The Undergraduate Calendar

The information in this Calendar applies to the 1980-81 academic session which commences in September 1980.

The University also publishes:

- a Graduate Studies Calendar
- an Admissions Brochure
- a Correspondence Programme Calendar
- a Part-Time Studies Calendar
- Academic Programme Brochures by Faculty

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 pre-registration document.

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

Enquiries

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
# Undergraduate Calendar 1980-81

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Glossary of Terms

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

Credit
A unit of an academic 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 0.5 is normally assigned to a 13 week (1 term) course. These credit weights are used in the calculation of averages for academic standing.

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.

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 is a subject outside his/her "major" area.

Note
Most courses have credit weights of 0.5 or 1.0, but some have other weights such as 0.25, 0.75, 2.0.

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).

Option
A specified combination of 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-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 1980**

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*Some university departments may be open for limited service on these days.
**1980 Continued**

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August 4  
Monday

**Examinations End – Spring Term**  
August 7  
Thursday

**Lectures End – Summer Session**  
August 8  
Friday

**Examinations – Summer Session**  
August 9  
Saturday

**Final Examination Results Due**  
August 14  
Thursday

**Spring Work Term Ends – Co-operative Programmes**  
August 22  
Friday

**Fall Work Term Begins – Co-operative Programmes**  
August 25  
Monday

**Labour Day – University Holiday**  
September 1  
Monday

**Registration Begins – Undergraduate Regular and Co-operative Programmes**  
September 2  
Tuesday

**Meeting – Senate Executive Committee**  
September 2  
Tuesday

**Registration – Graduate Studies – Fall Term**  
September 5  
Friday

**Registration Ends – Undergraduate Regular and Co-operative Programmes**  
September 5  
Friday

**Lectures Begin – Fall Term**  
September 8  
Monday

**Start of Late Fees – Fall Term**  
September 8  
Monday

**Meeting – University Senate, 7:30 p.m.**  
September 15  
Monday

**End of Course Change Period – Fall Term**  
September 26  
Friday

**Meeting – Senate Executive Committee**  
October 6  
Monday

**Meeting – Board of Governors, 10:00 a.m.**  
October 7  
Tuesday

**Thanksgiving Day – University Holiday**  
October 13  
Monday

**Meeting – University Senate, 7:30 p.m.**  
October 20  
Monday

**Fall Convocation**  
October 24  
Friday

**Application Deadline, Correspondence – Winter Term**  
October 24  
Friday

**Supplemental Examinations Begin – Co-operative Programmes**  
October 31  
Monday

**Last Date to Register – Fall Term**  
October 31  
Friday

**Meeting – Senate Executive Committee**  
November 3  
Monday

**Pre-registration Begins On Campus Co-operative Students for Spring Term 1982**  
November 5  
Wednesday

**Pre-registration Ends – On-Campus Co-operative Students for Spring Term 1982**  
November 7  
Friday

**Meeting – University Senate, 7:30 p.m.**  
November 17  
Monday

**Meeting – Senate Executive Committee**  
December 1  
Monday

**Lectures End – Fall Term**  
December 3  
Wednesday

**Examinations Begin – Fall Term**  
December 5  
Friday

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December 15  
Monday

**Fall Work Term Ends**  
December 19  
Friday

**Examinations End – Fall Term**  
December 20  
Saturday

**Winter Work Term Begins**  
December 29  
Thursday

**Christmas Holidays**  
December 25 -  
Thursday-

December 31  
Wednesday

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University of Waterloo Campus

Legend

- Information Kiosks
  After hours please enquire at
  Security Office. (Com)

Parking
Visitor parking available in following lots:
- D 50 cents per hour
  (50 cent coin entry after 8 p.m.)
- M.N.O 50 cents per entry
  (coin operated, two quarters)
- H.B evenings and weekends only.
  75 cent coin entry.
- C student lot. 25 cent coin entry.
  Reserved parking in other lots.

Arts
Lib Dana Porter Library
AL Arts Lecture Hall
ML Modern Languages
Theatre of the Arts;
Art Gallery
HH J.G. Hagey Hall of Humanities
Humanities Theatre
PAS Psychology, Anthropology, Sociology

Engineering
E1 Engineering 1
E2 Engineering 2
E3 Engineering 3
CPH Carl A. Pollock Hall
EL Engineering Lecture Hall

Environmental Studies
Env Environmental Studies
ES2 Environmental Studies 2
Arc Architecture

Human Kinetics and Leisure Studies
MC Office in Mathematics and Computer Building
PAC Physical Activities

Integrated Studies Programme
PAS Offices in PAS Building

Mathematics
MC Mathematics and Computer
EMS Library (Engineering, Mathematics and Science)

Science
PHY Physics
ESC Earth Sciences and Chemistry
C2 Chemistry 2
B1 Biology 1
Biology and Earth Sciences Museum
B2 Biology 2
OPT Optometry

Colleges
CGR Conrad Grebel College
Ren Renison College
SU St. Jerome's College
NoD Notre Dame Women's Residence
StP St. Paul's College

Residences
V1 Student Village 1
V2 Student Village 2
TH Tutor Houses
MHR Minota Hagey Graduate Residence
MSA Married Students Apartments

University Services
Adm Administrative Services
NH Needles Hall (Student Services)
SCH South Campus Hall
Cafeteria, Book Store
CC Campus Centre
FC Faculty Club
CSB Central Services Building
Com Commissary (Security)
MSF Maintenance and Stores
GH Graduate House
HS Health Services
GM Grounds Maintenance
Radio Waterloo
BHH Brubacher House
CIF Clemmer Farm (Day Care)

Off-Campus Buildings
ES2 Environmental Studies 2
AS Architecture, 419 Phillip St
Ann Annex 1, 415 Phillip St
SS Seagram Stadium (City of Waterloo)
Ham Hammarstrand Co-op Residence
CoR Phillip St. Co-op Residence
ResC Resurrection College
The University of Waterloo
The Undergraduate Calendar

The Undergraduate Calendar is published once a year by the Office of the Registrar, University of Waterloo. The Calendar serves to provide a current and official list of academic courses and 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 1980-81 academic session which commences in September 1980.

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.

Since the opening of the first permanent structure on campus in 1958, the University has expanded steadily. The thirty teaching and service buildings presently on campus include a Computing Centre, a Physical Activities Complex, 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-old 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 focussed 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 November 1, 1979)

| Faculty of Arts | 2,386 |
| Faculty of Engineering | 3,071 |
| Faculty of Environmental Studies | 1,338 |
| Faculty of Human Kinetics and Leisure Studies | 1,087 |
| Integrated Studies Programme | 78 |
| Faculty of Mathematics | 3,291 |
| Faculty of Science | 1,857 |

Total Undergraduate Enrolment (Full-Time) 13,108
Graduate Student Enrolment (Full-Time) 1,100

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 this Calendar, St. Jerome's faculty members and courses are indicated by a J suffix. Graduates of the college receive University of Waterloo degrees in accordance with the terms of the federation agreement. A continuous building 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.

**Rension College**

Rension 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 Rension 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 Arts, English, Fine Arts, Geography, History, Psychology, Religious Studies and Sociology. Rension College faculty members and courses are indicated by an R suffix. The college has two residences accommodating 100 men and 75 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.

The College provides residence accommodation for 100 students.

**St. Paul's College**

St. Paul's United College is a teaching and residential community of 150 men and women. The College offers two interdisciplinary options which students may take in conjunction with degree programmes at the University of Waterloo. The Canadian Studies option allows students to gain an expertise in Canadian culture and society.

The second interdisciplinary option is Studies in Personality and Religion. The intent of this option is to help students to more fully comprehend the relationship between religious growth and experience, and the dynamics of personality development.

Students should consult the appropriate section of the University calendar for more information about these two options.
The University of Waterloo
Degrees Offered
Systems of Study

The College also offers a limited number of courses in Religious Studies, which are available for academic credit to any student enrolled in the University. St. Paul’s College faculty members and courses are indicated by a ‘P’ suffix.

There is an attempt on the part of the College to integrate its academic life with life in the residence, but there is no requirement that a student be registered in one of the above programmes in order to live in this residence. Resident life in the College provides a valuable contribution to university experience beyond that which comes from courses taken for credit. Through a 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 (BArch)
Bachelor of Arts (BA)
Bachelor of Applied Science (BASc)
Bachelor of Environmental Studies (BES)
Bachelor of Independent Studies (BIS)
Bachelor of Mathematics (BMath)
Bachelor of Science (BSc)
Doctor of Optometry (OD)

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

The University of Waterloo offers the following graduate degrees:

Master of Arts (MA)
Master of Applied Science (MASc)
Master of Mathematics (MMath)
Master of Philosophy (MPhil)
Master of Science (MSc)
Doctor of Philosophy (PhD)

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

Honorary Degrees

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

Doctor of Engineering (DEng)
Doctor of Environmental Studies (DES)
Doctor of Laws (LLD)
Doctor of Letters (DLitt)
Doctor of Mathematics (DMath)
Doctor of Science (DSc)

Systems of Study

The University offers 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

The University makes a special effort to provide opportunities for students pursuing a degree on a part-time basis. These students may:
- normally take any of UW's regularly scheduled daytime classes in the Fall, Winter and Spring terms;
- choose from a substantial number of late afternoon and evening courses scheduled for their convenience in each term;
- choose from over 200 courses offered through the Correspondence Programme;
- take courses offered primarily through the Faculty of Arts in a six-week Summer Session;
- take courses offered each term at various off-campus centres.

Some degrees may be completed entirely by part-time study.
- There is no distinction between part-time and full-time students in regard to admission requirements, grading practices and promotion
policies. Tuition is assessed on a fee-per-course basis for both part-time and full-time students.

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

Part-time Studies Off-Campus
Over forty University of Waterloo credit courses are now being offered annually off-campus in such communities as Orangeville, Palmerston, Walkerton, Cambridge and Stratford. Most of these courses meet in the evening for three hours each week during one term (Fall, Winter or Spring), although some are held in the day-time hours and through two terms. These courses may also be attended as free public interest lectures. For information about 1980-81 off-campus lectures, call or write the Part-Time Studies Office. (519-885-1211, ext. 3447)

Correspondence Courses
The University of Waterloo offers more than 200 degree credit courses by correspondence in Anthropology, Arts, Biology, Chemistry, Classical Civilization, Combinatorics and Optimization, Earth Sciences, Economics, English, Fine Arts, Mathematics, Music, Philosophy, Physics, Political Science, Psychology, Recreation, Russian Literature in Translation, Science, Sociology, Spanish, Statistics, and Urban and Regional Planning. Other courses are contemplated.

Specially prepared lectures, recorded on audio tape cassettes, and accompanying lecture notes are prepared by the professors to explain and supplement material in the text. These, together with assigned problems, form the basis of the courses. 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. Several General Degree programmes in Arts, Mathematics and Science may be taken entirely on a part-time basis by correspondence or by any combination of correspondence, regular or summer courses which will fulfill the degree requirements of the faculty.

Further information and correspondence application forms are included in the Correspondence Calendar which can be obtained from:

Correspondence Programme,
University of Waterloo
Waterloo, Ontario
N2L 3G1

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.

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

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

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

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

For further details, contact the Registrar's office.

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

Overall standings are reported in all faculties as numeric averages. The weighting factors are used for calculating overall averages for students on the letter grade system, and for converting assigned
letter grades, where required, for students whose faculty is on the numeric system.  
Please refer to the individual Faculty sections for a complete breakdown of the appropriate grading system.

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<th>Assigned</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grades</td>
<td>Factors*</td>
<td>Grades*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A+</td>
<td>95</td>
<td>90-100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>89</td>
<td>85-89</td>
<td></td>
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</tr>
<tr>
<td>A-</td>
<td>83</td>
<td>80-84</td>
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</tr>
<tr>
<td>B+</td>
<td>78</td>
<td>77-79</td>
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<td></td>
</tr>
<tr>
<td>B</td>
<td>75</td>
<td>73-76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-</td>
<td>72</td>
<td>70-72</td>
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<tr>
<td>C+</td>
<td>68</td>
<td>67-69</td>
<td></td>
<td></td>
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<tr>
<td>C</td>
<td>65</td>
<td>63-66</td>
<td></td>
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<tr>
<td>C-</td>
<td>62</td>
<td>60-62</td>
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<td></td>
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<tr>
<td>D+</td>
<td>58</td>
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<td>D-</td>
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<tr>
<td>F+</td>
<td>46</td>
<td>42-49</td>
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<tr>
<td>F</td>
<td>38</td>
<td>35-41</td>
<td></td>
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<tr>
<td>F-</td>
<td>32</td>
<td>0-34</td>
<td></td>
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</tbody>
</table>

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

Interpretation of Averages  
Averages are classified in the following broad categories. The “Passing” and “Failure” categories do not apply to the Faculty of Engineering (refer to the Engineering Examinations and Promotions policy – chapter 9).

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

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

Examination Regulations  
The following are excerpts from the Senate Regulations governing Examination Procedures: a more complete version of these regulations may be obtained from the Registrar's office or from the office of the Dean in each Faculty. Specific regulations pertaining to each Faculty may be found in the individual Faculty programme sections of this Calendar, Chapter 8-14.

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

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

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

Each term the formal lecture period, as defined by the dates shown on pages 5-8 of this calendar, normally ends two or three days before final examinations begin. The periods between the end of the formal lecture period and the beginning of final examinations shall be ones in which no instructor shall be permitted to administer, and no student shall be required to sit for, examinations, tests or lectures.

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

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

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

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

**Academic 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.

**Right of Appeal**

A student may appeal any decision by the Dean to the President.

The complete version of the Report on Academic Regulations and Discipline may be obtained from the University Secretariat or from the office of the Dean in each faculty.
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 overriding policy of the Board is to operate on as close to a break-even point as possible.

**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 Department of Computing Services
Mathematics and Computer Building
The Department of Computing Services, located on the first two floors of the Mathematics and Computer Centre building, provides computing facilities and services for faculty, staff, graduate and undergraduate students. The facilities include key-punches, terminals and programme preparation areas, an input/output area for submission of batch jobs and retrieval of printed output, an incremental plotting facility, and a variety of computing hardware and software chosen to handle the wide range of computing applications in a university community.

Faculty, academic staff, graduate and undergraduate students use the computing facilities to aid them in their research; in addition, many academic courses require the use of the computer in course assignments. Administrative staff also use the computer in applications such as student records, course timetables, examination results, and financial accounting.

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

More advanced users also use both the WIDJET and cafeteria style DEBUG service for preliminary work. However, other services are also available, including a general BATCH environment, and the time-sharing system VM/370 CMS. In both environments general text-editing software and other special applications packages are provided. APL is available under CMS. The CMS environment allows the user to develop and execute programmes, with a choice of several languages, in an interactive manner, thus increasing human productivity, particularly during programme 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 the computing facilities and services outlined above, the Department of Computing Services provides several "user services". Programming consultation, non-credit courses and seminars, documentation, computer reference room facilities, and newsletters are provided by the user services personnel of the Department to help make using the computer an easier and more efficient process for all members of the University community.

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 Secondary School liaison, 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 University of Waterloo
Student and Administrative Services

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

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 coordinate and review all activities and procedures relating to the care of research animals.

Invention Evaluation: A service is provided to assist university and private inventors through the Inventor's Assistance Programme.

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.

Teaching Resource Office
Teaching Resource Office of the University of Waterloo was established in 1976, following the recommendation to the Undergraduate Council of Senate by the Vice-President Academic, "that the University appoint a person to act as a teaching consultant to the faculties". Terms of reference for the Teaching Resource Person include providing assistance to individual faculty members – especially new faculty members – in improving their teaching performance, offering assistance to departments on teaching methods and evaluation of learning, and keeping the university community informed about developments and innovations relevant to teaching and learning in higher education.

Visitors Reception Centre
This Centre is presently located on the second floor of Needles Hall and serves as a focal point for all visitors to the University. Visitors may arrange to take tours of the campus during the week by calling the Secondary School Liaison Office – ext. 2582.
Admissions

Campus Scene – The Crossroads at the Physics Building
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 correspondence 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 1980.

Authority to Admit

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

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

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

St. Jerome’s College

Applicants may apply for 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.

Renison College

Applicants may apply for the Social Development Studies Programme and for General Arts Programmes through Renison College. Renison College applicants should indicate “Renison College” clearly on the application form. All transcripts and documents should be sent directly to the college.

Inquiries and correspondence regarding admissions should be directed to: The Registrar, Renison College.

General Admission Requirements

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

In some 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 Grade 13 (see below) as well as meeting 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 1980 the following programmes will be designated as limited enrolment programmes:

Architecture
Engineering
Mathematics (Co-op)
Optometry
Recreation
Urban and Regional Planning

Normally students who are refused admission to a particular programme will automatically be considered for admission to other programmes for which they satisfy the specific subject and marks requirements.
Admissions
Applicants - Ontario Grade 13
Applicants - Other than Ontario Grade 13

Applicants - Ontario Grade 13

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

The 1980-81 Admission Requirements for applicants from Ontario Grade 13 Programmes are shown in the accompanying chart. (page 26-28)

Applicants - Other than Ontario Grade 13

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

Adult Students

Individuals of mature age who have been away from formal education for more than two years and who do not possess the minimum requirements for admission, stated in terms of Ontario secondary school preparation, may apply as adult students. Applicants applying as adult students are advised to contact the Assistant Registrar of the desired faculty to discuss admissibility and appropriate qualifying work. Generally, it is recommended that applicants who are applying to enter the University as adult students attempt to obtain standing in at least one Ontario Grade 13 level subject or its equivalent. This preparation should relate to the programme the applicant wishes to study at the University. Applicants to programmes requiring specific Ontario Grade 13 level prerequisites normally must have standing in these required subjects to be considered for admission. Mature students not meeting the requirements for degree candidacy may in certain cases be admitted to degree studies on a part-time probationary basis. Each application is considered on its own merit by the Admissions Committee.

