only one of Stat 220, 230.

Stat 231 F, W, S 3C, 1T .5
Statistics
Estimation, tests of significance, probability plots, Contingency tables, normal distribution theory, simple linear regression.
Prereq: Stat 230.

Credit will be given for only one of Stat 221, 231.

Stat 270 F, W, S 3C .5
Mathematics of Investment
The theory of rates of interest and discount. Annuities and sinking funds with practical applications to mortgage and bond questions. Yield rates.

Only one of Stat 270, 273 can be taken for credit.
Students planning to enroll in Honours Actuarial Science must take Stat 273.

Stat 273 F, W 3C .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: First year calculus.

Credit will be given for only one of Stat 270, 273.

Stat 274 F, W, S 3C .5
Introduction to Life Contingencies
Applications of probability to problems of life and death. The determination of single and annual premiums for assurances and annuities. Reserves. Company expenses and their incorporation into premium and cash value calculations.
Prereq: Stat 270 or 273

Stat 300 F 2C, 1T .5
Principles of Survey Design
The design of surveys of human or natural populations for research and planning. How to take a representative sample; efficient estimation of population quantities and sample size determination; ways of reducing response bias.
Prereq: An introductory half course in Statistics.

Stat 330 F 3C .5
Introduction to the Theory of Statistics
Prereq: Stat 221 or 231

Credit will be given for only one of Stat 330, 350.

Stat 331 F, W, S 3C .5
Applied Regression Analysis
Review of Normal, t, Chi-squared and F distributions and their applications. Introduction to the design of experiments. Analysis of variance, multiple linear regression.
Prereq: Stat 221 or 231 or the equivalent.

Credit will be given for only one of Stat 331, 351.

Stat 332 F, S 3C .5
Sampling
Introduction to sampling of survey populations. Elementary sampling designs. Efficiency comparisons for sampling designs and estimation procedures.
Prereq: Stat 221 or 231 or the equivalent
Course Descriptions
Statistics

Note
Credit will be given for only one of Stat332, 454.

Stat340 F,W,S 3C .5
Probability and Stochastic Processes 1
Discrete probability models. Random walk models.
Recurrent events. Theory and applications to Markov
chain models.
Prereq: Stat221 or 231

Stat341 F,W 3C .5
Probability and Stochastic Processes 2
Continuous probability distributions. Applications of
Poisson and other continuous time stochastic processes.
Renewal processes. Stationary processes.
Prereq: Stat340 or consent of instructor

Stat350 F,W,S 3C .5
Mathematical Statistics 1
Continuous random variables: moments and moment
generating function; distribution of t, chi-squared, and F,
and their applications. Large sample theory.
Prereq: Math 230, Stat 231 or consent of instructor

Note
Credit will be given for only one of Stat 330, 350.

Stat351 F,W 3C .5
Mathematical Statistics 2
The multivariate normal distribution, its properties and
uses; quadratic forms and Cochran’s theorem; multiple
regression; introduction to the analysis of variance.
Prereq: Stat 350, Math 231

Note
Credit will be given for only one of Stat 331, 351.

Stat373 F,S 3C .5
Finite Differences
A course in the calculus of finite differences, to include:
summation, numerical integration and differentiation,
relation between integration and summation; error
theory; topics in numerical analysis.

Stat374 F,S 3C .5
Life Contingencies – Single Life Function
An advanced course on problems with single lives,
including population theory.
Prereq: Stat 284

Stat383 W 3L .5
Topics in Actuarial Mathematics
Topics in Actuarial Mathematics for students intending to
take the professional examinations.
Prereq: Stat 273, 373

Stat384 F,W,S 3C .5
Life Contingencies – Multiple Life Functions
An advanced course on problems with multiple lives;
multiple decrement theory; accidental death and
disability benefits.
Prereq: Stat 374

Stat430 F,S 2C .5
Experimental Design 1
The requirements for a good experimental design
prior to the accumulation of data. The concepts of
randomization, replication and experimental error as
applied to basic designs; the completely randomized
block and latin square designs. Analysis of variance.
Introduction to factorial designs.
Prereq: Stat 331 or 351 or consent of instructor

Note
Credit will be given for only one of Stat 430, 452.

Stat431 W 2C .5
Experimental Design 2
Factorial experiments, confounding, fractional
replication. Applications of designs. Incomplete block
designs. Analysis of covariance.
Prereq: Stat 430

Note
Credit will be given for only one of Stat 431, 453.

Stat440 W,S 2C .5
Exploratory Data Analysis
Summary statistics. Transformation of data. Plotting
Random number generation techniques. Outliers in
regression and analysis of variance data. W-statistics and
tests for normality. Computational techniques in multiple
unweighted and weighted regression.
Prereq: Stat 331 or 351, and ability to programme in
FORTRAN.

Stat442 W 3C .5
Statistical Decision Theory
The decision problem, Bayesian and classical analyses;
acceptance sampling; sequential procedures; an
introduction to the statistical aspects of quality control.
Prereq: Stat 221 or 231; Math 220 or 230
Stat 444  2C,1S  .5
Statistical Methods with Socio-Economic Applications 1
Survey and analysis of typical statistical models in the
Extensions of the linear model. Specification errors. Time
series and forecasting.
Prereq: Stat 331 or 351
Note
May or may not be offered 1977-78. See pre-registration
lists.

Stat 445  2C,1S  .5
Statistical Methods with Socio-Economic Applications 2
Structural models, identification, estimation and
forecasting. Non-linear estimation. Discussion of data
base.
Prereq: Stat 444

Note
May or may not be offered 1977-78. See pre-registration
lists.

Stat 450  F,S  3C  .5
Topics in Estimation and Hypothesis Testing
Discussion of general inference problems under the
headings of point and interval estimation, hypothesis
testing, and decision theory. Large sample normal
likelihoods, maximum likelihood estimation, theory of
UMV estimation, least squares, Neyman-Pearson theory
of hypothesis testing.
Prereq: Stat 350/1

Stat 451  W  2C  .5
Statistical Inference with Small Samples
Logic of tests of significance; exact tests and confidence
intervals; normal approximations accurate for small
samples and relationship to the normality of the
likelihood function. Introduction to problems involving
more than one parameter.
Prereq: Stat 450 or permission of instructor

Stat 452  F,S  3C  .5
Theory of Experimental Design 1
Logical requirements of designed experiments. Design
and analysis of basic complete designs with fixed effects,
random effects, or both. Analysis of covariance. Latin
squares. Applications.
Prereq: Stat 331 or 351 or consent of instructor

Note
Credit will be given for only one of Stat 430, 452.

Stat 453  W  3C  .5
Theory of Experimental Design 2
Construction and analysis of incomplete designs: latin
square, confounded, fractional factorial, incomplete
block. Applications.
Prereq: Stat 452 or consent of instructor

Note
Credit will be given for only one of Stat 431, 453.

Stat 454  F,S  3C  .5
Sampling Theory and Practice
Introduction to sample theory and practice. Elementary
sampling designs and estimation procedures. Statistical
inference in survey sampling. Interrelationships between
survey sampling and the design of experiments.
Prereq: Stat 331 or 351

Stat 455  W  2C  .5
Sample Survey Design
Procedures for construction of sampling designs
commonly used in agricultural, economic and scientific
surveys, and corresponding estimation techniques.
Validation of survey results.
Prereq: Stat 454

Stat 464  2C  .5
Topics in Probability Theory
Prereq: Stat 340/1 or consent of instructor

Note
May or may not be offered 1977-78. See pre-registration
lists.

Stat 466  2C  .5
Topics in Statistics 1
Prereq: Stat 350/1 or consent of instructor

Note
May or may not be offered 1977-78. See pre-registration
lists.

Stat 467  2C  .5
Topics in Statistics 2
Note
May or may not be offered 1977-78. See pre-registration
lists.

Stat 468  R  .5
Readings in Statistics 1

Note
May or may not be offered 1977-78. See pre-registration
lists.

Stat 469  R  .5
Readings in Statistics 2

Note
May or may not be offered 1977-78. See pre-registration
lists.
Stat 474 F.S 3L .5
Advanced Topics in Actuarial Mathematics
Topics in Actuarial Mathematics for students intending to take the professional examinations.
Prereq or coreq: Stat 284, 374, 384, or consent of instructor

Stat 475 F.S 3C .5
Construction of Life Tables
Methods of analysis of data to produce raw rates for mortality, morbidity and other tables.
Prereq: Stat 273, 284, or consent of instructor

Stat 476 F.S 3C .5
Introduction to Demographic Statistics
Topics in demography with emphasis on population projections, mortality theories, and construction of life tables.
Prereq or coreq: Stat 284 or consent of instructor

Stat 480 W 3C .5
Life Insurance Systems
Selected topics for the advanced actuarial student.
Prereq: Consent of instructor

Stat 485 W 3C .5
Risk Theory
Prereq: Stat 330, Math 332b or consent of instructor

Stat 486 W 3C .5
Graduation of Life Tables
Methods for determining the underlying trends and eliminating fluctuation in disease, disability, and death data.
Prereq: Stat 373

Stat 500 F 2C,1T .5
Principles of Survey Design
The design of surveys of human or natural populations for research and planning. How to take a representative sample; efficient estimation of population quantities and sample size determination; ways of reducing response bias.
Prereq: An introductory half course in Statistics

Note
Stat 500 is intended for senior undergraduate and graduate students in faculties other than Mathematics. It cannot be taken for credit towards a Mathematics degree.

Stat 520 1.0
Introduction to Mathematical Statistics

Note
May or may not be offered 1977-78. See pre-registration lists.

Electives for Mathematics Students

The following courses may be counted as non-mathematics electives by mathematics students.

MTHEL 100 F.W.S 2C .5
Commercial Law for Mathematics Students

MTHEL 206a F 2C .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, extra-curricular activities, the relationship between elementary and secondary school mathematics, audio-visual materials, current textbooks.

Note
This course is offered only to students in the co-op Teaching Option.

MTHEL 302a F 2C,1T .5
Applications of Mathematics to the Biological Sciences 1
The course material has been selected with particular reference to some of the fundamentals of Medical Science including Macromolecular processes, Environmental Health, Genetics and aging processes and quantitative models which describe events in these areas. Theories and models for age-related changes: (i) Qualitative and quantitative changes in structural and functional proteins.

MTHEL 302b W 2C,1T .5
Applications of Mathematics to the Biological Sciences 2
Theories and models for age-related changes: (ii) Nucleic acids, genetics and cellular organization; (iii) Biochemical evolution.

MTHEL 303a F.W.S 2C .5
Readings in Modern Mathematics
A course based upon readings from the works of modern mathematicians selected to illustrate the nature of contemporary mathematics, its achievements, and its range of application. The course requirements will consist of prose reports upon assigned readings.
Prereq: Consent of instructor

MTHEL 304a F.W 3C .5
Foundations of Mathematics
An introduction to the problems of the foundations of mathematics. This course will normally be taken in third or fourth year. It will be an elective credit for mathematics students.
Prereq: Consent of instructor
Course Descriptions
Mathematics Electives

MTHEL304b F,W 3C .5
Foundations of Probability Theory
An introduction to the problems of the foundations of probability theory. This course will normally be taken in third and fourth year. It will be an elective credit for mathematics students.
Prereq: Consent of instructor

MTHEL305a F 3C .5
General Life Insurance 1
Types of Life Insurance contracts and their uses, basis of risk measurement, deficiency reserves, modified valuation methods, non-forfeiture values, dividend formulae, selection of risks, substandard risks, and principles of reinsurance.
No prereq

MTHEL305b W 3C .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

MTHEL402a F 2C .5
Topics in Mathematical Aspects of Chemistry, Biology and the Medical Sciences 1
Topics will be selected from the area of epidemiology and mathematical models of disease processes with special reference to heart disease and cancer.
Prereq: MTHEL 302a or consent of the instructor

MTHEL402b W 2C .5
Topics in Mathematical Aspects of Chemistry, Biology and the Medical Sciences 2
Factors contributing to various disease processes will be discussed, with special references to the quantitative evaluation of environmental factors relevant to human disease and aging processes.
Prereq: MTHEL 302a/b or consent of the instructor

Mathematics Service Courses
(not open to students registered in the Faculty of Mathematics)

Note
Course descriptions are given under the new course numbers introduced in 1976.

AM101 F 3C,1T .5
Applications of Mathematics 1 (Biology Students)
Models using difference equations will be formulated for examples drawn from biology, economics and psychology.

AM111 W 3C,1T .5
Applications of Mathematics 2 (Biology Students)
Sets of difference equations, probability and matrix theory will be used to describe models from biology, ecology, economics, psychology and physiology.

Math 101a F 3C .5
Number Systems and Functions (For Arts Students)
Development of number systems: Natural to real; properties and operations therein. Analysis of polynomial, linear, rational, exponential, and trigonometric functions and their graphs.

Math 101b W 3C .5
Geometry and Calculus (For Arts Students)
Measurement and relationships of geometric figures in 2 and 3 dimensions. Infinite series, the limit concept, introduction to calculus including the derivative and its applications to graph sketching.

Note
Math 101a, 101b are specially designed for students enrolled in General Arts programmes and are normally not available to students with Grade 13 Mathematics or equivalent.

Math 103 F 3C .5
Introductory Mathematics (For Arts Students)
Set Theory, Permutations and Combinations, Vectors and Matrices, Probability Theory, Solution of Linear Equations, Game Theory, Linear Programming.

Math 104 W 2C,2T .5
Algebra (For Psychology Students)

Math 105 F,W 3C .5
Mathematics (For Environmental Studies Students)
Quantitative analysis in environmental research. Elementary concepts in Algebra: notation, terminology, operations. Probability Theory. Permutations and Combinations, approaches to probability, dependent and independent events, conditional probability, distribution functions, including the Binomial, Poisson and Normal distributions, with applications to problems in Environmental Studies.

Math 106 F 3C .5
Mathematics (For Kinesiology Students)
Algebraic functions and their graphs; exponential and logarithmic functions; elementary differential and integral calculus; applications and problems associated with kinesiology.
Note
This course is open to Kinesiology students who have not taken Grade 13 Calculus.

Math 107  F  3C  .5
Mathematics (For Kinesiology Students)
Content similar to that of Math 106 except that it will be assumed that students have completed Grade 13 Calculus. Accordingly, there will be broader consideration of applications.

Math 110a  F  3C,2T  .5
Calculus 1a (For Engineering Students)
Functions and their inverses, limits, continuity and derivatives. The trigonometric functions, their inverses and derivatives. Applications to rate, max./min., curve sketching problems. Sequences, the definite integral, the fundamental theorem of calculus. Applications to area and volume problems.

Math 110b  F,S  3C,2T  .5
Calculus 1b (For Engineering Students)

Math 111a  F  3C  .5
Algebra and Solid Geometry (For Science Students)
The real and complex number system, Mathematical Induction, the Binomial Theorem, Monotone sequences and the Cauchy criterion, polynomial functions, Theory of equations.

Math 111b  W,S  3C  .5
Algebra and Solid Geometry (For Science Students)
Determinants, Vector and Matrix notation, Elementary Solid Geometry, Linear transformations, Eigenvalues and Eigenvectors.

Math 113  Y  3C,2T  1.0
Calculus (For Arts and Science Students)

Math 114  F  3C,2T  .5
Algebra and Vector Geometry (For Engineering Students)

Math 210  F,W  3C  .5
Calculus 2 (For Chemical Engineers)
Partial differentiation, the gradient, multiple integrals with applications, line and surface integrals, divergence and curl, theorems of Green and Stokes. Applications to physical problems.

Math 211  F,W  2C,2T  .5
Calculus 2 (For Electrical Engineers)
Differential calculus of functions of several variables. Differential equations. Multiple integrals. Prereq: Math 110 or equivalent

Math 212  F,S  2C,2T  .5
Advanced Calculus (For Electrical Engineers)

Math 213  Y  3C  1.0
Calculus (For Science Students)

Math 215  F,W  3C  .5
Differential Equations (For Chemistry)

Math 216  F,S  3C  .5
Differential Equations (Physics or Chemical Engineering)

Math 226  Y  2C  1.0
Elementary Differential Equations (For Science Students)
AM405  Y  2C  1.0
Applied Analysis (For Science Students)
Ordinary and partial differential equations. Laplace and
Fourier transforms. Special functions. Fourier series.
Vector and matrix methods. Calculus of variations. Other
topics in advanced calculus.
Course Descriptions
Mechanical Engineering

Department of Mechanical Engineering

Professor, Chairman of the Department
D. J. Burns, BSc, PhD (Bristol), CEng, PEng

Professor, Associate Chairman Graduate Studies
C. E. Hermance, BE (Yale), MA, MSE, PhD (Princeton)

Professor, Associate Chairman Undergraduate Studies
P. Niessen, BSc (McMaster), MASc, PhD (Toronto), PEng

Professor, Vice President Academic
T. A. Brzustowski, BASc (Toronto), AM, PhD (Princeton), PEng

Professors
S. A. Alpay, Dipl Ingr, Dr Ing (Berlin)
E. Brundett, BSA (OAC), BASc, MASc, PhD (Toronto), PEng
M. B. Danard, BASc (UBC), MA (Toronto), PhD (Chicago)
D. French, BSc, CEng, PEng
E. L. Holmes, BSc (Bristol), MASc, PhD (Toronto), PEng
J. H. G. Howard, BSc (Queen's), MSc, PhD (Birmingham), PEng
H. R. Martin, BSc, MSC (Queen's Belfast), PhD (Nottingham), PEng
W. B. Nicoll, SB (MIT), Engineer (Stanford), PhD (London), PEng
G. F. Pearce, BASc (UBC), MASc (Toronto), PEng
J. A. Schey, Dipl Ing, CSc (Budapest), PEng
D. M. R. Taplin, BSc (Aston), DPhil (Oxford), PEng
M. M. Yvanovich, BSc (Queen's), MS (Buf.), MScEd (MIT)

Associate Professors
K. G. Adams, BSc (Queen's), MASc, PhD (Waterloo), PEng
G. C. Andrews, BASc, MASc (UBC), PhD (Waterloo), PEng
G. M. Bragg, BASc (Toronto), PhD (Cambridge), PEng
R. N. Dubey, BSc (Hons) (Patna), BSc (Eng) Bihar, PhD (Waterloo), PEng
A. M. Hale, BSc, MA (New Brunswick), BASc (Toronto), MASc, PhD (Waterloo), PEng
K. G. T. Hollands, BASc (Tower), PhD (McGill), PEng
H. W. Kerr, BASc, PhD (Toronto), PEng
W. M. Mansour, BSc (Cairo), MSc, PhD (Toronto)
R. J. Pick, BASc (UBC), MSc (Imperial College), PhD (Waterloo), PEng
K. R. Piekarski, Dipl Ing (London), PhD (Cambridge), PEng
A. Plumtree, BSc, PhD (Nottingham), PEng
G. D. Raithby, BESc, MSc (Western), PhD (Minnesota), PEng
P. R. Slawson, BASc, MASc, PhD (Waterloo), PEng
A. B. Strong, BASc (Waterloo), MSc (Imperial College, London), PhD (Waterloo), PEng

Assistant Professors
G. A. Davidson, BASc (Hons) (Toronto), PhD (Toronto)
U. H. Mohaupt, BASc, MASc, PhD (Waterloo), PEng
H. F. Sullivan, BASc (Waterloo), AM, PhD (Princeton), PEng

Adjunct Professor
R. G. R. Lawrence, QC

Undergraduate Programmes

Details of the undergraduate programme in Mechanical Engineering are to be found in chapter 8. All courses extend over one term only, and consist of 3 hours of lectures per week unless otherwise specified. In general, the only prerequisites are the core courses, unless otherwise specified.

Undergraduate Course Descriptions

ME01  F,W  .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.

ME02  .5
Statistics for Engineers (Equivalent to MSci 21)


MF03  S,F  3C,1T  .5
Ordinary Differential Equations

ME 04  S,F  3C,1T  .5
Numerical Analysis
A survey of numerical procedures with emphasis upon
computer implementation using the FORTRAN 4
programming language. In particular, the following
topics are covered: Interpolation, curve fitting, solution of
non-linear equations, numerical integration, numerical
solution of Ordinary Differential Equations, matrix
algebra and solution of systems of linear equations, and
problems in the solution of partial differential equations.

ME 05  S,W  3C,1T  .5
Partial Differential Equations
Modelling physical systems with distributed parameters.
Boundary and initial conditions. Division into hyperbolic,
parabolic and elliptic equations by means of
discriminant.
Characteristics. Separation of variables; eigenvalues
Gamma functions. Bessel and Legendre equations.
Numerical solution of Laplace and diffusion equations.
Analogue simulation techniques.

ME 12  S,W  3C,1T  .5
Dynamics
An introduction to the kinematics of particle and rigid
body motion. Impulse-momentum equations.
Work-energy methods and Euler's equations. Simple
gyroscopes. Vibrations.

ME 15  F,W  2C,3L  .5
The Mechanical Behaviour of Materials
The relevance of materials engineering to the ascent of
man, the internal structure of materials, electrical,
magnetic and optical properties of materials, structure of
imperfect solids, microscopy of materials, elasticity and
anelasticity, stress-strain behaviour in metals, plasticity
in metals, non-metallic behaviour, fracture of materials,
improving materials.

ME 19  F,W  2C,1D,1T  .5
Mechanics of Deformable Solids I
An analytical treatment of statics and resistance of
materials. Equilibrium of particles, rigid bodies and
deformable bodies. Vector fields. Introduction to stress
and strain. Stress-strain relationships. Elastic and
inelastic behaviour of prismatic members subjected to
axial, shearing, torsional and flexural deformations.

ME 20  S,F  2C,1D,1T  .5
Mechanics of Deformable Solids
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 unsymmetrical
bending, torsion of circular members, columns and
stability, and virtual work.

ME 21  S,W  3C,1L  .5
Kinematics and Dynamics of Machines
Principles of the geometry of motion. Uniform and
non-uniform motion, linkage, gears, cams. Synthesis and
analysis of mechanisms. Consideration of the dynamic
forces in machines. Gyroscopic torque. Vibration
analysis, response to shock, motion and force
transmissibility, vibration isolation.

ME 22  F,W  3C,1T  .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 gear.

ME 30  S,F  2C,3L  .5
Control of the Behaviour of Materials
The stability and control of micro-structure, phase
diagrams, vacancies and diffusion, reaction rate theory,
solid state transformations in materials, materials at high
temperatures, alloying and strengthening, composite
materials and bio-materials, environmental degradation
of materials, review of materials engineering.

ME 32 Physical Metallurgy 2
Not given in 1977-78

ME 33  F,W  6L  .5
Experimental Materials Science
This course is designed to acquaint students with
materials phenomena using an experimental approach.
Microstructural changes and their effects on the
mechanical properties in various materials will be
studied using such techniques as optical and scanning
electron microscopy together with electron probe
microanalysis and X-ray analysis. The student may work
on a project of his own choice provided it meets the
objectives of this course.

ME 35  S,F,W  3C  .5
Industrial Metallurgy
This course is intended for those students interested in
acquiring a working knowledge of metallurgy. It will
cover: Metals and alloy systems, iron-carbon alloys, heat
treatment and the function of alloying elements in steel,
corrosion and scale resistant alloys, copper and nickel
base alloys, light metals and their alloys; casting, hot and
cold working of metals; soldering, brazing and welding;
corrosion and oxidation; metal failure analysis.

ME 40  S,W  3C  .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 costs and production rates of
competitive processes.
Course Descriptions
Mechanical Engineering

ME 44 F,W 3C .5
Production Engineering
Introduction to a number of problem areas in production/industrial engineering. Topics will be selected from product and process design including value analysis; location and layout of facilities; job design and work measurements; production planning, scheduling and inventory control; planning and control of large-scale projects; quality control; reliability and maintenance.

ME 46 Polymer Processing
Not offered 1977-78

ME 47 Analysis and Design of Manufacturing Systems 1
Not offered 1977-78

ME 48 W†† 3C,2T .5
Analysis and Design of Manufacturing Systems 2
Analysis and design of the plant layout and materials handling systems as basic components of a manufacturing facility and system. Product range and mix and their effect on these systems. Proven systematic analysis and synthesis and evaluation techniques for efficient and effective plant design.

ME 50 S,F 3C,1L .5
Thermodynamics

ME 51 S,W 3C,3L .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.

ME 52 W 3C .5
Air Conditioning
Thermodynamic properties of moist air; psychrometric charts; humidity measurements; direct water contact processes; heating and cooling of moist air by extended surface coils; solar radiation; heating and cooling of loads on buildings; effects of the thermal environment; air conditioning and calculations; air flow in and around buildings, diffusers.
Prereq: ME 54

ME 53 F,W 3C,2to3L .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.

ME 54 F,W 3C .5
Thermodynamics 2
Emphasis on applications of thermodynamics to flow processes, real fluids, evaluation of state functions of real fluids. Non-reacting mixtures, reacting-mixtures, equilibrium considerations. Introduction to the kinetic theory of gases.

ME 55 F,S 3C .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.

ME 56 W†† 3C .5
Internal Combustion Engines
Reciprocating SI and CI engines, gas turbines, jets, rockets: principles of operation, modern developments (for pollution control and improvements in efficiency).
Prereq: ME 54

ME 57 F,S 3C .5
Energy Conversion
Applications of fundamental principles of thermodynamics, fluid mechanics, combustion and heat transfer to the design of power plants using fossil and nuclear fuel heat sources. Economics and pollution problems associated with power equipment. Other energy conversion devices such as batteries, fuel cells, solar cells, thermionic and thermoelectric devices and MHD generators.
Prereq: ME 54
ME 60 S,W 3C,T 0.5
Introduction to Control Systems

ME 62 F,W 3C,T 0.5
Fluid Mechanics 2
Basic equations of two-dimensional flow, exact viscous solutions, introduction to lubrication, boundary layers, and introduction to turbulence. Turbomachinery fundamentals and applications. Selected advanced topics.

ME 63 S,F 3C 0.5
Tribology
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.

ME 69 S,W 3C 0.5
Introduction to the Environmental Sciences

ME 82 S,F,W 9L 0.5
Mechanical Engineering Projects
Engineering assignments requiring the student to demonstrate initiative and assume responsibility. Student activity is guided and co-ordinated by 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.

ME 100 F,W 3C 0.5
Introductory Survey of Law
The rights and responsibilities of the engineer as a citizen of Ontario and Canada under the law; brief history of Canadian law differentiating between Civil and Criminal Law, the rights and duties of citizens and police, a review of Domestic Law, Real Estate Law, Landlord and Tenant Law. The law as it may pertain to the engineer in his profession, brief reviews of the Laws of Contracts, Patents, Trade marks, industrial design, and copy-right, Bills of Exchange, Company Law, incorporation of companies, Common and Preferred shares, the Law of Master and Servant, Surveying Law, Constitutional Law, Private International Law, and other topics. The ME 100Z section is restricted to senior Mechanical Engineering students.

ME 116 W,S 2C,4L 0.5
Engineering Concepts 2
A continuation of Gen E 115 with applications of graphics, measurement and other analytic principles to introductory problems in the various disciplines of Mechanical engineering; an introduction to engineering design methods as applied to Mechanical engineering and including specification development, information-gathering, concept formulation, feasibility analysis and report writing.

Prereq: Gen E 115

ME 200 F,W 1C 0
Introduction to Mechanical Engineering 1
Discussion of structure of Mechanical Engineering curriculum, operation of Department, Faculty, University, technical societies.

ME 300 S,W 1C 0
Introduction to Mechanical Engineering 2
Technical specialties in Mechanical Engineering, discussion of options in Mechanical Engineering curriculum, seminars and technical topics in the various options.

ME 400 S,F 1C 0
Introduction to Mechanical Engineering 3
Research frontiers in Mechanical Engineering, specific discussion of research done at Waterloo, seminars by members of research groups.

ME 523 W,S 3C 0.5
Mechanical Design 2
Principles of optimum design of machine elements; minimum cost, minimum weight, maximum power, etc. Statistical considerations in factors of safety and tolerances. Effect of manufacturing errors on product performance. Introduction to value engineering and reliability.

Prereq: ME 22
ME524 Advanced Dynamics
Not offered 1977-78

ME525 W 3C .5
Mechanical Vibrations in Machines

ME527 W 3C .5
Mechanics of Deformable Solids 3

ME528 Experimental Mechanics
Not offered 1977-78

ME531 F, W 3C .5
Physical Metallurgy 1

ME534 S 3C .5
Properties of Polymers

ME537 W†† 3C .5
Ceramics
The crystallography of ionic and covalent compounds. The vitreous state. Important phase diagrams in oxide-ceramic systems. Production methods for glass, porcelain and graphite shapes. Properties and applications of special ceramics.

ME541 F, S 4C .5
Deformation Processes

ME542 W†† 3C .5
Mechanics of Machining Processes

ME543 W 3C .5
Metal Casting Processes

ME544 W 3C .5
Welding Processes
Static and dynamic design of welding details. Temperature distributions, distortion and residual stresses. Solidification in welding. Fracture modes and mechanical destructive tests.

ME548 S,F 3C,4L .5
Numerical Control of Machine Tools 1

ME555 Thermodynamics 3
Not offered 1977-78

ME557 W 3C .5
Combustion 1
Combustion thermodynamics; Introduction chemical kinetics of combustion; Combustion properties of fuels; Flammability of combustible mixtures, Flame propagation mechanisms, pre-mixed and diffusional; Stability of flames; Introduction to combustion aerodynamics, jet flames; Atomization: Droplet and spray combustion; Elementary ignition concepts and theory; Basic detonation theory.

ME560 S,F 2C,2T,3L .5
Instrumentation
Choice of instrumentation systems, sensing devices and conversion devices. Examples and experiments of techniques used in the measurement of flow, pressure, temperature, position, velocity acceleration, strain, sound, surface finish and dimensions.
ME561 S,F 3C .5
Fluid Power Control System

ME562 S,F 3C .5
Introduction to Automation

ME563 W 3C .5
Turbomachines

ME565 W 3C .5
Gas Dynamics
Basic laws of compressible fluid flow. Wave propagation in compressible fluids, isentropic flow of a perfect gas, normal and oblique shock waves, Prandtl-Meyer flow. Flow in ducts and over bodies, flow with friction (Fanno) and heat transfer (Rayleigh). Imperfect gas effects, measurement of compressible flows, use of formulae, charts and tables, introduction to the methods of characteristics.

ME566 F,S++ 3C .5
Fluid Mechanics 3
Prereq: ME 62

ME568 S,F 3C .5
Noise Analysis and Control
School of Optometry

Professor, Director of School
M. E. Woodruff, OD (College of Optometry of Ontario),
PhD (Indiana)

Professors
C. W. Bobier, OD (College of Optometry of Ontario),
BA (Ohio State), MS (Ohio State)
E. J. Fisher, BA, MA (Toronto), DSc (Penn. College of
Optometry)
W. S. Long, OD (College of Optometry of Ontario),
BA (Toronto)
W. M. Lyle, OD (College of Optometry of Ontario),
MS, PhD (Indiana)
J. D. Moreland, BSc (London), DIC, PhD (Imperial
College)
R. D. Pellowe, OD (College of Optometry of Ontario)
F. Van Nus, BA, BSc (Western Michigan),
OD, MS (Indiana)

Associate Professors
R. D. Beauchamp, BA (McMaster), MA, PhD (Brown)
A. Remole, OD (College of Optometry of Ontario),
BFA (Manitoba), MS, PhD (Indiana)
J. G. Sivak, LScO (Montreal), MS (Indiana), PhD (Cornell)
T. D. Williams, OD (College of Optometry of Ontario),
MS, PhD (Indiana)
G. C. S. Woo, OD (College of Optometry of Ontario),
MS, PhD (Indiana)

Assistant Professors
M. G. E. Callender, OD (College of Optometry of Ontario),
BSc (S.G.W.U.), MS (Waterloo)
W. F. Long, BA (William Jewell Coll., Missouri),
MS, PhD (Mich. State Univ.), OD (Indiana)

Adjunct Professors
D. E. Andrew, BA, MD (Toronto)
I. Baker, OD (College of Optometry of Ontario)
D. H. Lamont, BA (Toronto) OC
C. W. Schwenger, MD, DPH (Toronto)
G. W. Wyszecki, Dipling, Dr Ing (Tech. Univ. Berlin)

Visiting Professors (1976-77)
H. W. Jervis, BSc, OD (LA Coll Optometry), BA (UBC)
W. D. Wright, ARCS, DIC, DSc (London)
G. A. Hopkins, BPharm, PhD (London), MPS

Lecturer
H. A. McDonald, BA (Saskatchewan), OD (College of
Optometry of Ontario), MSc (Waterloo)

Clinic Supervisors – Full-time (1976-1977)
D. B. Buck, OD (College of Optometry of Ontario)
W. B. Foley, OD (Waterloo)
J. P. Johnson, OD (College of Optometry of Ontario)

Clinic Supervisors – Part-time (1976-1977)
W. R. Andrews, OD (College of Optometry of Ontario)
A. J. Baldock, OD (College of Optometry of Ontario)
R. R. Bock, OD (College of Optometry of Ontario)
J. D. Capell, OD (Waterloo)
R. R. Chen, OD (College of Optometry of Ontario)
K. S. Chhatwal, OD (Waterloo)
A. N. Fruman, BA, (Saskatchewan) OD (Waterloo)
G. A. Grant, OD (College of Optometry of Ontario)
M. L. Gross, BSc (Toronto), OD (Waterloo)
R. M. Haber, BSc (Toronto), OD (Waterloo)
D. M. Hector, OD (Waterloo)
J. F. Jantzi, OD (Waterloo)
V. A. Kuraitis, OD (Waterloo)
P. E. Martinello, OD (Waterloo)
A. J. MacKinnon, OD (College of Optometry of Ontario)
D. Modestu, OD (Waterloo)
M. S. Munn, Dip Opt (College of Optometry of Ontario)
M. A. Oiffer, BSc (York University), OD (Waterloo)
R. J. Pace, OD (Waterloo)
J. S. Peaker, OD (Waterloo)
S. Peta, OD (Waterloo)
K. M. Pickard, OD (Waterloo)
D. Richardson, OD (Waterloo)
J. M. Robertson, Dip Opt (College of Optometry of
Ontario)
V. M. Russell, OD (College of Optometry of Ontario), BA
(Toronto)
R. L. Saari, OD (Waterloo)
C. U. Santone, OD (Waterloo)
L. E. Springer, OD (Waterloo)
P. Szak, OD (Waterloo)
N. C. Turnour, Dip Opt (College of Optometry of Ontario)
N. Van Ymeren, OD (Waterloo)
B. M. Wiseman, BSc (McGill), OD (Waterloo)
W. Woolner, OD (Waterloo)
E. J. Wylie, OD (College of Optometry of Ontario)

Clinic Residents (1976-1977)
D. Adams, BS, OD (U.C., Berkeley)
C. C. Dalziel, OD (Waterloo)
D. J. Egan, BSc (St. John's Univ.), OD (Penn. College of
Optometry)
D. R. Frenson, BA, OD (Indiana)
R. A. Wiggins, BS, OD (Indiana)
Undergraduate Course Descriptions

Students in other disciplines may register for Optometry courses only upon the approval of the Director of the School of Optometry.

Optom 200  F  2C  .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 206  F  3C,3L  .5
Geometrical Optics
Prereq: Phys 111, 111L, 112, 112L, Math 113

Optom 211  W  3C,3L  .5
Physiological Optics
Prereq: Optom 206

Optom 224  F  3C,3L  .5
Anatomy of the Eye and Associated Structures
The gross, microscopic and ultra structure of ocular tissues. The embryology and comparative anatomy of the eye will be emphasized. The relationship of the eye to the vascular supply of the head and the nervous system will be studied. This course is credited only upon completion of Optom 234.
Coreq: Biol 201

Optom 234  W  3C,2L  .5
Anatomy of the Eye and Associated Structures
A continuation of Optom 224.
Prereq: Optom 224

Optom 301  F  3C,3L  .5
Physiological Optics
Ocular motility: description and analysis of eye movements, measurement of eye movements, the innervational systems of the extraocular and intraocular musculature.
Prereq: Optom 211

Optom 302  F  3C,3L  .5
Clinical Optometry
Lectures and laboratories on clinical techniques for examination of the optical properties of the eye.
Prereq: Optom 211

Optom 305  F  3C,1T  .5
General Pathology
Basic disease processes, including inflammation, degeneration, neoplasia; pathogenic microbiology and related diseases; immunity and hypersensitivity; disease caused by physical agents; diseases of the organ systems.
Prereq: Biol 201, Optom 224-234

Optom 306  F  3C,4L  .5
Optometrical Optics
The properties of ophthalmic glass and lenses, and the problems and solutions involved in fitting lenses to the eyes. Laboratory work involves processing prescriptions as well as experiments in optics.
Prereq: Optom 206

Optom 311  W  3C,3L  .5
Physiological Optics
Prereq: Optom 301

Optom 312  W  3C,3L  .5
Clinical Optometry
Lectures and laboratories on clinical techniques for examination of the optical properties of the eye.
Prereq: Optom 301, 302

Optom 315  W  4C,1T  .5
General Pathology
A continuation of 305.
Prereq: Optom 305

316  W  3C,4L  .5
Optometrical Optics
A continuation of 306, dealing with problems peculiar to bifocal and multifocal lenses. Aberrations of thin lenses and the design of lenses of ophthalmic use.
Prereq: Optom 306

Optom 401  F  3C,3L  .5
Physiological Optics
Prereq: Optom 301, 311
Optom 402  F  3C,2L  .5
Clinical Optometry
Case analysis of the nonstrabismic patient: case history, testing the health and integrity of the visual system, refractive tests, binocular relations, analysis, diagnosis, prognosis and modes of therapy.
Prereq: Optom 302, 312

Optom 404  F  2C,2L  .5
Physiology of the Visual Systems
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 224

Optom 405  F  3C,1L  .5
Ocular Pathology
A detailed study of the diseases which involve the eye and related structures with emphasis on early recognition. Symptomatology, differential diagnosis. Evidence of systematic disease as manifest in the eye. A study of headaches.
Prereq: Optom 305, 315

Optom 406  F  2C,4L  .5
Optometrical Optics
The lecture course deals with problems involved in selecting, preparing and fitting ophthalmic materials. Optical, cosmetic and comfort requirements, and patient counselling are considered. The laboratory course provides experience in preparing and fitting materials to patients.
Prereq: Optom 306, 316

Optom 407  F  2C,2L  .5
Optometric Specialties: Contact Lenses
A series of lectures and laboratories on the principles and procedures of prescribing and fitting contact lenses.
Prereq: Optom 401, 402

Optom 408  F  8 Clinic  .5
Optometric Clinic
The student is assigned to the Visual Analysis Clinic and under the direct supervision of optometrists of the clinic staff, carries out routine clinical investigations of patients who attend the public clinic. No credit given until successful completion of Optom 418.
Prereq: Permission of Clinic Director

Optom 409  F  2C,2L  .5
Light and Illumination
Light sources, transmitting and reflecting surfaces; principles of radiometry and photometry; illumination and related factors involved in the control of the visual environment.

Optom 411  W  3C,3L  .5
Physiological Optics
Binocular vision and perception: The binocular system; binocular integration and interaction; effects of disparate stimulation; perceived size, shape, direction, distance, motion, colour, illusions.
Prereq: Optom 401

Optom 412  W  3C,2L  .5
Clinical Optometry
Detection and evaluation of sensory and motor characteristics of vision in strabismus. Classifications, diagnosis, prognosis, modes of therapy for strabismus and amblyopia.
Prereq: Optom 302, 312, 402

Optom 414  W  3C,2L  .5
Physiology of the Visual Systems
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 404

Optom 415  W  3C,1L  .5
Ocular Pathology
A continuation of 405.
Prereq: Optom 405

Optom 418  W  8 Clinic  .5
Optometry Clinic
A continuation of 408.
Prereq: Optom 408

Optom 427  W  2C,2L  .5
Optometric Specialties: Aniseikonia and Low Vision Aids
A series of lectures and laboratories in examining low vision and aniseikonic patients with specific techniques described. Treatment and therapy will be included.
Prereq: Optom 401, 402

Optom 428  S  1.0
Summer Clinic
Each student is required to complete 120 hours of clinical practice during the summer term. Times will be arranged by the student with the approval of the clinic staff.
Prereq: Successful completion of completed Year 4 programme.
Optom 500  F  2C  .5
Optom500: Optometrical Jurisprudence and Praxis
Lectures relating to legal aspects of practicing Optometry in Canada; the rights and responsibilities of the optometrist in practice; practice management; financial management, establishing a practice, interprofessional relations, office design, optometric assistants professional associations.

Optom 501  F  3L  .5
Optom501: Optometry Research Project
Students with an interest in research may arrange with a professor to undertake a research project of mutual interest. This course serves as an alternative to Psych 357. Contact the course co-ordinator for details.

Optom 502  F  3C  .5
Optom502: Advanced Clinical Optometry
Special techniques for the examination of refractive and binocular properties of vision; binocular refraction; prism adaptation; etiology of refractive errors; changes in refraction with age; epidemiology; seminars and presentation of case reports.
Prereq: Optom 302, 312, 402, 412

Optom 504  F  4C,1L  .5
Optom504: Ocular Pharmacology
Neurohumoral theory, response to drugs, sterile techniques, disinfectants. Drugs used in contact lens practice, drugs used topically on the eye, drugs on the eye and vision.
Prereq: Optom 404, 405, 415

Optom 508  F  24 Clinic  .5
Optom508: Optometry Clinic
The clinical programme teaches the student how to provide optometrical services including pathology detection, strabismus evaluation and the application of spectacle therapy, contact lenses and vision training. The patients cared for extend from the pediatric to the geriatric, and include those with perceptual problems, or with low vision.
No credit given until successful completion of Optom 518.
Prereq: Permission of Clinic Director

Optom 509  F  4C  .5
Optom509: Community Health Optometry
Governmental and social aspects of health and vision care delivery, are discussed in relationship to the epidemiology of vision problems. The special aspects of management of vision problems of pediatric, geriatric and industrial populations are discussed.

Optom 510  W  2C  .5
Optom510: Optometrical Jurisprudence and Praxis
A continuation of 500.
Prereq: Optom 500.

Optom 511  F  3L  .5
Optom511: Optometry Research Project
A continuation of 501. This course serves as an alternative to Optom 513.
Prereq: Optom 501

Optom 512  W  3C  .5
Optom512: Advanced Clinical Optometry
Prereq: Optom 502

Optom 513  W  2C  .5
Optom513: Optometric Communication
Verbal communication and counselling during the optometrical examination, alternatives to technical terminology, report and letter writing, preparing and delivering papers and talks for professional societies and public information.

Optom 514  W  2C  .5
Optom514: 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, etc. Genetic counselling, and the detection of carriers.
Prereq: Optom 405, 415

Optom 518  W  24 Clinic  .5
Optom518: Optometry Clinic
A continuation of 508.
Prereq: Optom 508

Optom 519  W  4C  .5
Optom519: Community Health Optometry
A continuation of 509

Note
Graduation in Optometry is contingent upon successful completion of comprehensive examinations involving oral, written and clinical applications of optometry. These examinations are ordinarily held in the Winter term of the fourth professional year.
Undergraduate Course Descriptions

Note 1
Courses 370 to 372, 380 to 389, 435 to 439, 440 to 444; 471 to 473; 480 to 489; are special courses offered in response to student demand or special interests of the faculty. The Department will publish each Spring a list of the courses offered under these numbers for the following academic year. This list will include descriptions of those courses whose content is not specified below and names of instructors for each course.

Note 2
Any full course of two half courses in Philosophy can be used to satisfy the group A(i) requirement.

Note 3
Courses suffixed with 'J' are administered by St. Jerome's College; those suffixed with a 'P' are administered by St. Paul's College; and those suffixed with an 'R' are administered by Renison College.

Note Concerning Introductory Courses
It is Departmental policy to have small sections of each introductory course staffed by regular faculty. In addition there are weekly seminar-sized discussion groups in each course.

Phil 100 Y 2C,1D 1.0
Introduction to Philosophy
A broad selection of the main problems in philosophy will be considered. For example: How can we know whether anything is right or wrong? Can we know whether there is a God? Is mind in any sense distinct from matter? Original texts of both classical and contemporary thinkers are employed.

Phil 111 FW 3C .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 people to philosophize. Approaches, such as those of the mystic, the scientist, the existentialist, the pleasure seeker, and the practical man, will be discussed.

No prereq.

Phil 125 F,W,S 2C,1D .5
Introduction to Social and Political Philosophy
Introduction to basic value-questions about society. Theories about the meaning and basis of rights, justice, and government are examined. Both classical writers (Hobbes, Mill, Marx) and contemporary writers (Rawls) may be used. Sample issues: civil disobedience, racial and sexual discrimination, and socialism versus capitalism.

No prereq.
Phil 135 F,W 3C .5
Introduction to Philosophy of Religion
A philosophical consideration of problematic aspects of religious belief. Topics to be discussed will include: attempts to prove the existence of God, the problem of evil, faith and reason, religious experience, and religious language. Classical and contemporary readings will be used.
No prereq.

Phil 140 F,W,S 3C .5
Introduction to Formal Logic
Elementary sentence and predicate logic. Translation from the English into the formalism, decision methods and deductions. Application of Graphic Methods to Logic. This course is a preparation for courses in the foundations of mathematics, scientific methods, and more advanced logic courses.
No prereq.

Phil 145 F,W,S 3C .5
Critical Thinking
An analysis of basic types of reasoning, structure, of arguments, the critical assessment of information, common fallacies, problems of clarity and meaning.
No prereq.

Phil 150 F,W 2C,1D .5
Introduction: Knowledge and Reality
Discussion of the nature of reality. Rival theories concerning mind, matter, freedom, the existence of God, and the place of experience and reason in human knowledge.
No prereq.

Phil 201 F,W 2C,1D .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.
No prereq.

Phil 202 3C .5
Philosophy of Women
A study of some of the issues raised by the Women's Liberation movement, such as the nature of Women and her rights and liberties in various contexts - family, childbearing, economic, political and social.
No prereq.

Phil 203 3C .5
Philosophical Perspectives on Death
This course critically examines how philosophers from the Pre-Socratics to Wittgenstein have analysed the concept of death. The course is also concerned with topics like the concept of a person, personal identity, and survival after death.

Course Descriptions
Philosophy

Phil 210 Philosophical Literature
Not offered 1977-78

Phil 221 F 3C .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 222 W 3C .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.
Phil 221 recommended

Phil 223 Moral and Social Philosophy
Not offered 1977-78

Phil 224 3C .5
Mankind and Nature
An examination of some of the issues raised by recent discussions on ecology. Various theories of nature, the human being; and relations between the two will be explored. Possible foundations for duties of mankind toward nature will be examined.

Phil 225 W 3C .5
Social and Political Philosophy: Canadian Problems
This is philosophical study of various Canadian social and political problems such as foreign control, nationalism, the redistribution of wealth, native rights, and the War Measures Act. Canadian socialist, liberal, conservative, and anarchist approaches to such problems will be examined from a moral point of view.
Prereq: Phil 125 or consent of instructor

Phil 226 3C .5
Ethics and Life Sciences
An investigation of some critical ethical issues in human research and therapy. Includes discussion of the right to live and right to die, behavior control (e.g. psychosurgery, behavior modification and psychotherapy), human experimentation (including "informed consent" and fetal research) and human engineering.
Prereq: Phil 125, 221, 222, or consent of instructor
<table>
<thead>
<tr>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phil 235 Philosophy and Mysticism</td>
<td>2C .5</td>
<td>A critical examination of mystical writings, with regard to the nature of the experience reported, their typology, and their implications for epistemology, ethics, and philosophy of religion.</td>
</tr>
<tr>
<td>Phil 236 Philosophy of Religion: The Occult</td>
<td>2C .5</td>
<td>A critical philosophical discussion of reports of several kinds of extraordinary experiences, such as magic, extra-sensory perception, mysticism, and divination.</td>
</tr>
<tr>
<td>Phil 240 Logic</td>
<td>Not offered 1977-78</td>
<td></td>
</tr>
<tr>
<td>Phil 241 Intermediate Logic</td>
<td>F,W 3C .5</td>
<td>The course begins with a brief review of the materials covered in Phil 140. Axiom systems of logic are developed and compared with natural deduction procedures. Then certain properties of these logical systems, such as consistency, completeness, compactness, will be investigated. Prereq: Phil 140 or familiarity with elementary sentence and predicate logic</td>
</tr>
<tr>
<td>Phil 242 Philosophical Logic</td>
<td>F,W 3C .5</td>
<td>The course begins with a brief review of the materials covered in Phil 140. Then systems of modal logic will be developed and applied to such philosophical problems as obligation, belief and knowledge, essentialism, future contingencies, existence of God. Prereq: Phil 140 or familiarity with elementary sentence and predicate logic</td>
</tr>
<tr>
<td>Phil 243 Risk, Decision, Games, Amalgamation</td>
<td>F,W 3C .5</td>
<td>Fundamentals of probability and game theory. Problems of decision making under conditions of certainty, risk and uncertainty. The definition and measurement of utility functions. Translation of decisions and preferences of members of a group into collective preference. Some applications to the Social Sciences. Prereq: Phil 140, 145 or consent of instructor</td>
</tr>
<tr>
<td>Phil 250 Knowledge and Reality</td>
<td>Not offered 1977-78</td>
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</tr>
<tr>
<td>Phil 258 Introduction to the Philosophy of Science</td>
<td>F 3C .5</td>
<td>A discussion of the fundamental concepts on which science is based. Consideration is given to such topics as scientific explanation, the structure of scientific theories, the nature of law-likeness, the grounds for scientific confirmation, and the debate between rationalism and empiricism in science.</td>
</tr>
<tr>
<td>Phil 265 The Existentialist Experience</td>
<td>3C .5</td>
<td>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.</td>
</tr>
<tr>
<td>Phil 270/271 Special Topics in Philosophy</td>
<td>3C .5</td>
<td>Philosophic examination of areas of current or traditional social or conceptual interest. No special preparation in Philosophy. Topics dealt with may include Philosophical Anthropology, Philosophy and linguistic theory, Minds and Machines, The Concept of Deviance.</td>
</tr>
<tr>
<td>Phil 280 History of Ancient Philosophy 1</td>
<td>F 3C .5</td>
<td>From the beginnings to Plato. Prereq: Second year standing or above, or consent of instructor</td>
</tr>
<tr>
<td>Phil 281 History of Ancient Philosophy 2</td>
<td>W 3C .5</td>
<td>From Aristotle to the close of classical antiquity. Prereq: Phil 280</td>
</tr>
<tr>
<td>Phil 282 History of Modern Philosophy 1</td>
<td>F 3C .5</td>
<td>Earlier period beginning with Descartes. Prereq: Second year standing or above, or consent of instructor</td>
</tr>
<tr>
<td>Phil 283 History of Modern Philosophy 2</td>
<td>W 3C .5</td>
<td>Later period including Hume and Kant. Prereq: Second year standing or above, or consent of instructor. Phil 282 recommended.</td>
</tr>
<tr>
<td>Phil 284 19th Century Philosophy</td>
<td>Not offered 1977-78</td>
<td></td>
</tr>
<tr>
<td>Phil 285 20th Century Philosophy</td>
<td>3C .5</td>
<td>A course intended to introduce the student to the dominant themes of 20th century philosophy, centering on the major figures of this century, such as Bertrand Russell, Ludwig Wittgenstein, G. E Moore, Edmund Husserl, and Jean-Paul Sartre.</td>
</tr>
</tbody>
</table>
Phil300  F,W  3C .5
The Philosophy of Games
An introduction to philosophical issues relating to sports and other games. Among the issues examined will be the nature of games, games and sports, and the relevance of games and sports to other philosophical interests: eg., ethics and aesthetics.

Phil301  3C .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 largely determined by student interest.
Prereq: At least second year standing or consent of instructor

Phil311  W  3C .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

Phil312  F  3C .5
Philosophy of Education 2
Critical evaluation of selected problems of education in an attempt to relate theory to practice. Recent Canadian studies will be among those considered.
Prereq: Phil 311 or consent of instructor

Phil321/324  3C .5
Studies in Ethics
Various half courses dealing with special topics; one or more of these will be offered each year as announced by the Department.
Prereq: Phil 221/222. See Note 1

Phil325  3C .5
Political Philosophy 1
Philosophical analysis of central concepts in political theory and its relation to moral and metaphysical problems of various periods.
Prereq: One full or two half Philosophy courses

Phil326  3C .5
Political Philosophy 2
A detailed discussion of contemporary theories.
Prereq: Phil 325, or consent of instructor

Phil327  3C .5
Philosophy of Law
Besides considering some of the more prominent views of what law is (e.g., those of Aquinas, Kant, Austin, Keisen, and Hart), we will also take up some other topics central to Jurisprudence, such as liability, right, and judicial reasoning.
Prereq: One full or two half Philosophy courses or consent of instructor

Phil328 The Philosophy of Karl Marx
Not offered in 1977-78

Phil329  3C .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 125, 221/222 or consent of instructor

Phil331  3C .5
Aesthetics
Philosophical consideration of works of art and the problems of beauty using selected readings to enable the student to recognize and formulate his own views in a philosophic manner.
Prereq: One full or two half Philosophy courses

Phil335  3C .5
Philosophy of Religion
A critical examination of the methods and substantive arguments found in selected major works of religious philosophy. The writings chosen for consideration will be announced in advance each year.
Prereq: One full or two half Philosophy courses

Phil340  Y  3C 1.0
Logical Theory
A rigorous and general development of the propositional and predicate calculus within which alternative calculi are examined. Study of such concepts as completeness, consistency, extensionality, and modality from both formal and philosophical points of view. Intended primarily for those interested in philosophical issues connected with logic.
Prereq: Phil 140, or (preferably) Phil 240, 241 or 242, or consent of instructor
Phil 350 3C  1.0  
**Epistemology**

An analysis of human knowledge, its conditions and types. The first part concentrates on criteria of meaningfulness, the possibility of a *priori* knowledge, and the concept of knowledge. The second part deals with our knowledge of the physical world and other minds.

*Prereq:* One full or two half courses in Philosophy.

Phil 350A 3C  .5  
**Epistemology 1**

The first part of Phil 350.

*Prereq:* One full or two half courses in Philosophy

Phil 350B 3C  .5  
**Epistemology 2**

The second part of Phil 350.

*Prereq:* One full or two half courses in Philosophy

*Note*

Either 350A or 350B may be taken separately.

Phil 359 3C  .5  
**Philosophy of the Formal Sciences**

A study of philosophical problems concerning mathematics. Topics discussed include formalism, intuitionism, logicism, the mathematical paradoxes, and other topics in foundations and metamathematics.

*Prereq:* At least second year standing or consent of instructor

Phil 362 3C  .5  
**Philosophy of Social Science**

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-numbered as Soc 371)

Phil 363 3C  1.0  
**Philosophy of Language and Linguistic Analysis**

The first part examines issues in the philosophy of language, such as synonymy, propositions, meaning, semantics, reference. The second part will consider ordinary language analysis as a method for solving philosophical problems as compared with structural linguistics.

*Prereq:* At least second year standing or consent of instructor

Phil 363A 3C  .5  
**Philosophy of Language**

The first part of Phil 363

*Prereq:* At least second year standing or consent of instructor

Phil 363B 3C  .5  
**Linguistic Analysis**

The second part of Phil 363.

*Note*

Either Phil 363A or Phil 363B may be taken separately.

Phil 365-366 3C  .5  
**Oriental Philosophy**

Studies of a selected area of non-western Philosophy (e.g. Indian or Chinese). Parallels will be drawn between modes of Eastern thinking and European conceptions with emphasis on essential differences as well as similarities.

*Prereq:* Consent of instructor

Phil 370-372 3C  .5  
**Special Subjects**

One or more half courses will be offered at different times as announced by the Department.

*Prereq:* Consent of instructor. See Note 1

Phil 380-389 3C  .5  
**Studies in the History of Philosophy**

Various half courses dealing with a particular philosopher, a selected work or period; one or more of these will be offered each year as announced by the Department.

*Prereq:* Phil 280/281 and 282/283. See Note 1

Phil 390 3C  .5  
**Medieval Philosophy 1**

The early period to the 13th century. Among those considered will be: Augustine, Boethius, Anselm, and Abelard.

*Prereq:* Phil 280/281

Phil 391 3C  .5  
**Medieval Philosophy 2**

The later period from the 13th century. Among those considered will be: Bonaventure, Aquinas, Scotus, and Ockham.

*Prereq:* Phil 390

Phil 398a-b R  .5  
**Directed Reading in Special Areas**

*Prereq:* Consent of instructor

Phil 399 T  1.0  
**Tutorial for Honours Students**

Students wishing to enrol in 399 should consult the Department.
Phil 425 3C .5
Philosophy of the City
Analysis and evaluation of the philosophical points of view that underlie current criticism of urban life and prevalent schemes for its reconstruction.
Prereq: One half Philosophy course

Phil 435-439 3C .5
Studies in Philosophy of Religion
A study of a particular philosopher or problem. The topic will be announced in advance each year.
Prereq: Consent of instructor. See Note 1

Phil 440-444 3C .5
Studies in Logic
Various half courses dealing with specific topics; one or more of these will be offered each year as announced by the Department.
Prereq: Phil 240, 241, 242 or 340 or Math 436. See Note 1

Phil 446 3C .5
Philosophy of History
Consideration of various possible views about ultimate nature of history and historical knowledge. Offered in sequence with Hist 466.
Prereq: One full course equivalent in Philosophy, or consent of instructor

Phil 455 3C 1.0
Metaphysics
Theories of reality, historical and contemporary, with emphasis on metaphysical problems in the light of recent studies.
Prereq: Two full courses (or equivalent) in Phil.