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

Advanced Standing

Applicants to advanced years must specify the Faculty to which they are seeking admission, the 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 courses 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 this calendar for detailed regulations.

Applicants from Ontario Colleges of Applied Arts and Technology.

As a general policy, applicants who have achieved first class honours or high second class honours in each of the three years of a 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 of the desired faculty.

Letters of Permission

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

Text continued on page 29
### Specific Faculty Programme Recommendations and Requirements.

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Required Grade 13 Subjects and Averages</th>
<th>Recommendations</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts</td>
<td>A 60% overall average is required in 6 Grade 13 credits</td>
<td>Applicants should include Grade 13 courses such as English, History, Languages (other than English) in their Grade 13 programme. Grade 13 English courses, particularly those that stress writing skills, are especially recommended. A Grade 13 Mathematics course is recommended for applicants who are considering Social Science programmes.</td>
<td>Admission to departmental programmes occurs following year one. Students also may apply for co-op programmes in Arts Faculty disciplines during year 1 or year 2.</td>
</tr>
<tr>
<td>Co-op</td>
<td>a 70% overall average is required in 6 Grade 13 credits</td>
<td>Applicants should include Grade 13 courses such as English, History, Science, Mathematics and a second language in their Grade 13 programme.</td>
<td>Enrollment in this programme is limited. Students admitted to general Arts in year 1 may apply for admission to Arts Co-op during year 1 or year 2.</td>
</tr>
<tr>
<td>Engineering</td>
<td>Relations &amp; Functions, Calculus, Physics, Chemistry, one unspecified credit</td>
<td>Applicants with high overall standing who are missing one or two of the five specific Grade 13 requirements must contact the Admissions Officer no later than January (for September admission). Applicants will be evaluated and advised on possible courses of action required to meet the specific requirements. Since Engineering requires considerable writing of reports and reviews as well as the reading of books, articles and journals, the sixth credit for admission should be a subject requiring literary and writing performance such as English, History, Geography, etc.</td>
<td>Year 1 enrollment is limited to 700 students. Approximately 90% of these places are filled by Ontario Grade 13 students. In recent years, most students admitted have Grade 13 averages in the required subjects of 75% or better. However a number of students with lower averages are admitted when other evidence indicates an aptitude and interest in Engineering. The University reserves the right to withdraw offers of early admission for students receiving final marks below 60% in any of the 6 credits.</td>
</tr>
<tr>
<td>Environmental Studies</td>
<td></td>
<td>Because of the increasing use of statistics and quantitative methods in environmental research, students should be encouraged to consider at least one Grade 13 Mathematics course for admission to all programmes in Environmental Studies.</td>
<td></td>
</tr>
<tr>
<td>Architecture (pre-professional programme)</td>
<td>In addition to the 60% minimum overall average on 6 Grade 13 credits, a 50% overall average is required in Relations &amp; Functions, Calculus, Physics, English (Français).</td>
<td>Selected applicants are normally required to come to the University for an interview as part of the admission process. Selection for the interview is based on Grade 12 and Grade 13 standings. Admission is based on the results of the interview, (including a required portfolio), an English writing exercise designed to test skills of analysis and expression, and on secondary school achievement. The first year programme is limited to 70 students.</td>
<td></td>
</tr>
<tr>
<td>Faculty</td>
<td>Required Grade 13</td>
<td>Recommendations</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------</td>
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</tr>
<tr>
<td>Geography</td>
<td>A 60% overall average is required in 6 Grade 13 credits.</td>
<td>While it is not obligatory, applicants are encouraged to include Geography in their Grade 13 programme.</td>
<td>The first year programme is limited to approximately 70 students.</td>
</tr>
<tr>
<td>Man-Environment Studies</td>
<td>A 60% overall average is required in 6 Grade 13 credits.</td>
<td>Applicants may find at least one Grade 13 mathematics course helpful.</td>
<td></td>
</tr>
<tr>
<td>Urban and Regional Planning</td>
<td>A 60% overall average is required in 6 Grade 13 credits.</td>
<td>The first year programme is limited to 70 students.</td>
<td>Selected applicants are normally required to come to the University for an interview as part of the admission process. Selection for the interview is based on Grade 12 and Grade 13 standings. Admission is based on the results of the interview and on secondary school achievement.</td>
</tr>
<tr>
<td>Human Kinetics &amp; Leisure Studies</td>
<td>A 60% overall average is required in 6 Grade 13 credits.</td>
<td>Applications may find at least one Grade 13 mathematics course helpful.</td>
<td>An Honours B.A. degree programme.</td>
</tr>
<tr>
<td>Dance</td>
<td>A 60% overall average is required in 6 Grade 13 credits.</td>
<td>Applicants are encouraged to include Algebra, Biology, Calculus and Physics in their Grade 13 programme.</td>
<td>Applicants are encouraged to include Algebra, Biology, Calculus and Physics in their Grade 13 programme.</td>
</tr>
<tr>
<td>Health Studies</td>
<td>A 60% overall average is required in 6 Grade 13 credits.</td>
<td>Applications are encouraged to include Grade 13 Biology and Chemistry in their Grade 13 programme.</td>
<td>Applicants with overall Grade 13 averages above 65% are given first consideration. Students applying to the joint Honours programme in Health Studies - Kinesiology must fulfill the Kinesiology admission requirements.</td>
</tr>
<tr>
<td>Kinesiology</td>
<td>In addition to the 60% minimum overall average on 6 Grade 13 credits, applicants must present a Grade 13 Mathematics course and two Grade 13 courses from Biology, Chemistry, Physics.</td>
<td>Applicants are encouraged to include four Grade 13 courses from Biology, Chemistry, Physics, Functions &amp; Relations, Algebra and Calculus.</td>
<td>Applicants are reminded that the Kinesiology programme includes required University courses in Calculus, Biology, Chemistry, Physics and Computer Science.</td>
</tr>
<tr>
<td>Recreation</td>
<td>In addition to the 60% minimum overall average on 6 Grade 13 credits, applicants must present one Grade 13 mathematics course.</td>
<td>Applications are encouraged to include four Grade 13 courses from Biology, Chemistry, Physics, Functions &amp; Relations, Algebra and Calculus.</td>
<td>Applicants with overall Grade 13 averages above 65% are given first consideration. Applicants may be required to come to the University for an interview as part of the admission process. Admission is based on the results of the interview, if required, a &quot;statement of interest&quot; form, and secondary school achievement.</td>
</tr>
<tr>
<td>Integrated Studies</td>
<td>Each applicant to Integrated Studies is considered on the basis of a personal interview with a committee composed of students, resource persons and staff. Those who show an aptitude for self direction and independent study and the ability to flourish in an unstructured academic setting will be given preference.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mathematics</td>
<td>In addition to the 60% minimum overall average on 6 Grade 13 credits, applicants to the Regular Mathematics programme must present a 66% overall average in Calculus, Algebra, and Relations &amp; Functions. Applicants to Co-operative Mathematics programmes must present 66% on these three Mathematics courses.</td>
<td>Students with high overall standing who are missing one of the three specific requirements are encouraged to apply. These students should contact the Assistant Registrar, Mathematics, as soon as possible for advice on how to fill any gaps in their mathematical background.</td>
<td>Competition for admission to Mathematics programmes has been keen over the past several years ... particularly in the Co-operative programmes. Accordingly, applicants not offered admission to Co-op will automatically be considered for admission to Regular.</td>
</tr>
</tbody>
</table>
## Admissions
### Specific Faculty Programme Recommendations and Requirements

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Required Grade 13 Subjects and Averages</th>
<th>Recommendations</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regular</td>
<td>In addition to the 60% minimum overall average on 6 Grade 13 credits, applicants must present a 60% overall average on two Science courses (one of which must be Chemistry or Physics), Calculus, and one Mathematics course from Relations &amp; Functions or Algebra.</td>
<td>Applicants to all Science programmes are advised to select both Grade 13 Chemistry and Physics courses.</td>
<td></td>
</tr>
<tr>
<td>(and pre-professional Optometry)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Co-operative Biology</td>
<td>Same as above.</td>
<td></td>
<td>Applicants to the Co-operative Biology programme with an overall average of over 70% are given first consideration.</td>
</tr>
<tr>
<td>Co-operative Applied Earth Sciences</td>
<td>Same as above</td>
<td></td>
<td>Applicants to the Co-operative Applied Earth Sciences programme with an overall average of over 70% are given first consideration.</td>
</tr>
<tr>
<td>Co-operative Applied Chemistry</td>
<td>In addition to the 60% minimum overall average on 6 Grade 13 credits, applicants must present two Science courses (one of which must be Chemistry), Calculus, and one other Mathematics course from Relations &amp; Functions or Algebra. A 70% average is required in each of the Chemistry and Mathematics courses.</td>
<td>Applicants to Co-operative Applied Chemistry and Physics are advised to select both Relations &amp; Functions and Algebra in addition to the required Calculus course.</td>
<td></td>
</tr>
<tr>
<td>Co-operative Applied Physics</td>
<td>In addition to the 60% minimum overall average on 6 Grade 13 credits, applicants must present two Science courses (one of which must be Physics), Calculus, and one other Mathematics course from Relations &amp; Functions or Algebra. A 70% overall average is required in Physics and Mathematics courses.</td>
<td>Applicants to Co-operative Applied Chemistry and Physics are advised to select both Relations and Functions and Algebra in addition to the required Calculus course.</td>
<td></td>
</tr>
</tbody>
</table>
Certificates Equivalent to the Ontario Secondary School Honour Graduation Diploma

All applicants are required to hold the specific subject requirements indicated on pages 26-28 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>Equivalent to Ontario Grade 13</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 subsidiary passes on the ‘Higher School Certificate’ of recognized examining bodies will be accepted as equivalent to Ordinary level passes on the G.C.E. and Principal or Main passes on the ‘Higher School Certificate’ as equivalent to Advanced Level passes.

International Baccalaureate

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

Hong Kong

Hong Kong Certificate of Education (English) and University of Hong Kong Matriculation (Advanced Level) with passes in at least 5 subjects, 2 of which must be at the Advanced Level. (Applicants with 3 or more University of Hong Kong Advanced Level subjects will also be considered.) Chinese University of Hong Kong First Year standing with courses appropriate to 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 Grade 13.

Other Countries

Normally the Secondary School programme 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 programmes 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) a) Applicants requesting part-time, or non degree courses should contact the Registrar's office for the appropriate application forms. Do not apply through the Application Centre.

b) Applicants requesting correspondence courses should write to the Correspondence Programme, University of Waterloo, Ontario N2L 3G1 or call (519) 885-1211 extension 3901.

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 applicants 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 1, 1980</td>
<td>March 1, 1980</td>
</tr>
<tr>
<td>July 2, 1980</td>
<td>June 1, 1980</td>
</tr>
<tr>
<td>September 2, 1980</td>
<td>July 1, 1980</td>
</tr>
<tr>
<td>January 5, 1980</td>
<td>November 1, 1980</td>
</tr>
</tbody>
</table>

Correspondence Programme

<table>
<thead>
<tr>
<th>Term</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Term 1980</td>
<td>August 15, 1980</td>
</tr>
<tr>
<td>Winter Term 1981</td>
<td>October 24, 1980</td>
</tr>
<tr>
<td>Spring Term 1981</td>
<td>February 20, 1981</td>
</tr>
</tbody>
</table>

*Applications and all supporting documentation must be received no later than May 1, 1980 for all Year 1 limited enrolment programmes, with the exception of Architecture, in which case applications must be received by April 1, 1980.

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

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

All Ontario Grade 13 applicants will be notified on or after June 13, 1980, of the status of their application for admission. Grade 13 applicants who do not receive an offer of admission at this time will have their applications deferred until the final Grade 13 marks are received by the University. When these marks have been received, qualified applicants will be admitted until the remaining places are filled.

Ontario Grade 13 applicants who receive an early offer of admission are encouraged to confirm as soon as possible, but are not required to respond before June 27, 1980.

Applicants who are not currently enrolled in an Ontario Grade 13 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 37 of this calendar.
Fees and Registration
Pre-Registration, Registration, Fees

Pre-Registration
Pre-registration is the process of choosing courses and having them approved by the appropriate advisor prior to the beginning of lectures. All students must pre-register for courses as follows:

A) Returning Students
   1) Co-operative Programmes
      During the preceding on-campus term.
   2) Regular Programmes
      During March of the preceding academic year.

B) Newly Admitted Students
   As soon as possible after academic admission.

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

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

Assessment
Fees are assessed as follows: (Student Visa Students – see note 4 on page 38)

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

B) Regular Programmes
   1) Fall/Winter Session
      a) Architecture Year 1, Integrated Studies and Optometry
         Students are assessed on a programme basis for the Total Tuition and Incidental Fees shown on the Schedule of Fees.
   2) Winter or Spring Term
      a) Architecture Year 1, Integrated Studies and Optometry
         Students are assessed on a programme basis for the Total Tuition and Incidental Fees shown on the Schedule of Fees.
      b) Other Regular Programmes
         Students are assessed by course at the Unit Course Fee shown to a maximum of the Basic Fee. Students taking more than two term courses are also assessed Incidental Fees.
   3) Summer Session (July – August)
      Students are assessed by course at the Unit Course Fee shown.

Payment
A) Timing and Amounts Due
   All fees are due and payable by the end of the registration period. See pages 5 to 8 for appropriate dates. Students must pay or arrange fees by these dates, whether or not a final class schedule has been received.
   For sessional students unable to pay fees in full prior to the first day of lectures in September, the University will allow payment of fees in two instalments, the first payable before the start of lectures in September, and the second payable by the start of lectures in January. Instalment values are as follows:
   1) For students assessed the Total Fee as shown in the Schedule of Fees, the first instalment will be for one-half of the tuition fee plus incidentals. The second instalment will be for the balance of the tuition fee.
   2) For students assessed less than the Total Fee as shown in the Schedule of Fees, the first instalment will be for the value of the courses taken in the fall term plus incidentals. The second instalment will be for the balance of the tuition fee.
B) Methods

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

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

3) General Information
   i) Fees should be paid with cash, money order or certified cheque payable to "University of Waterloo".
   ii) Students registered through Renison College or St. Jerome's College must pay their fees directly to the appropriate College.
   iii) Fee payments by scholarships or bursaries not administered by the University or methods other than those outlined must be authorized in writing by Student Accounts, Financial Services.
   iv) Students who have received a "Notice of Assessment" under the Ontario Student Assistance Programme may arrange payment of fees using this source of funds.
   v) For the 1980/81 year, the University will accept post-dated cheques as an arrangement for the payment of fees. Students choosing this method of payment must post-date the cheque as follows:
      
      | Session/Term | Cheque must be dated not later than |
      |--------------|-----------------------------------|
      | September 1980 | 29 August 1980 |
      | January 1981  | 19 December 1980 |
      | May 1981      | 24 April 1981 |
   vi) Students who are not able to pay or arrange fees as shown above must visit the "Fees Aranged" section of Financial Services during the on-campus registration period to discuss fee arrangements.
   vii) Canadian or Landed Immigrant students age 60 or over will be awarded a University bursary to cover tuition and related incidentals (correspondence tape deposits not included). Proof of eligibility for this bursary should be furnished to the appropriate Assistant Registrar at the time of pre-registration.
   viii) Students whose cheques are returned by the bank for any reason will be assessed a handling charge of $15.00 plus late registration penalty as applicable.
   ix) Students who fail to fulfill fee payment arrangements will be assessed a 5% surcharge on the total fees outstanding plus 1% per month service charge applied to the balance outstanding and calculated from the due date.
   x) Failure to pay all outstanding fees, accounts or other assessments such as library fines before conclusion of lectures may bar a student from writing examinations and will result in withholding of credit and transcripts for previous work.

Banking Information

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

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

Late Registration

Students who register late, see pages 5 to 8 for dates, will be assessed a late fee penalty as follows:

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

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

<table>
<thead>
<tr>
<th>Session/Term Starting</th>
<th>Last Date to Register</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 1980</td>
<td>30 June 1980</td>
</tr>
<tr>
<td>July 1980</td>
<td>30 July 1980</td>
</tr>
<tr>
<td>September 1980</td>
<td>31 October 1980</td>
</tr>
<tr>
<td>May 1981</td>
<td>30 June 1981</td>
</tr>
</tbody>
</table>
Withdrawals
A student who finds it necessary to withdraw from attendance is required to obtain a Notice of Withdrawal from the Registrar. This notice, when signed by both the Dean and the Registrar, or their delegates, may entitle the student to a refund of tuition fees calculated as follows:

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

b) Students withdrawing in the first three weeks of a term (first week for Summer Session) will receive a full refund less a $25 registration charge. Part-time students will be charged $10.

c) Students withdrawing during weeks 4 to 7 of a term (second week of Summer Session) will receive a refund of 50% of one term fee plus the second term payment, if applicable.

d) Refunds are not provided to students after week 7 of a term (week 3 of Summer Session). Sessional students who withdraw after week 7 of the Fall term and before the start of the Winter Term will receive a refund of the second term tuition payment.

e) Requests for refunds of refundable incidental fees must be addressed to the organization concerned. Such refunds are available for only three weeks, after the start of classes.

f) The Intercollegiate Athletic fee is refundable on the same basis as tuition fees.