Phil 465 3C 1.0
Existential Philosophy
An in depth study of the thought of some major existentialist figures such as Kierkegaard, Unamuno, Nietzsche, Heidegger, Sartre, Camus, Marcel, Jaspers, Ortega y Gasset.
Prereq: Consent of instructor

Phil 470 3C 1.0
Phenomenology
A critical examination of the issues and methods of phenomenology, including the attempt to understand the uses and ramifications of phenomenological methods through the working out of a particular analyses. The basic writings of phenomenologists such as Husserl and Merleau-Ponty will be used.
Prereq: One full or two half courses in Philosophy, or consent of instructor

Phil 480-489 3C .5
Advanced Studies in the History of Philosophy
Various half courses dealing with a particular philosopher, a selected work or period; one or more of these will be offered each year as announced by the Department.
Prereq: Consent of instructor. See Note 1

Phil 498(a-b) F,W,S R .5
Directed Reading in Special Areas
Prereq: Consent of instructor

Phil 499 Y T 1.0
Tutorial and Honours Essay
Students wishing to enrol in 499 should consult the Department.

The following courses are administered by St. Jerome's College

Phil 100J Y 3C 1.0
Introduction to Philosophy
A broad selection of the main problems in philosophy will be considered. For example: how can we know whether anything is right or wrong? How can we know about things we cannot directly observe? Can we know whether there is a God? Is mind in any sense distinct from matter?
Offered at St. Jerome's College

Phil 120J F 3C .5
Philosophy of Life and Death
A study of what some of the great philosophers have said about the meaning of life and death and the transition from life to death. Students are urged to raise questions and help direct discussion.
Offered at St. Jerome's College

Phil 130J W 3C .5
Philosophy of Discontent
A study of what some of the great philosophers have said about the causes of discontent. Social disobedience and the extent to which ethical principles can be altered to accommodate changing conditions are possible topics for discussion.
Offered at St. Jerome's College

Phil 200J F 3C .5
Intentional Logic
An introduction to the understanding of how words are used, the formation of propositions, the construction of arguments and the examination of fallacies to help the student to argue with order, with facility and without error.
Offered at St. Jerome's College

Phil 205J Elements of the Philosophy of Science
Not offered 1977/78
Phil 206J **Special Problems in the Philosophy of Science**  
*Not offered 1977-78*

Phil 210J F 3C .5 **Philosophy of Man**  
What is man? What is man's place among other creatures? Is man an accident of evolution? What are the major views on man as a species? How are love and sex aspects of man's life?  
*Offered at St. Jerome's College*

Phil 218J F 3C .5 **Ethical Theory**  
A normative approach, employing several of the classic Western traditions of rational thought, to general ethics. The various schools of ethical thought will be discussed.  
*Also offered in the evening. Offered at St. Jerome's College*

Phil 219J W 3C .5 **Practical Ethics**  
This course will discuss the applications of general ethics to more specific areas of human endeavour. Among the topics discussed will be abortion, contraception, sex, obscenity, violence, drugs, egoism, dishonesty, and various forms of human exploitation.  
*Also offered in the evening. Offered at St. Jerome's College*

Phil 230J **God and Philosophy**  
*Not offered 1977-78*

Phil 237J W 3C .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.  
*Offered at St. Jerome's College*

Phil 260J W 3C .5 **Issues in Higher Education**  
Why go to college? What are the present realities today 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.  
*Offered at St. Jerome's College*

Phil 300J F 3C .5 **The Western Philosophical Tradition (to 1600)**  
An intensive overview of the major recurring themes in Western intellectual history from both an historical and a philosophical viewpoint.  
*Prereq: Second year standing. Offered at St. Jerome's College*

Phil 301J W 3C .5 **The Western Philosophical Tradition (1600 - Present)**  
A continuation of 300J.  
*Prereq: Second year standing. Offered at St. Jerome's College*

Phil 321J **Canadian Philosophy**  
*Not offered 1977-78*

Phil 333J **Contemporary Philosophical Problems in Art**  
*Not offered 1977-78*

Phil 349J **Philosophy of Human Cognition**  
*Not offered 1977-78*

Phil 396J-397J .5 each **Special Topics/Directed Readings**  
A series of readings and/or seminars on one or two topics or thinkers, with periodic reports and discussion.  
*Prereq: Consent of instructor Offered at St. Jerome's College*

Phil 399J Y 1.0 **Tutorial**  
Students wishing to enrol in 399J should consult the College Department.  
*Offered at St. Jerome's College*

Phil 450J Y 3C 1.0 **Being and Existence**  
An advanced course for the serious student, delving into the notions of reality, being, essence, existence, analogy, etc. The techniques of linguistic analysis will be employed. Also, the very possibility of any kind of metaphysics will be discussed.  
*Prereq: Third year standing or consent of instructor Offered at St. Jerome's College*

Phil 496J-497J .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 Offered at St. Jerome's College*

Phil 499J Y 1.0 **Tutorial and Honours Essay**  
Students wishing to enrol in 499J should consult the College Department.  
*Offered at St. Jerome's College*
Department of Physics

Professor, Chairman of the Department
J. W. Locch, BSc, PhD (London), FinstP

Professor, Associate Dean Graduate Affairs, Faculty of Science
N. R. Isenor, BSc (Acadia), MSc, PhD (McMaster)

Professor, Dean of the Faculty of Science
W. B. Pearson¹, DFC, MA, DSc (Oxon), FRSC, FCIC

Professors
R. A. Aziz, BA, MA, PhD (Toronto)
G. A. Bakos, MA (Bratislava), MA, PhD (Toronto)
F. W. Boswell, BA, MA, PhD (Toronto)
D. E. Brodie, BSc, MSc, PhD (McMaster)
J. A. Cowan, BSc (Manitoba), MA, PhD (Toronto)
I. R. Dagg, BSc (Manitoba), MS (Penn State), PhD (Toronto)
J. D. Leslie, BASc, (Toronto), MS, PhD (Illinois)
J. L. Ord, BASc (Toronto), MS, PhD (Illinois)
R. K. Pathria, BSc, MSc (Panjab), PhD (Delhi)
M. M. Pintar, BSc, MSc, PhD (Ljubljana)
G. E. Reesor, BA, MA (McMaster), PhD (Toronto)
G. Scoles¹, BSc, PhD (Genova)
R. A. Snyder, BSc, PhD (Western)
S. F. Wang, DSc (Nagoya)

Adjunct Professors
J. A. Barker, DSc (Melbourne), FAAS
P. A. Egelstaff, BSc, PhD (London)
D. J. Henderson, BA (UBC), PhD (Utah), FinstP
H. E. Petch, BSc (McMaster), MSc, PhD (UBC), FRSC, DSc (McMaster)
J. D. Poll, CandDoc (Leiden), PhD (Toronto)

Research Associate
G. L. H. Harris, BA (Mount Holyoke), MA (Wesleyan), PhD (Toronto)
L. A. A. Read, BA, MSc (McMaster), PhD (Waterloo)

Associate Professors
A. Anderson, MA, DPhil (Oxon)
J. M. Corbett, BSc (Toronto), MSc, PhD (Waterloo)
A. E. Dixon, BSc (Mt. Allison), MSc (Dalhousie), PhD (McMaster)
P. C. Eastman, BSc, MSc (McMaster), PhD (U.B.C.)
H. K. Ellenton, BSc (Western), MA (Toronto)
M. P. Fitzgerald, BSc, MSc (Toronto), PhD (Case)
D. Hemming, BSc, PhD (Bristol)
J. Kruuz², BASc, MSc (Waterloo), PhD (Western)
C. C. Lim, BA (DePauw), MA (Nebraska), PhD (Toronto)
R. A. Moore, BSc, MSc (McMaster), PhD (Alberta)
H. M. Morrison, BSc, PhD (Edinburgh)
A. D. S. Nagi, BA, BSc, (Panjab), PhD (Delhi)
H. J. T. Smith, BSc, PhD (London)
B. H. Torrie, BASc (Toronto), PhD (McMaster)
K. A. Woolner, BSc (London)

Assistant Professors
J. K. Brandon, BSc, PhD (McMaster), MA (Cantab.)
D. R. Rayburn, BSc (Calgary), PhD (Queen’s)
J. Vanderkooy, BEng, PhD (McMaster)

Senior Demonstrators
A. B. Haner, BSc, MSc (Waterloo)
D. S. McVicar, BSc (Waterloo)

Faculty members holding cross appointments as shown
¹ Chemistry and Physics
² Physics and Biology

Undergraduate Course Descriptions

Note 1
Details of the undergraduate programmes offered by the Faculty of Science are to be found in Chapter 13.

Note 2
Prerequisites are given as a guide to the student and may be waived with the consent of the instructor.

Phys 001  T .00

Pre-University Physics
This course covers the topics in Ontario Year 3 to 5 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
Phys 011  F  3C,2T  .5  
Mechanics
Brief review of kinematics and translation. Particle 
dynamics, work, energy, conservation of energy. 
Conservation of linear momentum, collisions. Rotational 
kinematics. Rotational dynamics, conservation of 
angular momentum. Equilibrium of rigid bodies. 
For students in Year 1 Engineering

Phys 103  F  3C,3L  .5  
Mechanics in Human Movement
An introduction to the physical principles required for the 
analysis of the mechanics of human movement. A course 
for Kinesiology students.  
Lab. alternate weeks, optional tut.

Note
Normally students who have completed Ontario Year 5 
Phys should select Phys 104 instead of 103.

Phys 104  F  3C,3L  .5  
Mechanics, Electricity and Magnetism
An introduction to the physical principles required for the 
analysis of mechanics of human movement. Basic 
electricity and magnetism. A course for Kinesiology 
students.  
Prereq: Ontario Year 5 Phys. Lab alternate weeks, 
optional tut.

Phys 111  F  3C,1T  .5  
General Physics 1
Mechanics, properties of matter, modern physics, heat 
flow and thermodynamics.  
Tut. on alternate weeks.

Phys 111L  F  3L  .25  
General Physics 1 Laboratory
For students taking Phys 111.  
Lab. alternate weeks

Phys 112  W,S  3C,1T  .5  
General Physics 2
Electric fields and potential, D.C. circuits, magnetic 
fields, A.C. generators and circuits, elementary 
electronics. The thin lens equations, diffraction, 
resolution of optical instruments, the eye; camera, 
telescope and microscope, coherent light, colour, 
polarization, birefringence and photometry.  
Tut. on alternate weeks

Phys 112L  W,S  3L  .25  
General Physics 2 Laboratory
For students taking Phys 112.  
Lab. alternate weeks

Note
The one-year sequence Phys 111-112 is primarily 
tended for students who plan to proceed in Biol, Biol 
and Chem, or Earth. Phys 111L-112L is recommended for 
students who plan to proceed in the Optom programme 
and for those students who want some practical 
experience to complement their theoretical studies or to 
fulfill entrance requirements of certain medical or dental 
schools.

Phys 121  F  3C,1T  .5  
Introductory Physics 1
Introduction to mechanics including special relativity, 
motion of particles, conservation of energy and 
momentum, fluid statics and dynamics, rotational 
kinematics. 
Prereq: Ontario Year 5 Math – Functions and Relations, 
Calculus. Ontario Year 5 Physics recommended. Tut. on 
alternate weeks. Science students must take 121L with 
this course.

Phys 121L  F  3L  .25  
Introductory Physics 1 Laboratory
For students taking Phys 121.  
Lab. alternate weeks

Phys 122  W  3C,1T  .5  
Introductory Physics 2
This course is a continuation of Phys 121. Rotational 
dynamics, vibrations, waves, gravitation, heat and 
thermodynamics, properties of materials. 
Prereq: Phys 121. Tut. on alternate weeks. Sci students 
must take 122L with this course

Phys 122L  W  3L  .25  
Introductory Physics 2 Laboratory
For students taking Phys 122.  
Lab. alternate weeks

Note
The one-year sequence Phys 121-122 is primarily 
tended for students who plan to proceed in Phys and 
Math.

Phys 162  F  3C,1T  .5  
Introductory Physics A
Introduction to Newtonian mechanics including 
gravitation, collisions and conservation laws, 
conservative forces and motion under central forces. 
Prereq: At least 75% average in Ontario Year 5 Phys, 
Math – Functions and Relations, and Calculus. Tut. on 
alternate weeks. Sci students must take 162L with this 
course.
Phys 162L  F  3L  .25
Introductory Physics A Laboratory
For students taking Phys 162.
Lab. alternate weeks

Phys 163  W  3C,1T  .5
Introductory Physics B
This course is a continuation of Phys 162. Rotational dynamics, vibrations of physical systems, resonance, coupled oscillators and normal modes, waves and interference.
Prereq: Phys 162. Sci students must take 163L with this course. Co-operative students wishing to take this sequence must have their 1B term in the Winter. Tut. on alternate weeks.

Phys 163L  W  3L  .25
Introductory Physics B Laboratory
For students taking Phys 163.
Lab. alternate weeks

Note
The one-year sequence Phys 162-163 is an enriched version of Phys 121-122 sequence intended for students in the Year 1 Sci programme or the Year 1 Math programme.

Phys 222  F  2C,1T  .5
Electricity and Magnetism 1
Coulomb’s law, electric field, Gauss’s law, potential, capacitance, properties of dielectrics, current, resistance, electromotive force, D.C. circuits and instruments.
Prereq: First year phys and calculus. Not for Hons. Phys students. Phys Majors must take 222L with this course

Phys 222L  F  3L  .25
Electricity and Magnetism 1 Laboratory
For students taking Phys 222.
Lab. alternate weeks

Phys 223  W,S  2C,1T  .5
Electricity and Magnetism 2
Magnetic fields, induced electromotive forces, magnetic properties of matter, alternating currents, electromagnetic waves.
Prereq: Phys 222. Not for Hons. Phys students. Phys Majors must take 223L with this course

Phys 223L  W,S  3L  .25
Electricity and Magnetism 2 Laboratory
For students taking Phys 223
Lab. alternate weeks

Phys 226  F  2C  .5
Optics 1
Reflection and refraction at plane and curved surfaces, thin and thick lenses, optical instruments. Reading assignments on various topics in modern optics.
Prereq: First year phys and calculus. Not for Hons. Phys students. Phys Majors must take Phys 226L with this course

Phys 226L  F  3L  .25
Optics 1 Laboratory
For students taking Phys 226.
Lab. alternate weeks

Phys 227  W  2C  .5
Optics 2
The wave nature of light, interference, diffraction, slits and gratings, resolution, polarization, photometry. Reading assignments on lasers and the uses and properties of laser light.
Prereq: Phys 226. Not for Hons. Phys students. Phys Majors must take Phys 227L with this course

Phys 227L  W  3L  .25
Optics 2 Laboratory
For students taking Phys 227.
Lab. alternate weeks

Phys 243  F,W,S  3C  .5
Electricity and Magnetism
Magnetic fields, electromagnetic induction, A.C. circuits, electrical measurements, diodes, transistors.
Prereq: First year phys and calculus. This course is primarily intended for Hons. Chem students.

Phys 243L  F,W,S  3L  .25
Electricity and Magnetism Laboratory
For students taking Phys 243.
Lab. alternate weeks

Phys 244A  F  2C  .5
Quantum Physics 1
Electronic charge, special relativity, particle accelerators, black body radiation and Planck’s law. Photoelectric effect, Bohr atom, wave equation, eigenfunctions and eigenvalues, wave properties of light, X-ray production and properties. Compton effect. de Broglie’s hypothesis, Heisenberg’s uncertainty principle.
(Term A)
Prereq: A first year phys course and Math 113 or equivalent
Phys 244B W 2C .5
Quantum Physics 2
Schroedinger equation, wave functions, potential steps barriers and wells, transmission and reflection probabilities, tunnel effect, Hydrogen atom, Zeeman effect, selection rules, electron spin and the Pauli exclusion principle, relativistic Doppler effect, elementary statistical mechanics, basic crystallography.
(Term B)
Prereq: Phys 244a or equivalent

Phys 246 W 3C,1T .5
Physical Optics
Prereq: First year phys and calculus. Coreq: Phys 246L. This course is primarily intended for students registered in the Optom programme.

Phys 246L W 3L .25
Physical Optics Laboratory
For students taking Phys 246. Lab. alternate weeks

Phys 250 F 3C .5
The Solar System
An introduction to the astronomy and astrophysics of the solar system for students with a background in elementary (University) Physics and Mathematics.
Prereq: First year phys and math

Phys 251 W,S 3C .5
The Stellar System
An introduction to the astronomy and astrophysics of objects beyond the solar system for students with a background in elementary (University) Physics and Mathematics.
Prereq: First year phys and math

Phys 252 F 2C,1T .5
Electricity and Magnetism 1
Coulomb's Law, electric fields, Gauss' theorem, divergence theorem, potential, capacitance, dielectric theory, resistivity, DC circuits, transient currents, AC circuits, measuring instruments.
Phys Majors must take Phys 252L with this course.
Prereq: First year phys and calculus. Recommended for students in Hons. Programmes. This course is a good basis for the understanding of practical circuits and of electrostatic forces in matter.

Phys 252L F 3L .25
Electricity and Magnetism 1 Laboratory
For students taking Phys 252. Lab. alternate weeks

Phys 253 W,S 2C,1T .5
Electricity and Magnetism 2
Magnetic Fields, Ampere's Law, Induced electromotive forces, magnetic properties of materials, magnetic devices, displacement currents, Maxwell's equations, electromagnetic waves.
Phys Majors must take Phys 253L with this course.
Prereq: Phys 252, Math 216. Recommended for students in Hons programmes. This course, with Phys 252, forms a basis for the understanding of most of today's electronic and electrical technology.

Phys 253L W,S 3L .25
Electricity and Magnetism 2 Laboratory
For students taking Phys 253. Lab. alternate weeks

Phys 255 W,S 3C .5
Quantum Physics
Background to quantum physics: special relativity, Bohr atom, wave-particle properties, uncertainty and wave packets. Introduction to quantum mechanics: equation for travelling wave, Schroedinger equation, solutions with potentials, correspondence principle, brief description of transitions and radiation processes.
Prereq: First year phys and calculus. Recommended for students in Hons. programmes

Phys 256 F 3C,1T .5
Optics
Reflection and refraction at plane and curved surfaces using the matrix method, thin and thick lenses, optical instruments. The wave nature of light, interference, diffraction, slits and gratings, resolution. Polarization, optical activity, photometry.
Prereq: First year phys and calculus.
Phys Majors must take Phys 256L with this course.
Prereq: First year phys and calculus. Recommended for students in Hons. Programmes

Phys 256L F 3L .25
Optics Laboratory
For students taking Phys 256. Lab. alternate weeks

Phys 259 W,S 3C .5
Crystallography and X-Ray Diffraction
Space lattices, symmetry, crystal structure, crystal geometry and stereographic projections. Electronic structure of atoms and atomic bonding in solids. Theory of X-ray diffraction, X-ray methods and the reciprocal lattice. Crystal formation, crystal defects and physical properties of crystals.
Prereq: First year phys and calculus. Coreq: Phys 259L
Phys 258L  W,S  3L .25  
**Crystallography and X-Ray Diffraction Laboratory**  
For students taking Phys259.  
Lab. alternate weeks  

Phys 265  F,W,S  3C .5  
**Introduction to Mathematical Physics**  
Some mathematical techniques used in the areas of physics familiar to second-year students i.e. mechanics, thermodynamics and electromagnetism. The use of differential equations, partial derivatives, vectors, polar co-ordinates and matrices. Elementary statistics for the analysis of experimental data.  
Prereq: First year phys and calculus  

Phys 270  F  3L .25  
**Laboratory**  
Further experiments in optics for students taking Phys258L.  
Lab. alternate weeks  

Phys 271  W,S  3L .25  
**Laboratory**  
Further experiments in electricity and magnetism for students taking Phys253L.  
Lab. alternate weeks  

Phys 301  F  2C .5  
**Physical Instrumentation for Biologists 1**  
Optics and microscopy; interference, phase contrast, polarizing, dark field and ultraviolet microscopes; polarimetry, spectra, spectroscopic techniques, luminescence.  
Prereq: First year phys. Physics students may not take this course for credit.  

Phys 302  W  2C .5  
**Physical Instrumentation for Biologists 2**  
Radioactivity and the use of radioactive tracers, nuclear magnetic resonance, mass spectrometry, the ultracentrifuge and other techniques.  
Prereq: Phys301. Physics students may not take this course for credit.  

Phys 324  F  3C .5  
**Atomic and Nuclear Physics 1**  
Fundamentals of modern physics, special theory of relativity, quantization of electromagnetic radiation, wave properties of particles, the hydrogen atom.  
Recommended for students in General programmes  

Phys 325  W  3C .5  
**Atomic and Nuclear Physics 2**  
Many electron atoms, atomic and X-ray spectra, nuclear structure, nuclear reactions, molecular and solid state physics.  
Prereq: Phys324.  
Recommended for students in General programmes  

Phys 350  F  3C .5  
**Astrophysics 1**  
Prereq: None, however, familiarity with the contents of Phys 250-251 will be assumed. For third and fourth year students.  

Phys 351  W,S  3C .5  
**Astrophysics 2**  
Prereq: None, however, familiarity with the contents of Phys 250-251 will be assumed. For third and fourth year students.  

**Note**  
Phys 450, Phys 451, are also open to third and fourth year students. Phys 350 alternates with Phys 450 and Phys 351 alternates with Phys 451.  

Phys 352  F,S  3C .5  
**Electronics 1**  
Basic A.C. circuit theory. A survey of tubes, transistors and solid state devices, equivalent circuits, power supplies, amplifiers and feedback.  
Prereq: Phys 222-223 and Math 216. Coreq: Phys352L.  
Also given in Winter term if sufficient demand.  

Phys 352L  F  3L .25  
**Electronics 1 Laboratory**  
For students taking Phys352.  
Lab. alternate weeks, given in the same terms as Phys 352  

Phys 353  W  3C .5  
**Electronics 2**  
Applications of feedback to oscillators, operational amplifiers, analogue computers and multi vibrators. Introduction to pulse techniques, FM and TV circuits.  
Prereq: Phys 352. Coreq: Phys 353L  

Phys 353L  W  3L .25  
**Electronics 2 Laboratory**  
For students taking Phys353.  
Lab. alternate weeks
Course Descriptions

Physics

Phys 354  F,S  2C  .5
Atomic and Molecular Physics
The Schrödinger equation applied to simple one- and
two-dimensional potentials. Hydrogen atoms, angular
momentum and spin, molecular vibrational and rotational,
many electron atoms, radiation processes.
Prereq: Phys 255

Phys 355  W  3C  .5
Nuclear and Particle Physics
Nuclear structure, interactions of nuclear radiations with
matter, radioactive decay, nuclear reactions, nuclear
force, elementary particles.
Prereq: Phys 255

Phys 358  F,S  3C  .5
Thermodynamics
Thermodynamic systems, equation of state, the laws of
thermodynamics with applications. Change of phase.
Prereq: Math 213 and a first year phys course

Phys 359  W  3C  .5
Statistical Mechanics
Basic theory, ideal, classical and quantum gas.
Occupation numbers. Effects of statistics. Applications
to metals, perfect crystals, radiation and dense fluids.
Prereq: Phys 358

Phys 360A  F,S  3L  .25
Intermediate Laboratory
Selected experiments in mechanics, atomic physics,
solid state physics, optics and electronics.
18 hours of experiments

Phys 360B  W  3L  .25
Intermediate Laboratory
Continuation of 360A.
18 hours of experiments

Phys 362  F,S  3C  .5
Classical Mechanics 1
Foundations of Newtonian mechanics. Dynamics of a
particle, harmonic oscillator, central force motion,
conservative force, potential energy. Dynamics of a
system of particles, conservation laws.
Prereq: First year phys, Math 113, 213 and 216. This
course is primarily intended for Hons. Phys students

Phys 363  W  3C  .5
Classical Mechanics 2
Statics, translation and fixed-axis rotation of a rigid body.
Moving frames of reference, gravitation. Lagrange's
equations.
Prereq: Phys 362. This course is primarily intended for
Hons. Phys students

Phys 364  F,S  3C  .5
Mathematical Physics 1
Vector and tensor analysis with applications.
Prereq: Math 213 and 216. This course is primarily
intended for Hons. Phys students

Phys 365  W  3C  .5
Mathematical Physics 2
The partial differential equations of mathematical
physics. Sturm-Liouville theory, Bessel and Legendre
functions. Fourier analysis.
Prereq: Math 213 and 216. This course is primarily
intended for Hons. Phys students

Phys 366  F  2C  .5
Geophysics 1
Introductory topics on the physics of the earth.
Seismology and the earth's interior. Thermal history of
the earth, gravity and isostasy. Origin of the continents
and continental drift. (Identical to Earth 366).
Prereq: First year phys and calculus

Phys 369  W  2C  .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.
(Identical to Earth 369).
Prereq: First year phys and calculus

Phys 371A  F,S  3L  .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  .25
Intermediate Laboratory
Continuation of 371A. For honours students who are taking Phys 360B.
18 hours experiments

Phys 380  F  3C  .5
Molecular Biophysics
Energy production, transport and release in cells,
structure of large molecules and their replication,
genetic code, control of intracellular processes.

Phys 381  W  3C  .5
Cell Biophysics
Structure and behaviour of cell membranes, diffusion
problems, selective ion transport, electrical activity and
nerve conduction, cilia and flagella, muscle cells,
sensory receptor cells, synthesis of cell components and
cell division.
Phys 431 Classical Mechanics 3
Not offered in 1977-78

Phys 432 W 3C .5
Physics of Solid State Devices
The theories of solid state physics are applied to explain the operation and use of several modern electronic devices, including the p-n junction, transistors, thyristors, tunnel diodes, field effect devices, optical devices, etc.
Prereq: Phys 435

Phys 433 Y 6L 1.0
Experimental Research Project
An experimental research project. This course is designed for students in the Honours Physics Programme and in the Co-operative Applied Physics programme.
Students in the regular Hons Phys programme must take either Phys 433 or Phys 437. Although students in the Co-operative Applied Phys (Hons) programme are recommended to take one of these courses, enrolment may be limited.

Phys 434A F 2C,1T .5
Introductory Quantum Mechanics
Prereq: Phys 354

Phys 434B W 2C,1T .5
Quantum Mechanics
Prereq: Phys 434A

Note
Phys 434B is strongly recommended for students intending to do graduate work.

Phys 435 F 3C .5
Solid State Physics
Introductory concepts in crystal diffraction and the reciprocal lattice. Crystal bonding, lattice vibrations, thermal properties of insulators, free-electron theory of metals, band theory, semiconductors.
Prereq: Phys 255

Course Descriptions

Phys 437 W 3R .5
Theoretical Physics Project
Selected subjects for advanced study by theoretically inclined students, topics in relativistic, quantum, and statistical physics.
Students in the regular Hons Phys programme must take either Phys 437 or Phys 433. Although students in the Co-operative Applied Phys (Hons) programme are recommended to take one of these courses, enrolment may be limited.

Phys 438 Geophysics 3
Not offered in 1977-78

Phys 441 Y 2C,1T 1.0
Electromagnetic Theory
A generalized treatment of the basic laws of electricity and magnetism, mathematical techniques for the problems of electrostatics, solution of Maxwell’s equations in free space and the study of plane waves, theory of waveguides and introduction to radiation.
Prereq: Phys 222-223 or Phys 252-253, Phys 364-365

Phys 442 W 3C .5
Structure of Solids
A survey with emphasis on the physical properties and behaviour of metals and alloys. Elastic and plastic deformations of crystals. Solidification, structure of alloys, free energy of alloy systems, equilibrium diagrams, diffusion, solid state phase transformations.
Prereq: Phys 435

Phys 443 F 3C .5
Continuum Mechanics
Fluids: classification, perfect fluids, Newtonian fluids, boundary layers, turbulence. Viscoelasticity, plasticity. Applications to various systems.
Prereq: Phys 364-365

Phys 444 W 3C .5
Nuclear Physics
Elements of nuclear structures and systematics. Alpha emission, beta decay, gamma emission, two-body systems and nuclear forces, nuclear reactions. Neutron physics. Sub-nuclear particles.
Prereq: Phys 355

Phys 445 F 3C .5
Modern Optics
Prereq: Phys 256, Phys 354
Phys 449 **Radio Astronomy**  
*Not offered in 1977-78*

Phys 450 **Astrophysics 3**  
*Not offered in 1977-78*

Phys 451 **Astrophysics 4**  
*Not offered in 1977-78*

Phys 452  
F 2C,3L 0.5  
**Digital Electronics**  
Fundamentals and advanced concepts of digital logic  
stressing practical uses of modern integrated circuit  
technology.  
*Prereq: Phys 352-353. 18 hours experiments*

Phys 453  
W 3C 0.5  
**Analogue Circuits**  
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 464  
F 2C,1T 0.5  
**Mathematical Physics 3**  
Applications to Physics of the theory of functions of a  
complex variable.  
*Prereq: Phys 364-365*

Phys 465  
W 2C,1T 0.5  
**Mathematical Physics 4**  
Theory and applications of integral transforms (Fourier,  
Laplace), integral equations and Green's functions  
*Prereq: Phys 464*

Phys 480  
F 3C 0.5  
**Radiation Biophysics**  
The effect of radiation of various kinds on cells and  
tissues, exposure calculations, mechanism of damage,  
repair theories, genetic effects, target theory, isotopic  
tracers in biophysical research.

Phys 481  
W 3C 0.5  
**Biophysics of Organ Systems**  
Physics of homeostasis, interactions with the  
environment, circulation of blood, temperature  
regulation, respiration, transport problems and special  
organ systems.

Phys 482  
F 3C 0.5  
**Biophysics of Nervous Systems**  
Neurons; nerve conduction, sensory transducers;  
coding, processing and storage of information; control of  
muscles and other effector organs.  
*Recommended for third or fourth year students in Math,  
Eng or Sci.*
Department of Political Science

Professor, Chairman of the Department
J. M. Wilson, BA, MA (Toronto)

Professors
J. Jupp, BSc, MSc, PhD (London) (Visiting, 1976-77)
J. E. Kerselle, BA, MA, (Queen’s), PhD (London)
T. H. Qualter, BA (New Zealand), PhD (London)

Associate Professors
C. H. Grant, BA, MA (Leicester), PhD (Edinburgh)
A. D. Nelson, AB, AM, PhD (Chicago)

Assistant Professors
J. D. Fraser, BA (Cantab.), PhD (Leicester)
A. Kapur, BA (Panjab), MA (George Washington),
PhD (Carleton)
J. E. Surich, BA, MA (Waterloo)
R. J. Williams, BA, MA (McMaster), PhD (Toronto)
R. P. Woolstencroft, BA (Alberta), PhD (Alberta)

Lecturers
S. D. Burt, BA, MA, (Waterloo), (part-time)
W. B. Moul, BA, MA (UBC)

Adjunct Professors
W. W. Johnston, BA (Memorial), LLB (Queen’s)
W. J. Morrison, BA (Western), LLB (Osgoode)
B. A. Rogers, Dipl in Journalism, (Ryerson)

Undergraduate Course Descriptions

Note
Extensive descriptions of the content of Political Science courses are available in the Department at the time of pre-registration.

PSci101 F .5
Introduction to Politics 1
An introduction to the nature of politics and to the conflict of modern political ideas. The course involves a common lecture series and tutorials led by faculty members.

PSci102B W .5
The ABC’s of Parliament
A study of the origin, function, and evolution of the parliamentary form of government in Great Britain and modifications of the parliamentary model in the newer societies outside of Britain, such as Canada and Australia, and others.

PSci102C W .5
Politics in Action
An examination of the way in which society’s conflicting demands are organized, articulated, and translated in action. The part played by the various political and economic forces in society will be examined in a comparative framework.

PSci102D W .5
The Political Process in the Modern Democracies
A study of power and influence in the modern democracies, based on an examination of three contending models of the political process—the liberal-democratic or popular rule model, the pluralist model, and the elitist model.

PSci102E W .5
An introductory examination of the characteristic ways in which modern democratic political systems attempt to implement their basic aims: attain their priorities, and struggle with their characteristic problems.

PSci102H W .5
Citizen Participation in Canada
An investigation of the relationship between political participation and democracy-exploring the question of how much participation is good and the ways in which it can be exercised—leading to an in-depth examination of the distribution of power in Canada.

PSci102K W .5
Mass Political Violence
A distinctive social feature of our century is the amount of political violence. Man-made deaths number approximately one hundred million. This course will describe and evaluate various theories of political violence.
Course Descriptions
Political Science

PSci214 .5
Quantitative Analysis
An introduction to the use of quantitative methods in Political Science. Only a rudimentary understanding of mathematics is required. Open to Political Science majors.

PSci221 The History of Political Theory 2: The Classical Period
Not offered 1977-78

PSci222 The History of Political Theory 2: The Modern Period
Not offered 1977-78

PSci225 F .5
Political Theory 1
A survey of the principal ideas of Western political theorists from the earliest times to the seventeenth century. 
Prereq: Second year standing

PSci226 W .5
Political Theory 2
A survey of the principal ideas of Western political theorists since the seventeenth century.
Prereq: Second year standing

PSci231 .5
Politics and the Administrator
A study of various political factors involved in administrative decision-making in the public and private sectors. Particular attention will be given to inputs from the general public, media, special interests, and institutions and agencies of government.
No prereq but prior completion of Econ193 would be helpful

PSci232 Policy Making in Canada
Not offered 1977-78

PSci251 F .5
Comparative Politics 1
A survey of the principal historical and contemporary forces shaping politics in Western Europe, especially Britain, France, Germany, and Italy.
Prereq: Second-year standing

PSci252 W .5
Comparative Politics 2
A continuation of PSci251, with an emphasis on cleavage structures and conflict in European and non-European political systems.
Prereq: PSci251

PSci260 Y 1.0
Canadian Government and Politics
An analysis of the structure and practices of the Canadian political system.
Prereq: Second-year standing

PSci260A F .5
Canadian Government and Politics 1
The first half of PSci260, for students in co-operative programmes only.
No prereq for students in the second year and above

PSci260B W .5
Canadian Government and Politics 2
The second half of PSci260, for students in co-operative programmes only.
Prereq: PSci260A or consent of instructor

PSci262 .5
Soviet Government and Politics
A survey of the development of Soviet political structures with analysis of the relative influence of ideological goals on the one hand and social forces on the other.
No prereq for students in the second year and above

PSci266 .5
American Government and Politics
The theory and practice of the American political system as revealed by the institutions and operations of American national government.
No prereq for students in the second year and above

PSci268 .5
British Government and Politics
An examination of the uniquely British characteristics of the British political system.
No prereq for students in the second year and above

PSci271 F .5
Political Behaviour 1
An examination of the impact of behaviourism upon the study of politics, focusing on the methodological assumptions and aspirations of behaviourism.
No prereq for students in the second year and above

PSci272 W .5
Political Behaviour 2
An examination of the behavioural literature in the study of politics. Selected topics centering on both the micro and macro levels of political systems will be discussed.
Prereq: PSci271 or consent of instructor

PSci281 F .5
International Politics 1
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
Course Descriptions
Political Science

PSci282 W .5
International Politics 2
This course studies the roots of foreign policy behaviour of selected western and non-western (particularly Asian) states.
Prereq: PSci281 or consent of instructor

P Sci 323 .5
Ancient Political Philosophy
A selective examination of political philosophy during the classical period in Greece.
Prereq: Consent of the instructor

P Sci 324 .5
Modern Political Philosophy
A selective examination of political philosophy in the modern period.
Prereq: Consent of instructor

P Sci 327 .5
Political Science and Political Values
An examination of the relationship of “values” to a proper science of politics.
Prereq: Consent of instructor
Alternates with P Sci 311

PSci291 .5
The Canadian Legal Process
An analysis of the manner in which the Common Law functions, together with an examination of the structure and jurisdiction of the Canadian court systems. Taught by a member of the legal profession.
Prereq: Open to all students in the second year and above

PSci292 .5
Aspects of Canadian Law
A study of the way in which the law reflects and influences political ideas and attitudes in Canada in relation to a number of aspects of Canadian life. Taught by a member of the legal profession.
Prereq: PSci291 or consent of instructor

PSci293 .5
Political Journalism
An account of the special factors affecting political reporting and commentary in the broadcast and print media, with a critical evaluation of contemporary practice in the field. Taught by a practising journalist.
No prereq for students in the second year and above.

PSci294 .5
The Politics of Women
An examination of the participation of Canadian men and women in political life and political power, with emphasis on the relationship between the political role of women and their social, economic, sexual, and familial roles.
Prereq: Second-year standing

PSci311 .5
Methodology of Political Science: The Foundations
A selective examination of seminal works which have contributed to our understanding of the methods appropriate to the study of politics. Not a survey course.
Prereq: Consent of the instructor

PSci321 .5
Marxist Theory
An examination of the formation of Marx’s method and of its significance for the proletariat.
No prereq for students in the third year and above

PSci322 .5
Marxism and Revolution After Marx
A selective study of developments in Marxist theory and political movements after Marx.
Prereq: PSci321

PSci331 .5
Public Administration 1
An introduction to the principles of public administration illustrated by the study of Canadian institutions largely at the federal level, but including provincial and municipal examples.
Prereq: PSci260 or consent of instructor

PSci332 .5
Public Administration 2
Analyses of problems and issues in the field applying the knowledge gained in PSci331.
Prereq: PSci331 or consent of instructor

PSci341 .5
Provincial Politics
A comparative analysis of the political systems of the Canadian provinces which explores the possibility that as many as ten political cultures exist in Canada.
Prereq: PSci260

PSci343 .5
Canadian Municipal Government
A study of the assumptions, structures, and performance of municipal government in Canada with reference to metropolitan and regional structural innovations (particularly in Ontario).
Open to students in the third year and above with at least one previous course in Political Science

PSci344 .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: PSci343 or consent of instructor
P Sci 350  Y  1.0
The Politics of the Developing Areas
An examination of selected topics in the politics of
developing areas. Emphasis will be placed upon the
theoretical and empirical adequacy of explanations of
both macro and micro political and economic change in
Asian, African and Latin American states.
No prerequisite for students in third year and above.

P Sci 365  .5
Studies in Soviet Politics
Selected topics in the theory and practice of Soviet
politics, with some discussion of comparative
Communist studies.
Prerequisite: P Sci 262

P Sci 371  .5
Political Culture
An analysis of the development of the concept of political
culture as an analytical tool.
Prerequisite: P Sci 271/272 or consent of instructor

P Sci 372  .5
The Political System
An examination of the concept of system as applied to the
study of politics.
Prerequisite: Consent of instructor

P Sci 373  .5
Political Parties
An examination of the relationship of political parties and
party systems to the dynamics of social change taking
into account the imperatives of survival and adaptation
and the dilemma of principles versus power.
Prerequisite: At least one of P Sci 251, 252, 260, 264, 262 or 268

P Sci 374  .5
Interest Group Politics
A study of interest group theory and comparative analysis of
the internal politics of interest groups and their role in
the political process.
Prerequisite: At least one of P Sci 251, 252, 260, 264, 262 or 268

P Sci 377  .5
Political Socialization
A study of the processes and agents of political
socialization and their effect on political stability or
change in liberal-democratic societies.
Prerequisite: Consent of the instructor

P Sci 380  Y  1.0
World Politics
An examination of the structure or institutional
arrangements of global society and their inter-
relationships with interstate war and the allocation of
misery. A wide range of theories of international violence
and imperialism will be considered.
Open only to students in the third year and above.

P Sci 390-398  .5 each
Special Studies
From time to time courses of special study may be added
to the programme at the third year level. Students
wishing to add such courses should consult the
Department's Undergraduate Officer.

P Sci 411  .5
Theories and Methods of Political Science
An examination of selected topics in political science
research such as measurement, causal analysis, and
experimentation.
Prerequisite: Consent of the instructor

P Sci 424  .5
Contemporary Socialist and Communist Thought
This course examines recent trends in Marxist theory and
its contribution to the analysis of capitalist and socialist
societies.
Prerequisite: Consent of instructor

P Sci 426  .5
Selected Subjects in Political Philosophy
A selective treatment of basic themes in political
philosophy in the modern and pre-modern periods.
For third year Political Science students, but open to
others with prerequisite P Sci 221, 222, 323 or 324, or consent
of instructor

P Sci 427  .5
Special Topics in Political Philosophy
A selective examination of basic problems in political
philosophy in the modern and pre-modern periods.
Prerequisite: P Sci 221, 222, 323 or 324

P Sci 428  .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.
Prerequisite: Consent of the instructor

P Sci 431  .5
Canadian Public Policy 1
An examination of the policy initiatives as taken, for
example, by the cabinet and the bureaucracy itself; how
policy initiatives and related information are processed at
the federal level by departments, the Privy Council Office,
cabinet committees, etc.
Prerequisite: P Sci 260 or 331/332 or consent of instructor

P Sci 432  .5
Canadian Public Policy 2
A study of the internal controls and external influences on
the federal bureaucracy in its role of policy
implementation.
Prerequisite: P Sci 431 or consent of the instructor
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credit</th>
<th>Course Title</th>
<th>Description</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>P Sci 434</td>
<td>0.5</td>
<td><strong>Canadian Foreign Policy</strong></td>
<td>A seminar devoted to the courses, factors and challenges of Canadian foreign policy. Some attention will be paid to how policy is made. The general patterns may, if students wish, be illustrated by case studies of major contemporary issues.</td>
<td>Consent of the instructor</td>
</tr>
<tr>
<td>P Sci 442</td>
<td>0.5</td>
<td><strong>Politics in Ontario</strong></td>
<td>A critical examination of the distinctive elements of government and politics in the Province of Ontario.</td>
<td>P Sci 260 or 341 or consent of the instructor</td>
</tr>
<tr>
<td>P Sci 443</td>
<td>0.5</td>
<td><strong>Politics in Western Canada</strong></td>
<td>A critical examination of the distinctive elements of government and politics in the provinces of Manitoba, Saskatchewan, Alberta, and British Columbia.</td>
<td>P Sci 260 or 341 or consent of instructor. Alternates with P Sci 445</td>
</tr>
<tr>
<td>P Sci 444</td>
<td>0.5</td>
<td><strong>Politics in Quebec</strong></td>
<td>A seminar dealing with the political and social development of Quebec. The emphasis will be on the problems and issues of contemporary Quebec.</td>
<td>P Sci 260 or 341 or consent of instructor</td>
</tr>
<tr>
<td>P Sci 445</td>
<td>0.5</td>
<td><strong>Politics in the Atlantic Provinces</strong></td>
<td>A critical examination of the distinctive elements of government and politics in the provinces of Newfoundland, Prince Edward Island, Nova Scotia, and New Brunswick.</td>
<td>P Sci 341. Alternates with P Sci 443</td>
</tr>
<tr>
<td>P Sci 451</td>
<td>0.5</td>
<td><strong>Comparative Parliamentary Systems</strong></td>
<td>An analytical comparison of parliamentary institutions and processes as they have developed in various political systems influenced by Britain.</td>
<td>P Sci 251 or consent of instructor</td>
</tr>
<tr>
<td>P Sci 458</td>
<td>0.5</td>
<td><strong>The Third World</strong></td>
<td>This course deals with the Third World primarily in the international context. As the problems of this group of countries are on a large scale and very diverse, they will be examined on a comparative basis.</td>
<td>P Sci 350 or consent of instructor</td>
</tr>
<tr>
<td>P Sci 461</td>
<td>0.5</td>
<td><strong>Problems in Canadian Politics 1</strong></td>
<td>A critical examination of various problems of Canadian politics, with an emphasis on political integration, federalism and political parties.</td>
<td>Consent of the instructor</td>
</tr>
<tr>
<td>P Sci 462</td>
<td>0.5</td>
<td><strong>Problems in Canadian Politics 2</strong></td>
<td>A senior research course on selected aspects of Canadian political life, with emphasis on the preparation of a major and original research paper. <em>For fourth year Political Science students but open to others with prereq P Sci 461</em></td>
<td></td>
</tr>
<tr>
<td>P Sci 471</td>
<td>0.5</td>
<td><strong>Public Opinion and Propaganda</strong></td>
<td>A detailed study of the nature of public opinion and the attempt to control it through propaganda.</td>
<td>Consent of the instructor</td>
</tr>
<tr>
<td>P Sci 473</td>
<td>0.5</td>
<td><strong>Voting Behaviour</strong></td>
<td>A comparative study of the motivations underlying electoral choice in Canada, Great Britain and the United States.</td>
<td>P Sci 214, 373 or consent of instructor</td>
</tr>
<tr>
<td>P Sci 478</td>
<td>0.5</td>
<td><strong>Research Seminar in Political Socialization</strong></td>
<td>This course is designed to follow the introductory work undertaken in P Sci 377 and will focus on the content of the socialization process, particularly in liberal-democratic societies.</td>
<td>Consent of the instructor</td>
</tr>
<tr>
<td>P Sci 485</td>
<td>0.5</td>
<td><strong>International Politics of Asia</strong></td>
<td>This course examines Asia’s emergence after 1945. The role of the superpowers in Asia is assessed in relation to behaviour of select middle and small states.</td>
<td>Consent of the instructor</td>
</tr>
<tr>
<td>P Sci 490-498</td>
<td>.5 each</td>
<td><strong>Special Subjects</strong></td>
<td>From time to time courses of special study may be added to the programme at the fourth year level. Students wishing to add such courses should consult the Department’s Undergraduate Officer.</td>
<td></td>
</tr>
<tr>
<td>P Sci 499</td>
<td>1.0</td>
<td><strong>Senior Honours Essay</strong></td>
<td>Students wishing to undertake a senior honours essay in their fourth year should consult the Department’s Undergraduate Officer.</td>
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</table>
Department of Psychology

Professor, Chairman of the Department
R.K. Banks, BA, MA, PhD (Toronto)

Associate Professor, Associate Chairman
Undergraduate Affairs
G. A. Griffin, BA (Colgate), MA, PhD (Wisconsin)

Associate Professor, Associate Chairman
Graduate Affairs
T. G. Waller, BS, MS (Southern Mississippi), PhD (Vanderbilt)

Professors
G. A. Barnard, BA, MA (Cambridge), PhD, DSc (London)
K. S. Bowers, BA, PhD (Illinois)
M. P. Bryden, BS (MIT), MSc, PhD (McGill)
W. C. Corning, BA (Heidelberg), PhD (Rochester)
D. P. Crowne, BA (Antioch College), EdM (Rochester), PhD (Purdue)
J. A. Dyal, BA (Oklahoma), PhD (Illinois)
W. D. Fenz, BA (Southern Missionary), MA, BD (St. Andrew's), MSc (Hawaii), PhD (Mass)
M. Kinsbourne, BA, MA (Oxford), BM, BCh (Guy's Hospital), DM (Oxford), (part-time)
C. K. Knapper, BA (Sheffield), PhD (Saskatchewan)
H. M. Lefcoort, BA (Antioch), MS, PhD (Ohio State)
M. Lerner, BA, MA (Ohio State), PhD (New York University)
D. Meichenbaum, AB (City College of New York), MA, PhD (Illinois)
S. Reins, MD, CSc (Charles University)
P. M. Rowe, BA (Toronto), MA (Dalhousie), PhD (McGill)
D. A. Sprott, BA, MA, PhD (Toronto), FSS
R. A. Steffy, BA (Albright), MA, PhD (Illinois)
M. D. Vogel-Sprott, BA (McMaster), MA, PhD (Toronto)

Associate Professors
D. M. Amoroso, BA, MA (Toronto), PhD (Waterloo)
J. M. Anglin, BA (Toronto), PhD (Harvard)
M. Breidenbaugh (Mrs.), BA (Wittenberg), PhD (Vienna)
T. E. Cadell, BA (UBC), MSc (Massachusetts), PhD (Wisconsin)
J. A. Cheyne, (WLU), MA, PhD (Waterloo)
J. M. Cornell, BA, MS, PhD (Washington)
J. G. Holmes, BA, MA (Carleton), PhD (North Carolina)
G. E. MacKinnon, BA (Queen's), PhD (John Hopkins)
R. G. Marteniuk, BPE, MA (Alberta), EdD (California)
P. M. Merkle, BA (Knox), MA, PhD (Virginia)
P. J. Naus, BA, PhD (Nijmegen)
M. A. Ross, BA (Toronto), MA, PhD (North Carolina)

K. H. Rubin, BA (McGill), MA, PhD (Penn State)
R. D. Seim, BA (Queen's), PhD (Waterloo)
R. V. Thyssen, BA (Montana), MA, PhD (Iowa)
D. L. Wahlstein, BA (Alma College)
PhD (California, Irvine)
E. E. Ware, BA, MA (Richmond), PhD (Illinois)
M. P. Zanna, BA, PhD (Yale)

Assistant Professors
R. J. Alapack, BA (Scranton), MA, PhD (Duquesne)
F. A. Allard, BA, BPE, MA, PhD (Waterloo)
R. F. Asarnow, BS (Rutgers), MA, PhD (Illinois)
P. E. Bowers, (Mrs.), BA (Rosemount), MA, PhD (Illinois)
(part-time)
A. J. Cohen, BA (McGill), MA, PhD (Queen's)
J. H. Davison, BA (York), PhD (Waterloo), (part-time)
R. H. Lahue, BSc (Fordham), PhD (Waterloo)
T. J. Lottmann, BS, MA (Xavier), PhD (Loyola of Chicago)
J. E. Orlando, BA (Western Ontario), MA, PhD (Michigan)
J. Psotka, BA (Toronto), AM (Harvard), PhD (Yale)
H. Ross (Mrs), BA (Toronto), PhD (North Carolina)
D. M. Willows, BA (Manitoba), MA, PhD (Waterloo)

Adjunct Professors
J. R. Amdur, BS (Portland State Coll.), MA, PhD (Denver)
D. S. Barnes, BA, MD (Western Ontario)
R. E. Enfield, BA (Whittier College), MA, PhD (Arizona)
B. S. Francis, BS (Ursinus College), MA, PhD (Arizona)
J. J. Hartford, MD (Toronto)
P. L. Ritchie, BA (McGill), PhD (Duke)
R. W. Robinson, BA (Rutgers), MA, PhD (Temple)
G. Sherwood, BA (Cambridge), MA, MB, BCHr (London)
G. Sumner-Smith, MRCVS, BVSc, BVSc (Liverpool), FR-CVS, MSc (Guelph)
J. L. Williams, BA, MA (Alberta), PhD (Missouri)

Lecturer
G. A. Lawson, BA (McMaster)

Faculty members holding cross appointments as shown
1 Counselling Services and Psychology
2 Environmental Studies and Psychology
3 Kinesiology and Psychology
4 Renison and Psychology
5 Sociology and Psychology
6 St. Jerome's and Psychology
7 Statistics and Psychology

Course Descriptions
Psychology 403
Undergraduate Course Descriptions

Psych 101  F,W,S,J  3C .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 behavioral science.
Also offered through Renison College and St. Jerome's College

Psych 102  F,W,S,A  3C .5
Introductory Psychology Special Topics
A more in depth study of selected topics introduced in Psych 101.
Prereq: Psych 101. Also offered through Renison College and St. Jerome's College

Psych 203  F,W  3C .5
Learning and Motivation
This course is designed to introduce the student to theories in Learning and Motivation and to provide the student with an understanding of the experimental techniques in these areas.
Prereq: Psych 101

Psych 205  F  3C .5
Sensory Processes
A consideration of data and theory concerning sensory processes. Topics will include psycho-physical methodology, sensory mechanism and the neuro-psychological basis of perception.
Prereq: Psych 101

Psych 206  F,W  3C .5
Perceptual Processes
An examination of data and theory concerning perceptual processes. Topics will include the perception of form and space, perceptual learning and a consideration of the effect of personality variables in perception.
Prereq: Psych 101

Psych 207  F,W  3C .5
Cognitive Processes
An examination and evaluation of selected topics dealing with human learning, thinking, concept formation, memory and language.
Prereq: Psych 101

Psych 211  F,W,S,J  3C .5
Developmental Psychology
An examination of the process and factors of human development.
Prereq: Psych 101
Also offered at St. Jerome's College

Psych 214  F,W  3C .5
Psychology of Adolescence
A study of the psychological processes occurring in the second decade of human development. Consideration is given to such areas as intellectual development, emotional and social growth, and identity formation. Current concepts, issues, and research are stressed.
Prereq: Psych 211
Offered at St. Jerome's College

Psych 218  F,W  3C .5
Aging, Dying and Death
An examination of both the psychological aspects of the aging process and the traditional and recent literature relating to various views as to the part played by the reality of death in the life of man. Recent attempts at therapy with dying individuals are reviewed and evaluated.
Prereq: Psych 101
Offered at St. Jerome's College

Psych 231 Psychology of Religious Experience.
Not offered 1977-78

Psych 241  F,W,S,J  3C .5
Educational Psychology: The Psychology of Classroom Learning
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 242  F,W,S  3C .5
Educational Psychology: Learning Disabilities
Analyses of learning disabilities associated with various categories of exceptionality including mental retardation, emotional problems, and receptive and expressive handicaps.
Prereq: Psych 101
Also offered at St. Jerome's College

Psych 253  F,W,S,J  3C .5
Social Psychology
An introduction to theories and research on people in their physical and social environment. Typically, topics such as conformity, persuasion, attraction, prejudice, communication, aggression, the psychology of freedom, justice and human exchange will be introduced.
Prereq: Psych 101
Cross-listed as Psych 220R
Also offered at St. Jerome's College
Psych 254 W 3C .5
Interpersonal Relations
A psychological analysis of social interaction. The development of interpersonal attraction from first impressions to long-term relationships. The roots of hostility, conflict and communication problems.
Prereq: Psych 253
Cross-listed as Psych 221

Physiological Psychology
The structure and function of the nervous system and their relation to behaviour.
Prereq: Psych 101 or permission of instructor

Animal Behaviour
An in depth study of the behaviour of animals emphasizing both observational and experimental research.
Prereq: Psych 101 or permission of instructor

Statistics and Measurement
An introduction to basic statistical concepts and to the theory and use of psychological tests. Consideration is given to the assessment of personality, intelligence, aptitudes, and interests, and to the analysis of individual and group differences in behaviour.

Statistical Methods in Psychology
An introduction to the logical and theoretical base for the application of statistical methods to the solution of problems in the social sciences. Consideration will be given to the descriptive statistics, to sampling statistics and to an introduction to inferential statistics.

Experimental Design
An examination of the effective use and interpretation of statistics in design and understanding of experiments in the social sciences.
Prereq: Psych 283

Tests and Measurements
An introduction to the theory and use of psychological tests. Special emphasis is placed on the assessment of personality, intelligence, aptitudes and interests.
Prereq: Psych 283

Research in Learning and Motivation
Open only to students in a Psychology Programme (Honours, Joint Honours, General or Minor Programmes).
Prereq: Psych 283 and one of Psych 203, 207 or 271
Psych 333 F 3C .5
**Industrial Psychology**
An introduction to the methods and problems in Industrial Psychology.
*Prereq: Psych 101*
(Cross listed as M Sci 44)

Psych 334 F,W 3C .5
**Theories of Counselling Psychology**
An introduction to the methods, theories and problems in Counselling Psychology.
*Prereq: Psych 101*
*Also offered at St. Jerome's College*

Psych 340 Y 3C 1.0
**Community Psychology**
Theory and practice are integrated in an attempt to identify and to understand the social factors which inhibit or facilitate healthy development of the individual. The adequacy of existing social structures and institutions in the treatment of various personal problems is assessed.
*Prereq: Psych 253*
*Offered at St. Jerome's College*

Psych 341 F 3C .5
**Psychology of Early Childhood Education**
An introduction to the field of early childhood education. Topics to be considered include: (1) historical review of the area; (2) application of psychological theory to early childhood education; (3) the disadvantaged child and head start.
*Prereq: Psych 211*

Psych 350 Y 3C 1.0
**Group and Individual Counselling**
Facilitative human relations within the context of education, guidance and interpersonal exchanges are treated in terms of current psychological theories and research. The demonstration and development of these concepts are aided by personal participation, observation and taped sessions.
*Prereq: Psych 355, 357 and 334 or suitable alternative and permission of instructor*
*Offered at St. Jerome's College*

Psych 353 **Aggression and Social Conflict**
Not offered 1977-78. Offered in alternate years

Psych 354 W 3C .5
**Interpersonal Processes in Critical Situations**
The course will examine reactions to other people's misfortunes such as serious physical and mental illness, natural disasters, poverty and discrimination. The focus will be on the understanding of the processes which occur within the observer and how these processes are reflected in interpersonal behaviour.
*Prereq: Psych 253*
*Offered alternate years*

Psych 355 F,W 3C .5
**Personality Theory**
An examination and evaluation of some of the outstanding theories of personality.
*Prereq: Psych 101*
(Cross-listed as Psych 322R)
*Also offered at St. Jerome's College*

Psych 357 F,W 3C .5
**Psychopathology**
The nature and origin of deviant behaviour.
*Prereq: Psych 101*
(Cross-listed as Psych 323R)
*Also offered at St. Jerome's College*

Psych 359 W 3C .5
**Personality and Adjustment**
A study of theory and research related to the adaptation and to the function of personality in a variety of natural and artificial settings. The focus is on normal behaviour.
*Prereq: Psych 355*
*Also offered at St. Jerome's College*

Psych 363(A-E) - 366(A-E) 3C .5
**Special Subjects**
One or more half courses will be offered at different times as announced by the Department.
*Prereq: Consent of instructor*

Psych 372 W 3C .5
**Environmental Psychology**
This course is intended to increase the awareness and understanding of the impact of the environment on human behaviour and experience. Topics to be discussed include: spacing, territoriality, crowding, subjective impressions of environments, and research paradigms.
*Prereq: Psych 101 and 275 or 283 or permission of instructor*
*Offered at St. Jerome's College*

Psych 393 W 2C,2L .5
**Research in Development Psychology**
Open only to students in a Psychology Programme (Honours, Joint Honours, General or Minor Programmes).
*Prereq: Psych 283 and 211*

Psych 395 W 2C,2L .5
**Research in Social Psychology**
Open only to students in a Psychology Programme (Honours, Joint Honours, General or Minor Programmes).
*Prereq: Psych 283 and 253*
Psych 397  W  2C,2L  .5
Research in Personality and Psychopathology
Open only to students in a Psychology Programme
(Honours, Joint Honours, General or Minor Programmes).
Prereq: Psych 283 and one of Psych 355 or 357

Psych 410  Y  3C  1.0
History and Systems
An examination of current theoretical approaches to
psychological problems present in a historical context.