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

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

Schedule of Fees
The fee schedule is the one proposed for the 1980/81 year and at the time of printing is still subject to review and possible changes. If a fee change is made, a notice will be issued with a new 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 & Incidental Costs for all Years

(Student Visa Students refer to Fees for Student Visa Students [page 38])

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Session/ Term</th>
<th>Basic Fee $</th>
<th>Co-op Fee $</th>
<th>Total Tuition Fees $</th>
<th>Total Incidental Fees $</th>
<th>Total Fees (See Note 12) $</th>
<th>Unit Course Fee $</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Architecture - Yr 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Upper Yr, Co-op</td>
<td>Session</td>
<td>857.00</td>
<td></td>
<td>857.00</td>
<td>89.22</td>
<td>946.22</td>
<td>176.00</td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td>428.50</td>
<td>84.75</td>
<td>513.25</td>
<td>46.95</td>
<td>560.20</td>
<td>88.00</td>
</tr>
<tr>
<td><strong>Arts - Regular</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Winter, Spring</td>
<td>Session</td>
<td>818.00</td>
<td></td>
<td>818.00</td>
<td>84.22</td>
<td>902.22</td>
<td>176.00</td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td>409.00</td>
<td></td>
<td>409.00</td>
<td>38.99</td>
<td>447.99</td>
<td>88.00</td>
</tr>
<tr>
<td>- Co-op</td>
<td>Term</td>
<td>409.00</td>
<td>84.75</td>
<td>493.75</td>
<td>44.45</td>
<td>538.20</td>
<td>88.00</td>
</tr>
<tr>
<td><strong>Engineering</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Co-op</td>
<td>Term</td>
<td>428.50</td>
<td>84.75</td>
<td>513.25</td>
<td>48.45</td>
<td>561.70</td>
<td>88.00</td>
</tr>
<tr>
<td><strong>Environmental Studies</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>- Regular</td>
<td>Session</td>
<td>818.00</td>
<td></td>
<td>818.00</td>
<td>83.72</td>
<td>901.72</td>
<td>176.00</td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td>409.00</td>
<td></td>
<td>409.00</td>
<td>38.74</td>
<td>447.74</td>
<td>88.00</td>
</tr>
<tr>
<td>- Co-op</td>
<td>Term</td>
<td>409.00</td>
<td>84.75</td>
<td>493.75</td>
<td>44.20</td>
<td>537.95</td>
<td>88.00</td>
</tr>
<tr>
<td><strong>HKLS - Regular</strong></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Winter, Spring</td>
<td>Session</td>
<td>818.00</td>
<td></td>
<td>818.00</td>
<td>85.22</td>
<td>903.22</td>
<td>176.00</td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td>409.00</td>
<td></td>
<td>409.00</td>
<td>39.49</td>
<td>448.49</td>
<td>88.00</td>
</tr>
<tr>
<td>- Co-op</td>
<td>Term</td>
<td>409.00</td>
<td>84.75</td>
<td>493.75</td>
<td>44.95</td>
<td>538.70</td>
<td>88.00</td>
</tr>
<tr>
<td><strong>Integrated Studies</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>- Regular</td>
<td>Session</td>
<td>818.00</td>
<td></td>
<td>818.00</td>
<td>79.22</td>
<td>897.22</td>
<td>176.00</td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td>409.00</td>
<td></td>
<td>409.00</td>
<td>36.49</td>
<td>445.49</td>
<td>88.00</td>
</tr>
<tr>
<td>- Winter, Spring</td>
<td>Session</td>
<td>818.00</td>
<td></td>
<td>818.00</td>
<td>83.22</td>
<td>902.22</td>
<td>176.00</td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td>409.00</td>
<td></td>
<td>409.00</td>
<td>38.99</td>
<td>447.99</td>
<td>88.00</td>
</tr>
<tr>
<td>- Co-op</td>
<td>Term</td>
<td>409.00</td>
<td>84.75</td>
<td>493.75</td>
<td>44.45</td>
<td>538.20</td>
<td>88.00</td>
</tr>
<tr>
<td><strong>Mathematics</strong></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Regular</td>
<td>Session</td>
<td>818.00</td>
<td></td>
<td>818.00</td>
<td>84.22</td>
<td>902.22</td>
<td>176.00</td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td>409.00</td>
<td></td>
<td>409.00</td>
<td>38.99</td>
<td>447.99</td>
<td>88.00</td>
</tr>
<tr>
<td>- Co-op</td>
<td>Term</td>
<td>409.00</td>
<td>84.75</td>
<td>493.75</td>
<td>43.95</td>
<td>537.70</td>
<td>88.00</td>
</tr>
<tr>
<td><strong>Optometry</strong></td>
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</tr>
<tr>
<td>- Regular</td>
<td>Session</td>
<td>857.00</td>
<td></td>
<td>857.00</td>
<td>83.22</td>
<td>940.22</td>
<td>176.00</td>
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<tr>
<td>- Winter, Spring</td>
<td>Session</td>
<td>818.00</td>
<td></td>
<td>818.00</td>
<td>83.22</td>
<td>901.22</td>
<td>176.00</td>
</tr>
<tr>
<td>- Co-op</td>
<td>Term</td>
<td>409.00</td>
<td>84.75</td>
<td>493.75</td>
<td>43.95</td>
<td>537.70</td>
<td>88.00</td>
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<tr>
<td>- Full Course</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>176.00</td>
</tr>
</tbody>
</table>

Schedule of fees effective April 28, 1980, as known at the date of printing.
Fees for Student Visa Students (see also Note 4)
Regular Programme fees are $1,628.00 per session or $814.00 per term plus incidental fees as shown above. The Unit Course Fee is $326.00 per Full Course or $163.00 per term course. Registration in Co-operative programmes is available only to students who have Canadian Citizenship or Landed Immigrant status.

Incidental Fees
The following incidental fees are compulsory:

<table>
<thead>
<tr>
<th>Session Term</th>
<th>Session Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercollegiate Athletics</td>
<td>$28.00 $14.00</td>
</tr>
<tr>
<td>Health Insurance</td>
<td>$18.72 $ 6.24</td>
</tr>
<tr>
<td>(see Note 5) - Regular - Co-op</td>
<td>$14.00 $ 3.66</td>
</tr>
<tr>
<td>The following incidental fees must be paid on registration but are refundable on request from the organization listed below within three (3) weeks after the start of lectures for the session or term.</td>
<td></td>
</tr>
</tbody>
</table>

| Federation of Students | $20.00 $10.00 |
| - (see Note 6) | |
| Student Society (see Note 7) | |
| - Architecture | $10.00 $ 5.00 |
| - Arts | $ 5.00 $ 2.50 |
| - Engineering | $ - $ 4.00 |
| - Env. Studies | $ 4.50 $ 2.25 |
| - HKLS | $ 6.00 $ 3.00 |
| - Int. Studies | $ - $ - |
| - Mathematics | $ 5.00 $ 2.50 |
| - Optometry | $ 4.00 $ 2.00 |
| - Science | $ 4.00 $ 2.00 |

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

| WPIRG (see Note 8) | $ 4.00 $ 2.00 |
| Sanford Fleming Foundation (see Note 9) | $ - $ 2.50 |
| Radia Waterloo (see Note 10) (effective September, 1980) | $ 5.00 $ 2.50 |
| Imprint (see Note 11) | $ 6.00 $ 3.00 |

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 $176.00 for each full course at a weight of 1.0; at $88.00 for each half or term course at a weight of 0.5; and at a prorated value for other course weights. The Unit Course Fee for Student Visa Students is as shown “Fees for Student Visa Students” in above.

Note 4 - Student Visa Students
The Ontario Government has established a policy of higher tuition fees for international students studying in Ontario on student visas. The policy came into effect as of 1 January 1977. Fees for visa students who had successfully completed one or more terms of a programme prior to that date remain the same as those for Canadian students until the completion of their programme or the Winter term 1980, whichever occurs earlier. The higher fees apply to all students beginning a programme on or after 1 January 1977, except for those who qualify for exemption under one of the following categories:

1) A citizen of Canada within the meaning of the Canadian Citizenship Act or a person registered as an Indian within the meaning of the Indian Act;
2) A permanent resident within the meaning of the Immigration Act, 1976;
3) A visitor admitted to and remaining in Canada under clause 10 (c) of the Immigration Act, 1976 who has entered Canada or is in Canada to carry out his official duties as a diplomatic or consular officer or representative or official properly accredited of a country other than Canada, or of the United Nations or any of its agencies or of any intergovernmental organizations in which Canada participates or as a member of the staff of any such diplomat, consular officer, representative or official;
4) A dependent of a visitor admitted to and remaining in Canada under clause 10 (c) of the Immigration Act, 1976 for the purpose of engaging in employment;
5) A person admitted to and remaining in Canada who is officially recognized by the Employment and Immigration Commission of Canada as a Convention refugee within the meaning of the Immigration Act, 1976;
6) A person admitted to and remaining in Canada under clauses 10 (a) or 10 (b) of the Immigration Act, 1976 who is sponsored and financially assisted by the Canadian International Development Agency (including the Commonwealth Scholarships and Fellowships), or by the International Development Research.
Centre, or by any program of financial assistance to students under an aid program of the United Nations or its agencies provided such a program is recognized and directly or indirectly assisted by the Government of Canada;

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

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

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

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

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

Note 5 - Health Insurance
Effective 1 September 1978, a revised supplementary Student Health Insurance Plan was put into effect at the request of the student body. Student premiums which are nonrefundable are as shown in the Schedule of Fees. Dependent (family) coverage may be obtained on request and by payment of a further $8.52 per term.

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

Further details are available from Health Services.

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

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

Note 8 - WPIRG (Waterloo Public Interest Research Group)
A student funded environmental and social research group.
This fee is voluntary, refundable, and not a requirement for registration. Requests for refunds or questions concerning WPIRG should be directed to the on-campus WPIRG office within three (3) weeks after the start of lectures for the term or session as indicated on pages 5 to 8 of this Calendar.

Note 9 - Sandford Fleming Foundation (S.F.F.)
An organization dedicated to the development of co-operative engineering education.
This fee applies to Engineering students only and is voluntary, refundable and not a requirement for registration. Requests for refunds should be directed to the on-campus Engineering Society office, within three (3) weeks after the start of lectures for the term as indicated on pages 5 to 8 of this Calendar.

Note 10 - Radio Waterloo
The on-campus student radio station.
This fee is voluntary, refundable, and not a requirement for registration. Requests for refund should be directed to the Radio Waterloo office within three (3) weeks after the start of lectures for the term or session involved as indicated on pages 5 to 8 of this Calendar.

Note 11 - Imprint
The student newspaper.
This fee is voluntary, refundable and not a requirement for registration. Requests for refunds should be directed to the Imprint office within three (3) weeks after the start of lectures for the term or session involved as indicated on pages 5 to 8 of this Calendar.
Note 12 – Other Costs
The fees shown do not include the costs of textbooks, class notes, Correspondence Programme tape or kit deposits, mandatory supplies, certain accommodation or other costs associated with field trips, or other similar expenses.

Miscellaneous
Supplemental Examination – Each Paper $10.00
Presiding Fee
(at outside centre half day) $10.00
Returned Cheques – Handling charge (plus late registration penalty as applicable) $15.00
Duplicate Fee Statement or Tax Receipt (per request) $ 2.00
Transcript of Record (per request) $ 2.00
Replacement of lost Identification Card $ 5.00
Replacement of lost Health Insurance Card – Payment equivalent to the original premium.

Residence
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. See page 22 for further information.

Income Tax Receipts
Receipts for income tax purposes for fees paid covering the academic period 1 May 1980 to 30 April 1981 will be mailed after 1 March 1981 to the home address on record.
Scholarships
Bursaries, Prizes and Financial Aid

Bookstore and dining facilities are located at South Campus Hall
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 (OSAP) 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 from the donor.

Undergraduate Scholarships

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

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

Chemistry Scholarships:
students must write the Chem 13 News Exam.

Mathematics:
students must write the Descartes Mathematics Competition.

Physics:
students must write the Sir Isaac Newton Physics Contest.

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

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

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.

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 AOCA Canada Limited Scholarship
AOCA 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.

Alfred Armbrust Memorial Scholarship
Value: $1,000 Awarded annually to an outstanding student entering the Faculty of Engineering.

Arts Faculty Scholarships
The Faculty of Arts is offering several entrance and upper year scholarships in recognition of academic excellence. Entrance scholarships, awarded on the basis of secondary school performance and recommendations, are valued at $1,500. Of which $850 is allocated for first year and an additional $650 for second year, if the student maintains an A average. Upper year scholarships valued at $650 are awarded on the basis of the previous year's standing and require the recommendation of the candidate's department. Special awards may be made at the discretion of the Faculty of Arts Scholarship Committee, which Committee is responsible for both regular and special awards.

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

The Bausch and Lomb Optical Company Limited Award for Clinical Proficiency
Bausch and Lomb Optical Company offers a prize to the student in the fifth professional year judged to have demonstrated the highest levels of proficiency in clinical activities. The prize is a Greens Refractor or equivalent ophthalmic instrumentation to the approximate value of $2600.

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.

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 on the basis of academic achievement.

Canada Packers Limited Awards
Two $500 awards, one to a third-year student in each of Chemical Engineering and Mechanical Engineering, based on high academic achievement, extra-curricular activities, and personal characteristics.

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

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

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

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

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 $600 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.

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

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

Dow Chemical of Canada Scholarship in Chemical Engineering
$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.

Randy Duxbury Memorial Scholarship
Value: $600. Awarded to a student in third year Chemical Engineering who has a high academic standing and who has demonstrated a strong interest in extra-curricular activities and athletics. Apply in writing to the Awards Office.

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

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

General Motors Scholarships
Two awards of $1,000 to students in the penultimate or final year of Engineering, Mathematics-Business Option or Computer Science, or a Business related program. Awarded on the basis of academic performance, leadership ability, career goals, and an interview with a Company representative. Recipients must serve an internship with General Motors in the summer or work term preceding the year in which the award is payable. The awards may be renewable for a second year.

Don Hayes Award
Awarded annually to a deserving undergraduate student who has a minimum of B average standing and who is involved in athletics or the sports training function in the University or the community. Letters of application, including the names of references, should be forwarded to the Awards Officer by November 1.

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

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

Institution of Production Engineers Canadian Council Award
Value: $100 and a one-year membership in the Institution. Awarded annually to be best all around fourth year student in the production and manufacturing option of Mechanical Engineering, based on academic standing and involvement in student affairs. Established in memory of Stan Thurgar and all the members of the Institution who have conscientiously worked for the good of Canadian industry.

The William Feinbloom Low Vision Award
Consists of a Low Vision Trial Set awarded to the final year student who has shown excellence in both the didactic and the clinical aspects of Low Vision care.
Ready Mixed Concrete Association of Ontario Scholarship
Two scholarships of $500.00 each to students in 3B Civil Engineering who are residents of Ontario, who have demonstrated particular interest in the use of concrete and reinforced concrete, and who have obtained a high average in related courses. Consideration will be given for experience gained in work terms which involved working with concrete.

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 freshman, and are value 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 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 Literautre and Language. The value of this award is $100 and is provided annually by Mr. Friedrich Lehner of Lehner Travel Service, Toronto, Ontario, Canada.

John McKay Memorial Award
Interest from an endowment awarded annually to a student who has completed 3A co-op Geography, on the basis of good academic standing, work-term performance, and broad involvement in class activities.

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

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 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 Sept. 15 of each year.

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

Gladys and Norman Raiter Memorial Scholarships
A number of Entrance Scholarships awarded to the top eligible students graduating from Waterloo County secondary schools. Awarded in conjunction with Waterloo County Entrance Scholarships.
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. For Chemistry awards, see Chemistry Scholarships and Assistantships. For Physics, see Sir Isaac Newton Scholarships.

Smale Fellowship
Value: $300. Based on work in the fourth year (BArch) programme, leadership ability and academic and design excellence.

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

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 programme (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 outstanding ability in mathematics and science and demonstrated potential for success in engineering. The following criteria will be used in allocating these awards:
- minimum overall average of 85% in Year 5;
- performance in the special Waterloo tests (Descartes Mathematics, Sir Isaac Newton Physics and CHEM 13 NEWS competitions);
- students must write at least one and are encouraged to write all three of these tests;
- principal’s recommendation and other supporting material
Students must submit an application form which can be obtained from the Awards Office.

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

Michael Wright Memorial Scholarship
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: $700. 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.
Work Term Report Awards

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

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

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

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

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

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

James F. MacLaren Limited Awards
Three awards of $100 each to second, third and fourth year Civil Engineering students.

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

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

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

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, 1979.

Year 1 Admission Scholarships

Faculty of Arts
St. Jerome's College is offering entrance scholarships in order to recognize and encourage academic excellence.

Applicants will be offered scholarships according to the following criteria.

<table>
<thead>
<tr>
<th>Admissions Average</th>
<th>Scholarship Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>85% and over</td>
<td>$850.00</td>
</tr>
<tr>
<td>80% to 84.9%</td>
<td>$500.00</td>
</tr>
<tr>
<td>78% to 79.9%</td>
<td>$200.00</td>
</tr>
</tbody>
</table>

Assessment of these awards will be based on preliminary grades submitted to the Ontario Universities' Application Centre by the candidates' secondary schools in April and will be awarded in June along with the candidates' offers of admission to St. Jerome's College, University of Waterloo. Those students who receive admission scholarships are eligible for scholarships in upper years provided that high academic standing is maintained.

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

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

St. Jerome's College Upper Year Scholarships
St. Jerome's College is offering upper year scholarships in order to recognize and encourage academic excellence. Upper year scholarships 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, CR, who taught at the College. Five annual scholarships of $150 each are awarded to deserving students who combine academic excellence and contribution to College life. Application forms are required.

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

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

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

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, CR, who taught at the College. The Fund makes $100 available annually to a student or students registered in the College and majoring or honouring in Psychology. Application should be made to the Chairman of the Psychology Department.