Psych 421  Y  4P  1.0
Senior Practicum in Preschool Groups
Laboratory experience for advanced students in guiding
and supervising developmental experience for young
children. Consideration of professional practical matters
of organization and administration in early childhood
education and care.
Prereq: Psych 321
Graded on a Credit-Fail basis.

Seminars

Psych 451  F  2S  .5
Senior Seminar in Learning
Admission by consent of instructor

Psych 452  W  2S  .5
Senior Seminar in Perception
Admission by consent of instructor

Psych 453  F  2S  .5
Senior Seminar in Development Psychology
Admission by consent of instructor

Psych 454  W  2S  .5
Senior Seminar in Educational Psychology
Admission by consent of instructor

Psych 455  F  2S  .5
Senior Seminar in Social Psychology
Admission by consent of instructor

Psych 456  W  2S  .5
Senior Seminar in Personality
Admission by consent of instructor
Also offered at St. Jerome’s College

Psych 457  F,W  2S  .5
Senior Seminar in Clinical Psychology
Admission by consent of instructor
Also offered at St. Jerome’s College

Psych 458  F  2S  .5
Senior Seminar in Cognitive Processes
Admission by consent of instructor
Psych 459  W  2S  .5
**Senior Seminar in Motivation**
*Admission by consent of instructor*

Psych 461  W  2S  .5
**Senior Seminar in Physiological Psychology**
*Admission by consent of instructor*

Psych 462  F  2S  .5
**Senior Seminar in Animal Behaviour**
*Admission by consent of instructor*

Psych 463  2S  .5
**Senior Seminar in Special Topics**
*Admission by consent of instructor*

Psych 464  2S  .5
**Senior Seminar in Special Topics**
*Admission by consent of instructor*

Psych 465  2S  .5
**Senior Seminar in Special Topics**
*Admission by consent of instructor*

Psych 466  2S  .5
**Senior Seminar in Special Topics**
*Admission by consent of instructor*

Psych 480  Y,M  3R  1.0
**Directed Studies in Special Topics**
*For the student who desires to pursue a particular topic in depth through independent experimental research and/or extensive reading. A faculty member must approve a student’s project prior to registration for this course. Open to exceptional students with permission of the instructor and the Department. Also offered at St. Jerome’s College*

Psych 498  Y,M  R  1.0
**Senior Honours Essay – Review Paper**
*Each student will work under the direction of a member of the department on a critical integrative review of an issue in the research literature. The result of this review will be presented in the form of a thesis, which will be critically examined by members of the department. Also offered at St. Jerome’s College*

Psych 499  Y,M  R  1.0
**Senior Honours Essay – Experimental Study**
*Each student will work under the direction of a member of the department on an experimental study. The result of this investigation will be presented in the form of a thesis, which will be critically examined by members of the department. Also offered at St. Jerome’s College*

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**Course Descriptions**

**Psychology**

The following courses are administered by Renison College. Since these courses are intended primarily for students in the Social Development programme, students planning a General or Honours Psychology programme must consult their faculty advisor concerning Psychology major credit for these courses.

Psych 120R/121R  F/W  3C/3C  .5/.5
**Introductory Psychology**

Psych 220R  F  3C  .5
**Social Psychology**

Psych 221R  W  3C  .5
**Interpersonal Interaction**

Psych 322R  F  3C  .5
**Personality (Personality Theory)**

Psych 323R  W  3C  .5
**Abnormal Psychology (Psychopathology)**

Psych 367R-369R
**Special Topics in Psychology**

Psych 369R  W  3C  .5
**Advanced Topics in Counselling Psychology**

Psych 370R  F  3C  .5
**Cross-Cultural Psychology**

**Independent Study**
*(Open to senior Social Development Studies majors only)*
Department of Recreation

Professor, Chairman of the Department
W. F. Theobald, BS (Seton Hall), MA, EdD (Columbia)

Dean, Faculty of Human Kinetics and Leisure Studies
G. S. Kenyon, BPE (British Columbia), MS (Indiana), PhD (New York)

Assistant Professor and Associate Chairman, Undergraduate Affairs
R. Johnson, BA, MA (Windsor), PhD (Minnesota)

Professor, Associate Chairman, Graduate Affairs
E. M. Avedon, BSS (William and Mary), MA, EdD (Columbia)

Associate Professors
D. M. Crapo, BPE (Alberta), MS, PhD (Michigan State)
C. A. Griffith, BA (Sir George Williams), MS, ReD (Indiana)
D. Ng., BA (Lingnan), MA (Carver), MS, ReD (Indiana)
J. Zuzanek, MA (Moscow), PhD (Charles University, Prague)

Assistant Professors
K. R. Balmer, BA (Toronto), PhD (Liverpool)
E. G. Caris, BS, MS, PhD (Illinois)
J. H. Davison, BA (York), PhD (Waterloo)
C. R. Edginton, BA (San Jose), MA (Illinois), PhD (Iowa)
W. D. Kinney, BSE (Sunny Courtland), MS (Illinois), PhD (New York)
L. Heywood, BA (North Dakota), MA (Florida State), PhD (Wisconsin)
J. Levy, BA (Waterloo Lutheran), BPE (Waterloo), MSW (Waterloo Lutheran), PhD (Waterloo)
S. L. Smith, BA (Wright State), MA (Ohio State), PhD (Texas A & M)

Lecturers
R. D. Graham, BA, MA (Western)
R. E. Mansell, DC (UDC), MS (Illinois)

Adjunct Associate Professor
J. Bauman, BA, MA (Saskatchewan), PhD (Cornell)

Faculty member holds cross appointment as shown:
1 Geography
2 Sociology
Faculty member holds joint appointment as shown:
3 Psychology
4 Kinesiology

Undergraduate Course Descriptions

Rec 100 F 3C .5
Introduction to the Study of Leisure and Recreation
A course designed to develop an overview of the total field of recreation and an understanding of the leisure phenomena and the implications for contemporary society.

Rec 101 F,W 2C,1T .5
Introduction to Leisure Services
An introduction to various leisure service agencies and the services provided. Field trips to municipalities, specialized institutions, and voluntary agencies.
Prereq: Recreation students only

Rec 200 F,W 3C .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 204 F 3C .5
Leisure and Recreation in Historical Perspective
Analysis of socio-cultural determinants which have influenced Canadian Leisure behavior.
Prereq: Rec 100 or consent of instructor

Rec 210 F,W 3C .5
Organization and Administration of Recreation Services
The organization and administration of recreation on federal, provincial and municipal levels, legislation, financing, budgeting, problem solving, public relations, administrative practices and departmental organization with particular emphasis on the municipal level.

Rec 220 F,W 2C,2L .5
Recreation Programme Development
A study of the scope of community recreation programmes and the factors involved in programme leadership. Emphasis will be placed on the goals in recreation for the leader and participant, effective leadership of individuals and groups, individual and group creativity.

Rec 230 W 3C .5
Introduction to Outdoor Recreation
A study of outdoor education and recreation in relation to contemporary lifestyles, natural and human resource systems. Includes the examination of outdoor settings as an integral part of an education-outdoor recreation continuum. Includes the role of selected governmental and non-governmental bodies.
Rec 241 W 3C .5
Administration of Camping and Outdoor Education
The philosophy and objectives of camping and outdoor education; administration, organizing, planning, staff relationships, leadership training, trends in camping and outdoor education. The emphasis in this course will be the place of the resident camp in education and recreation.
Prereq: Rec 230

Rec 250 W 3C .5
Introduction to Recreation for Special Populations
Examines the philosophical, theoretical and empirical frameworks of recreation as a therapeutic service and process to individuals with physical, emotional and intellectual disabilities.

Rec 252 F 3C .5
Recreation and Mental Retardation
An analysis of the motoric and psycho-social behavioral dimensions specific to the retarded with direct and obvious applicability to the planning, implementing and evaluating of recreational programmes.
Prereq: Rec 250, Psych 242

Rec 253 W 3C .5
Recreation and Physical Disabilities
The psycho-social aspects of physical disabilities will be analysed, with special focus given to the planning, implementing and evaluating of leisure activities.
Prereq: Rec 250, permission of instructor

Rec 254 F 3C .5
Recreation and Mental Health
A psycho-social analysis of the determinants and consequences of recreational behaviour as related to positive and negative mental health, discussing in detail, structure, semiotic factors and interaction patterns.
Prereq: Rec 250

Rec 270 F 3C .5
Statistical Techniques Applied to Leisure Studies
An introduction to descriptive and inferential statistics and the interpretation of data. A major consideration of the course is the use of statistics in the solution of problems in recreation and leisure.

Rec 300 F,W 3C .5
Philosophy of Leisure
Examination of major philosophical themes through the ages with reference to contemporary viability and effect upon social behaviour.
Prereq: Consent of instructor

Rec 301 W 3C .5
Sociology of Leisure (Soc 375)
Nature and extent of leisure phenomena in contemporary society. Examination of institutional and formal organizational aspects, social role, social research strategies employed in the study of leisure.
Prereq: Two term courses in Sociology

Rec 302 W 3C .5
Travel and Tourism
The scope and nature of travel and tourism as contemporary leisure experiences. Economic, political and social ramifications, research strategies employed, implications for the future.
Prereq: Rec 301

Rec 303 W,S 3C .5
Sport in Society (Kin 452)
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

Rec 306 W 3C .5
Psychodynamics of Leisure Behaviour
Examination of the psychodynamics of popular leisure experiences, e.g. - sport, gambling, fashion, and the like, and their relationship to psychopathology. Examination of the use of leisure experience to resolve emotional conflict and cope with stress.
Prereq: Rec 301, Psych 357

Rec 307 W,S 3C .5
Group Processes in Physical Activity (Kin 354)
An examination of the social influences and group processes which occur within sport teams. Topics include conformity, the influence of onlookers, and co-actors, leadership, group structure, and cohesion.
Prereq: 2 term courses in Psychology

Rec 311 School Recreation
Not offered 1977-78

Rec 312 S 3C .5
Recreation and Community Action
The role of the citizen in recreation systems with regard to social change. Students will examine models for social change which interact with recreation systems and power relationships between citizen's groups and recreation systems.
Prereq: Rec 210
Rec 316 W 3C .5  
**Principles of Recreation Planning (Plan 344)**
An exploration of alternative approaches to the planning of recreation opportunities in urban-centred regions. The demand for and supply of recreation opportunities; standards, models and systems; recreation planning policies and agencies; and selected recreation planning issues.
*Prereq*: Plan 100 or a full credit in Geography, or consent of instructor

Rec 320 W 2C,2L .5  
**Evaluation of Recreational Programmes**
Evaluation procedures and techniques applicable to recreation programmes are examined in detail. Specification of objectives, development of practical recording procedures and experimental analysis are stressed. Students conduct field evaluations in local community agencies.
*Prereq*: Rec 270, 2 hrs. lab in community agencies

Rec 321-324 .5  
**Selected Topics in Recreation**
The study of particular topics pertaining to recreation. Course topics will be announced in advance, but will not be offered on a regular basis.
*Prereq*: Consent of instructor

Rec 331 F 2C,2L .5  
**Outdoor Education in Recreation**
The present status of outdoor recreation in modern society; government functions and policies related to outdoor recreation services; the planning and administration of outdoor recreation activities. Current problems.
*Prereq*: Rec 230

Rec 334 F 3C .5  
**Park Management**
Basic administrative procedures in park management. Operational techniques are examined together with general policies of acquisition, operation and development.
*Prereq*: Rec 210, Rec 230 or equivalent

Rec 336 W 3C .5  
**Aging and Leisure**
Social parameters of the aging process with particular reference to the Leisure Service Industry.
*Prereq*: Rec 301

Rec 370 F,W,S .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*: Faculty approval

Rec 371 F,W,S 3C .5  
**Research Designs Applicable to Leisure Studies**
An introduction to the methods and techniques of research as applied to leisure studies and services. General consideration will be given to the technical problems involved in various stages of research methodology with emphasis on the logic underlying the research process.
*Prereq*: Rec 270

Rec 400 W,S 3C .5  
**Seminar in Recreation and Leisure**
An in depth analysis of the current major issues and trends.
*Fourth year Departmental students only*

Rec 402 Colloquium on Religion and Leisure  
Not offered 1977-78

Rec 406 S 1.0  
**Comparative Recreation Systems**
A study of multi-national recreation systems. Course meets on Campus and in the field in other countries. Full term study over a period of 6-8 weeks. Laboratory fee varies with field observation.

Rec 410 F 3C .5  
**Planning of Recreation Facilities**
A course to introduce the student to the planning, design and layout to recreation areas and facilities.
*Prereq*: Rec 210

Rec 432 W 3C .5  
**Interpretation**
Concepts, philosophy and practices relative to the enrichment of school and community curricula through the use of the natural environment. Emphasis on the role of the school and the community. The provincial and federal government relative to a systems approach toward an integrated design.
*Prereq*: Rec 332 or consent of the instructor

Rec 434 W 3C .5  
**Advanced Park Management**
A study of policies, procedures, and practices relative to the management of natural resources. Emphasis is placed on a systems approach to management as it relates to park management at all levels of government.
*Prereq*: Rec 334
Rec 435  F  3C  .5
Recreation Resource Policy
A study of policies (both existing and emerging), policy
development and policy gaps related to recreation
resources in Canada. Based on a literature review and
discussion of decision-making procedures, roles and
tools used in the recreation field; students are required to
research real and theoretical situations for seminar
presentation.
Prereq: Rec 100 and Rec 230 or consent of instructor

Rec 470/471  W,S  3C  .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 Programme.
Rec 470 includes an approved design and completion
of the first segment of the paper.
Prereq: Completion of an honours optional course
sequence.
Rec 471 requires the completion of the project begun
in 470.

Rec 580  2C,2D  .5
The Dynamics of Tourism
An examination of the behaviour factors which influence
the tourist; the research methodologies employed to
examine these factors; and the relationship between
tourism and other aspects of leisure behaviour.
Prereq: Rec 302 or equivalent, and a course in statistics.
Open to advanced undergraduate students and graduate
students.
Religious Studies

Assistant Professor and Chairperson
B. J. Hubbard, BA (Seattle), MA (Marquette),
PhD (Iowa) J

Professor
W. Klaassen, BA (McMaster), BD (McMaster Divinity
School), PhD (Oxford) G

Associate Professors
A. M. McLachlin, MA (Toronto), BD, ThD (Emmanuel) P
H. S. Kim, BA (Kyungpook), BD (Hankook),
ThM (Pittsburgh), ThD (Knox) P
J. W. Miller, BA (Goshen), MA (N.Y.U.), BD (Princeton),
ThD (Basel) G
D. Sahas, BD (Athens), STM (Christian Theological
Seminary), PhD (Hartford Seminary Foundation)
A. F. Thompson, BA (Toronto), BTh (Huron),
MA (Western), STM, PhD (McGill)

Assistant Professors
M. D. Anderson, BA (Missouri), BD (Kenyon),
MA, PhD (Missouri) P
W. J. Bildstein, BA (Western), STB (Gregorian),
MA (Windsor), STD (Angelicum) J
R. M. Bird, BA, MA, PhD (Iowa) R
M. D. Bryant, BA (Concordia), STB (Harvard),
MA, PhD (St. Michael's) R
R. D. Legge, BA (Transylvania), STB (Harvard),
PhD (McMaster)
R. Sawatsky, BA (Bethel College), MA (Minnesota),
MA (Princeton) G
J. D. Whitehead, BA (Toronto), PhD (Chicago) J

Lecturers
P. K. Hawkes, MA (McMaster), MDiv (Queen's),
MA (Toronto) P (part-time)
J. Rempel, MA (Waterloo), MDiv (Assoc. Mennonite
Seminaries) G

Note
Professors designated with suffix G (Conrad Grebel),
J (St. Jerome's), P (St. Paul's), and R (Renison) are
located in the respective Colleges.

Undergraduate Course Descriptions

Note
Please consult the Course Offerings List to determine
which courses are offered in the church colleges.

RS 103 F,W 3C .5
Introduction to Biblical Studies 1
A survey of the literature, history and religion of ancient
Israel as seen in its cultural background in the Ancient
Near East.

RS 104 F,W 3C .5
Introduction to 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.

RS 105 Y 3C 1.0
Elementary Biblical Hebrew
A study of elementary Biblical Hebrew grammar. Written
exercises in both Hebrew and English. Reading of
selected portions of the Hebrew scriptures.

RS 106 Y 3C 1.0
New Testament Greek
This course will consist of two parts:
a) An introduction to Greek grammar with appropriate
grammatical exercises and development of vocabulary.
b) An exegetical study of the Greek text of the Synoptic
Gospels, with Mark as the basis.

RS 110 F,W 3C .5
Religions of Mankind 1
An introduction to the religious traditions of the East:
history, religious beliefs and practices of Hinduism,
Buddhism, Confucianism, Taoism and Shinto.

RS 111 W 3C .5
Religions of Mankind 2
Encounter with Judaism, Christianity and Islam: the
history and interaction of the three major religious
traditions which have shaped the image of the Western
World.
RS130 F 3C .5
Introduction to Theology
A study of the nature of the Christian faith with consideration of questions such as these: How do you speak of God in a secular age? What significance have the Bible and Church doctrines for history and faith? Who is Jesus? The Cross and Resurrection; the question of Salvation.

RS131 W 3C .5
Introduction to Theology
Further study of the Christian faith to include the questions and issues: What is man? What is freedom? Is there a Christian lifestyle? the new morality; Men and Nature; the Church: Mission and Worship; the Future.

RS160 F 3C .5
Religion and Culture 1
An introductory exploration of the interrelationships of religion and culture through the medium of the arts. A consideration of the religious dimensions of man's artistic, personal and social quest in cultures East and West.

RS161 W 3C .5
Religion and Culture 2
An exploration of religion as the "substance of culture" and culture as "the form of religion". The manifestation of this relationship in terms of the quest for meaning, the evolution of human sexuality, the creation of the "good society" and the creations of the fine arts.

RS203 Wisdom Literature in the Old Testament
Not offered in 1977-78

RS204 W 3C .5
Song and Poetry in Ancient Israel
A selection of songs and psalms which were used in the worship of ancient Israel will be studied against the background of religious practices and poetry in the ancient Near East.

RS205 F 3C .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.

RS206 F 2C,1D .5
Modern Study of Jesus
An examination of recent approaches to the study of Jesus of Nazareth to determine his significance for the beginnings of the Christian Church and for modern man.

RS207 F 2C,1D .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 104, RS 202 or consent of the instructor

RS209 W 2C,1D .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.

RS211 W 3C .5
Religion in Japan
A historical survey of Religion in Japan from ancient time to the present. The course will examine the development and inter-relationships of folk religion, Shinto, Buddhism, Confucianism, religious Taoism, Christianity, and the emergence of new religion.

RS212 Ancient Near Eastern Religions
Not offered in 1977-78

RS213 F 3C .5
Hinduism
A study of the development of religious thought in India from the Vedic Period to the present. The course will combine a historical survey with a study of representative texts from the religious, philosophical, social, and political thought of the Hindus.

RS214 F 2C,1T .5
Buddhism in India and South-East Asia
A historical survey of the essential doctrines and practices of Buddhism in India and South-East Asia, along with a study of representative texts that illustrate interpretations of the Buddha's teachings that proved to be significant for the cultures of these areas.

RS215A F 2C,1T .5
Religion in China 1
A study of the development of religious beliefs and practices in China from the Ancient Period through the Early Han Dynasty, and of the contributions of the philosophers of the Classical Period to Chinese spirituality.

RS215B Religion in China 2
Not offered in 1977-78

RS216A F 3C .5
Islam: "Religion Perfected"
The study of the religious experience of the Muslim community with an emphasis on pre-Islamic Arabia, Muhammad the Prophet, the Qur'ān as the Word of God, the Articles of Faith and the Pillars of Islam.
RS216B W 3C .5
The Development of the Muslim Community
The evolution of the "Brotherhood of Believers" from the time of Muhammad to the present: a study of the Islamic expansion and civilization, the Khalifate, the development of Letters and Sciences and the condition of the Islamic States in the modern world.

RS217 F 3C .5
Judaism
An introduction to the religious tradition of the Jews, in terms of beliefs, practices, ideals and institutions from the beginning to the present time.

RS218 W 3C .5
Christianity
An introduction to the Christian tradition in retrospect; the facts and the experiences pertinent to the evolution of beliefs, institutions, practices and cultural expressions, as these elements delineate the essential identity of Christianity as one of the religious traditions of the world.

RS220 F,S 2C,1D .5
Evangelical Christianity
A descriptive, historical and theological review of that wing of North American Christianity known as evangelicalism, fundamentalism, or revivalism.

RS221 W,J 2C,1D .5
Religions of Waterloo County
A consideration of North American religion through the study of a variety of local religious groups, such as Mormons and Missionaries, Scientologists and Presbyterians, Amish and newly emergent religions.

RS227-228 (Hist235-236) F,W 3C 1.0
History of Christianity 1 and 2
The object of this course is to study the historical development of Christianity from its beginnings to the present, as well as the institutions and doctrines expressed in the major forms of Roman Catholicism, Eastern Orthodoxy and Protestantism.

RS231 The Evolution of Christian Thought: A Catholic Survey
Not offered in 1977-78

RS232 Christ and Contemporary Man
Not offered in 1977-78

RS233 F 2C,1S .5
Contemporary Atheism & Christian Faith 1
The sources of atheism in Western culture. The God of philosophical proof and the God of Christian faith. Christian responses to contributions to present day atheism made by Hegel, Feuerbach, Nietzsche, Marx and Lenin.

RS234 W 2C,1S .5
Contemporary Atheism & Christian Faith 2
Prereq: RS233 or consent of instructor

RS235 F 2C,1D .5
Issues in Catholic Moral Theology 1
A study in moral theology of current social problems. Concrete possibilities for individual initiative toward needed social change will be stressed.
Prereq: Second year standing or consent of instructor.

RS236 W 2C,1D .5
Issues in Catholic Moral Theology 2
An investigation of the moral implications of an evolving sexual consciousness in the Christian tradition.
Prereq: Second year standing or consent of instructor.

RS238 The Ecumenical Movement
Not offered in 1977-78

RS239 F 2C,1D .5
History and Thought of Christian Pacifism 1
The Biblical materials. An examination of the documents of the early church, notably the Bible, with reference to their teaching on war and peace.

RS244 W 2C,1D .5
History and Thought of Christian Pacifism 2
The Contemporary Discussion. A survey of Christian teaching on war and peace, focusing on the twentieth century discussion.

RS255 F 3C .5
Christian Ethics 1
An introductory study of the relationship between Christian faith and moral decision as expressed in major ethical writings both historical and contemporary. Special reference will be made to such historical authors as Augustine, Aquinas, Luther and Calvin, and among more recent authors, Barth, Bonhoeffer, the Niebuhrs, Lehmann, Curran and Gustafson.

RS256 W 3C .5
Christian Ethics 2
A continuation of the study of Christian ethical thinking. Such thematic considerations as the Christian view of human nature, the tension between freedom and law, principle vs. situation, love as an ethical norm and the individual and community, will be discussed with reference to the writers studied in RS255.
RS260 F 3C .5
Issues in Science, Technology and Religion
An exploration of issues, themes and personalities in the encounter of modern science and religion. Questions such as the impact of technology, modern physics and the theory of evolution upon the religious traditions will be considered.

RS262 Religion and Politics 1
Not offered in 1977-78

RS263 F 2C,1D .5
Religion and Politics 2
An examination of the relationship between religion and politics in the 20th century. Areas of concentration will vary from year to year, and will include the following topics: The Nazi phenomenon, the Christian-Marxist dialogue in Latin America and Europe, and movements for the "rebirth of politics".

RS264 F 2C,1D .5
Religion in Canada 1
An examination of religion in Canada with particular attention to topics such as the introduction of Christianity into Canada, Amerindian religion, religious life in colonial times, denominational differences and ecumenism, the impact of religion on social and political activity.

RS265 W 2C,1D .5
Religion in Canada 2
A continuation of the study of religion into the 20th Century, with special consideration of issues and motifs arising out of the Canadian experience, e.g., Social Gospel, immigration and national building, ecumenism, the open society and transcendence, and the post-Christian era.
Prereq: RS264

RS266 F 2C,1S .5
Religion and the Film 1
A theological approach to the study of film as a world-transforming phenomenon for man. An assessment of film's special characteristics as an art form capable of addressing man's quest for a significant existence. Consideration of a wide range of films and directors, with particular emphasis on Ingmar Bergman. Cross-listed as Fine 246(R)
Film fee $5.00

RS267 W 2C,1S .5
Religion and the Film 2
An exploration of selected themes—death, evil, guilt, fate, alienation, love redemption—in the films of several of today's leading directors: Bunuel, Pasolini, Kurosawa, Fellini, Pintonioni, Polanski. Cross-listed as Fine 247(R)
Film fee $5.00

RS268A F 3C .5
Religious Perspectives in Contemporary Literature
A discussion of religious perspectives in contemporary literary works. Emphasis will be on religious pluralism as reflected in the culture with a primary focus on man's search for meaning, both individually and culturally.

RS268B W 3C .5
Religious Perspectives in Contemporary Canadian Literature
A discussion of religious perspectives, focused on salvation and survival motifs, in recent Canadian poets and novelists. Uniquely Canadian aspects of the larger tradition in the 20th century will be examined.

RS269 W 3C .5
Myths & Symbols of Indian Art & Civilization
An approach to understanding symbols and perennial themes of Indian religion through a study of representative art, architecture and folk-literature of Hinduism, Indian Buddhism and Jainism.

RS270 W 3C .5
Psychology of Religion
A study of theories of the psychological nature of religious experience, the sources of religious belief and religious significance of psychological phenomena. Topics include faith, doubt, evangelism, conversion, faith healing, mysticism, drugs and religious experience, tongue-speaking.

RS275 W 2C,1D .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.

RS280 W 3C .5
The Parables of Jesus
Detailed examination of the stories Jesus told, their form, method, message, and significance for religious thought, past and present.

RS281 F 2C,1D .5
Foundations of Sacramental Theology
A study of the nature of Sacrament as an encounter between man and God in Christ. The mysterious, communal, symbolic and personalizing aspects of sacramentality will be discussed. The course will critically examine and evaluate the impact of social change, the secularization process and traditional forms on the sacramental life in the Roman Catholic experience.
Prereq: Second year standing or consent of instructor.
RS 202 W 2C,1D .5
New Perspectives in Sacramental Theology
A discussion of sacramental theology in the light of the ongoing renewal, inaugurated by the Second Vatican Council, through a study of the individual sacraments and their role as meaningful cultic signs in contemporary Roman Catholicism.
Prereq: Second year standing or consent of instructor.

RS 291 A-D F 3C .5
Studies in the History of Religions
Studies using the 'History of Religions' methodology will focus on specific movements or streams of religious life.

RS 301 Palestinian Archeology
Not offered in 1977-78

RS 303 Palestinian Archeology: Field Experience
Not offered in 1977-78

RS 304 Selected Topics in Israelite Religion
Not offered in 1977-78

RS 305 Intermediate New Testament Greek
Prereq: RS 106 or consent of instructor.

RS 306 Y 3C 1.0
Intermediate Biblical Hebrew
Reading and grammatical analysis of selected prose and poetic portions of the Hebrew Bible.
Prereq: RS 105 or the equivalent

Note
This course is offered in 1977-78 at Wilfrid Laurier University and in alternate years at St. Jerome's College.

RS 307 A-D F 3C .5
Selected Topics in Biblical Theology
Studies in Biblical theology based on contemporary approaches to the text of the Bible.
Prereq: RS 103-104 or consent of the instructor.

RS 308 The New Testament World
Not offered in 1977-78

RS 309 W 2C,1D .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 202, RS 104 or consent of the instructor.

RS 313 W 3C .5
Modern Religious Movements in India
A study of the development of Hinduism from medieval times to the present, with emphasis on new movements of religion and thought in the 19th and 20th centuries.
Prereq: RS 110, or 213 or consent of the instructor.

RS 314 Zen Buddhism
Not offered in 1977-78

RS 321 (Hist 347) F 3C .5
Radical Reformation 1
A study of spokesmen for radical reform of the Church including Andreas Carlstadt, Thomas Müntzer, Caspar Schwenckfeld, Sebastian Franck, Michael Servetus and others.

RS 322 (Hist 348) W 2C,1S .5
Radical Reformation 2
A study of Anabaptism and its place in the history of the Christian Church and of the Reformation period.

RS 323 (Hist 353) F 3C .5
Medieval Church History from 312-1122
A study of the evolution of the dogmatic approach. Topics will include dogmatic, moral and political questions which have affected the teaching of the Church.

RS 324 (Hist 354) W 3C .5
Medieval Church History from 1122-1449
A study of the evolution of the dogmatic approach. Topics will include dogmatic, moral and political questions which have affected the teaching of the Church.

RS 325 F 2C,1D .5
The Orthodox Church
A study of "Eastern" Christianity; its history, theology, culture, spiritual experience, and its situation in modern Greece, Russia, Eastern Europe, the Middle East, and in the West.
Prereq: RS 111, or 218 or consent of the instructor.

RS 331 The Church in the Modern World
Not offered in 1977-78

RS 332 Fantasy
Not offered in 1977-78
RS333 Creativity: A Religious Perspective
Not offered in 1977-78

RS334 Islamic Theology, Philosophy and Mysticism
Not offered in 1977-78

RS336 Y 3C 1.0
Contemporary Theology
The sources of contemporary theology in 18th and 19th century thought, with particular reference to Kant, Schleiermacher and Kierkegaard. Selected 20th century theologians, including Buber, Barth, Tillich, Bonhoeffer and Teilhard de Chardin. Special attention to current themes such as secularization, the 'death of God', hope and the recovery of religion.

RS351 Contemporary Western Mysticism
Not offered in 1977-78

RS352 Situation Ethics
Not offered in 1977-78

RS353 Ethics in Indian Thought
Not offered in 1977-78

RS360 F 2C,1S .5
Sacred and Profane in the Arts 1
A consideration of 'the holy' and of categories of sacred and profane in the arts. Thematic and methodological issues will be explored in the areas of painting, music, architecture, dance and cinema.
Prereq: Introductory RS course or consent of instructor

RS361 W 2C,1S .5
Sacred and Profane in the Arts 2
A continuation of issues in RS360.
Prereq: RS 360 or consent of instructor

RS365 W 3C .5
Religious Issues in Marxism
An examination of essentially religious issues in the writings of Karl Marx and in selected 'classical literature' of Marxism: the nature of transcendence, the question of ultimate reality, the nature of man, the meaning of history, the problems of alienation ideology and ethics.

RS373 Religion and Social Change in the Third World
Not offered in 1977-78

RS398-399 Directed Reading in Special Subjects†

RS401 Studies in Jewish Scriptures†

RS402 Studies In the Christian Scriptures†

RS415 Studies in Comparative Religion†

RS425 Studies in Church History†
The Faculty of Science offers the following courses of a general nature, intended for students registered in other Faculties (Arts, Environmental Studies, Engineering, Mathematics, Human Kinetics and Leisure Studies) as well as for Science students desiring electives. Normally, no more than eight of these Science term courses (or their equivalent) at the 100-, 200- or 300-level may be applied towards any Science degree programme.

Scil20 Y 3C 1.0
The Physical Sciences
A survey of science specially designed for the needs of elementary school teachers. The lectures will provide a coherent background knowledge of astronomy, geology, physics and chemistry which will enable a teacher to answer questions presented by today's enlightened students. Workshop and discussion sessions will stress communicating the ideas of science to students in all grades.
No specific prereq. except an interest in teaching science. Offered in the evening.

Scil10 F 3C 1.0
Science
The Faculty of Science offers the following courses of a general nature, intended for students registered in other Faculties (Arts, Environmental Studies, Engineering, Mathematics, Human Kinetics and Leisure Studies) as well as for Science students desiring electives. Normally, no more than eight of these Science term courses (or their equivalent) at the 100-, 200- or 300-level may be applied towards any Science degree programme.

Scil10 F 2C.2L .5
Geological Foundations of the Environment
Lab. alternate weeks. Not normally available to students in regular Science programmes.

Note
Students desiring a full-year Geology elective should consider Earth 130 (Introductory Geology) to be found in the listings of the Earth Sciences Department. Students who are taking, or have taken Earth 130 may not take Sci 100 for credit because of overlapping material.

Scil11 F 3C .5
From Matter to Man
Astronomy and Earth Science. A special course available to Math students who do not have a strong Science background. Not open to students registered in the Faculty of Science.
No prereq. A special division of this course may be offered to first year Eng. students in other terms if sufficient demand exists.

Scil11 W 3C .5
From Matter to Man
Chemistry: The nature of matter, atomic and nuclear reactions, Chemical bonds and the formation of molecules.
6 weeks.
6 weeks.
A special course available to students in the Mathematics Faculty who do not have a strong science background, especially at the Secondary School Year 5 level. Not open to students registered in the Faculty of Science.
No prereq.

Scil21 W 3C .5
From Matter to Man
Chemistry: The nature of matter, atomic and nuclear reactions, Chemical bonds and the formation of molecules.
6 weeks.
6 weeks.
A special course available to students in the Mathematics Faculty who do not have a strong science background, especially at the Secondary School Year 5 level. Not open to students registered in the Faculty of Science.
No prereq.

Scil22 F 3C .5
Computational Methods In Science
The digital computer and graphical methods of problem solving in science will be used in the discussion of topics selected from: elementary data analysis, elementary functions, numerical and graphical differentiation and integration, solution of algebraic and differential equations, series approximation.
Intended for first year Sci students. Offered on a CR/NC basis. No prereq.

Scil23 W 3C .5
Applied Physics In the Modern World
Selected topics in the applications of physics such as acoustics, cosmology, fusion, health physics, lasers and holography, oceanography, physics in Canada, reactor physics, space research, superconductivity, symmetry.
Course Descriptions
Science

Sci 209 F,W 2C .5
Information (formerly Scientific Writing and Literature)
Information is considered from two points of view: (1) the information explosion and you: the nature of the scientific, technical and social sciences literature. Retrieval of information: use of libraries and computers. (2) Imparting the information you have to others: the art of speaking, and writing scientific papers, reports, letters, etc. Common errors in writing. No prereq.

Sci 210 J,A 1.0
Geology of the British Isles
Stratigraphy of the British Isles. Relationship of Geological structures and lithologies to land forms: geological factors influencing the distribution of extractive industries. The course will consist of two weeks of lectures, followed by a four week field excursion through Wales, Scotland, and England. Prereq: Earth 130 or equivalent

Sci 219 F 2C .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 .5
Chemistry of Pollution
A study of the chemistry involved in pollution problems encountered with consumer products and in selected industries. Progress in 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.W.S 3C .5
Descriptive Astronomy
A survey course in astronomy intended for non-Science students (primarily Arts, Environmental Studies and Human Kinetics and Leisure Studies students). The solar system, stars, the galaxy, galaxies and the universe. Open to first year or upper year students. (Not for Eng., Math or Sci students). No prereq.

Sci 238 F.W.S 3C .5
Descriptive Astronomy
A survey course in astronomy intended for Mathematics, Engineering and Science students. The solar systems, stars, the galaxy, galaxies and the universe. Open to first year or upper year students. (Students whose major field is Phys may not take this course for credit.) No prereq. A special division of this course may be offered in the Winter and/or Spring term primarily for Eng. students if sufficient demand exists.

Note
Students interested in the above courses in Astronomy should note that because of overlapping material both courses may not be taken for credit - only the one most suitable to their background. Similarly students who have taken Phys 250 - The Solar System or Phys 251 - The Stellar System may not take the above courses in Astronomy for credit because of overlapping material.

Sci 249 W 3C .5
Continents Adrift
A review of the current revolution in the Earth Sciences. This course will trace the evolution of the Earth as we know it today, primarily from the new viewpoint afforded by the hypothesis of seafloor spreading, plate tectonics and continental drift. (Students whose major field is Earth Sciences may not take this course for credit.) No prereq.

Sci 250 W 3C .5
Environmental Geology
The influence of geological factors on the natural environment: natural hazards: effects of engineering works on the environment; geological aspects of water resources and water disposal with particular attention to solid waste (garbage) and deep well injection of liquid wastes. Prereq: Students will find a course in Physical Geography or Earth Sciences to be an advantage. (Students whose major field is Earth Sciences may not take this course for credit).

Sci 251 F 2C .5
Human Genetics
An examination of recent advances in human heredity including the genetic, cytological and biochemical aspects of individual inheritance. The principles of human population genetics will be discussed. The social implications of some of the modern discoveries will be stressed. (Students whose major field is Biology may not take this course for credit). No prereq.
**Sci 252  W  3C  .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.)  
No prereq.

**Sci 260  F  2C  .5**  
**Man and Vision**  
Elementary treatment of physical, physiological and psychological aspects of vision. Emphasis will be placed upon the visual environment and man. Selected phenomena in vision will also be covered. (Open to non-Optometry students only.)  
No prereq.

**Sci 270  W  3C  .5**  
**Nuclear Science**  
A non-mathematical general treatment of the following areas of nuclear Science: historical development and discovery of new fundamental particles; artificial transmutation of elements; nuclear sources of energy; biological effects of radiation and use of radioisotopes in industry, medicine and agriculture. The impact of nuclear science on social, economic and political systems will be discussed.  
Prereq: At least one year Secondary School Chemistry or Physics

**Sci 312  F  3C  .5**  
**Physics of Music 1**  
A discussion of the nature of musical sounds. The mathematical basis of harmony, musical scales. Sound production by various instruments including the human voice; radiated power, sound spectrum. Acoustics of auditoriums; amplifier and speaker systems.  
Recommended for any student who understands logarithms and who is interested in both Music and Physics.

**Sci 313  W  3C  .5**  
**Physics of Music 2**  
Prereq: Sci 312

**Sci 350  F  3C  .5**  
**Canadian Non-Renewable Natural Resources**  
An introduction to mineral resources and the state of reserves of selected minerals. Geologic factors affecting the occurrence of economic minerals and rocks, concentrating upon energy supplies, metallic and non-metallic minerals. The historical development of certain extractive industries will be discussed together with the political and social implications of economic development.  
(Identical to M Env 356). (Students whose major field is Earth Sciences may not take this course for credit).  
No prereq.

**Sci 351  F  3C  .5**  
**Human Biology 1**  
An approach to man as a “biological machine”, and the design and function of systems which interact to promote homeostasis. (Sci 351 or 352 are not recommended to those students who have taken or are taking Biol 301, 203, 204 or 342). (Students whose major field is Biology may not take this course for credit).

**Sci 352  W  3C  .5**  
**Human Biology 2**  
Selected topics in human biology such as co-ordination of tissue function, metabolism, reproduction and the effects of harmful chemicals and drugs in common usage. (Sci 351 or 352 are not recommended to those students who have taken or are taking Biol 301, 203, 204, or 342). (Students whose major field is Biology may not take this course for credit).

**Sci 400A  F  2C  .5**  
**The History of Science 1**  
The development of scientific concepts from the Renaissance to the early 19th century. Astronomy from Copernicus to Newton, physics from Galileo to Newton. The physical and biological sciences during the 18th century. Lavoisier and La Révolution Chimique. The beginnings of the industrial revolution. Emphasis will be on reading the works of the originators of Science.  
Prereq: First year Science or equiv.

**Sci 400B  W  2C  .5**  
**The History of Science 2**  
The growth of scientific ideas in the 19th and early 20th centuries. Developments in physics, chemistry, geology, biology (particularly Darwin) and technology. Emphasis will be on reading the works of the originators of science.  
Prereq: First year Science or equiv.
Sci 410 .5
Technological Report (for Students in co-op Applied Chemistry, co-op Applied Physics and co-op Applied Earth Sciences only)
Technical reports covering work term assignments are submitted by all co-op Science students. These will be carefully evaluated for technical content and writing ability. Four satisfactory reports are required prior to graduation but this number will be reduced to three for students transferring to co-op Science in the 2B or later terms. A word Grading system will be used and will range from Excellent to Unsatisfactory. This course will be added to the student’s transcript at the completion of Year 4 and will be given 0.50 course credit; this credit is to be in addition to the regularly required number of course credits shown in the programme listings.

Sci 452 W 3C .5
Our Biological Environment. The Water
A lecture course providing a study of freshwater and marine environments with special reference to the effects of modern man. (Students whose major field is Biology may not take this course for credit.) No prereq.

Sci 462 F 3C .5
Biology of Food Production
A survey of world food production from the biologist’s viewpoint. Topics: Nutrition; food chains; origins of agriculture; basic plant and animal food crops; primitive and modern scientific agricultural practices and the environmental implications of each. (Students whose major field is Biology may not take this course for credit.) No prereq.
Social Development Studies

Professors
D. G. S. M'Timkulu, BA, MA (South Africa), MA (Yale), Dip Anthropology, Dip Ed, PhD (Natal) R
J. O. Towler, BA (Toronto), MEd (Alberta), PhD (Alberta) R

Assistant Professors
R. Lahue, BSc (Fordham), PhD (Waterloo) R
M. Nagler, BA (U.B.C.), MA (Chicago) R
M. Smyth, BA (Toronto), MA, PhD (York) R
M. Zentner, BA (Temple), MSW (Kansas) R

Associated Faculty

Assistant Professor, Religious Studies
M. Bird, BA, MA, PhD (Iowa) R

Assistant Professor, Religious Studies
D. Bryant, BA (Concordia College), STB (Harvard), MA, PhD (St. Michael's) R

Associate Professor, Geography
B. Hyma, BSc, MSc (Madras), MA (Sheffield), PhD (Pittsburgh) R

Assistant Professor, History
W. Packull, BA (Guelph), MA (Waterloo), PhD (Queen's) R

Associate Professor, English
H. Tuyn, MA (Utrecht & Oxon), Docteur de L'Universite de Paris R

Undergraduate Course Descriptions

Interdisciplinary Social Science

ISS 120R W 3C  .5
Focal Issues in Contemporary Society
An attempt to bring together and condense what are believed to be essential elements of the several social science disciplines. Under study is a group of selected contemporary issues with implications that cut across all the various disciplines. An effort will be made to discuss values appropriate for our age.

ISS 220R F 3C  .5
The History of Development of Modern Day Social Problems
A study and examination of the development of selected trends within modern society in both their historical and contemporary aspects.
Prereq: ISS 120R or consent of the instructor

ISS 221R W 3C  .5
Community Issues
An examination of political, social, and ethical issues in selected social problems with particular emphasis on the Kitchener-Waterloo community. Consideration will be given to various strategies for maximizing social concern and response. Emphasis on social research as a vehicle for examination and analysis.
Prereq: Social research course or consent of instructor

ISS 250R/251R F/W 3C/3C  .5
Social Research
Introduction to the philosophy and methods of applied social science, the problems and strategies of research design and analysis. Emphasis on collection, statistical analysis, and descriptive presentation of research data using a variety of qualitative and quantitative methods.
Prereq: Second year standing or consent of instructor

ISS 320R F 3C  .5
Critical Encounter with the Study of Man
An attempt to develop a critical sense of the relevance of the social science disciplines to man. Special attention to men, theories and methodologies at the "cutting edge" of the social sciences, with emphasis on those taking an interdisciplinary approach.
Prereq: Courses in at least two of the social sciences or consent of instructor

ISS 321R A continuation of ISS 320
Not offered in 1977-78

ISS 330R Education as a Social Problem
Not offered in 1977-78
ISS 341R  W  3C  .5  
**Males in Society**
Exploration of psychological, sociological, cultural and biological influences upon the development of individuals, particularly males, in society. Discussion will include socialization and development, affiliation and emotional expressiveness, power, violence, fatherhood, work, sexuality and marriage.  
*Prereq: Introductory psychology recommended*

ISS 343R  S,W  3C  .5  
**Interdisciplinary Investigation of Human Sexuality**
Focus on the sex research of Kinsey, Masters and Johnson, and areas of import for human sexuality theory and therapy. Exploration of current sexual myths, the supporting literature, the clinician's role in changing individual and societal attitudes and sanctions regarding sexual behaviour.

ISS 346R  F  3C  .5  
**Women's Problems in Contemporary Society**
An examination of the evolution of women's problems in contemporary society emphasizing the implications for social welfare. Attention given to those women who are frequent recipients of social service: poor women, single mothers, welfare recipients, women prisoners, and to the role of women in the helping professions.  
*Prereq: Socwk 120R or consent of instructor*

ISS 350  (a-f) **Special Topics in Interdisciplinary Social Science**
*Not offered in 1977-78*

**Independent Studies**
Interdisciplinary focus, in greater depth than is available in other courses, on 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 programme faculty members.  
*Prereq: Permission of Undergraduate Officer*

ISS 469R  Y  2S  1.0  
**Senior Seminar Workshop**
Social and human phenomena will be examined holistically. Students will be encouraged to synthesize knowledge learned in other social science courses in an intensive study of specific social issues and human concerns. The issues examined will vary from year to year reflecting social change, immediate community concerns, developments in the social sciences and the interests of students and instructors. Students will be required to engage in field projects, including community based learning experiences.  
*Prereq: Open to senior honours students only*

ISS 499R  Y  T  1.0  
**Senior Honours Essay**
The essay will normally be related to the student's chosen theme area, supervised by only one faculty member, but critically examined by faculty from all areas of the programme.  
*Prereq: Open to senior honours students only*
Psychology

Psych 120R/121R F/W 3C/3C .5/.5

Introductory Psychology
Basic concepts and techniques of modern psychology as a behavioural science. The development of behaviour, learning and remembering, motivation, values and attitudes, personality, sensation and perception, and small group processes will be studied with reference to physiological correlates.

Psych 220R F 3C .5

Social Psychology
An examination of psychological principles involved in the interaction of the individual and society. Topics include conformity, mass media, attitude formation, prejudice, attraction, aggression.
(Cross-listed with Psych 253)
Prereq: An introductory psychology course

Psych 221R W 3C .5

Interpersonal Interaction
A consideration of theories and research into interpersonal interaction. Topics include H. S. Sullivan; Double Bind Theory; Non-verbal Behaviour; Transactional Analysis; R. D. Laing; Interaction Approaches to Personality; Social Exchange; balance, attribution and reinforcement theories; complementary needs; rules of encounter.
(Cross-listed with Psych 254)
Prereq: Psych 220R or Psych 253

Psych 322R F 3C .5

Personality (Personality Theory)
An examination of the major theories of personality including consideration of the psychoanalytic, dispositional, humanistic, and behaviouristic models.
(Cross-listed with Psych 355)
Prereq: An introductory psychology course

Psych 323R W 3C .5

Abnormal Psychology (Psychopathology)
A consideration of the theory and research in the area of abnormal psychology.
(Cross-listed with Psych 357)
Prereq: An introductory psychology course

Psych 334(R) F 3C .5

Theories of Counselling Psychology
An introduction to the theories, methods and problems in Counselling Psychology.
Prereq: An introductory psychology course

Psych 367R/369R .5 each

Special Topics in Psychology
One or more half courses will be offered from time to time as announced by the Social Development Studies Programme. Subjects will be dependent upon special research and/or instructional interests of faculty.

Psych 369R W 3C .5

Advanced Topics in Counselling Psychology
An in-depth study of special topics arising in Psych 334 (R).
Prereq: Psych 334 (R)

Psych 370R F 3C .5

Cross-Cultural Psychology
An examination of the findings in several areas of psychological interest in a diversity of cultural settings will provide students in psychology and other disciplines with an appreciation for the cultural relativity of psychological data and concepts.
Prereq: An introductory psychology course


Independent Studies
An independent in-depth study of a selected area of concern to the student within the discipline of psychology. Available to individuals or small groups of third- or fourth-year Social Development Studies majors and arranged with one of the faculty members from the programme.
Prereq: Permission of Undergraduate Officer.
**Sociology**

**Soc 120R/121R**  
**F/W 3C/3C  .5/.5**  
**Fundamentals of Sociology**  
An examination of the fundamental concepts of sociology and their application in seeking to understand the changing patterns and lifestyles taking place specifically in Canada, and in general, within North American society.

**Soc 220R**  
**F 3C  .5**  
**The Individual, Society and Religion**  
An application of sociological analysis to the study of religion. Development of an approach or methodological perspective which can be applied to the study of other social institutions.  
*Prereq: An introductory Sociology course*

**Soc 221R**  
**W 3C  .5**  
**Master Trends in Modern Society**  
Introduction to the major problems of urban, industrial, and political sociology studied within a framework emphasizing social change. Illustrations will be drawn from emergent as well as advanced societies.  
*Prereq: Introductory Sociology course*

**Soc 225R**  
**F 3C  .5**  
**Race and Culture in the Third World 1**  
A general introduction to contemporary problems of race, culture and ethnic relations in the developing countries of Asia and Africa.  
*Prereq: Introductory Sociology course or consent of instructor*

**Soc 226R**  
**Race and Culture in the Third World 2**  
*Not offered in 1977-78*

**Soc 325R**  
**W 3C  .5**  
**Issues in Third World Development**  
The course will examine the impact of modernization on the value systems and social structures of selected South African societies. The course will in particular investigate the functioning of the new elite including some analysis of its new habitat, the city.  
*Prereq: Introductory Sociology or consent of instructor*

**Soc 326R**  
**A continuation of Soc 325R**  
*Not offered in 1977-78*

**Soc 327R/328R**  
**F/W 3C/3C  .5/.5**  
**Canadian Ethnic and Cultural Minorities**  
A detailed examination of various minorities in Canadian society. The course will stress the fundamental concepts and issues of race and ethnic relations and the application of these fundamentals to the various groups in Canadian mosaic.  
*Prereq: Introductory Sociology*

**Soc 396R/399R**  
**F,W/F,W  R/R  .5/.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 programme.  
*Prereq: permission of Undergraduate Officer*
Course Descriptions
Social Development Studies

Social Work
Socwk120R  S,F  3C  .5
Introduction to Social Work
An introduction to the methods, values and concepts of social work. A broad survey of methods of social work practice: casework, group work, community organization, family therapy, etc. An overview and development of social work settings; public assistance, mental health services, welfare services, etc.

Socwk121R  W  3C  .5
Social Problems
A study of contemporary social problems with which social work is concerned. Emphasis is divided between theoretical approaches to understanding the problems and study of societal responses to and intervention in the problem.

Socwk220R  F  3C  .5
Social Casework 1
A presentation of some of the theoretical constructs necessary for the understanding of the individual in the casework relationship, as well as an introduction to some appropriate casework interventions. Emphasis in the course will be theoretical.
Prereq: Socwk120R or consent of instructor

Socwk221R  F  3C  .5
Social Group Work and Family Therapy 1
Presentation of some of the theoretical constructs necessary for the understanding of the family and the group in the social work relationship, as well as an introduction to some appropriate social group work and family therapy interventions. Emphasis will be theoretical.
Prereq: Socwk120R or consent of instructor

Socwk222R  F  3C  .5
Community Organization 1
An examination of social work practice as it relates to functional and geographical communities. The course will explore the theoretical foundations of organization practice as well as a variety of models.
Prereq: Socwk120R or consent of instructor

Socwk320R  W  3C  .5
Social Casework 2
A methodological examination of some of the more complex intellectual components of the social work skills necessary to work with individuals in casework. Social work theories of the individual will be examined in order for the students to learn some clinical casework applications.
Prereq: Socwk220R, or consent of instructor

Socwk321R  W  3C  .5
Social Work and Family Therapy 2
A methodological examination of some of the more complex intellectual components of some of the social work skills necessary to work with families and groups. Social work theories of the family and of the group will be concretized in order for the student to learn some clinical applications.
Prereq: Socwk221R, or consent of instructor

Socwk322R  W  3C  .5
Community Organization 2
An examination of social change tactics as they have been operationalized by individuals and groups committed to the social work ethos. This course will concentrate on the Canadian scene and such diverse formations as social work unions, collective action by welfare recipients, political parties, etc.
Prereq: Socwk222R, or consent of instructor

Socwk326R  W  3C  .5
History of Social Welfare
The historical development of the religious, philosophical, technological and cultural bases of social welfare services from early civilization to the modern welfare state.
Prereq: Socwk120R, or consent of instructor

Socwk350 (a-f)  Special Topics in Social Work
Not offered in 1977-78

Socwk355R  F/W  3C/3C  .5/.5
Child Abuse: Identification and Treatment
The objectives of this course are to provide an understanding of the dimensions and causes of child abuse, to develop skills in identifying cases of this social problem and to explore current methods of management and treatment of persons involved in child abuse situations.

Socwk365R/366R  J/A  3C/3C  .5/.5
Medical Social Work
An analysis of the Social Work function in a medical setting, with emphasis on the contribution of social work in identifying and treating the emotional component of illness. Areas of study will cover the growth of medical social work and development of social work departments in the complexity of a hospital. An examination of various types of in-patient individual and group services. An exploration of social work's responsibilities and opportunities for influencing community public health programmes and issues.
Prereq: consent of instructor
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 programme.
Prereq: Permission of Undergraduate Officer.

Elective Courses
The following elective courses are administered by Renison College. For fuller descriptions, see appropriate departments.

Arts
Arts 220R Chinese Thought and Culture 1
Arts 221R Chinese Thought and Culture 2
Arts 250R Art and Society
Arts 320R/325R Special Topics in Chinese Thought and Culture

English
Engl 109Z (R) Basic Writing Skills
Engl 140R/141R The Use of English, 1 and 2
Engl 205R The Canadian Short Story
Engl 245R Form and Function
Engl 376R/377R Our Changing Language: Syntax and Semantics, 1 and 2
Engl 385R Twentieth Century Literature

Fine Arts
Fine 246R/247R Religion and the Film, 1 and 2
Fine 348R The Films of Chaplin
Fine 349R The Films of Fellini

Geography
Geog 125R Introduction to the Development World
Geog 126R The Emerging "Third World"
Geog 225R Urbanization in Newly Developing Countries
Geog 226R Population Growth and Resource Development in "Third World" Countries
Geog 325R/326R Special Topics in the Study of Third World Development

History
Hist 101R/102R Major Themes of Western Civilization, 1 and 2
Hist 269R A History of Modern Revolutions
Hist 364R The Enlightenment 1, Europe in Ferment
Hist 365R The Enlightenment 2, Europe in the 18th Century
Department of Sociology

Associate Professor, Chairman
K. Westhues, BA (Conception), MA, PhD (Vanderbilt)

Professors
L. A. Costa-Pinto, BA, Lic, Doctor in Sociology (Federal University of Brazil)
G. L. DeGra, BSS (City College, N.Y.)
H. J. Failing, BA, BSc, MA (Sydney)
PhD (Australian National)
J. W. Freer, AB (Bluffton), BD (Chicago Theol Seminary), MA, PhD (Chicago)
D. G. M'Timkulu, MA (S. Africa), MA (Yale), PhD (Natal) R

Associate Professors
J. Curtis, BA (Sir George Williams), MA (Central Michigan), MA (Cornell)
F. A. Fasick, BA (Penn. State), MA, PhD (Columbia)
A. A. Hunter, BA (U.B.C.), MA, PhD (Wisconsin)
L. A. Johnson, BA (Waterloo), MA, MPhil (Toronto)
D. Kubat, MA (Kansas), PhD (L. Maximilian, Munich)
R. D. Lambert, BA, MA (McMaster), PhD (Michigan)
W. G. Scott, BA (Western), MA (Toronto)
M. Shimpo, BA (International Christian, Japan), MA, PhD (UBC) J
E. W. Vaz, BA, MA (McGill), PhD (Indiana)
A. Wipper, BA, MA (McGill), PhD (Cal. Berkeley)

Assistant Professors
J. Z. Adolf, BA, MA (Cracow, Poland), PhD (York), Visiting, 1976-77
L. Fischer, BA (Rutgers), MA (Northwestern), PhD (Duke)
J. Goyder, BA (Bishop's), MA, PhD (McMaster)
A. Q. Lodhi, MA (Punjab), MA, PhD (Toronto)
M. L. Nagler, BA (UBC), MA (Chicago) R
R. C. Prus, BA (Manitoba), MA, PhD (Iowa)

Assistant Professors
S. Karlinsky, BA, MA (Manitoba), (part-time, 1976-77)
S. A. McDaniel, BA (Massachusetts), MA (Cornell)

Undergraduate Course Descriptions

Sociology

Note 1
General Students who major in Sociology must elect the following courses Soc 101, a half course in sociological methods, (one of Soc 321 or 322), a half course in sociological theory, (one of Soc 290, 331, 425, or 426) and three and one half full courses (or equivalent half courses) in Sociology. Students are strongly encouraged to elect Soc 202, although this is not required.