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

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

Awards for Candidates for the Congregation of the Resurrection:

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

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

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

Awards for Candidates for the Diocese of Hamilton

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

Renison College Awards

A number of scholarships and awards are available to Renison students. For the most part they are restricted to students who have enrolled in their studies through the College. A limited number are available to students who live in residence but are following academic programmes elsewhere in the University. The Renison Scholarships and Awards Committee has a small amount available for loans or grants to students facing serious financial problems. Information on scholarships, bursaries, awards and other financial aid made available through the University of Waterloo may be obtained from their Awards Office.

Application forms for Renison scholarships and awards are available from the College Registrar.
A. W. Rees Memorial
This award was established by College personnel in memory of the first principal of the College. The award is made annually to an outstanding student for an all-around contribution to the life of the College.

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

Lenora Monk Scholarship
This scholarship was bequeathed by Miss Leonora Monk. It is awarded annually to a Renison student for excellence in academic performance. Some consideration is given to financial need in making the award.

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

The Renison College Entrance Scholarship
Two scholarships, each valued at one-half the tuition fee for one session, are provided annually to students entering the programme in Social Development Studies. They are granted on the basis of excellence in academic performance with some consideration of financial need.

Renison College Achievement Scholarships
The three scholarships are awarded annually to a student in each of the three upper years of study. They are available to students in the Social Development Studies programme and to students following the General Arts Programme of the University of Waterloo who have registered through Renison College.

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

Bursaries

Note
Bursaries are awarded on the basis of academic standing (minimum B average) and evidence of financial need. 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, Refrigerating & 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. Special application is available from the Awards Office.

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.

Central Optical Bursary
A bursary in the amount of $1500.00 will be awarded to a student who has successfully completed one or more years of the professional program. The award is to support student research under the direction of a faculty member of the School of Optometry. Application should be made through the Awards Officer of the University of Waterloo.

Huron County Bursaries
Huron County Council has established a bursary fund at the University of Waterloo for students who attended high school in Huron County and whose home is in the County. The bursaries, offered annually, will be for an amount of $150 and will be awarded to full-time undergraduate students in any faculty of the University who have good academic records and who are in need of financial assistance to enable them to continue their studies.

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

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.
Mike Moser Bursary Fund
Bursaries will be awarded to deserving third and fourth year students who have financial need, an exemplary academic record, and who have achieved a high level of accomplishment in extra-curricular activities. Applications should be made in writing to W. N. Widmeyer, Associate Dean, Faculty of Human Kinetics and Leisure Studies.

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

Rockwell International of Canada Limited, Collins Canada Division Bursary
A bursary of $200 to a deserving undergraduate in Electrical Engineering. Applications should be made to the Awards Officer by the end of the first month of the term. Preference will be given to students in second year.

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.

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

Prizes

Ambassador of Switzerland Book Prizes
Awarded annually to an outstanding student in each of the French, German and Italian programmes.

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 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 Bobby Bauer Memorial Awards
The Bobby Bauer Memorial Foundation makes awards annually to deserving undergraduate students who demonstrate proficiency in athletics. Applications are available from the address below and must be submitted to the Foundation by Sept. 30.

Bobby Bauer Memorial Foundation,
60 Victoria Street North,
Kitchener, Ontario.

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

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

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

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

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

All of the above prizes are made available through contributions of the following Canadian Suppliers and Laboratories:
Aiden Optical Laboratories, Fort Erie, Ontario
Canadian Optical Supply Co; Montreal, Quebec
Gordon Contact Lenses, Inc; Rochester, N. Y.
Kahn Optical Company Limited, Toronto, Ontario
N & N Optical, Mississauga, Ontario
Perfect Optical (Canada) Ltd, Downsview, Ontario
Plastic Contact Lens Co., Toronto, Ontario
Professional Optical Co., Willowdale, Ontario
Superlite Optical Co., Toronto, Ontario
Union Optics Corp. (Canada) Ltd., Scarborough, Ontario.

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 Applied Mathematics with Engineering electives; the other is for the third year Applied Mathematics student who ranks first on the final examinations.

No application is necessary.

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

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

The Sandford Fleming Debate Awards
The Sandford Fleming Foundation has established the annual Sandford Fleming Debates in order to encourage the art of debate among Engineering undergraduates. Awards of $100 each are made to members of the winning team and of $50 each, to members of the runner-up team.
The Sandford Fleming Undergraduate Travel Grants
The Sandford Fleming Foundation has established a number of travel grants to enable engineering undergraduate students to present a paper at a technical conference. The paper must be authored or co-authored by the student and must be based on work done in the course of undergraduate study. Application should be made to the Awards Committee Chairman, The Sandford Fleming Foundation.

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

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

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

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

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

Lieutenant Governor's Medal for Architecture
Awarded to the fifth year's top academic and design student in Architecture.

The J. R. Matthews Memorial Prize in Biology
Value: $100.
The colleagues, friends and relatives of the late Dr. Jonathan R. Matthews offer an annual prize to the student who graduates from the Honours Biology (or Biology/Chemistry) programme with the highest overall average in third and fourth year courses.

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

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

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

Ontario Association of Architects Second Year Award
Value: $250.00. Based on studio performance in second year and overall performance up to the second year.

Ontario Association of Architects Third Year Award
An award of $250.00 to a student based on studio performance in third year and overall performance up to third year.

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

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

Royal Architectural Institute of Canada Medal
Awarded to a graduating student on the basis of high proficiency in the B.Arch. programme.

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

Toronto Chapter of Architects Award
Value: $4,000.00. Available to students registered in the final year of Architecture. Students must apply to the Director of the School of Architecture by December 31.

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

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

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

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.

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

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 Faculty of Environmental Studies. The maximum loan is normally $100. These funds are made available by the Society and represent a part of the proceeds of functions sponsored by the Society.

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. Dougilas 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.

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

   The fund is to represent contributions received from classmates, friends and other interested donors in memory of students who lost their lives while enrolled in the Engineering Faculty, and while at the University or on their work terms.

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

Government Assistance Programmes

The Ontario Student Assistance Programme (OSAP)
OSAP provides various types of assistance based on financial need to eligible students. This assistance is intended to supplement, not to replace, the resources of the student and his/her family. Although assistance is not based on academic standing, students are expected to make satisfactory progress in their studies.

OSAP consists of the following four plans:
1) Ontario Study Grant Plan;
2) Canada Student Loans Plan;
3) Ontario Student Loans Plan;
4) Ontario Special Bursary Plan.

   1) Under the Ontario Grant Plan, Ontario students may apply for non-repayable grant assistance without having to borrow money first.

   2) The Canada Student Loans Plan provides assistance in the form of interest-free loans to students who wish to pursue post-secondary studies at the graduate or professional level, or to students who are not eligible for any, or sufficient, grant assistance.

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

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

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

Students from provinces other than Ontario should approach the provincial assistance authority in their home provinces concerning the possibility of assistance from that source.
The Department of Co-ordination and Placement

Co-op student on a work-term project at a local insurance firm
Department of Co-ordination and Placement

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

Associate Directors
B. A. McCallum, BA (W. Ont.)
J. C. Wilson, BSc, CE (New. Br.), PEng

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

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

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

Co-ordinators
D. G. S. Anderson, BASc (Toronto), PEng
G. P. Berthin, BSc (Manitoba), PEng
J. A. Calder, BASc (Br. Col.), PEng
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
A. L. Lind, BSc (Queen's), PEng
R. Mateyk, BASc (Toronto), PEng
R. McDowell, BSc (Sask.), PEng
W. A. Runge, BSc (Queen's), PEng

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

Co-ordinators
C. Bech-Hansen, BA (Sask.), MSc (Br. Col.)
L. R. Bricker, BSc, MSc (Waterloo)
G. G. Ellsworth, BA (Princeton)

Mathematics
Programme Administrator
R. A. Klawitter, BA (W. Ont.)

Co-ordinators
D. J. Beaupre, BComm (Loyola), CA
W. G. Clapham, BMath (Waterloo), MBA (York)
M. O. Deschenes, BA, BEd (Queen's)
I. F. Ferguson, BSc (Waterloo)
E. M. Johnson, BA (Queen's)
D. A. Robinson, BA (W. Ont.)
R. M. Slater, BSc (Toronto)
S. R. Stankus, BSc (RMC)
G. M. Subasic, BASc (Washington)
E. P. Whelan, BA (Waterloo)

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

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

Environmental Studies - Geography
Co-ordinator
M. A. McMartin, BA (W. Ont.)

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

Co-ordinators
B. D. Beatty, BSc (Waterloo), BEd (W. Ont.)
C. N. McPhun, BA (Waterloo)

Arts
Co-ordinators
I. U. Ostick, BA (Waterloo)
G. M. W. Srivastava, MA (Aberdeen, Waterloo)

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

Placement Officer
P. B. Graham, BA (Carleton)

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
# Work-Study Sequence

## Programme (By Faculty)

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* Denotes work term where it appears on the chart

† These work terms involve 6 months in a Secondary School & 2 months in the summer at Althouse College of Education, London.

V Admission occurs by January for the 2B term.

W Admission occurs by January for the 1B term. You cannot be admitted to co-op at the beginning of first year.

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

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.

Z Admission occurs at the time of selection of 2nd year courses. You cannot be admitted to co-op in 1st year.
Co-ordination and Placement
Seeking Employment and Employer Interviews

 Seeking Employment and Employer Interviews

Seeking Employment
Students are expected to seek employment through the interview process arranged by the Department of Co-ordination and Placement. Since channels of communication already exist, students may not seek employment directly with a participating co-operative employer unless specific arrangements are made with the Department. Students who have a job available before entering the co-operative 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”.

in no sense a substitute for, but is rather a complement to, the academic studies.

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

Operation of the Plan
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. 59) 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. 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.

Employment
Although every effort is made by the Department to find a sufficient number of work term positions for students enrolled in all co-op programmes, no guarantee of employment can be made. The employment process is competitive, and academic performance, skills, motivation, maturity, potential, etc., will determine whether a student is offered a job. If a student is unplaced after the interview process, the Department will earnestly attempt to find suitable work experience.
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.

Work Terms

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

Allowance can be made for personal considerations, educational opportunities, and other "On Own" conditions with prior approval from the Department of Co-ordination and Placement. However, "On Own" conditions do not count toward the minimum requirements for graduation.

Performance Evaluation
Evaluation grades are recorded on the Employer Evaluation of Co-operative Student form or on a special form developed in conjunction with a professional licensing body.

Academic Record for a Student Enrolled in a Co-operative 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".

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.

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.

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

Work Reports

Quantity
Normally the minimum number of satisfactory work reports required for graduation is four. Where other than four are required by the University, this is stated in the calendar or in the Individual student’s file. However, employers may require additional reports from students as part of the job. Normally for a report to be considered 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:
Upon entry to a co-op programme a student is expected to follow the work-term/academic-term sequence appropriate for that particular programme. In some cases this may include as many as six work terms. A student may, for one reason or another, fail to satisfactorily complete the full complement of work terms. For these students, and for students given advanced admission to a co-op programme, a certain minimum number of satisfactory work terms must be completed before graduation, namely, a number of work-term/months equal to, or greater than, half the number of academic-term/months in the programme from the time the programme begins. In those Faculties which offer both regular and co-op programmes, the minimum number of related work terms required for a co-operative degree is normally four. In those Faculties offering only the co-op 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.

Allowance can be made for personal considerations, educational opportunities, and other “On Own” conditions with prior approval from the Department of Co-ordination and Placement. However, “On Own” conditions do not count toward the minimum requirements for graduation.

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 students, 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-op 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-op 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-op programmes, University of Waterloo graduates in those disciplines are known to have gone through the co-operative system. In programmes which can be taken on the co-operative or regular basis, graduates completing the co-operative plan requirements will receive a "co-operative" degree designation.

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.

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

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

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

The Career Planning and Placement offices are located on the first floor of the Ira G. Needles Hall.
Industrial Advisory Council for Cooperative 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.

E. N. Banks (Chairman)  
Dow Chemicals of Canada Limited
J. R. Coutts (Vice Chairman)  
Teklogix Limited
G. A. Henderson (Secretary)  
General Foods Limited
J. R. Adare  
Canadian Blower/Canada Pumps Limited
W. E. Baigent  
Canon Limited
P. J. Boyd  
De Leuw Cather Canada Limited
Y. C. Chang  
Syncrude Canada Limited
D. J. Dickie  
Champion Road Machinery Limited
V. R. Duxbury  
3M Canada Limited
W. B. Foster  
Syncrude Canada Limited
R. H. Fox  
Westinghouse Canada Limited
A. R. Harvey  
Kimberley Clark Canada Limited
D. M. Hendrick  
Kerr Addison Mines Limited
T. E. Hogan  
Petro-Canada
R. C. Hore  
Ontario Ministry of the Environment
A. J. Kingan  
Bell Canada
F. J. Mayer  
Steel Company of Canada Limited
M. A. F. Murray  
Private Consultant
A. Nitenberg  
Ontario Hydro
J. Schneider  
Dominion Bridge Limited
W. B. Taylor  
Ontario Cancer Institute

Organizations Employing Co-operative Arts Students

Bank of Canada
Bell Canada
Bell-Northern Research
Canadian Broadcasting Corporation
Canadian Business
Canadian Labour Congress
Central Ontario Television Limited
Data Resources of Canada
Deloitte Haskins & Sells
Dow Chemical of Canada Limited
General Motors of Canada Limited
Globe & Mail
Government of Canada
  Environment
  Health & Welfare
  Public Service Commission
  Secretary of State
  Urban Affairs
Government of Ontario
  Colleges & Universities
  Correctional Services
  Energy
  Health
  Housing
  Industry & Tourism
  Treasury & Economics
Government Members' Service Bureau
Gulf Canada Limited
Highway Bookshop
IBM Canada Limited
Imperial Oil Limited
Kitchener Public Library
McGraw Hill Ryerson Limited
McLelland & Stewart Limited
Midwestern Regional Centre
The Mutual Life Assurance Company of Canada
Office of the Legislative Assembly
Office of the Premier
Ontario Agriculture Museum
Ontario Arts Council
Ontario Youth Secretariat
Prentice-Hall of Canada Limited
Prime Minister's Office
Regional Municipality of Ottawa-Carleton
Royal Bank of Canada
Royal Trust
J. J. Singer Consulting Economists Limited
University of Waterloo
Woods Gordon & Company
# Organizations Employing Co-operative Architecture Students

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<td>Agnew Peckham &amp; Associates Limited</td>
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<td>Air Canada</td>
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<td>Akitt &amp; Swanson</td>
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<td>Alberta Housing &amp; Public Works</td>
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<td>Allen &amp; Sherriff</td>
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<td>Allward &amp; Gouinlock</td>
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<td>Arcop Associates</td>
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<td>Arnott MacPhail Johnstone</td>
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<td>Ausable-Bayfield Conservation Authority</td>
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<td>The Austin Company Limited</td>
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<td>Ball Brothers Limited</td>
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<td>Bank of Montreal</td>
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<td>J. Bruce Bateman</td>
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<td>Beatson Finlayson &amp; Partners</td>
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<td>Bell Canada</td>
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<td>W. L. Bielaska</td>
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<td>Joseph Bogdan Architect/Urban Design</td>
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<td>Boigon &amp; Armstrong</td>
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<td>Bregman &amp; Hamann</td>
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<td>B. Breivik</td>
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<td>Brewers Warehousing Company Limited</td>
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<td>Karl Brestensky</td>
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<td>John Brock</td>
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<td>brook Carruthers &amp; Shaw</td>
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<td>R. V. B. Burgoyne</td>
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<td>Canadian Imperial Bank of Commerce</td>
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<td>Canadian National Railways</td>
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<td>R. S. Carter Architect</td>
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<td>Central Mortgage &amp; Housing Corporation</td>
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<td>Chandler Kennedy Partnership</td>
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<td>Howard Chapman</td>
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<td>Andrew M. Clarke</td>
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<td>Clifford Lawrie Bolton Ritchie</td>
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<td>Cohos Evamy &amp; Partners</td>
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<td>Commonwealth Holiday Inns of Canada</td>
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<td>Graeme Consiglio</td>
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<td>The Co-operators</td>
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<td>Craig Kohler &amp; Dickey</td>
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<td>Crang &amp; Boake</td>
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<td>Ludmila Dejmeck</td>
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<tr>
<td>A. J. Diamond Associates</td>
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<td>Dominik Polsann Thompson LaFramboise Mallette</td>
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<tr>
<td>Gene Dub Architect</td>
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<td>Dufferin Peel Separate School Board</td>
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<td>Dunlop Farrow Aitken</td>
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<td>Dyer/Brown &amp; Associates</td>
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<td>Elliott Stahl &amp; Associates</td>
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<td>Ellwood &amp; Henderson</td>
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<td>Henry Fliess</td>
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<td>Freure Homes</td>
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<td>Giffels Associates Limited</td>
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<td>Glos Architect</td>
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<td>R. M. Goldman</td>
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<td>Gore &amp; Storrie Limited</td>
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<td>Govan Kaminker Keenleyside Wilson Milne</td>
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<td>Praetorius Slaunwhite Stevenson</td>
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<td>Government of Canada</td>
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<td>Agriculture</td>
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<td>Indian &amp; Northern Affairs</td>
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<td>Grand River Conservation Authority</td>
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<td>Gugula Smedley &amp; Barban</td>
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<tr>
<td>Haas-Ruebsam Limited</td>
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<td>Mr. D. Hallford</td>
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<td>Hamilton Hegon Conservation Authority</td>
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<td>Harley Little Associates Limited</td>
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<td>Peter Hemingway</td>
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<td>Humber College of Applied Arts &amp; Technology</td>
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<td>IBI Group</td>
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<td>Imperial Oil Limited</td>
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<td>Integra Planning Limited</td>
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<td>William R. Jarrett</td>
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<td>Jung/Brannen Associates Incorporated</td>
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<td>Kappele Wright &amp; MacLeod Limited</td>
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<td>Davis S. Kenworthy</td>
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<td>Jack Klein &amp; Henry Sears</td>
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<td>L. Keffman</td>
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<td>V. W. Kuchar</td>
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<td>Gail E. Lamb</td>
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<td>Robert L. Langlois</td>
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<td>Lipson &amp; Dashkin</td>
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<td>Lithwick Johnston &amp; Møy</td>
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<td>London Board of Education</td>
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<td>Long Point Conservation Authority</td>
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<td>MacBeth Williams Woodruff &amp; Hadaway</td>
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<td>MacDonald &amp; Zuberec</td>
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<tr>
<td>MacLennan Associates Architects</td>
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<td>Mark Musselman McIntyre Combe</td>
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<td>Menno S. Martin Contractor Limited</td>
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<td>Mathers &amp; Haldenby</td>
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<td>Matsui Baer Vanstone</td>
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<td>McNab Barkley Young</td>
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<td>Joseph A. Medwecki</td>
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<td>Meek Klausen Servage Walker</td>
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<td>David A. G. Mills Architect</td>
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<td>Moffat Moffat &amp; Kinoshita</td>
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</table>
Co-ordination and Placement
Employers of Co-operative Engineering, Science & Geography Students