Note 2
An Honours programme in Sociology is a preprofessional degree, so the specific requirements have been formulated in the light of professional and graduate school requirements. Students are reminded that Sociology is now accepted as a high school teaching subject in Ontario. Potential high school teachers should keep informed of the requirements for teaching Sociology in high schools. Students may elect Honours Sociology (Canadian Studies) by fulfilling the requirements listed under Canadian Studies in this calendar.

Associated Faculty

Professors
W. F. Forbes, PhD, DSc (London), DIC, Statistics
G. S. Kenyon, BPhysEd (U.B.C.), MS (Indiana), PhD (N.Y.U.), Kinesiology
M. Lerner, BA, MA (Ohio State), PhD (N.Y.U.), Psychology
D. Smucker, BA (Bluffton), BD (Princeton), MA, PhD (Chicago), Social Sciences, Conrad Grebel
P. J. Wooldridge, BA (Chicago), BS, MA (Florida), PhD (Yale), Nursing and Sociology, Rochester, Adjunct

Associate Professors
G. M. Anderson, BA, MA (McMaster), PhD (Toronto), Sociology and Anthropology, Wilfrid Laurier, Adjunct
M. Eichler, MA, PhD (Duke), Sociology in Education, O.I.S.E., Adjunct
B. McPherson, BA, MA (Western Ontario), PhD (Wisconsin), Kinesiology
Z. Zuzanek, MA (Moscow State Univ.), CSc, PhD (Charles Univ., Prague), Recreation

Assistant Professor
J. M. Alleyne, BA (Sir George Williams), PhD (Johannes Gutenburg), Sociology and Anthropology, St. Jerome's

'Jointly with Department of History
Note 3
The student is reminded that an Honours or a major programme in Sociology is intended to provide a liberal arts education. Students are encouraged to avoid excessive concentration in Sociology, and to elect courses in a variety of social sciences, humanities, modern languages, as well as in other Faculties.

Note 4
First year students who are interested in Sociology as a major are encouraged to take courses in other Social Science such as Anthropology 101, 102, Political Science 115, and Psychology 101.

Soc 101 S,F,W 2C .5
Introduction to Sociology
An introduction to the basic concepts and frames of reference of sociological investigation and interpretation. Topics for analysis will include communities, associations and institutions, classes and status groups, crowds and publics, social processes, and social change. Special attention is given to Canadian society.
Not open to students who have taken Soc 141, 101(f) or 101(m). 101(m) is an introductory course intended as an elective for mathematics students or as a basis for a combined honours in Mathematics and Sociology. 101(u) is especially designed for Planning students. Also offered at St. Jerome's College

Soc 201 W 2C .5
Canadian Society: Structure and Development
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.
No prereq

Soc 202 F,W 2C,2L .5
Sociological Statistics
A first course in sociological statistics; sampling, central tendency, probability, co-variance, as illustrated in specifically sociological data.
Prereq: Soc 101, or equivalent other introductory social science course.

Soc 203 Introduction to Comparative Social Thought
Not offered 1977-78

Soc 205 S,F,W 2C .5
Sociological Analysis of Social Problems
An examination of cultural forces that create social problems and failures in personal and institutional adjustments. Specific attention is paid to the problems of emotional disturbance, poverty, delinquency and industrial disruptions in Canadian society.
Also offered at Renison College

Course Descriptions
Sociology

Soc 207G F,W 3C .5
Sociology of Education
This course is designed for co-op and regular students who plan to enter the teaching field. Attention will be focused on the concepts and theories of sociology as they apply especially to the educational system.
Prereq: Soc 101

Soc 210 W 3C .5
Social Psychology of Beliefs and Attitudes
Examines the nature of social beliefs and attitudes toward various groups in society, such as ethnic, political and religious groups. Considers the sources, organization and distribution of beliefs and attitudes, and their implication for Canadian society.
Prereq: Soc 101 or Psych 101

Soc 211 W 2C .5
Social Structure and Character
In the context of comparative studies of slavery in the Americas this course examines the relationship between social institutions and types of human personality or "Social Identity".
Prereq: Soc 101

Soc 212 F 2C .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 Psych 101

Soc 213 W 2C .5
Sociology of Death and Dying
The course deals with the current literature on death and dying; also, with the sociological implications of institutional housing of the terminal patients. Patterns of mortality as affecting different social groups and as reflecting differential life changes of individuals in society are described. North American issues of death and dying are considered against a historical background.

Soc 215 F,W 2C .5
Sociology of Sex Roles
A comparative analysis of women's roles in past and present with selected cross-cultural data. Assessment of the present situation, especially sex role socialization and the impact of sex roles on the family and the economy. A discussion of the men's and women's liberation movement is included.
Prereq: Soc 101
Soc 216 F, W 2C .5
An Introduction to the Sociology of Marriage and the Family
A survey of sociological perspectives on marriage and the family in urban-industrial societies. Special attention is given to marriage and the family in Canada. Comparisons with the U.S. and Britain will be undertaken.
Prereq: Soc 101
Also offered at St. Jerome's College

Soc 218 S, F 2C .5
Sociology of Adolescence
The social definitions of adolescence in cross-cultural and historic perspective. Social roles of adolescence in the institutional structures of urban industrial societies with special emphasis on the family, education, and the economy. The relationship of adolescent's social roles to processes of social change and stability.
Prereq: Soc 101

Soc 230 G W 3C .5
Family and Kinship
An evaluation of the origin and growth of the family as a social institution; its structures and functions in primitive and modern societies; the effect of modern technology on the family, trends and contemporary problems.
Prereq: An introductory social science course

Soc 240 F 2C .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

Soc 241 W 2C .5
Social Movements
The sociological analysis of varieties of social movements and their relationships to social organization and social change.
Prereq: Soc 101

Soc 245 F W 2C .5
Deviance: Perspectives and Processes
The deviance-making process is examined in a variety of social contexts. Examines the emergence of rules and control agencies, the processes by which persons become involved in deviant activities, and the contingencies affecting persons' careers as deviants.
Prereq: Soc 101 or consent of instructor

Soc 250 F, W 2C .5
Crime and Society
An analysis and criticism of the major theories of criminal behaviour. Emphasis is given to the relationship between social structure and criminal behaviour; types of criminal behaviour such as drug addiction; statistics and contemporary research. Special attention is given to Canadian data. A sound knowledge of sociological concepts is advisable.
Prereq: Soc 101

Soc 251 F, W 2C .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
Also offered at St. Jerome's College

Soc 252 S, F, W 3C .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

Soc 261 F 2C .5
Population Issues (Human Ecology)
The study of population as an area of sociological investigation; population size, composition, and distribution; population trends and problems.

Soc 262 F 2C .5
Canadian Population
Study of the basic demographic processes in the population of Canada. Demographic implications for selected social institutions. Use of Canadian enumeration and registration data.

Soc 270 S, F 2C .5
Communication
An analysis of the role of language and other symbol systems in social interaction; the interplay between communication and the social system, the formation of attitudes through language; social and individual disorders as caused by, and reflected in, the breakdown in the communication process.
Prereq: Soc 101

Soc 275 F 3C .5
The Mennonites as a Sociological Community
A case study of the Waterloo County Mennonites as a social system. Attention is paid to a methodology for studying a religious-cultural group by engaging in direct field studies. The community's charter resources, integration, family system, life ceremonies, adaptation to change, and survival techniques will be examined.
Prereq: An introductory social science course
Soc290G W 3C .5
Utopian Communities Past and Present
An examination of international communities; extinct and contemporary. Attention will be paid to origin, purpose, structure and process in each community studied. An assessment of factors contributing to success and failure will be attempted.
Prereq: An introductory social science course

Soc280 Organization of Animal Societies
Not offered 1977-78

Soc300 W 2C .5
Canadian Social Institutions
General theoretical and methodological issues in the study of social institutions and Canadian substantive examples in comparative perspective. Special attention is paid to such social institutions as the economy, polity, stratification and the family and to institutional interrelations.
Prereq: Soc 101

Soc301 W 2C .5
Urban Sociology
The comparative study of urbanization as a process; the culture and social 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

Soc303 F 2C .5
Crises in Social Structure and Character
This course proposes a frame of reference for the systematic study of human predicaments, ranging in scope from illness and dying to natural disasters and socially induced calamities like forced migration, total war, and genocide.
Prereq: Soc 101

Soc304 W 2C .5
Crisis Management
Some crises of social structure, such as disease, death, and poverty, are so pervasive as to call forth universally equivalent mechanisms of coping. This course explores such institutionalized mechanisms as medical and welfare services in the context of Weber's types of authority and of rationality.
Prereq: Soc 303 or consent of the instructor

Course Descriptions
Sociology

Soc305 Pariah Peoples: Gypsies and Jews
Not offered 1977-78

Soc306 Nazi Holocaust: The Destruction of Europe's Pariah People
Not offered 1977-78

Soc307G F,W,A 2C,1U .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 programmes. Themes will be selected and studied in depth on a seminar basis.
Prereq: Soc 101 and 207G

Soc310 F 2C .5
Seminar in Group Dynamics
An analysis of natural and experimental groups from a social structural view. The study of processes of differentiation, integration, power, etc., internally; and of nesting of small groups in larger collectives.
Prereq: Third or fourth year standing in a social science or by permission.

Soc315 W 2C .5
Social Stratification
Analysis of social classes in society including their basis for development, composition, and consequences for society. Special attention is given to social stratification in Canada.
Prereq: Soc 101

Soc316 F 2C .5
Family Structures in Comparative Perspective
Family structures in a number of different societies will be compared. The impact of specific structures on individual family members and the relationships between the structures and other social institutions will be analyzed. Change occurring in the predominant family structure in North America will be considered.
Prereq: Soc 101

Soc321 F 2C,1L .5
Research Methods 1
A systematic treatment of the logic and practice of methods basic to social research. Emphasis is on problems of research design based on the analysis of case studies.
Prereq: Soc 101 or equivalent
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<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Title</th>
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<tbody>
<tr>
<td>Soc 322</td>
<td>2C,1L</td>
<td>Research Methods 2</td>
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<tr>
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<td>Continuation of Research Methods 1. Includes an introduction to sampling, scaling, the analysis of change, and experimental design. Students will be asked to construct a research design for the study of a theoretically relevant problem in sociology.</td>
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<td>Prereq: Soc 321</td>
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<tr>
<td>Soc 323</td>
<td>2S</td>
<td>Projects in Sociological Research</td>
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<td>Introduction to sociological research through the formation of a theoretically based research objective and its implementation in a small scale team research project.</td>
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<td>Prereq: Soc 101</td>
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<tr>
<td>Soc 324</td>
<td>3C</td>
<td>Social and Demographic Data Analysis</td>
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<td>The analytical uses of routinely collected Canadian data are examined as a valuable resource for demographic and social research. Examines the potential of and the difficulties inherent in the development of adequate health and social indicators.</td>
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<tr>
<td>Soc 330</td>
<td>2C</td>
<td>Comparative Social Structure</td>
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<td>General theoretical and methodological issues facing comparative sociology; comparative methods at work in the treatment of Western and non-western societies (including Canada).</td>
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<tr>
<td>Soc 331</td>
<td>2C</td>
<td>Theories of Social Change</td>
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<td>A systematic review and analysis of major theories of social change including some of the classical and modern theories. Analysis will focus upon the sources, patterns, processes and consequences of change. Special topics to be included are: Marxism, social change in developing countries, the role of ideas, and the breakdown and reorganization of social structure.</td>
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<td>Prereq: Soc 101</td>
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<tr>
<td>Soc 332</td>
<td>2C</td>
<td>Social Conflict and Modernization</td>
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<td>This course constitutes a sociological study of violent and non-violent conflict and modernization in comparative perspective. A critical review of the selected theoretical explanations of collective protest and social change will be done to discover linkage between social conflict and modernization.</td>
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<td>Prereq: Soc 101</td>
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<td>Soc 333</td>
<td></td>
<td>The Sociology of Regional Planning</td>
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<tr>
<td></td>
<td></td>
<td>Not offered 1977-78</td>
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<tr>
<td>Soc 335</td>
<td>2C</td>
<td>Sociology of Science</td>
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<tr>
<td></td>
<td></td>
<td>The study of science as an institution; its historical development and contemporary relationship with other institutions including government, education and industry.</td>
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<td>Prereq: Soc 101</td>
</tr>
<tr>
<td>Soc 338</td>
<td></td>
<td>Sociology of Literature</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not offered 1977-78</td>
</tr>
<tr>
<td>Soc 339</td>
<td>2C</td>
<td>Industrial Sociology</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sociological analysis of industry, including relationships between labour and management and industry and society.</td>
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<tr>
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<td>Prereq: Soc 101</td>
</tr>
<tr>
<td>Soc 340</td>
<td>2C</td>
<td>Formal Organizations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A survey of theory and research on formal organizations making use of selected contributions from the scientific management and human relations approaches, but with emphasis on the structure and functions of large scale organizations.</td>
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<td>Prereq: Soc 101</td>
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<tr>
<td>Soc 341</td>
<td>2C</td>
<td>Occupational Sociology</td>
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<tr>
<td></td>
<td></td>
<td>An introduction to the study of work and occupations; the problems of occupational choice, occupational socialization and identification, the concept of careers and career mobility, the professionalization process, the nature of professions, the impact of occupation on life styles, leisure and retirement.</td>
</tr>
<tr>
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<td></td>
<td>Prereq: A 100 level Sociology course. Soc 342 is recommended as complementary</td>
</tr>
<tr>
<td>Soc 342</td>
<td></td>
<td>Social Structure of the Canadian Labour Force</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not offered 1977-78</td>
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<tr>
<td>Soc 355</td>
<td>2C</td>
<td>Sociology of Religion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>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, ethnic, and religious experience.</td>
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<tr>
<td></td>
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<td>Prereq: Soc 101</td>
</tr>
<tr>
<td>Soc 360</td>
<td>2C</td>
<td>Political Sociology</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The sociological analysis of the institutionalization of power, political movement, parties, conflict and its accommodation.</td>
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<tr>
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<td>Prereq: Soc 101</td>
</tr>
</tbody>
</table>
Course Descriptions
Sociology

Soc361 Conflict Simulation Workshop
Not offered 1977-78

Soc370G F 3C .5
Sociology of Law
Special attention will be paid to the growing public awareness of the failure of law to provide justice or social control in a growing number of situations. Local judges, lawyers and police officials are invited to discuss such issues as the jury system, police and violence, civil rights and mass media.
Prereq: Third year standing in a social science course or by permission

Soc371 3C .5
Philosophy of Social Science
Problems about the fundamental methods and aims of the social sciences generally, the problems specific to Psychology, Sociology, Political Science, etc. and their relations to one another will be considered.
(Same as Phil362). Prereq: Some previous work in a Social Science or in Philosophy

Soc372 W 2C .5
Medical Sociology
Examination of the medical care structures from the point of view of patients, health care professionals in the system, and systems analysis. Structures of interest are primary health care settings, hospitals, and professional associations.
Prereq: Soc101

Soc373 Aging, the Aged and Leisure: A Sociological and Social Psychological Perspective
Not offered 1977-78

Soc374 W S 3C .5
Sport in Society
An introduction to the sociology of sport. Utilizing the major frames of reference of the social sciences, the function of sport in contemporary society is examined.
(Same as Rec303 and Kin 452). Prereq: Soc 101 and one other Soc course

Soc375 W 3C .5
Sociology of Leisure
Nature and extent of leisure phenomena in contemporary society. Examination of institutional and formal organization aspects, social role, social research strategies employed in the study of leisure.
(Same as Rec301). Prereq: Two term courses in Sociology, i.e. Soc 101 and 341

Soc377G .5
Seminar: Studies in Sociology of the Mennonites
This seminar will devote attention to research methods, sociological theory and interdisciplinary approaches to the study of Mennonite communities and culture.
Prereq: Permission of the instructor

Soc382 Techniques of Demographic Analysis
Not offered 1977-78

Soc398 W 3S .5
Seminar in Nationalism and Ideology in Canada and Québec
A research oriented seminar dealing with varieties of nationalism, national identity, separatism, independence and political/economic ideology and values in Canada and Québec.
Prereq: Third or fourth year standing

Soc399 F 3S .5
Research Seminar in Canadian Society
A research oriented seminar dealing with selected topics in Canadian society and cross-national comparisons.
Prereq: Registration in 3rd or 4th year of social science honours programme

Soc401 F 2C .5
Seminar on the Comparative Sociology of Youth
The aim of this seminar is mainly to study the prevailing patterns and resulting problems connected with the ways in which different societies react to the emergence of new generations. Concentrates on analysis of the sixties.
Prereq: Third or fourth year (or graduate) standing and interview with instructor

Soc402 W 2S .5
Marxist Social Theory
This course will focus on the contribution of Marxism to the development of sociological theory in its relation to other types of social thought. Readings will include selections from Marx, Engels, Lenin, Gramsci, Plekhanov, Lukacs, and contemporary sources.
Prereq: Fourth year Honours or graduate standing.

Soc410 W 2S .5
Seminar: Symbolic Interactionism
Examines the perspectives, methods and contemporary research of a sociological social psychology. Considers: the emergence of symbols and meaning in group life; self identities; impression management and interpersonal maneuvering; labeling; and ethnmethodology.
Prereq: Soc210 or 212 or consent of instructor

Soc415 Seminar: The Impact of Sex Factors on Sociological Theory and Research
Not offered 1977-78

Soc421 Secondary Analysis of Survey Data
Not offered 1977-78
Soc 425 F 2C .5
The Development of Sociological Theory
Development of sociological theory in the 19th and early
20th centuries. Emphasis is on the European tradition
although selective attention is given to North American
theorists.
Prereq: Open only to students in Sociology

Soc 426 W 2C .5
Contemporary Sociological Theory
Development of sociological theory in the 20th century.
Included is discussion of current theoretical work.
Prereq: Open only to students in Sociology.

Soc 428 W 3C .5
Seminar: Problems in Contemporary Theory and
Research
Examinations of current frames of reference and theories
in sociology and related disciplines. Their utility in
sociological problem formation and their test by current
methods and techniques.
Prereq: Third or fourth year Honours

Soc 466 F 1T .5
Reading 1
Selected readings and essay assignments under the
direction of a faculty member.
Prereq: Third or fourth year standing in Sociology and
permission of the instructor

Soc 476 W 1 .5
Reading 2
Selected readings and essay assignments under the
direction of a faculty member.
Prereq: Third or fourth year standing in Sociology and
permission of the instructor

Soc 480 F 2C,1L .5
Advanced Social Statistics
Multiple and partial correlation; regression; analysis of
variance and covariance; selected non-parametric
techniques.
Prereq: Soc 202 or equivalent

Soc 481 2C .5
Mathematical Sociology
Selected mathematical techniques with applications to
sociology; sets and graphs, Markov chains and game
theory.
Prereq: Permission of instructor

Soc 499 F,W 1.0
Senior Honours Essay
Required of all honours students in Sociology or by
election by joint honours students in their fourth year. For
students electing Honours Sociology (Canadian Studies)
the essay should bear on some topic of particular
sociological significance for Canadian Society.
Prereq: Fourth year Sociology Honours
Also offered at St. Jerome's College

The following courses are administered by Renison
College
See page 000 for descriptions of these courses.

Soc 120R F 3C .5
Fundamentals of Sociology

Soc 121R W 3C .5
Fundamentals of Sociology

Soc 220R F 3C .5
The Individual Society and Religion

Soc 221R W 3C .5
Master Trends in Modern Society

Soc 225R F 3C .5
Race and Culture in the Third World 1

Soc 226R Race and Culture in the Third World 2
Not offered 1977-78

Soc 227R Issues in Third World Development

Soc 228R Issues in Third World Development
Not offered 1977-78

Soc 229R F 3C .5
Canadian Ethnic and Cultural Minorities

Soc 232R W 3C .5
Canadian Ethnic and Cultural Minorities

Soc 367R-369R Special Topics in Sociology
Not offered in 1977-78

Soc 398R. F,W R .5
Independent Study

Soc 399R F,W R .5
Independent Study
Course Descriptions
Systems Design

Undergraduate Course Descriptions

SyDe101-102  F,S  1C  0.0
Tutorial
Systems Design first year students will meet with a faculty member designated as their class professor. Performance in assignments, conceptual difficulties with courses, inter-relation of coursework, later work and engineering practice will be discussed.

Non-credit courses

SyDe111  F  3C,1T  .5

Calculus 1

SyDe112  S  3C,1T  .5

Calculus 2
Techniques of systematic integration, applications of integration. Sequences, series, infinite series, power series, with applications.

SyDe113  F  3C,1T  .5

Linear Algebra

SyDe114  S  3C,1T  .5

Theory and Applications of Probability

SyDe121  F  3C,1T  .5

Digital Computation
Introduction to electronic digital computers; hardware and software organization, basic features of Fortran, examples of efficient algorithms for engineering computations.

SyDe131  F  2C,1T  .5

Engineering Economics
Cost-benefit analysis, critical path methods, interest, project economics, decision making, utility theory, project organizational theory.
Course Descriptions

Systems Design

SyDe 142 S 2C,1T .5
Introduction to Ergonomics
The man-machine environment complex; the nature of the operational environment; human sensory processes, perception, human information processing; motor function; human work, skill, fatigue; problems of acoustic noise, vibration, heat, cold; needs of ventilation lighting.

SyDe 161 F 2C,1T .5
Systems Behaviour
Introduction to the ideas and techniques of systems analysis and design. Data collection and handling, statistical methods, systems representation, modelling and simulation, allocation of function and interface design, systems dynamics. Examples: container handling, air traffic control, telephone systems, etc.

SyDe 162 F 1C,1T,1L .5
Engineering Design Methodology
The principles of engineering design culminating in a project. Specific topics introduced are: The systems approach, principles of planning, innovation and the creation of design solutions, physical, economic and financial feasibility, solution evaluation and selection. Value and utility, simulation, modelling and optimization.

SyDe 181 F 3C,1T .5
Statics
Statics of particles, vectors, equilibrium of rigid bodies, centroids, the analysis of structures, forces in beams and cables, friction and moments of inertia.

SyDe 182 S 3C,1T .5
Dynamics
Rectilinear motion, plane motion, dynamics of particles, work and energy, linear momentum, rotational motion, angular momentum, harmonic motion. Gravitational wave motion.

SyDe 183 F 3L .5
Graphics and Design
Fundamentals of Graphics with emphasis on basic techniques required for visual communication and computation. Use of graphics as an aid to idea generation in design. The course includes projects designed to enhance the creative abilities of the student.

SyDe 184 S 2C,1T,2L .5
Electricity and Magnetism
Electric charge, Coulomb’s Law of Electrostatic Forces; Electric fields, Gauss’ Law, conductors and electric fields; Electric Potential; Capacitance, dielectrics. Magnetic fields, flux of magnetic induction; current, resistance and electric circuits; Induced EMF, inductance, Lenz’ law, Faraday’s law; magnetism in matter, etc.

SyDe 201, SyDe 202 W,F 1C 0
Tutorial
Systems Design second year students will meet a faculty member designated as their class professor. Performance in assignments, conceptual difficulties with courses, inter-relation of coursework, later work and engineering practice will be discussed.

SyDe 211 W 3C,1T .5
Applicable Mathematics for Systems Design 1
(Also listed as Math 61)

SyDe 221 W 2C,1T .5
Numerical Analysis and Computation
(Formerly SyDe 222)
Application of digital computers to the solution of equations; determinants and matrices; eigenvalue problems, numerical solution of ordinary differential equations; difference equations, numerical integration methods; error analysis.

SyDe 242 F 2C,1T .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 a micro-system and man as a complex of systems and sub-systems.

SyDe 252 F 3C,1T .5
Physical Systems 1
Component models, interconnection models, system equations and their rank properties and solutions. These concepts are developed with respect to electrical systems.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Term</th>
<th>Credits/Labor Hours</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SyDe 261</td>
<td>W</td>
<td>1C,3L</td>
<td>Systems Design Workshop 1</td>
</tr>
<tr>
<td>SyDe 262</td>
<td>F</td>
<td>1C,3L</td>
<td>Systems Design Workshop 2</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>A problem and project oriented course wherein emphasis is placed on designing and presenting creative solutions to real-life problems. The problems are selected to cover all disciplines. Both the problems and the student's work are expected to increase in sophistication through the course.</td>
</tr>
<tr>
<td>SyDe 281</td>
<td>W</td>
<td>3C,1T</td>
<td>Mechanics of Deformable Solids (formerly SyDe 282)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Statics and resistence of materials. Equilibrium of particles, rigid bodies and deformable bodies. Vector fields, Bay streams. Stress-strain relationships. Elastic and inelastic behaviour of prismatic members subjected to axial, shearing, torsional and flexural deformations.</td>
</tr>
<tr>
<td>SyDe 282</td>
<td>F</td>
<td>3C,1T</td>
<td>Thermodynamics (formerly SyDe384)</td>
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<td>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 connection with information theory are described.</td>
</tr>
<tr>
<td>SyDe 284</td>
<td>F</td>
<td>3C,1T</td>
<td>Fluid Mechanics</td>
</tr>
<tr>
<td>SyDe 291</td>
<td>W</td>
<td>1C,3L</td>
<td>Systems Design Lab</td>
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<td>A continuation of 192 for second year students. The first part of the course will cover the general concept of transducers and specifically the use of some sensors used in the human systems experimental environment. The second part will emphasize the conduct of experiments using human subjects.</td>
</tr>
<tr>
<td>SyDe 292</td>
<td>F</td>
<td>1C,3L</td>
<td>Systems Design Lab</td>
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<tr>
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<td></td>
<td></td>
<td>A continuation of 291 for second year students. The first part will cover signal-conditioning, noise and recording techniques and physical systems sensors. The second part will cover digital logic with the emphasis on the use and characteristics of integrated circuits and the design of sub-systems using digital components.</td>
</tr>
<tr>
<td>SyDe 301,</td>
<td>S,W</td>
<td>1C</td>
<td>Tutorial</td>
</tr>
<tr>
<td>SyDe 302</td>
<td></td>
<td>0.0</td>
<td>Systems Design third year students will meet with a faculty member designated as their class professor. Performance in assignments, conceptual difficulties with courses, inter-relation of coursework, later work and engineering practice will be discussed.</td>
</tr>
<tr>
<td>SyDe 311</td>
<td>S</td>
<td>2C,1T</td>
<td>Systems Operations 1</td>
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<td>&quot;Deterministic operations research models.&quot; 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.</td>
</tr>
<tr>
<td>SyDe 322</td>
<td>W</td>
<td>2C,1T</td>
<td>Computer Simulation of Systems</td>
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<tr>
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<td>System modelling, system simulation techniques, digital computer methods, fundamentals of analog computation, digital simulation of analog computers; block-oriented languages; introduction to system simulation using hybrid computers.</td>
</tr>
<tr>
<td>SyDe 324</td>
<td>W</td>
<td>3C,1T,1L</td>
<td>Principles of Digital Computers</td>
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<td>0.5</td>
<td>Boolean algebra, number systems and data representation; flip flop and registers; computer operation, control unit, instruction sequencing, arithmetic unit; storage organization; operating systems, compilers, assemblers, multiprocessing, multiprocesssing and time-sharing.</td>
</tr>
<tr>
<td>SyDe 332</td>
<td>W</td>
<td>2C,1T</td>
<td>Mathematical Programming (formerly SyDe 513)</td>
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<td>0.5</td>
<td>Theory and application of linear programming, techniques: simplex, the transportation and assignment problems, duality and degeneracy. Industrial applications to production and inventory control. Selected problems from nonlinear and dynamic programming.</td>
</tr>
<tr>
<td>SyDe 333</td>
<td>S</td>
<td>2C,1T</td>
<td>Experimental Design</td>
</tr>
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<td>0.5</td>
<td>Analysis of experimental optimum-seeking techniques. Studies include deterministic and stochastic problems. Topics include: single variable search, simultaneous and sequential search, simulations and sequential search, geometry of multidimensional response surfaces and methods of steepest ascent; regression analysis.</td>
</tr>
</tbody>
</table>
Sy De 341 S 2C,1T .5
Ergonomics of Special Environments (formerly Sy De 541)
Neuroendocrine system and the human response to stress (Adaptation); sustained acceleration, weightlessness and restrictive confinement; hypobarism, hypoxia, and high altitude; hyperbarism and underwater environments; impact acceleration and automotive safety; toxic atmospheric contamination.

Sy De 351 S 2C,1T .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 structural and hydraulic systems.

Sy De 352 W 2C,1T .5
Algorithms for Computer-Aided Systems Analysis (formerly Sy De 354)
Techniques for tree selection, manipulation of topological information, evaluation of the exponential function of a matrix, etc. The emphasis is on the algorithms but students will be expected to implement them on the computers. A survey of the capabilities of existing programmes for system analysis.

Sy De 353 S 2C,1T .5
Time Domain Models for Physical Systems
State equations for two-terminal component systems; time varying and non-linear components; analytical solutions for state models, numerical and analogue methods for solution.

Sy De 361 S 1C,5L .75
Systems Design Workshop 3
A continuation of the Systems Design Workshop for third year students.

Sy De 362 W 1C,5L .75
Systems Design Workshop 4

Sy De 364 W 3C,1T .5
Manufacturing Science

Sy De 366 W 2C,1T .5
Aesthetic and Perceptual Aspects (formerly Sy De 563)
Presentation and discussion of appropriate and possible methods for the design of systems of artifacts in which aesthetic characteristics and visual form are primary requirements of the design.

Sy De 381 S 3C,3L .5
Material Engineering
A general introduction to the science of materials; To demonstrate some of the important relationships existing between the structure of a material and its properties, and to consider some of the ways in which materials are shaped, formed and fabricated into articles for everyday use.

Sy De 382 W 3C,1T .5
Applied Electronics
Component models of various electronic devices, oscillation, amplification, modulation, detection, application to instrumentation.

Sy De 383 S 2C,1T .5
Introduction to Biochemical and Polymer Systems
An introduction to the chemistry of amino acids, peptides, proteins, nucleic acids, carbohydrates and lipids: An introduction to polymer chemistry, isomerism, chain-growth polymerization and co-polymerization, ionic polymerization.

Sy De 392 W 1C,3L .5
Systems Design Lab 4
This course serves as a focus for the complete lab programme sequence. The emphasis is on the design of major experiments which are themselves complete systems requiring the application of previously acquired knowledge in the areas of sensing, synthesis, control, measurement and evaluation. At least one experiment will be drawn from the digital control of computer control environment and one from the analog control environment.

Sy De 401, Sy De 402 F,W 1C 0
Tutorial
Systems Design fourth year students will meet with a faculty member designated as their class professor. Conceptual difficulties, the inter-relation of course work and engineering practice will be discussed.

Non-credit courses

Sy De 411 F 2C,1T .5
Systems Operations 2 (formerly Sy De 312)
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, feed back control, probabilistic inventory, competitive strategies and related topics.

Sy De 412 W 1C,2T .5
Topics in Operations Research (formerly Sy De 411)
Readings suited to individual interests of the students, and aimed at solving special project problems students may select.
**Courses Descriptions**

**Systems Design**

**SyDe 421** F 2C,1T .5  
*Computer Aided Design 1*

The design process; computer-oriented system models; simulation languages for continuous and discrete systems; man-machine interaction; design of problem-oriented computer language.

**SyDe 431** F 2C,1T .5  
*Economics of Engineering Design*

Economics in the engineering design environment. The economics of resource assignment to research and development; applications of such techniques as benefit/cost and cost/effectiveness analysis to engineering design projects; economic problems with product life, obsolescence, design cycles, etc.

**SyDe 432** W 2C,1T .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.

**SyDe 433** F 2C,1T .5  
*Conflict Analysis (formerly SyDe 331)*

The application of non-quantitative game theory to the analysis of conflict, particularly conflicts arising in the implementation of design projects, the general characteristics (through Metagame theory) and specific applied techniques for analyzing conflicts between parties each with separate objectives.

**SyDe 442** W 2C,1T .5  
*Occupational and Environmental Systems Safety*

Historical development of occupational safety and safety legislation. Master and servant relationships, assumption of risk, product liability, etc. Concept of system safety and safety as a system component in design and industry.

**SyDe 445** F 2C,1T .5  
*Measurement Methods in Human Engineering*

Requirements of human measurement and its role in design. Techniques of environmental measurement with respect to noise, vibration, heat, lighting, air sampling, etc., and selected studies in the methods of anthropometry.

**SyDe 451** F 2C,1T .5  
*Multi-Terminal Representations and Piecewise Analysis of Physical Systems*

Multi-terminal representations, coupled 2-terminal components, tree transformations, solution of large systems through subsystems, two-ports and their interconnection, equivalent 2-terminal component systems.

**SyDe 452** W 2C,1T .5  
*Introduction to Linear Control Systems*

Application of Systems theory to the problems of control. The course integrates this study with an exposition of classical control theory.

**SyDe 454** W 2C,1T .5  
*Hydraulic Systems*

Applications of systems theory to the analysis of hydraulic systems; particular emphasis is given to the analysis and design of fluid distribution systems.

**SyDe 456** W 2C,1T .5  
*Power Systems (formerly SyDe 453)*

Application of systems theory to large power distribution networks and electromechanical energy conversion systems.

**SyDe 461** F 1C,5T .5  
*Systems Design Workshop 5*

**SyDe 462** W 1C,5T .5  
*Systems Design Workshop 6*

A continuation of the Systems Design Workshop for fourth year students. The emphasis will be on an individual problem chosen from the student's technical option area.

**SyDe 463** F 2C,1T .5  
*Structures and Design*


**SyDe 464** W 2C,1T .5  
*Theory and Application of Photographic Methods to Measurement and Design*

Photo-instrumentation; high and low speed data recording techniques and theory; submicrosecond shadow-graphs; photomicrography and photomacrography; theory and visual techniques of photographing physical models; visual perception in engineering design; pulsed visual teaching and learning methods.

**SyDe 472** W 2C,1T .5  
*Man-Machine Communications (formerly SyDe 475)*

The nature and design of machine-mediated human communication systems. Displays, computer graphics, computer-aided instruction and mass communication media (film, T.V., radio, print). A system approach will be adopted with special attention to the socio-economic effects of such systems.
Course Descriptions
Systems Design

Sy De 511  F  2C,1T  .5
Linear Graph Theory
Fundamental definitions, properties of circuits, paths a
graph, and Euler graphs. Properties of cutsets. Matrix
representation of linear graphs and trees. Planar graphs
and their duals. Nonplanar graphs, pseudo cuts and
duals. Oriented graphs.

Sy De 512  W  2C,1T  .5
Application of Linear Graph Theory
Topological formulas for general linear systems,
synthesis of communication nets, system diagnosis.
Applications to switching theory, sociology, economics,
etc.

Sy De 521  F  2C,1T  .5
Analog and Hybrid Computing Systems
Theory and operation of analog computers, parallel logic;
digitally simulated analog computers; introduction to
hybrid computing.

Sy De 522  W  2C,1T  .5
Computer-Aided Design 2
A detailed study of two major simulation languages, one
continuous (CSMP or equivalent) and one discrete-event
(GPSS or equivalent). Simulation projects.

Sy De 525  2C,1T  .5
Computer Methods for System Simulation
System modelling and simulation techniques, fundamentals of analogue computation, time and
magnitude scaling; continuous system simulation on the
digital computer; advantages and disadvantages of
digital and analogue simulation techniques;
discrete-event system simulation on the digital
computer; system simulation examples and problems.

Sy De 534  W  2C,1T  .5
Planning of Facilities
Industrial and Non-Industrial facilities. Networks,
locational analysis, physical layout and spatial analysis,
allocation of facilities, criteria for optimality, utilization
and occupation, various operations research techniques
for the analysis and synthesis of networks of facilities,
n-job, m-machine problem.

Sy De 535  F  2C,1T  .5
Selected Topics for Socio-Economic Systems Design
This course is intended for students who, with little prior
background, are interested in enlarging their knowledge
of Systems Design. The emphasis is on quantitative
methods applicable to the design of engineering systems
wherein the criteria concerning social, environmental
and economic considerations are important. Both
deterministic and probabilistic situations are discussed.

Sy De 543  W  2C,1T  .5
Human Engineering
Man-machine systems; man-machine interface;
presentation of information; design of displays and
controls; workplace layout, human factors in design.

Sy De 544  F,S  2C,1T  .5
Ergonomics
Significance of ergonomics; man-machine-environment
complex; physiology of work, fatigue, and boredom;
environmental factors in industry (noise, vibration, vision,
illumination, heat, cold, toxic chemicals, radiation);
industrial, and automotive safety.

Sy De 555  F  2C,1T  .5
Introduction to Physical Systems
A unified approach to Physical System Theory. Specific
topics include: component modelling, the system graph
and its matrices, system modelling by the branch, chord
and branch-chord methods, power, energy, Tellegen's
theorem, multiterminal representations, piecewise-
analyticic systems through subsystems, multiphase
representations, formulation and solutions of state
models, introduction to advanced topics.

Sy De 564  W  2C,1T  .5
Methodological Processes in Design
Presentation and discussion of appropriate and possible
methods for the design of system or artifacts in which
manufacturing processes, material properties and
distribution processes constrain the design.

Sy De 565  F  2C,1T  .5
Design Morphology and Organization
Generation of problem statements, system identification,
generation of solution sets, feasibility determination.
Construction of archetypes; sensitivity, compatibility and
stability analysis; behaviour prediction and solution
communication.

Sy De 567  F  2C,1T  .5
Introduction to Systems Behaviour
The basic aim of this course is to introduce the student to
the study and understanding of systems and their
general behaviour, to broad systems concepts and the
techniques used in applying these concepts in a variety
of fields. The fields chosen cover biological, ecological,
social, operational, economic and man-machine
systems. A number of case studies are conducted.
Course Descriptions
Urban and Regional Planning

School of Urban and Regional Planning

Professor, Director
H. S. Coblenz, BA Hons (Durham), MRP (North Carolina),
MCIP, FRTP; AIP, FSS

Associate Professor, Associate Director
G. G. Mulamoottil, BSc (Mysore), MSc (Bombay),
PhD (Delhi)

Associate Professor, Graduate Officer
N. E. P. Pressman, BArch, (McGill), MArch, urb des
(Cornell), Cert USP (Manchester), MCIP, AIP, AIU

Associate Professor, Associate Dean (Graduate Affairs)
L. R. G. Martin, BA (Queen's), MA, MRP, PhD (Syracuse),
MCIP

Lecturer, Undergraduate Officer
N. M. Lazarowich, BA (Saskatchewan),
MA, MRC (Cincinnati), AIP

Professors
R. S. Dorney, BSc, MSc, PhD (Wisconsin), MCIP
L. O. Gertler, BA (Queens), MA, MSc, PhD (Western)
K. Izumi, BArch (Manitoba), MCP (MIT), ARCA, FRAIC,
RIBA, MCIP, AIP, CMAOP

Associate Professors
N. A. M. Carter, BA (UBC), MSW (U.B.C.)
J. T. Horton, BA (Wheaton), MA (Northwestern)
R. R. Krueger, BA, MA (Western), PhD (Indiana)
R. T. Newkirk, BArch, MSc, PhD (Western)
S. G. Rich, MCIP, MRAIC, ARIBA, In-Career
Development Officer
W. I. Shalinsky, BA, BSW (McGill), MSc, DSW (Western Reserve)
J. B. Theberge, BScA (Guelph), MSc (Toronto),
PhD (UBC)
D. F. Walker, BSc (London), MA, PhD (Toronto)
S. M. Weaver, BA, MA, PhD (Toronto), Chairperson,
Anthropology

Assistant Professors
L. Fischer, BA (Rutgers), MA (Northwestern),
PhD (Duke)
M. E. Haight, BSc, MSc, PhD (McMaster)
S. Herzog, BArch (Toronto), MRAIC (on Sabbatical Leave 1977-78)
E. A. McBean, BSc (UBC), CE, SM, (MIT),
PhD (MIT)
J. Perry, BA, MSc (P) (Toronto)
R. C. Suffling, BSc Hons (Wales), PhD (Guelph)

Adjunct Professors
H. C. Abell, BHSc (Toronto), MS, PhD (Cornell)
A. deVos, MSc, PhD (Wisconsin)
M. K. Foster, BA, MA (Toronto), MPhil, PhD (Columbia)
H. L. Stricker, BASc (Civil) (Toronto)
D. H. Wood, BComm, LLB (Toronto)

Adjunct Lecturer
H. T. Lemon, MCIP, Professional Liaison Officer

Planning Graphics Technician
M. A. Boggie, BID (Manitoba)

Faculty members holding cross appointments
1 Planning and Environmental Studies
2 Biology and Planning
3 Geography and Planning
4 Anthropology and Planning
5 Civil Engineering and Planning
6 Sociology and Planning

Undergraduate Course Descriptions

Plan 100 Y 3C,1D 1.0
Introduction to Urban and Regional Planning Concepts and Techniques
An introduction to the regional city; the development of contemporary planning concepts and principles; the nature, purpose and scope of urban planning; the planning process and decision-making in a democratic society. Particular attention is directed to methodological aspects of designing a planning programme: identification of objectives and constraints, conduct of basic surveys and analysis, plans and policies preparation, evaluation and implementation.
Prereq: Planning students only

Env St 111 Introduction to the Study of the Future
See Environmental Studies course description, page 294.

Plan 156 F,W 2C,1D .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).
Plan 159  F,W  2std  .5  
**Graphics for Planning**
Basic instruction in graphic techniques used in planning. Emphasis will be placed on the use of graphics for the communication of ideas.  
*Prereq: Planning students or consent of instructor.*  
*Estimated cost to student: $30*

Env St 195 **Introduction to Environmental Problems**  
*See Environmental Studies course descriptions, page 294.*

Env St 200 **Field Ecology**  
*See Environmental Studies course descriptions, page 294.*

Plan 222  W  2C,1D  .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 the structural and functional forces that are characteristics of the major regions of Canada, e.g., Atlantic Provinces, British Columbia.  
*Prereq: None*

Plan 230  W  3C  .5  
**The Small Group in the Planning Process**
The small group and its relevance to the planning process. Focus on work groups such as committees, councils and boards. Various important elements of small groups such as leadership, goal setting, influence, decision-making and interpersonal relationships will be examined and related to planning.  
*Prereq: Soc 101, or consent of instructor*

Env St 252 **Media Tools for Environmental Studies**  
*See Environmental Studies course descriptions, page 294.*

Env St 253 **Media Tools for Environmental Studies – Advanced Level**  
*See Environmental Studies course descriptions, page 294.*

Plan 255  W  2C,2wkshp  .5  
**Planning Surveys and Analysis**
Sources of data for planning and their analysis. The course will emphasize the sources, methods of collection and analysis of urban and regional land-use data. Particular attention is paid to the types of land-use information essential to transportation, housing, public facilities and recreation planning. Both lecture and workshop are related to a significant problem of land-use planning in Ontario.  
*Prereq: Plan 100, or consent of instructor*

Plan 256  Y  2C,2std  1.0  
**Principles of Environmental Design**
Design concepts in Urban and Regional Planning, illustrated by recent work. Individual and group projects in planning design in urban and regional settings. Using graphic, model film and verbal presentations.  
*Prereq: second year Planning, or Environmental Studies students with consent of instructor*

Plan 258  F,W  3S  .5  
**Readings and Research in Planning**
Special readings and research on planning topics chosen in consultation with an instructor. This course gives the opportunity for supervised individual reading and study of planning or related topics in which the student is particularly interested.  
*Prereq: Plan 100, or consent of instructor.*  
Prior to registering for this course students must arrange with a faculty member to serve as advisor.

Env St 271 **Introduction to Quantitative Research Methods**  
*See Environmental Studies course descriptions, page 295.*

Env St 272 **Computer Programming in Environmental Studies**  
*See Environmental Studies course descriptions, page 295.*

Plan 300  Y  3wkshp  1.0  
**Seminar/Workshop Project In Urban and Regional Planning**
An integrated approach to the comprehensive analysis and design of communities; identification and synthesis of factors relating to function; structure, environmental context, regional framework, etc., in the preparation of comprehensive development programmes. A major project undertaken in small project groups.  
*Prereq: Third year Planning students only*

Plan 301  F,W  3std  .5  
**Planning Design**
A study of a particular design aspect of planning through a series of individual and group projects. The topic varies each term.  
*Prereq: Planning students or consent of instructor*

Plan 307  F,W  2C,1D  .5  
**Social Survey Techniques**
Social research and the planning process; interview and self-administered surveys; questionnaire design; profile data; data processing; sampling; non-survey data collection techniques; practical applications. Cross-listed as Geog 307.  
*Prereq: May be taken in second or third year*
Course Descriptions

Urban and Regional Planning

Plan 316  F  3S  .5
Multivariate Statistics
The theory and application of multivariate statistics, with particular emphasis upon the use of the computer. Cross-listed as Geog 316.
Prereq: Env St 271, or consent of instructor

Plan 317  W  2C,1L  .5
Nonparametric Statistics
The theory and application of non-parametric statistics with emphasis upon social science problems. Cross-listed as Geog 317.
Prereq: Env St 271, or consent of instructor

Plan 318  W  3C  .5
Spatial Analysis
Advanced quantitative analysis of spatial patterns and interactions. Focus on a selection of techniques from gravity models, linear programming, nearest neighbour analysis, Markov chain analysis, graph theory, simulation and trend surface analysis. Cross-listed as Geog 318.
Prereq: Env St 271, or consent of instructor

Plan 319  F  3S  .5
Regional Planning Techniques
Application of economic and social measurement techniques in regional planning. Discussion of input-output analysis; cost-benefit analysis, planning, programming and budgeting systems; and social area analysis. Cross-listed as Geog 319.
Prereq: Econ 101, 102, or instructor's consent

Plan 330  W  3C  .5
Urban Social Planning
This course examines a variety of urban social concerns and possible solutions to them. The solutions will focus on social planning, community development and social action. As well, the relationship between physical and social planning will be considered.
Prereq: Soc 101, or consent of instructor

Plan 332  F  3C  .5
The Sociology of Regions
Basic concepts of sociology; occupational and concomitant social adjustments of rural society in response to forces of urbanization and industrialization; social movements generated within the farm population.
Prereq: Soc 101, or consent of instructor

Plan 333  W  3C  .5
The Sociology of Regional Planning
Power structures, basic social institutions, attitudes and values related to the implementation of regional plans; regional development of human natural resources in Canada and abroad.
Prereq: Soc 101, or consent of instructor

Plan 342  F  3C  .5
Urban and Regional Planning: (Part 1)
Urban planning as a method of obtaining command over the major tools for problem identification, analysis and resolution. Planning types and practice; process and achievements, determinants of physical urban structure and supporting systems, case studies and examples. Emphasis on urban development and responses to dilemmas of the built environment.
Prereq: None. (Not available for credit to Planning students)

Plan 343  W  3C  .5
Urban and Regional Planning: (Part 2)
The role of the public and private sectors in regional development and their relationship to the planning process; current urban and regional issues and plans. Prereq: Plan 342 or consent of instructor. (Not available for credit to Planning students)

Plan 344  F,W  2C,1S  .5
Principles of Recreation Planning
An exploration of the nature and functions of recreation in modern urban-industrial societies and an analysis of alternative approaches to the planning of recreation opportunities in urban-centred regions. Application of the planning process to rural and urban recreation. Historical development of recreation planning; problems, assumptions and myths in recreation planning; recreation use/needs, resources; allocation, evaluation of services/programmes; selected recreation planning issues.

Plan 357  W  3C  .5
Conservation and Resource Management
History of the conservation movement; ecological principles of conservation and resource management. Analysis, use and planning of recreational resources. This course is the same as Geog 357 and M Env 357.
Prereq: Env St 200

Env St 358  Environmental Pollution and its Control
See Environmental Studies course descriptions; page 295.

Plan 356  W  2C,2wkshp  .5
Regional Planning and Development
The relationship of economic planning to regional planning. Theory and practice of regional planning and development to urban-centred, broad socio-economic, and frontier regions. A series of workshops focus upon the social and economic problems of a particular Canadian region and the role of federal, provincial and local governments in formulating and applying remedial policies in other nations.
Prereq: One of Plan 100, 156, 343, or consent of instructor
Plan 360 F 3C .5  
**Technology in Urban and Regional Planning**  
The influence of transportation, communications, and water and sewage systems on the form, function, and development of cities and regions; the application of this knowledge in urban and regional planning. Cross-listed as Civ E 190.  
Prereq: Plan 256 or consent of instructor  

Plan 370 W 3C .5  
**Land Development Planning**  
An examination of planning issues related to the economics and financing of public and private development projects including shopping plazas, residential subdivisions, and new towns. The course focuses on sources of financing, financial programming, effects of planning decisions on land values, and techniques of project evaluation.  
Prereq: Plan 255, or consent of instructor  

Env St 380/381 Environmental Studies Workshop  
See Environmental Studies course descriptions, page 295.  

Plan 391 W Fldlab .5  
**Field Research Methods and Projects**  
Selected field trip experiences directly related to the theme content of Plan 300, including assignments, follow-up discussion, and presentation of research papers. The School covers the cost of travel accommodations for field trips. Students are responsible for the cost of their meals. Approximately $45.00 will cover the cost of meals on a one week field trip.  
Prereq: Enrollment in Plan 300  

Env St 400 Environmental Law  
See Environmental Studies course descriptions, page 295.  

Env St 411 Alternative Future Environments 1  
See Environmental Studies course descriptions, page 295.  

Env St 412 Alternative Future Environments 2  
See Environmental Studies course descriptions, page 295.  

Plan 414 F 3C .5  
**Housing Policies**  
Focus on Canadian housing policies and programmes, particularly with regard to the housing of low and moderate income families. Economic, political, physical and social considerations underlying these policies will be examined in detail. Some consideration is given to housing problems and programmes in the United States and developing countries.  
Prereq: Plan 256, or consent of instructor  

Env St 417 Land Use History and Landscape Change 1  
See Environmental Studies course descriptions, page 295.  

Env St 418 Land Use History and Landscape Change 2  
See Environmental Studies course descriptions, page 295.  

Plan 430 F 3C .5  
**Social Policy Planning**  
This course develops a reasoned systems approach to understand change and develop strategies for change through an integration of social goals, policy and programmes. Institutional performance criteria are identified in time and space at the level of system, subsystems and their components. Identification of measures of quality and change strategies are attempted for the components for peaceful and fundamental social change through the development of enlightened social policy.  

Plan 431 F 3C .5  
**Citizen Involvement, Planning and Social Change**  
The theory and practice of citizen involvement and social change in relation to planning and policy formulation. Included are the ideology of involvement, social change and intervention strategies, policy planning and local area planning. Canadian case materials are emphasized, and there is some skills training.  
Prereq: Soc 101, fourth year Planning students; students from other departments with consent of instructor  

Plan 449 Y 1.0  
**Canadian Urban and Regional Planning: (Part 1)**  
An overview of the evaluation of Canadian urban and regional planning covering the Canadian Planner's heritage, colonial planning, growth stages of post colonial planning, planning principles with an indepth examination of comprehensive planning and zoning, and the scope of planning education especially in our School.  
Prereq: Consent of School  

Plan 450 Y 1.0  
**Canadian Urban and Regional Planning: (Part 2)**  
A review of Canadian urban literature focusing on major themes. The literature will be examined through subject areas such as housing, land policy, redevelopment and urban politics.  
Prereq: Consent of School
Plan 456 F,W 2C .1
Political and Administrative Processes in Urban and Regional Planning
The formulation of urban/regional policy, including planning legislation, in an inter-governmental setting: federal, provincial and municipal; the study of both the process and substance of urban policy-making, planning and implementation in Canada.
Prereq: fourth year Planning students or fourth year Environmental Studies students with consent of instructor.

Plan 470 W 2C .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: 3rd or 4th year Planning students, or consent of instructor.

Plan 475 F,W 3S .5
Projects, Problems and Readings in Planning
Special planning projects and problems chosen in consultation with instructor.
Prereq: Consent of instructor. A student must arrange with a faculty member to serve as advisor prior to registering for this course.

Plan 476 Y 3S 1.0
Projects, Problems and Readings in Planning
Special planning projects and problems, chosen in consultation with instructor.
Prereq: Consent of instructor. A student must arrange with a faculty member to serve as advisor prior to registering for this course.

Plan 480 Y 3S 1.0
The Philosophy and Methodology of Urban and Regional Planning
A seminar course on some current and changing social philosophies, the image of man, the notions of ethics, morality, authority, equity, etc., and the related perceptions and perspectives and conceptions of social and environmental realities and their relevance to planning, its human information base, processes and procedures.
Prereq: fourth year Planning students only.
Women's Studies

Women's Studies started at the University of Waterloo in 1971, when the first course on women was taught. Since that time this subject has developed so rapidly that by now the University has eleven undergraduate and several graduate courses on women and sex roles on its books. To the best of our knowledge, this constitutes the strongest combination of offerings on women or sex roles at any University in Ontario and probably in Canada.

All courses that are offered, both at the undergraduate and graduate level, are regular credit courses, counting like any other course toward the fulfillment of requirements for majors and honours in their respective disciplines. Courses on women or sex roles are offered in the Departments of Anthropology, English, History, Philosophy, Political Science, Psychology, Sociology and Social Work. The Arts Library has a special collection on women which has been constantly expanded and which now comprises more than 10,000 items on women. This makes it probably the largest collection on women in Canada. The Canadian Newsletter of Research on Women was started at this University. It appears three times a year and abstracts recent research on women in Canada and abroad.

Library, Newsletter, a relatively large number of courses and people who are actively concerned with research and teaching on women make women's studies an important and well developed topic at the University.

Students who are interested in The Women's Studies courses listed on this page will find complete course descriptions in the appropriate departmental sections of this Calendar.

Anth 350
Sex roles in Anthropology

Engl 108E
Women in Literature

Engl 208E
Women Writers of the Twentieth Century

Hist 204H
The individual and the family in History

Hist 440
Women in Chinese History

PSc 102H
Political Participation: The Case of Canadian Women

PSc 294
Women and Politics

Psych 365
The Behavioural Development of Women
Governing Bodies and Staff

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A. M. McLachlin, MA, BD, ThD
(Principal, St. Paul's)

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G. S. Kenyon, BPE, MS, PhD (Human Kinetics and Leisure Studies)
W. F. Forbes, DIC, PhD, DSc (Mathematics)
W. B. Pearson, DFC, MA, DSc, FRSC, FCIC (Science)
L. A. K. Watt, BSc, MS, PhD (Graduate Studies)

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W. Klaassen, BA, BD, PhD (Conrad Grebel College)
E. L. Holmes, BSc, MASC, PhD (At large)
J. S. Keeer, BASc, MASC (At large)
H. H. E. Leipholz, Dipl Ing, Dr Ing, Docent Habil (At large)
J. F. H. New, BA, MA, PhD, FRHistS (At large)
R. G. Woolford, MSc, PhD, FCIC (At large)
To 1978
K. L. Ledbetter, AB, MA, PhD (Arts)
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R. Johnson, BA, MA, PhD (Human Kinetics & Leisure Studies)
R. C. Mullin, BA, PhD
D. E. Irish, BSc, MSc, PhD, FCIC (Science)
D. R. Letson, BA, MA, PhD (St. Jerome’s College)
D. G. S. M’Timkulu, BA, MA, Dip Anthropology, Dip Ed, PhD (Affiliated Colleges)
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P. Y. Forsyth, AB, MA, PhD (Arts)
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Vacancy (Environmental Studies)
K. C. Haynes, Dip PE, MS, PhD (Human Kinetics & Leisure Studies)
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A. E. Dixon, BSc, MSc, PhD (Science)
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M. Anderson, MA, BD, PhD (St. Paul’s)
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D. E. Brodie, BSc, MSc, PhD (At large)
J. VanEvra, BA, MA, PhD (At large)
S. M. Weaver, BA, MA, PhD (At large)
D. G. Wertheim, BA, PhD (At large)

Student Representatives
To 1977
Undergraduate
D. B. Pattison (Engineering)
N. Smith (Human Kinetics & Leisure Studies)
H. Vanderzand (Mathematics)
F. Mensink (At large)

Graduate
R. A. Harrington
R. H. Irving

To 1978
Undergraduate
Vacancy (Arts)
L. DeLoyde (Environmental/Integrated Studies)
P. B. Thomas (Science)

Graduate
S. E. Sykes
L. van Goozen

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C. A. Totoke, BA
Director of Athletics
Administrative Offices

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Dean of Mathematics
P. J. Ponzo, MA, PhD
Associate Dean (Undergraduate Studies)
K. D. Fryer, BA, MA, PhD
Associate Dean (Undergraduate Studies)
D. D. Cowan, BASc, PhD
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R. G. Dunkley, BA
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Associate Dean (Graduate Affairs)

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H. Bensusan
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Kinetics and Leisure Studies, Integrated Studies
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