Organizations Employing Co-operative Engineering, Applied Science & Geography Students

Abacus Industrial Equipment Company Ltd.
Abex Corporation
Abitibi Forest Products Limited
Abitibi Paper Company Limited
Abitibi Price Mineral Resources
Abitibi Provincial Paper Limited
Accuflex Industrial Hose Limited
Acres Consulting Services Limited
The Adams Mine
Addiction Research Foundation
Advanced Concrete Services Limited
Aero Irrigation Limited
AES Data Limited
Agatronics Limited
Ainley & Associates Limited
Airphoto Analysis Associates Consultants Limited
Alberta Environment
Alberta Gas Chemicals Company
Albery Pullerits Dickson & Associates Limited
Alcore Fabricating Company
Algoma Ore Properties
The Algoma Steel Corporation Limited
Algoods
Allan Crawford Associates Limited
Allen-Bradley Canada Limited
All-Weld Company Limited
Amcan Castings
Amerace Limited
American Can of Canada Limited
AMF Canada Limited
Amoco Canada Petroleum Company Limited
R. V. Anderson Associates Limited
Angelstone Limited
H. H. Angus & Associates Limited
August Apon Associates Limited
AP Parts Canada Limited
Aquitaine Company of Canada Limited
Elizabeth Arden of Canada Limited
Argo Plastics
Armbro Materials & Construction Limited
Armco Canada Limited
Armstrong Cork Industries Limited
Arrowhead Metals Limited
Artex Precast Limited
Ascoelectric Limited
Associated Engineering Services Limited
Associated Test Equipment Limited
Associated Tube Industries Limited
Atlas Steels Company
Atomic Energy of Canada Limited
The Austin Company Limited
Automotive Hardware Limited
Babcock & Wilcox Canada Limited
Bacon Engineering Limited
Rakelite Thermosets Limited

Raymond Moriyama
James Murray & Murray Marshall
National Research Council
W. H. Nesbitt
Nicoll Ream Johnston
Nightingale & Quigley
Northern College of Applied Arts & Technology
North York Board of Education
Ogus Architect
Page & Steele
Parkin Architects Engineers & Planners
Edmund Percy Scherrer & Hicks
Prack Partners
Pye & Richards
Rafael & Burka
Re-Jen Aire Systems Limited
Robinson & Heinrichs
Roscoe Stienstra Havery & Rankin Architects
R. S. Scott & Associates
Sheridan College of Applied Arts & Technology
Shore Tibbe Henschel Irwin Peters
J. E. Sievenpiper Architect
Simpsons-Sears Limited
Donald E. Skinner
Smith Mill & Ross
SNC Geco Limited
Snider Reichard & March
Joseph C. Somfay
Stafford & Haensli
Stahl & Elliott
I. Stecura
Stone & Kohn
Richard Strong & Steven Moorehead
Swain & Rupnow
J. P. Thomson Associates
Tillmann & Ruth
Toronto Dominion Bank
Toronto Transit Commission
Michael Torsney
Joseph P. Toth Architect
Totten Sims Hubicki Associates Limited
Townend Stefura Baleshta
University of Waterloo
Viljoen & Baggley
Walbrook Appointments
Mykola Wasylyko
The Waterloo County Board of Education
The Webb Zerafa Menkes Housden Partnership
Wilson Newton Roberts Moody Moore Duncan
Carson Woods
James Wright
R. S. Yamamoto
Zaidler Partnership
Co-ordination and Placement
Employers at Co-operative Engineering, Applied Science & Geography Students

Bank of Nova Scotia
Barringer Research Limited
Bata Engineering
Bayly Engineering Limited
Beak Consultants Limited
Beardmore & Company Limited
Bekaert Industrial Limited
Bell Canada
Bell Northern Research
Bennett Paving & Materials Limited
Benson & Hedges (Canada) Limited
Best Pipe Limited
Beth Canada Mining Company
Bird Construction Company Limited
B & K Machinery International Limited
P. A. Blackburn Limited
Black Clawson Kennedy Limited
Black & Decker Manufacturing Company Ltd.
Black & McDonald Limited
Blake Brady Geological Consultants Limited
H. L. Blanchford Limited
B & L Metal Products Limited
Blue Cross Animal Hospital
Boeing of Canada Limited
Boise Cascade Canada Limited
Boots Drug Stores (Canada) Limited
Borden Company Limited
doreal Laboratories Limited
Borg-Warner (Canada) Limited
Borough of Etobicoke
Borough of Scarborough
Bottlers Engineering & Design Limited
BP Minerals Limited
BP Oil Limited
Brantford Public Utilities Commission
T. G. Bright & Company Limited
Bristol-Myers Canada Limited
Bristol-Myers Pharmacy Group
Brunswick Mining & Smelting Corporation
Budd Automotive Company of Canada Limited
Building Products of Canada Limited
Bundy of Canada Limited
Burlington Carpet Mills Canada Limited
Bunryd Canada Limited
R. J. Burnside & Associates Limited
Burroughs Business Machines Limited
Butler Metal Products Company Limited
CAE Electronics Limited
Canada Brick Company Limited
Canada Glue Company Limited
Canadair Limited
Canada Machinery Corporation Limited
Canada Packers Limited
Canada Sand Papers Limited
The Canada Starch Company Limited
Canada Wire & Cable Limited
Canadian Bechtel Limited
Canadian Blower/Canada Pumps Limited
Canadian Brass Limited

Canadian Canners Limited
Canadian Carborundum Company Limited
Canadian Forest Products
Canadian Fram Limited
Canadian General Electric Company Limited
Canadian General Tower Limited
Canadian Gypsum Company Limited
Canadian Home Products Limited
Canadian Imperial Bank of Commerce
Canadian industries Limited
Canadian Ingersoll-Rand Company Limited
Canadian Instrumentation and Research Ltd.
Canadian Motor Sales Corporation Limited
Canadian National Railways

Canadian Pacific
Canadian Pittsburgh Industries Limited
Canadian Plastics Concentrates Limited
Canadian Stackpole Limited
Canadian Standards Association
Canadian Tire Corporation Limited
Canadian Worcester Controls Limited
Can Am Instruments Limited
Canbar Products Limited
Can-Eng Alloys Limited
Can-Lake Explorations Limited
Canron Incorporated
Capital Industries Limited
C. D. Carruthers & Wallace Consultants Ltd.
Central Lake Ontario Conservation Authority
Central Optical Incorporated
CFTO TV Limited
Champion Road Machinery Limited
Chedoke-McMaster Centre
Chembond Limited
Chemetics International Limited
Chemex Labs (Alberta) Limited
Chempac Limited
Chevron Standard Limited
Chipman Chemicals Limited
Christie Brown & Company Limited
Chromasco Limited
Ciba-Geigy Canada Limited

Cimco Limited
City of Brampton
City of Brantford
City of Burlington
City of Calgary
City of Cambridge
City of Chatham
City of Cornwall
City of Edmonton
City of Guelph
City of Kitchener
City of London
City of Mississauga
City of Niagara Falls
City of North York
City of Peterborough
City of Port Colborne
Co-ordination and Placement
Employers of Co-operative Engineering,
Applied Science & Geography Students

City of St. Catharines
City of Sudbury
City of Thunder Bay
City of Toronto
City of Waterloo
City of Windsor
Clarke Institute of Psychiatry
T. Clay Manufacturing Limited
Colgate-Palmolive Canada Limited
Cominco Limited
Commercial Enclosed Fuse Company
Computing Devices Company
Connaught Laboratories Limited
Consolidated Bathurst Limited
Consolidated Computer Incorporated
Consumers Gas Company
Consumers Glass Company
Control Data Canada Limited
Conwest Exploration Company Limited
V. B. Cook Company Limited
A. Cope & Sons Limited
Corrosion Service Company Limited
Coulter Copper & Brass Limited
County of Brant
County of Grey
County of Hastings
County of Northumberland
County of Perth
County of Waterloo
E & B Cowan
Cox Construction Limited
Crane Packing Company Limited
Cumming-Cockburn & Associates Limited
Curtis Engineering & Testing Limited
DAF Indal Limited
Dalhousie University
Damas & Smith Limited
Data Plotting Services Incorporated
Daymond Limited
Dayton Walther Canada Limited
Decca Austin Insulators Limited
Decoustics
John Deere Welland Works
De Laval Company Limited
De Leuw Cather Canada Limited
Deloro Stellite
Delta-Benco-Cascade Limited
Denison Mines Limited
Derry Michener & Booth
Dewson Community Public School
Dexter-Lawson Products Limited
Diesel Equipment Limited
Digital Equipment of Canada Limited
Digital Graphics Limited
Digital Methods Limited
Digital Video Systems Limited
M. M. Dillon Limited
Diversey (Canada) Limited

Dive-Tek Limited
Dixion Applicators Limited
Dome Exploration Canada Limited
Dome Mines Limited
Dome Petroleum Limited
Domglas Incorporated
Dominion Chain Company
Dominion Cutout Limited
Dominion Dairies Limited
Dominion Foundries & Steel Limited
Dominion Soil Investigations Limited
Dominion Stores Limited
Domtar Limited
Domtar Chemicals Limited
Domtar Construction Materials Limited
Domtar Fine Papers
Domtar Research Centre
Dover Corporation Canada Limited
Dow Badische Canada Limited
Dow Chemical of Canada Limited
Drescor Industries Canada Limited
DSMA Alcon Limited
Dufferin Construction Company
Dunlop Farrow Aitken
Dupont of Canada Limited
Duval International Corporation
Dynamo Servicing (London) Incorporated
Eastern Construction Company Limited
Eaton Yale Limited
Ebastec Lavalin Incorporated
E C E Group
Ecodyne Limited
Ecolaire Limited
ECO Research Limited
The E B Eddy Company
Eddy Forest Products Limited
Edwards of Canada
Ekco Canada Limited
Fidrasdo Nuclear Limited
Electroalarm
Electro & Optical Systems Limited
Emerson Electric Canada Limited
Energy Product Group
Erco Industries Limited
Esso Chemical Canada
Esso Resources Canada Limited
E T S Towers Incorporated
Exco Engineering
Exolon Company of Canada Limited
Extramed Limited
Fab-Rec Steel Limited
Fag Bearings Limited
Fahramet Limited
Falconbridge Nickel Mines Limited
Farinon S R Systems
FBM Distillery Company Limited
Federal Pioneer Limited
Fermar Paving Limited
Co-ordination and Placement
Employers of Co-operative Engineering,
Applied Science & Geography Students

Ferranti-Packard Limited
Fiberglas Canada Limited
Firestone Canada Incorporated
Fischbach & Moore of Canada Limited
Fischer & Porter (Canada) Limited
Fisher Controls Company of Canada Limited
Foley Electrical Contractors Limited
Ford Motor Company of Canada Limited
Foster Wheeler Limited
The Foxboro Company Limited
Frankel Steel Limited
Fraser Companies Limited
Freihauf Trailer Company of Canada Ltd.
Funcraft Vehicles Limited
Galtaco Incorporated
Gandall Data Communications Limited
Garrett Manufacturing Limited
Gellman Hayward & Partners Limited
General Foods Limited
General Motors of Canada Limited
General Refrigeration Canada Limited
Geosearch Consultants Limited
Getty Mines Limited
Getty Oil Limited
Gidon Industries Incorporated
Giffels Associates Limited
Glaxo Canada Limited
Golder Associates
B. F. Goodrich Canada Limited
B. F. Goodrich Chemical Canada
Gore & Storrie Limited
Government of Canada
  Agriculture Canada
  Communications
  Consumer & Corporate Affairs
  Customs & Excise
  Energy Mines & Resources
  Environment
  Fisheries & Oceans
  Forestry Products
  Health & Welfare
  National Defence
  Post Office
  Public Service Commission
  Public Works
  Transport
Government of Newfoundland
  Mines
Government of Northwest Territories
  Public Works
Government of Nova Scotia
  Civil Service Commission
  Environment
Government of Ontario
  Agriculture
  Consumer & Commercial Relations
  Environment
  Government Services
  Health
  Housing
  Justice
  Labour
  Natural Resources
  Northern Affairs
  Revenue
  Solicitor General Public Safety/Fire Marshal
  Transportation & Communication
  Treasury & Economics
A J Graham Engineering
Grand River Cable TV Limited
Grand River Conservation Authority
Grandview Industries Limited
The Great Lakes Forest Products Limited
The Great Lakes Power Company Limited
A. P. Green Refractories (Canada) Limited
Greening Donald Limited
Griffith Laboratories Limited
GTE Automatic Electric (Canada) Limited
Guelph Hydro
Gulf Canada Limited
Gulf Minerals Canada Limited
Hamilton Foundry
The Hamilton Harbour Commissioners
Hart Chemicals Limited
Hatch Associates Limited
Hawker Siddeley Canada Limited
Hayee Dana Limited
Hayward Gordon Limited
Heathwood Engineering Associates Limited
H. J. Heinz Company of Canada Limited
Henderson Paddon & Associates Limited
John T. Hepburn Limited
Hercules Canada Limited
Hewlett-Packard (Canada) Limited
R. R. Higgins & Associates Limited
Home Oil Company Limited
Homeware Industries Limited
Honeywell Limited
The Hoover Company Limited
Hostess Food Products Limited
Hotpoint Appliances
Houdaille Industries of Canada Limited
Howden Applied Research Limited
Kerry T. Howe Limited
HSA Reactors Limited
Hudson Bay Exploration & Development Company Limited
Hudson Bay Mining & Smelting Company Limited
Hydro Electric Commission Cambridge & North Dumfries
Hymac Limited
IBM Canada Limited
IIC Mechanical Products Limited
Image Video Limited
Imperial Oil Limited
Imperial Tobacco Limited
Imasco Limited
Co-ordination and Placement
Employers of Co-operative Engineering, Applied Science & Geography Students

Inco Metals Company
Inducon Consultants of Canada Limited
Indusmin Limited
Industrial Life-Tech Service Incorporated
Ingersoll Public Utilities Commission
Inglis Limited
International Cooperage Company of Canada Limited
Intersteel Consultants Limited
IRA Carr Construction Limited
Iron Ore Company of Canada Limited
Irving Pulp & Paper Limited
IST Incorporated
Istec Limited
ITT industries of Canada Limited
Jacuzzi Canada Limited
Jarvis Clark Company Limited
John Labatt Limited
Johnson Controls Limited
Johnson & Matthey Limited
Joy Manufacturing Company (Canada) Limited
Kaiser Aluminum Company
Kaiser Resources Limited
Kaptest Engineering Limited
Kearney-National (Canada) Limited
Keeprite Products Limited
Kellogg Salada Canada Limited
Kelvin Energy Limited
Kendall Canada
Kenner Collegiate & Vocational School
Kerr Addison Mines Limited
Peter Kiewit Sons Company Limited
Kilborn Engineering Limited
Kimberley-Clark of Canada Limited
Kindred Industries Limited
King Hydraulic Power Limited
Kitchener-Waterloo Hospital
The Kleinfelldt Group Limited
Klockner-Moeller Limited
Knox Martin Kretch Limited
Knud Simonsen Industries Limited
Kodak Canada Limited
KSF Chemical Processes Limited
K-Tek Electro-Services Limited
K-Vet Limited
Labatt Breweries of Canada Limited
John Labatt Limited
Labrador Mining & Exploration Company Limited
Lackie Brothers Limited
Lafontaine Cowie Buratto & Associates
Lakefield College School
Lakefield District Secondary School
Lake Ontario Cement Limited
Lake Ontario Steel Company Limited
F. Joseph Lamb Company
Lear-Siegler Industries Limited
Leigh Instruments Limited
Ernst Leitz (Canada) Limited

Lely Limited
Lever Detergents Limited
Levitt Safety Limited
Eli Lilly & Company (Canada) Limited
Lindsay Specialty Products Limited
Linear Technology Incorporated
Thomas J. Lipton Limited
Litton Systems (Canada) Limited
Loblaws Limited
London Board of Education
London Concrete Machinery Company
Long Point Conservation Authority
Looby Construction Limited
Loram International Limited
Lord & Burnham Company Limited
Lorlea Steels Limited
Loyalist College of Applied Arts & Technology
Lubrizol of Canada Limited
Lumonics Research Limited
Luscar Limited
James F. MacLaren Limited
MacMillan Bloedel Limited
Madsen Electronics Canada Limited
Malcolm Condensing Company Limited
Paul Maney Laboratories
Manitoba Forestry Resources Limited
Manitoba Hydro Limited
Mansfield-Denman General Limited
Marshall Macklin Monaghan Limited
Ian Martin Associates Limited
Masdom Corporation Limited
Massey-Ferguson Industries Limited
Mattabi Mines Limited
Mattagami Lake Mines Limited
Max Factor (Canada) Limited
McAsphalt Engineering Services
McCormick Rankin & Associates Limited
McGeorge & Barry Limited
McGrath Engineering Limited
McInnis Equipment Limited
McKee Brothers Limited
McMaster University
Metal Shapes Incorporated
Meteorological and Environmental Planning Limited
C. E. Mickelson Associates Limited
Micom Canada
Midland Ross (Canada) Limited
Miffrod Metal Products Limited
MilTel Canada Limited
Mobil Chemical Canada Limited
Mobil Oil Canada Limited
Molson's Brewery (Ontario) Limited
Monarch Fine Foods Company Limited
Monroe Auto Equipment Company
Monsanto Canada Limited
Monteith & Sutherland Limited
Moore Corporation Limited
Moore Instrument Company Limited
Morrison & Beatty Limited
Co-ordination and Placement
Employers of Co-operative Engineering,
Applied Science & Geography Students

Motorola Canada Limited
MSA Canada
M & T Chemicals Limited
MTD Products Canada
Municipality of Metro Toronto
Municipal Planning Consultants
Nacan Products Limited
National Research Council
Navtel Limited
NCR Canada Limited
Nels Incorporated
Nestlé (Canada) Limited
Newmarketydro
Newmount Exploration of Canada Limited
Niagara Paint & Chemical Company
Niagara Peninsula Conservation Authority
Noranda Mines Limited
Noranda Research Centre
Norpak Limited
Northern and Central Gas Corporation Limited
Northern Telecom Limited
Northgate Exploration Limited
North Grey Region/Saugeaux Valley Conservation Authority
Novatronics of Canada Limited
Novopharm Limited
Nuodex Canada Limited
Ocean Falls Corporation
O & K Orenstein & Koppel Canada Limited
Oliver Mangione McCalla & Associates Limited
Ontario Cancer Institute
Ontario Crippled Children’s Centre
Ontario Educational Communications Authority
Ontario Geological Survey
Ontario Hydro
Ontario Northland Communications
The Ontario Paper Company Limited
Ontario Provincial Police
Ontario Research Foundation
Ortho Pharmaceutical (Canada) Limited
Oshawa Paving Company Limited
Otis Elevator Company Limited
Pacific Petroleum Limited
Pan Canadian Petroleum Limited
Papeterie Reed Limited
Parke Davis & Company Limited
Payton Associates Limited
Peace River Regional Planning Commission
Perle Systems Limited
Petro MacCallum Limited
Petro-Canada Exploration
Petrofina Canada Limited
Petrosar Limited
Philips Electronics Industries Limited
Pilkington Glass Industries Limited
Pitney Bowes of Canada Limited
Pitts Engineering & Construction Limited
The Planistics Engineering Inc.

Plough (Canada) Limited
Pneuveyor Systems Limited
Polysar Limited
Power Tel Utilities
Pratt & Whitney Aircraft of Canada Limited
Preston Metal & Roofing Products Limited
Preston Sand & Gravel Company Limited
The Price Company Limited
Prince George Pulp & Paper Limited
Procter & Gamble Company of Canada Limited
Procter & Gamble Specialties Limited
Proctor & Redfern Limited
Pro-Eco Limited
Provost Industrial Tankers Limited
Pulp & Paper Research Institute of Canada
Ralston Purina of Canada Limited
Rauscher Plating Limited
Raytheon Canada Limited
Rebco Chemicals Limited
Redpath Sugars Limited
Reed Limited
Regional Municipality of Durham
Regional Municipality of Halldimand Norfolk
Regional Municipality of Halton
Regional Municipality of Hamilton Wentworth
Regional Municipality of Niagara
Regional Municipality of Ottawa-Carleton
Regional Municipality of Peel
Regional Municipality of Waterloo
Regional Municipality of York
Reichhold Limited
Reichhold Chemical Canada Limited
Reid & Associates Limited
Reid Growther & Partners Limited
F. J. Reinders & Associates Limited
Repac Construction & Materials Limited
Richards Wilcox of Canada Limited
Rio Algom Limited
Rio Tinto Canadian Exploration Limited
Roads & Transportation Association of Canada
WM Roberts Electrical & Mechanical Limited
Robin Hood Multifoods Limited
Rockwell International of Canada Limited
David P. Rogers Limited
Rohm & Haas Canada Limited
Romm Construction Company Limited
Rondar Services (CAN) Limited
B. M. Ross & Associates Limited
P S Ross & Partners
Roxton Furniture Limited
Royal Military College of Canada
Rubbermaid (Canada) Limited
Rush Engineering Services Limited
Nicholas Rusz & Associates Limited
Rybka Smith & Ginsler Limited
Sandwell & Company Limited
Sarco Canada Limited
Saskatchewan Power Corporation
Co-ordination and Placement
Employers of Co-operative Engineering, Applied Science & Geography Students

Saskatchewan Telecommunications
Scannex International
S & C Electric Canada Limited
J M Schneider Incorporated
Seaway/Midwest Limited
Secord Manufacturing Limited
Semco Instruments Company Limited
G M Sernas & Associates Limited
Shawinigan Engineering Company Limited
Sheafer-Townsend
Sheldons Engineering Limited
Shell Canada Limited
Sheller-Globe of Canada Limited
Sheridan Nurseries Limited
Sherman Mines
Kenneth Siddall Incorporated
Siltronics Limited
Silverwood Dairies Limited
Simark Controls Limited
A G Simpson Company Limited
Simpsons-Sears Limited
Sinclair & Valentine Company of Canada Limited
Skega Canada Limited
Sommerville Belkin Industries Limited
Sonoco Limited
Sonotek Limited
South Central Postal Facility
Spar Aerospace Limited
Sparton of Canada Limited
Alan Spector & Associates
Sperry-Univac
Spruce Falls Power & Paper Company Limited
Standard Brands Canada Limited
Standard Pressure Pipe Company
St. Anne Nackawic Pulp & Paper Company Limited
Starr & Tarasick
St. Clair College of Applied Arts & Technology
St. Clair Parkway Commission
The Steel Company of Canada Limited
Sterling Varnish Company (Canada) Limited
St. Joseph's Exploration Company Limited
St. Joseph's Hospital
St. Lawrence Cement Company Limited
St. Mary's Cement Limited
Stokes Seeds Limited
Stratford Public Utilities Commission
Sulco Chemical Limited
Sunnybrook Medical Centre
Suncor Incorporated
Switzer Engineering Services Limited
Syncrude Canada Limited
Systemhouse Limited
Systems Approach Limited
Taylor Instrument Limited
J J Taylor & Sons Limited
Taylor Steel Incorporated
TCF of Canada Limited
Technical Coatings Company Limited
Technical Service Laboratories
Tectrol Incorporated
Teklogix Limited
Teledyne Laars Limited
Telesat Canada
Temprite Industries Limited
Temro Automotive Limited
Terra Mining & Exploration
Texaco Canada Limited
Texas Gulf Canada Limited
Texas Gulf Incorporated
Paul Theil Associates Limited
J E Thomas Specialties Limited
Timbergate Engineering Limited
Tonecraft Limited
Toronto Hydro Electric System
The Toronto Iron Works Limited
Toronto Parking Authority
Toronto Plastics Limited
Toronto Transit Commission
Totten Sims Hubicki Associates Limited
Town of East Gwillimbury
Town of Elliot Lake
Town of Grimsby
Town of Markham
Town of Oakville
Town of Pickering
Town of Port Elgin
Town of Whitby
Township of Sarnia
TransCanada Pipelines
Transsem-Transfer Embryo of Canada Limited
Transportation Agency of Saskatchewan
Trench Electric Limited
Tridon Limited
The Trow Group Limited
Truswal Systems Canada Limited
TRW Canada Limited
Umex Corporation Limited
Underwood McLellan & Associates Limited
Union Carbide Canada Limited
Union Drawn Steel Company Limited
Union Gas Company of Canada Limited
Union Miniere Explorations & Mining Corporation Limited
Uniroyal Limited
United Co-operatives of Ontario
United Technology & Science Company Limited
United Tire & Rubber Company Limited
Unitel Limited
University of Toronto
University of Waterloo
University of Western Ontario
Urangesellschaft Canada Limited
Urban Transportation Development Corporation Limited
Utah Mines Limited
Valcom Limited
Co-ordination and Placement
Employers of Co-operative HKLS Students

Varian Canada Limited
Varta Batteries Limited
Versatile Manufacturing Limited
Victaulic Company of Canada Limited
Volker Craig Limited
Vulcan Industrial Packaging Limited
Wabco Limited
Wabush Mines
W G Wahl Limited
B P Walker Associates Limited
Walker Brothers Quarries
Walker Exhausts
Walter Fedy McCargar Hachborn
Warnock Hersey Professional Services Limited
Jervis B Webb Company of Canada Limited
Wescon
Westeel-Rosco Limited
Western Foundry Company Limited
Westinghouse Canada Limited
Weston Research Centre
Westroc Industries Limited
Whiting Equipment Limited
Wilkin Engineering Limited
Wilson Machine Company Limited
R E Winter & Associates Limited
Woodbridge Foam Corporation
Woodstock Public Utilities Commission
W C Wood Company Limited
Worthington (Canada) Limited
Wyllie & Ufnal Limited
XDG Limited
Xerox Research of Canada Limited
X-Ray Assay Laboratories Limited
XYZ Paint Company Limited
York Steel Construction Limited
Yorkville Sound Limited
3M Canada Limited

Organizations Employing Co-operative Human Kinetics and Leisure Study Students

Adolescent Projects
Adult Occupational Centre
Ashbury College
Ausable-Bayfield Conservation Authority
Balmoral Hall
Bethesda Home
Blue Hills Academy
Blue Mountain Resorts Limited
Bluewater Centre for the Developmentally Handicapped
Borough of Etobicoke Board of Education
Borough of Scarborough
Borough of Torfaen
Branchton Camp
Brookside School
Cadillac Fairview Residential Management
Cambrian College of Applied Arts and Technology
Cambridge Club
Camp Kiwanis
Camp Tawingo
Carleton University
Carol Currier Residence
Cecil Facer School
Centralia College of Agricultural Technology
Central Peel Secondary School
Chedoke-McMaster Medical Centre
City of Brampton
City of Brantford
City of Burlington
City of Cambridge
City of Chatham
City of Kanata
City of Nepean
City of Oshawa
City of Ottawa
City of Peterborough
City of St. Catharines
City of Stratford
City of Sudbury
City of Waterloo
Cleveland’s House
Conestoga College of Applied Arts & Technology
Confederation College of Applied Arts & Technology
County of Waterloo Separate School Board
CPRI
Dominion Foundries & Steel Limited
Dorchester Manor
Durham Board of Education
Durham College of Applied Arts & Technology
East York Board of Education
Ecole Secondaire Theriault
Elgin Middlesex Detention Centre
Erindale Secondary School
Etobicoke Olympium
| Family Service Association                      | Queen Street Mental Health Centre |
| Fitness Cambridge                                | Royal Ottawa Hospital |
| Forest Heights Pool                              | Scouts Canada |
| Ganaraska Region Conservation Authority          | The Sheppard Squash Club |
| Gemini Health & Fitness Club                     | Sheridan College of Applied Arts & Technology |
| General & Marine Hospital                        | Simcoe Hall Crippled Children’s Center |
| Gordon Graydon Memorial Secondary School         | Sir James Whitney School |
| Government of Canada                            | Southwestern Regional Centre |
| Indian & Northern Affairs                        | Sprucedale School |
| National Defence                                 | Start Centre |
| Parks Canada                                     | St. Clair College of Applied Arts & Technology |
| Public Service Commission                        | St. Lawrence College of Applied Arts & Technology |
| Government of Ontario                            | St. Lawrence Regional Centre |
| Community & Social Services                      | Sunnybrook Medical Centre |
| Correctional Services                             | Sunnyside Home for the Aged |
| Culture & Recreation                             | Sunset Home for the Aged |
| Health & Welfare                                 | Thames Valley District Health Council |
| Grand River Conservation Authority               | Thunder Bay District Health Council |
| Grandview Lodge                                  | Town of Pelham |
| Halton District Health Council                   | Town of Renfrew |
| Hamilton Psychiatric Hospital                    | Town of Vaughn |
| C. M. Hincks Treatment Centre                   | Trent University |
| Homewood Sanitarium                              | University of Toronto |
| Huronia Regional Centre                          | University of Waterloo |
| Kawartha Lakes School                            | Upper Canada College |
| Kenner Collegiate & Vocational Institute         | Upper Thames River Conservation Authority |
| Kingston Psychiatric Hospital                    | Wellington County Board of Education |
| Kitchener-Waterloo Hospital                      | Wheel Fitness & Racquet Club |
| Lakehead Region Conservation Authority           | Whitby Psychiatric Hospital |
| Lakeshore Psychiatric Hospital                   | Windsor Separate School Board |
| Linhaven Home for the Aged                       | Woodingford Lodge |
| Lynwood Hall Children’s Centre                   | Workmen’s Compensation Board |
| Matador Fitness Centre Limited                   | Yamnuska Centre |
| Mental Health Centre                             | YMCA Belleville |
| Midwestern Regional Centre                       | YMCA Burlington |
| Mississauga Racquets Club                        | YMCA Kitchener |
| Montreal General Hospital                        | YMCA Kitchener-Waterloo |
| Muskoka Centre                                   | YMCA of Metro Toronto |
| North Bay Racquet Club                           | YMCA North York Branch |
| Northern College of Applied Arts & Technology    | YMCA St. Thomas |
| Northwestern Regional Centre                     | YM-YMCA Ottawa |
| North York Board of Education                    | York-Toronto Lung Association |
| Oakville Reception & Assessment Centre           | YWCA Calgary |
| Ontario Association for Mentally Retarded        | YWCA Hamilton |
| Ontario Association for Children with Learning   | YWCA Vancouver |
| Disabilities                                     |
Organizations Employing Co-operative Mathematics Students

Abbey Life Insurance Company of Canada
Abitibi Paper Company Limited
Adam Scott Collegiate & Vocational Institute
Addiction Research Foundation
AES Data Limited
Ainsworth Electric Company Limited
Air Canada
Ajax High School
Albert College
Alcan Smelters and Chemicals Limited
Aldershot High School
The Algoma Steel Corporation Limited
Loftus A. Allen & Company
Allinson-Ross Corporation
Alma College
Alphabetix Limited
Amcan Castings
Amdahl Limited
Applewood Heights Secondary School
Arthur Andersen & Company
Ashbury College
Atlantic Packaging Products Limited
Atlas Steels Company
Atomic Energy of Canada Limited
Aylmer Delmonte Limited
Babcock & Wilcox Canada Limited
Bailey & Rose Limited
Kenneth W. Ball & Company
Balmoral Hall
Bank of Canada
Bank of Montreal
Bank of Nova Scotia
The Bay
Bayridge Secondary School
Beale & Chan
Beaver Lumber Company Limited
Becker Milk Company Limited
Bell Canada
Bell-Northern Research
Birkbeck Thoburn & Kertes
Bishop's College School
B-N Software Research Incorporated
Boots Drug Stores (Canada) Limited
Borough of Etobicoke Board of Education
Borough of North York Board of Education
Bouris Wilson Scott & Proctor
BP Oil Limited
Brunton Browning Day & Partners
Budd Automotive Company of Canada Limited
Burlford District High School
Burnside Petrie & Company
Burrells Business Machines Limited
Cachia & Dockr
The Cadillac Fairview Corporation Limited
Campbell Lawless & Punchard
Campbell Sharp
Campbell Soup Company Limited
Canada Building Materials
Canada Life Assurance Company
Canada Permanent Trust Company
Canada Systems Group
Canada Trust
Canadian Broadcasting Corporation
Canadian Fram Limited
Canadian General Electric Company Limited
Canadian Imperial Bank of Commerce
Canadian Industries Limited
Canadian Pacific
Canadian Tire Corporation Limited
Carleton Board of Education
Carleton University
Carling O'Keefe Limited
CBS Records Canada Limited
CCM
Central Mortgage & Housing Corporation
Central Peel Secondary School
Chrysler Shillington Denomy & Peterson
City National Leasing Limited
City of Sault Ste. Marie
City of Sudbury
City of Thunder Bay
City of Toronto
City TV Channel 79
Clake Henning & Company
Clarke Starke & Diegel
Clarkson Gordon & Company
Classic Bookshops
CN Telecommunications
Coca Cola Limited
Cochrane-Iroquois Falls Board of Education
Cole Rubin Finkelstein & Green
Combined Insurance Company of America
Commercial Union Assurance Group
Commonwealth Holiday Inns of Canada
Computel Systems Limited
Computer Systems Services of Canada Limited
Comshare Limited
Comstat Consulting Services Limited
Confederation Life Insurance Company
Consumers Gas Company
Consumers Glass Company Limited
Continental Group of Canada Limited
Control Data Canada Limited
Cooper Baldwin & Company
Coopers & Lybrand
Cooper Tool Group Limited
The Corporation of the City of Kitchener
John V. Cortino
Cossar Hector Payne & Company
County of Elgin Board of Education
County of Essex Board of Education
County of Grey Board of Education
County of Huron Board of Education
County of Kent Board of Education
Co-ordination and Placement
Employers of Co-operative Math Students

County of Lambton Board of Education
County of Lanark Board of Education
County of Leeds-Greeneville Board of Education
County of Lincoln Board of Education
County of Lincoln Roman Catholic Separate School Board
County of Middlesex Board of Education
County of Oxford Board of Education
County of Peel Board of Education
County of Renfrew Board of Education
County of Simcoe Roman Catholic Separate School Board
County of Waterloo Board of Education
County of York Board of Education
Cox Hyatt & Company
Crawford Wills
Crown Life Insurance Company
Datacrown Limited
Data General (Canada) Limited
Philip M. Decarlo
Deloitte Haskins & Sells
Delta-Benco-Cascade Limited
Denison Mines Limited
Desmarais Arsenault & Company
Digital Equipment of Canada Limited
Dixon Gordon & Company
DMR & Associates
H. R. Doane & Company
Dome Petroleum Limited
Dominion Chain Company
Dominion Foundries & Steel Limited
Dominion Life Assurance Company
Dorland & Dorland
Dow Chemical of Canada Limited
Drake International Systems
Drewry & Company
DRG Limited
Dufferin County Board of Education
D. A. Dunlop & Company
Dunwoody & Company
Dyad Computer Systems Limited
Dynalogic Corporation Limited
Eastview Secondary School
Eaton Yale Limited
ECO Informatique Limitee
Ecole Secondaire Theriault
Elliott & Bohot
The Empire Life Insurance Company
Equitable Life Insurance Company of Canada
Esso Resources Canada Limited
Etobicoke Hydro
The Excelsior Life Insurance Company
Facelle Company Limited
Falconbridge Nickel Mines Limited
Faultless Doerner Company Limited
Fiberglas Canada Limited
Fireman's Fund Insurance Company of Canada
The Footwear & Leather Research Institute of Canada
Ford Keast Giles Smith & Phillips
Foseco Canada Limited
Fox Glicksman & Company
Gagne & Gagnon
Gardner McDonald & Company
Gaviller & Company
Geac Canada Limited
Gellman Hayward & Partners Limited
General Foods Limited
General Motors of Canada Limited
General Publishing Company Limited
Gerling Global Life Insurance Company
Gibbs Nathaniel (Canada) Limited
Global Travel Computer Services
Globe & Mail
Goebelle Wagner MacAdam
Mr. John E. Goodwin FCA
Goodyear Canada Incorporated
Gore Mutual Insurance Company
Government of Canada
Agriculture
Auditor General
Communications
Consumer & Corporate Affairs
Customs & Excise
Energy Mines & Resources
Environment
Industry Trade & Commerce
Insurance
National Defence
National Energy Board
Post Office
Public Service Commission
Regional Economic Expansion
Secretary of State
Statistics
Taxation
Transport
Government of Ontario
Consumer & Commercial Relations
Education
Environment
Government Services
Health
Housing
Natural Resources
Revenue
Transportation & Communication
Treasury & Economics
Graham Setterington
Grand & Toy Limited
Great Canadian Oil Sands Limited
Greenwood Meltz Silverstein & Herlick
Greer Flemming & Rolland
Griffith Laboratories Limited
Guaranty Trust Company of Canada
Guido De Bres High School
Gulf Canada Limited
Co-ordination and Placement
Employers of Co-operative Math Students

Gulf Canada Resources Incorporated
Hamilton Board of Education
Hamilton Wentworth Roman Catholic Separate School Board
Hammond Manufacturing Company Limited
Harbinson Glover & Company
Harlequin Enterprises Limited
Harman Data Service Limited
Harris Media Services Limited
Samuel Harrison & Company
Harris Title & Wasserman
Havergal College
Andrew Hayos & Associates
Heaton & Hassal
Hewlett Packard (Canada) Limited
Hilborn Ellis Grant & Company
Hinman & Company
Home Oil Company Limited
Honeywell Information Systems
Hostess Food Products Limited
Hudson Bay Oil & Gas Limited
Hutchins Mullins & Blair
Hyde Houghton & Company
IBM Canada Limited
ICL Computers Canada Limited
Imperial Oil Limited
Imperial Optical Company Limited
Inco Metals Company
The Independent Order of Foresters
Informetrica Limited
Insurers Advisory Organization of Canada
IST Incorporated
Jarrett Goold & Elliott
anton Jenset & Company
Johnson Cross Yanosik
Joselyn Laughlin Harper Tory
J. S. Redpath
Kaiser Resources Limited
Kaysea Consultants Limited
Keenan and Bell
Kelly McKay Lewis Stefanizzi
Kendall Canada
Kenner Collegiate & Vocational Institute
Kimberly-Clark of Canada Limited
King City Secondary School
Lahey System Design Limited
Lakefield District Secondary School
Lakehead Board of Education
Langhorne & Lynch
Langstaff Secondary School
Laura Secord Candy Shops Limited
Laurentian University
Levitsky Feldman Wexler & Partners
Libby McNeil & Libby of Canada Limited
Eli Lilly & Company (Canada) Limited
Lily Cups Limited
Listowel District Secondary School
Litton Systems (Canada) Limited
London Board of Education
London Concrete Machinery Company
London Life Insurance Company
Loran International Limited
Lord Elgin Secondary School
Lorne Park Secondary School
Lough & Lewis
Loyalist Collegiate & Vocational Institute
Ludwig Engel Canada Limited
Lutheran Life Insurance Society of Canada
MacGillivray & Company
Mack Canada Incorporated
MacKillican & Associates
A. F. MacLaren & Company
MacLean Hunter Limited
Mandlebaum Landau & Rosenberg
Manitoba Forestry Resources Limited
Manufacturers Life Insurance Company
Maritime Telephone & Telegraph Company Limited
Martin Tilley & Company
Massey-Ferguson Limited
Massey-Ferguson Industries Limited
Mayfield Secondary School
McCarney Swinerton Newland
McCay Duff & Company
McCluggage & Smith
McClurkin Schlegel & Partners
McColl Turner & Company
McConnell Advertising
McDonnell Douglas Canada Limited
P. F. McGaw & Associates
McPherson Scott & Company
Mercantile & General Reinsurance Group
William M. Mercer Limited
MFS Limited
Miccom Canada
Millard Rouse & Rosenbrugh
Milton District High School
Miracle Food Mart
M. M. Robinson High School
Mobil Oil Canada Limited
Mohawk College of Applied Arts & Technology
Monroe Auto Equipment Company
Monroe The Calculator Company
Monteith Monteith & Company
Montreal Engineering Company Limited
Mony Life of Canada Limited
Moore Business Forms
Morning Star Drive Secondary School
Motorola Canada Limited
Municipality of Metro Toronto
Murray Rumack Stern & Cohen
The Mutual Life Assurance Company of Canada
Mutual of Omaha Insurance Company
National Cancer Institute of Canada
National Life Assurance Company of Canada
National Research Council
National Trust Company Limited
NCR Canada Limited
Co-ordination and Placement
Employers of Co-operative Math Students

Claude Neon Industries Limited
Nestlé (Canada) Limited
New Brunswick Telephone Company
The New Stonehenge Limited
Niagara South Board of Education
A. C. Nielsen Company of Canada Limited
Nipissing Board of Education
Norcen Energy Resources Limited
Norpak Limited
Nortak Software Limited
North American Life Assurance Company
North Park Collegiate Institute
Northern Telecom
Northumberland & Newcastle Board of Education
North York Board of Education
North York Hydro
Office of the Provincial Auditor
Ontario Educational Communications Authority
Ontario Hydro
Ontario Institute for Studies in Education
Ontario Research Foundation
Onward Manufacturing Company Limited
Orangeville District Secondary School
Ortho Pharmaceutical (Canada) Limited
Oshawa Group Limited
Pan Canadian Petroleum Limited
Pauline Johnson College & Vocational School
Peat Marwick Mitchell & Co.
Peat Marwick & Partners
Peterborough Collegiate Institute & Vocational School
Peters Brown & Company
Petrosar Limited
Philips Electronics Industries Limited
Pickering College
Pilkington Brothers (Canada) Limited
Pilkington Glass Industries Limited
Polycom Systems Limited
Polysar Limited
Pope Starret & Company
Prescott & Russell County Board of Education
Price Waterhouse & Company
Prior Data Sciences Limited
Procter & Gamble Company of Canada Limited
Professional Financial Management Services Limited
Promac Controls Incorporated
Province of Ontario
Prudascio Data Services
Prudential Assurance Company Limited
Quasar Systems Limited
Reed Limited Pulp & Paper Group
Regional Municipality of Sudbury
Reichold Limited
Reid & Bradley
Rio Algom Limited
Robinson Lott & Brohman
Roland Michener Secondary School
Rosenberg Fine Goodfield & Sacks
Leonard R. Rosenberg
Ross Pope & Company
P. S. Ross & Partners
Royal Bank of Canada
Royal Insurance Company Limited
Royal Military College of Canada
Royal Trust
Ruddy Electric Wholesale Company Limited
Ryerson Polytechnical Institute
Saddington and Greenfield
Samson Belair & Partners
Sault Ste. Marie Board of Education
Savage Shoes Limited
Scarborough Board of Education
Scarborough Public Utilities Commission
J. M. Schneider Incorporated
SDI Associates Limited
Seaway/Midwest Limited
Secker Ross
Selby Mudgett Boler & Haar
Senator O'Connor College School
I. P. Sharp Associates Limited
Shawinigan Engineering Company Limited
Shell Canada Limited
Sheller-Globe of Canada Limited
Sheridan College of Applied Arts & Technology
Sherritt Gordon Mines Limited
Simpsons-Sears Limited
Smith Klymas Selk & Company
Smith Nixon & Company
A. H. Soufrine & Company
Sperry Univac Computer Systems
Springer Chapman & Company
Spruce Falls Power & Paper Company Limited
Standard Brands Canada Limited
Stanstead College
The Steel Company of Canada Limited
Stern Lass & Shoom
Stille & Sutton
Streetsville Secondary School
Sudbury Hydro
Sunbeam Corporation Limited
Suncor Incorporated
Systemhouse Limited
Systems Approach Limited
Systems Dimensions Limited
Systems Technology Services Limited
T. A. Associates
Tax Time Services
Teleglobe Canada
Telesat Canada
Texasco Canada Incorporated
Texasgulf Canada Limited
Thorne Riddell & Company
Thornlea Secondary School
Timiskaming Board of Education
Timmins Board of Education
Timmins High & Vocational School
TMS Management Services Limited
Toronto Dominion Bank
Toronto Hydro Electric Systems
Toronto Mutual Life Insurance Company
Toronto Transit Commission
 Touche Ross & Company
TransCanada Pipelines
Travelers of Canada
TRW Data Systems
B. J. Turner Incorporated
Twin Lakes Secondary School
United Co-operatives of Ontario
United Directory
United Dominions Corporation (Canada) Ltd.
University of Alaska
University of Ottawa
University of Toronto
University of Waterloo
The Upjohn Company of Canada
T. M. Vari & Associates Limited
Versa Management Systems Limited
Hiram Walker & Sons Limited
G. H. Ward & Partners
Warner-Lambert Canada Limited
Warner-Lambert Research Institute of Canada
Geo A. Welch & Company
Wellington County Board of Education
Welsh & Galloway
Westeel-Rosco Limited
Western Foundry Company Limited
Wilfrid Laurier University
Wilkinson & Company
C. W. Williams CA
Winspear Higgins Stevenson & Company
Woodbridge Foam Corporation
Wood Brown & Associates
Woods Gordon & Company
Workmen's Compensation Board
Xerox of Canada Limited
York Borough Board of Education
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York University
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R. Pinnell, BSc, MSc (Toronto), MLS (W. Ont.)
The University Library

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

The Dana Porter Arts Library, situated in the centre of the campus and rising to a height of ten stories, is the focal point of the University. The lower floors house the main reader services departments and support services. Reader services located on the first floor include a large reserve reading room with seating for 160 readers, a rare book room, a listening room with facilities for both phonodiscs and audio cassettes and eight typing cubicles. Upon entering the Library on the second floor the public catalogue, the circulation counter and the Information Desk are all immediately visible and close at hand. Also on the main floor is the current periodical reading room, the Inter-Library Loan Office and the reference collection. The periodical and newspaper collections and microforms are located on the third floor. Government publications are located on the fifth floor. The upper floors (six through ten) house the circulating book collection and contain seating accommodation for more than 700 library users.

The Arts Library collection numbers over 1,200,000 items including books, pamphlets, theses, microforms, documents, reports, sound recordings and other material. The Library subscribes to over 5,000 periodicals and 60 newspapers, both important elements of the collection.

The Engineering, Mathematics and Science Library occupies the fourth floor of the Mathematics and Computer Science Building. The three principal reader services - the catalogue, the circulation counter and the Information Desk are visible from the entrance to the Library. Seating is provided for 570 readers.

The E.M.S. Library collection numbers over 230,000 items including books, microforms, government publications, technical reports and maps. The Library subscribes to over 4,000 current periodicals.

The University Map Library is housed on the main floor of the Environmental Studies Building. It is the principal University centre for the provision of service relating to cartographic material. The collection consists of 47,000 maps, 725 atlases and 14,000, aerial photographs. Like the Arts and EMS Libraries, its resources are available to all members of the University.

The Architecture and Optometry Buildings house the two official Reading Rooms. They contain the bulk of the Library's collection in their respective fields.

The Federated or Affiliated colleges (St. Jerome's, Conrad Grebel, St. Paul's and Renison) have their own libraries which are accessible to University of Waterloo students and faculty. Conrad Grebel College Library has approximately 8,000 items, which include a special collection on Peace Studies. It is also the home of a Mennonite Archive which consists of church records and documents of the Mennonites of the Ontario community. St. Jerome's College Library has a collection of about 25,000 volumes. St. Paul's College Library has about 3,000 books specializing in the area of Religious Studies.

The University of Waterloo Library and Wilfrid Laurier University Library have a reciprocal borrowing agreement which allows students, faculty and staff of either Library to borrow monographs from both Libraries. WLU's collection is particularly strong in the field of Christian religion, business and social work. Material to support undergraduate programmes are available in both University Libraries.

The staff of the University Library is engaged in obtaining material, in processing it for the collections, and in providing access to the collections. During the day and evening, reference and circulation staff are on duty to assist in the use of collections, facilities and services. The library building remains open after reference and circulation services close.

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

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

A Fine Arts project
The Faculty of Arts

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

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

Admission

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

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

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

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

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

Arts Programmes

1) General Programmes

a) With a Major
A General Bachelor of Arts (BA) degree is offered by the University in the following disciplines:

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

There are no minors or double majors in General Programmes.

Year 1
Students in Year 1 normally choose 5 term courses in both the fall and winter terms (or a combination of the year and term courses equivalent to 5 term courses per term). The usual pattern of courses is 2 from Group A and 2 from Group B (see Degree Requirements), with 1 or 2 more as electives. Students are advised that a 6 course work load is quite heavy. At the end of Year 1, students who wish to major choose one of the disciplines listed above as their major field of study.

Note
A year course is one which extends for one full academic year (September through April) and carries a minimum of one credit. A term course lasts only one academic term (fall, winter, or spring) and carries a minimum of one half credit. Two term courses are the equivalent of a year course.

b) Non-Major
Students with interests in a variety of disciplines may choose an individualized programme rather than major in a single discipline. Any normal first-year Arts programme will satisfy the needs of a student contemplating a General Arts (non-major) Programme. The programme of non-major General Arts students must be arranged through the Arts Faculty Undergraduate Office.
2) Honours Programmes

a) Regular Programmes
An Honours Bachelor of Arts degree is offered by the University in the following disciplines:

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

Almost any 2 of the programmes may be combined or 1 of them may be combined with a number of programmes offered in other faculties for a Joint Honours degree. Joint Honours Programmes may also be arranged by consultation between the student and the departments concerned. Descriptions of the single Honours Programmes and each discipline's requirements for Joint Honours Programmes can be found in the section entitled "Departmental Programmes" beginning on p. 93.

Note 1
In Year 1 a student must normally complete the introductory course in the discipline in which the student will specialize in later years.

Note 2
Ontario Teacher's Certificate
Admission to the programme leading to an Ontario Teacher's Certificate at an Ontario Faculty of Education requires an acceptable university degree (3 or 4 years, general or honours, BA or BSc or equivalent). Specialization in certain subject areas is attained by completing the requirements for an Honour Specialist Qualification (HSQ). The HSQ requires an Honours Bachelor's degree or equivalent and appropriate course background: for one specialty the minimum is nine year course equivalents, for two specialties a total fourteen year course equivalents is required with no less than six in each subject area. In all cases, a B average is required to progress to the HSQ. The Honour Specialist Qualification is required to teach in a publicly supported high school.

b) Co-operative Programmes
A Co-operative Programme is an Honours Programme that allows the student to integrate work experience with his academic programme. (For a detailed description of the co-operative plan, see Chapter 5.) Beginning at the end of Year 1 the co-op student alternates 4 month terms on campus for academic studies with 4 months off campus for practical training in business, industry, or government.

The following co-operative programmes are now offered:

- Applied Studies Co-op (See Note 1)
- Co-op Honours Anthropology
- Co-op Honours Applied Economics
- Co-op Honours Economics with Management Accounting Option
- Co-op Honours Economics with Chartered Accountancy Option
- Co-op Honours English
- Co-op Honours Political Science
- Co-op Honours Political Science Administrative Studies Option
- Co-op Honours Psychology
- Co-op Honours Sociology

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

Note 1
The Applied Studies Co-operative Programme combines an Honours Programme in Arts with Applied Studies courses. The Applied Studies courses are intended to provide the student with a basic and practical general education and with skills appropriate to a wide range of careers. With the approval of the department any Honours Programme in Arts at the University may be combined with the Applied Studies courses for this co-operative programme. See the section entitled "Departmental Programmes" for details.

3) Minor Programmes
Students enrolled in Honours Programmes in Arts or other faculties may elect a minor in an Arts discipline. A minor programme in Arts requires the successful completion of 10 term course equivalents in the minor discipline with an overall cumulative average of 65% in those courses. Students should consult with departmental undergraduate advisors for details of more specific requirements.

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

Students in an interdisciplinary programme (either major or minor) may not use the same course to meet the minimum requirements of both the major and the minor.
4) Canadian Studies Option
Students in many Honours and General Programmes within Arts may choose an option in Canadian Studies which is designated on the diploma. The programmes with this option are:

- Anthropology
- Economics
- English
- French
- Geography
- History
- Political Science
- Sociology

For detailed information refer to “Canadian Studies” in the section entitled “Departmental Programmes”, and the Canadian Studies section in Chapter 14 of the Calendar.

5) Peace and Conflict Studies Option
Students in all general programmes within Arts and in Honours programmes within participating departments may choose a concentration in Peace and Conflict Studies. The participating departments include:

- History
- Philosophy
- Political Science
- Psychology
- Religious Studies
- Social Development
- Sociology

In addition, Honours students in any faculty may choose a minor in Peace and Conflict Studies.

For detailed information refer to “Peace and Conflict Studies” in the section entitled “Departmental Programmes”, and the Peace and Conflict Studies section in Chapter 14 of the Calendar.

6) Studies in Personality and Religion
This programme is an inter-disciplinary study option which may be chosen by a student in conjunction with a major in some other department, and have it designated on the diploma. The participating departments are:

- Philosophy
- Psychology
- Religious Studies
- Sociology

For detailed information, refer to SIPAR in the Departmental Programmes and Course Descriptions sections of the Calendar.

7) Selection of Year 1 Programmes
All Year 1 students are officially classified as being in the General Arts Programme or in the Arts Co-op Programme. Students may not select a specific major or an Honours programme until Year 2. 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
From time to time, due to space limitations, students admitted to the University or otherwise in good standing, cannot be granted 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
Students interested in Social Development Studies should consult the Undergraduate Officer at Renison College before selecting a Year 1 programme.

8) 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 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.
AtiS
Degree Requirements

e) A course that has not be 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 pose special problems in catching up with the work already covered.

Degree Requirements

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

Students in the General Programme with a major must complete a minimum of 30 term courses or their equivalent with a passing mark in each and an overall cumulative average of at least 60% and a cumulative average in their major of 65%. They must successfully complete either

i) a minimum of 16 term courses or their equivalent beyond the 100 level or
ii) courses from no more than 7 disciplines. The Faculty of Arts Group A and B requirements (see below) must also be met.

Students in the General Programme may graduate as non-majors upon completion of a minimum of 30 term courses or their equivalent with a passing mark in each including:

i) a minimum of 15 term courses or their equivalent beyond the 100 level,
ii) a minimum of 15 term courses or their equivalent in the Faculty of Arts,
iii) the Faculty of Arts Group A and B requirements for non-majors (see below). A cumulative average of 65% is required for graduation.

Students in an Honours Programme must complete 40 to 48 term courses or their equivalent (as specified in a Departmental Honours Programme), with a passing mark in each and an overall cumulative average in the honours discipline of 75%. The Faculty of Arts Group A and B requirements (see below) must also be met. Students are asked to refer to “Departmental Programmes” for other departmental requirements.

It is the student's responsibility to ascertain that all requirements for graduation have been met. Any exceptions in graduation requirements requested by a student must be approved in writing by the Examinations and Standing Committee of the Arts Faculty.

1) English Language Proficiency Programme

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

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

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

Note

When students who are completing all their Arts degree requirements through Correspondence courses or at off-campus centres have reached the halfway point toward the General BA degree – that is, when they have finished 16 of their 30 term courses or equivalent – they will be required to sit the English Language Proficiency Examination during a normally scheduled examination time at a convenient location.

2) Group A and B Requirements

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

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

In order to complete the Group A and B requirements an Arts student in either a Major or an
Honours Programme must complete with passing marks a minimum of 6 term course equivalents from Group A and a minimum of 4 term course equivalents from Group B, no more than 2 of which may be in the same discipline. The student should note that Group A is further sub-divided into Group A(i), Group A(ii), and Group A(iii). Of the 6 term courses from Group A, the student must complete with passing marks:
- a minimum of 2 term course equivalents from Group A(i)
- a minimum of 2 term course equivalents from Group A(ii)

An Arts student in a Non-Major Programme must complete with passing marks a minimum of 4 term course equivalents, from Group A, no more than 2 of which may be in the same discipline, and a minimum of 4 term course equivalents from Group B, no more than 2 of which may be in the same discipline.

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

<table>
<thead>
<tr>
<th>Letter 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>B+</td>
<td>78</td>
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<tr>
<td>B</td>
<td>75</td>
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<tr>
<td>C+</td>
<td>68</td>
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<tr>
<td>C</td>
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<td>D+</td>
<td>58</td>
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<td>C-</td>
<td>62</td>
</tr>
<tr>
<td>D-</td>
<td>52</td>
</tr>
<tr>
<td>F-</td>
<td>32</td>
</tr>
</tbody>
</table>

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

Note
When a course is repeated, the two marks are not averaged together. Rather, both marks are entered with all other marks in calculating the student’s cumulative overall average. A passed course may be repeated once with the approval of the department concerned.
b) Students may request that their performance in any given Arts course be marked as either Credit (C) 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 6 term course equivalents with a grade of Credit (C) in courses outside their major. Students in Honours Programmes may present up to 8 term course equivalents with a grade of Credit (C) 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.

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 both General and Honours Arts programmes normally register for 5 or 6 term courses each academic term. Full-time students in General Arts programmes may register for more than 6 term courses per academic term only with the consent of the Examinations and Standings Committee. Full-time students in Honours Arts programmes may not enrol in more than one term course per academic term in excess of the number specified for their programme (see Departmental Honours Programmes) except with the permission of the Examinations and Standings Committee.

4) Part-time Studies
Students may pursue degree studies part time (in both General and Honours Programmes) 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.

5) Standing
a) To be considered in good standing in a General programme, a student must maintain a cumulative overall average of at least 60%, as well as an average of at least 65% in all courses taken in the Major discipline. If a student's overall average falls between 56 and 60%, or the major or non-major average below 65%, the student may be granted conditional status for one year. During this period the student must make reasonable progress toward obtaining good standing or the student will be required to withdraw from the Faculty of Arts.

b) To be considered in good standing in an Honours programme, a student must maintain a cumulative overall average of at least 60%, as well as an average of at least 75% in all courses taken in the Honours discipline (unless the department specifies a higher average). A student in a Joint Honours programme must maintain a cumulative average of 75% in all courses taken in the two Honours disciplines (unless the departments specify higher averages).

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

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 Examinations and Standings Committee considers that the student will not profit by further study.

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

e) Students may withdraw before the final day of classes without penalty to their records; however, students who withdraw to avoid a number of failures will likely be ineligible for re-admission for at least two terms.
6) 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 the 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. The decision of the review committee and the reasons for the decision should be communicated in writing to the appellant. It is understood that the decision reached by the review committee on the substantive academic issues raised by the appeal is final and subject to change only under the following terms:

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

The Committee shall review the petition and transmit it with relevant documentation to the Arts Faculty Appeals Committee which shall comprise the Associate Dean (Undergraduate Affairs), a senior Professor appointed by the Arts Faculty Council Executive Committee, and a third or fourth year honours student designated by the Arts 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.
Departmental Programmes

Anthropology

General BA in Anthropology
The student must pass ten term courses or equivalent in Anthropology. Eight of these Anthropology courses must be in 200-level courses or above. One term course 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 may fill the linguistics portion of this last requirement.

Honours Anthropology
The student must pass 20 term courses or equivalent in Anthropology. Eighteen of these Anthropology term courses must be in 200-level courses or above. Two term courses 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 may be used to fill all or part of this linguistics requirement. The honour student's programme must also include two term courses in anthropological theory (400-level theory-oriented courses). The Anthropology honours student needs 40 term courses or equivalent to graduate.

Minor in Anthropology
An honours student may minor in Anthropology. The requirements for an Anthropology minor are identical to the requirements for a General BA in Anthropology.

Anthropology Joint Honours Programme
The recommended programme for Joint Honours includes fourteen term courses in Anthropology. Twelve term courses in Anthropology must be at the 200-level or above, one term course 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 may serve to meet the linguistics portion of this requirement. In the Joint Honours programme, students must also include two term courses or equivalent in anthropological theory (400-level theory-oriented course). The student should consult the recommended programmes of other departments to determine their requirements. The Joint Honours student completes forty-four term courses or equivalent before graduation.

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

Honours Anthropology (Co-operative) Programme
Co-op Anthropology students will pursue a normal first year Arts programme with two of the ten term courses being in Anthropology. In second year the student will be required to take three of the following courses, or an approved substitute:
- Anth 202 – Social Organization
- Anth 103 – The Nature of Language or Anth 204 – Language Learning
- Anth 260 – Human Evolution
- One term course in Archaeology.

The student in second year must also take one of the following courses or an approved substitute:
- Anth 333 – Canadian Communities and Planned Change
- Anth 370 – Ethnographic Field Methods
- Anth 372 – Archaeological Techniques
- Anth 373 – Archaeological Reporting
- Anth 388 – Applied Anthropology

In addition the student will take two term course Anthropology electives and four term courses or equivalent as "free" electives. After second year the student is free to follow his or her own interests while fulfilling the departmental degree requirements.

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

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

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

Note 3
Students planning a Joint Honours Programme are advised to consult the undergraduate officers of both departments before formulating their programme of study.
Applied Studies Co-op

A student in the Applied Studies Co-op Programme must maintain good standing in an Honours Programme in Arts and must complete 16 term course equivalents in the area designated Applied Studies. These courses are intended to provide the student with a basic and practical general education and with the skills appropriate to a wide range of careers. Specifically, they are intended to ensure that students in the programme are

a) capable of clear and precise oral and written communication in English;
b) familiar with the history and political institutions of Canada;
c) familiar with the economic structure and economic institutions of Canada;
d) aware of the impact of science and technology on Canadian society, with a particular awareness of the role of computers and data processing.

Following Year 1, six work terms alternate in regular sequence with six study terms. During each study term, students attend a special seminar designed to integrate their academic Honours Programme with their career interests and with the requirements of their employers.

Recommended Programme

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<th>Year 1A</th>
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<tr>
<td>A second language</td>
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<tr>
<td>English 109 or equivalent</td>
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</tr>
<tr>
<td>Philosophy 145 or equivalent</td>
<td></td>
</tr>
<tr>
<td>Proposed Major Subject and Electives</td>
<td>(3 term courses)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 1B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A second language</td>
<td></td>
</tr>
<tr>
<td>Arts 198 or equivalent</td>
<td></td>
</tr>
<tr>
<td>Economics 193</td>
<td></td>
</tr>
<tr>
<td>Systems Design 161 or equivalent</td>
<td></td>
</tr>
<tr>
<td>Proposed Major Subject and Electives</td>
<td>(2 term courses)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2A</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Canadian history or politics</td>
<td></td>
</tr>
<tr>
<td>English 210 or equivalent</td>
<td></td>
</tr>
<tr>
<td>Major Subject and Electives</td>
<td>(3 term courses)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Canadian history or politics</td>
<td></td>
</tr>
<tr>
<td>Economics 194</td>
<td></td>
</tr>
<tr>
<td>Science and technology</td>
<td></td>
</tr>
<tr>
<td>Major Subject and Electives</td>
<td>(3 term courses)</td>
</tr>
</tbody>
</table>

Note 1
Students must maintain an average of at least 75% both in the major field of specialization and in the Applied Studies courses.

Note 2
Upon successful completion of the 44 term courses required in this programme and a minimum of 4 successful work terms a student is granted an Honours degree in the major discipline with an Applied Studies Co-operative Programme designation.

Classical Studies
(Latin, Greek, Classical Studies, Classical Civilization)

General Programmes
Students choosing a three year General programme in Latin must complete five year course equivalents in Latin (normally not more than one of the five may be a year course equivalent in Classical Civilization). Students choosing a three year General programme in Greek must complete five year course equivalents in Greek (normally not more than one of the five may be a year course equivalent in Classical Civilization). Students choosing a three year General programme in Classical Civilization must complete five year course equivalents in Classical Civilization (normally not more than one of the five may be a year course equivalent in Latin or Greek).
Arts
Departmental Programmes
Classical Studies

Students choosing a four year General programme in Classical Civilization must complete seven year course equivalents in Classical Civilization (normally not more than two of the seven year course equivalents may be Latin or Greek courses).

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

Honours Programmes

Honours Classical Studies
Recommended Programme

<table>
<thead>
<tr>
<th>Year 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greek 100, or Latin 100, or Latin 151/152</td>
</tr>
<tr>
<td>C Civ 101/102</td>
</tr>
<tr>
<td>Three additional year course equivalents</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latin 151/152, or one year course equivalent in Latin at the 200 level, or one year course equivalent in Greek at the 200 level</td>
</tr>
<tr>
<td>C Civ 251/252, 265/266</td>
</tr>
<tr>
<td>Two additional year course equivalents</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>One year course equivalent in Greek or Latin at senior level</td>
</tr>
<tr>
<td>C Civ 271/272, 351/352</td>
</tr>
<tr>
<td>Two additional year course equivalents</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two year course equivalents in Classical Civilization</td>
</tr>
<tr>
<td>Three additional year course equivalents</td>
</tr>
</tbody>
</table>

Note 1
In the single honours programme in Classical Studies, three year course equivalents out of ten must be either Greek or Latin or both. Before graduation 20 year course equivalents must be completed.

Note 2
Students are advised that History 341/342 is acceptable as a Classical Civilization credit.

Joint Honours Classical Studies
Recommended Programme

<table>
<thead>
<tr>
<th>Year 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greek 100 or Latin 100, or Latin 151/152</td>
</tr>
<tr>
<td>C Civ 101/102</td>
</tr>
<tr>
<td>Three additional year course equivalents</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latin 151/152, or one year course equivalent in Latin at the 200 level, or one year course equivalent in Greek at the 200 level</td>
</tr>
<tr>
<td>C Civ 251/252, 265/266</td>
</tr>
<tr>
<td>Three additional year course equivalents</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>C Civ 271/272, 351/352</td>
</tr>
<tr>
<td>Three additional year course equivalents</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>One year course equivalent in Classical Civilization</td>
</tr>
<tr>
<td>Five additional year course equivalents</td>
</tr>
</tbody>
</table>

Note 1
In the joint honours programme in Classical Studies, two year course equivalents out of eight must be either Greek or Latin or both. Before graduation 22 year course equivalents must be completed.

Note 2
Students are advised that History 341/342 is acceptable as a Classical Civilization credit.

Honours Latin
Recommended Programme

<table>
<thead>
<tr>
<th>Year 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latin 100 or 151/152</td>
</tr>
<tr>
<td>Four additional year course equivalents</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two year course equivalents in Latin</td>
</tr>
<tr>
<td>One year course equivalent in Classical Civilization</td>
</tr>
<tr>
<td>Two additional year course equivalents</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two year course equivalents in Latin</td>
</tr>
<tr>
<td>One year course equivalent in Classical Civilization</td>
</tr>
<tr>
<td>Two additional year course equivalents</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two year course equivalents in Latin</td>
</tr>
<tr>
<td>One year course equivalent in Classical Civilization</td>
</tr>
<tr>
<td>Two additional year course equivalents</td>
</tr>
</tbody>
</table>
Note

Normally not more than three year course equivalents in Classical Civilization are permitted to complete the total of ten year course equivalents required for Honours Latin. Before graduation 20 year course equivalents must be completed; it is strongly recommended that students complete Latin 251/352 before graduation.

Joint Honours Latin

Students choosing a Joint Honours Programme involving Latin must complete eight year course equivalents in Latin (normally not more than two year course equivalents in Classical Civilization are permitted to complete the total of eight year course equivalents required for Joint Honours Latin). Before graduation 22 year course equivalents must be completed; it is strongly recommended that students complete Latin 251/352 before graduation.

Minor Programmes

Minor programmes are offered in Classical Civilization, Greek and Latin. Students interested in planning a sequence of five year course equivalents to complement their major field of study are encouraged to consult the Undergraduate Advisor in Classical Studies. All minor programmes must be approved by the Department.

Drama and Theatre Arts Group

Sequence of Study

In the first term all students must take Drama 101A and in the second term students must take Drama 101B and Drama 102.

The Honours programme is designed so that a student could work through a particular sequence of courses in one field (acting, academic, technical) which would in effect become an area of specialization. The Drama 499 project in the fourth year would then presumably be centred on this specialization. Students planning to major in Drama and Theatre Arts should confer with the Undergraduate Advisor before registering.

Drama and Theatre Arts Group General Programme

1) A total of thirty term course equivalents, including Faculty of Arts Groups A, B, and C courses required with an overall cumulative average of at least C- and a cumulative major average of C.

2) At least twelve term course equivalents must be in Drama and Theatre Arts.

3) Drama 101A and 101B are the required pre-requisites for most Drama and Theatre Arts courses.

4) In addition students must satisfy the following requirements:
   a) Drama 102
   b) Drama 243
   c) Three of Drama 251, 252, 253, 254, 255, 351, English 362, 363, 190 (See Note).
   d) Drama 371 or Drama 372
   e) Drama 409
   f) Any three other Drama courses or other approved courses in related departments.

Note

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

Honours Drama and Theatre Arts

1) A total of forty term course equivalents including Faculty of Arts Groups A, B, and C requirements with an overall cumulative average of at least C- and a cumulative major average of at least B.

2) At least twenty term course equivalents must be in Drama and Theatre Arts.

3) Drama 101A and 101B are the required pre-requisites for most Drama and Theatre Arts courses.

4) In addition students must satisfy the following requirements:
   a) Drama 102
   b) Drama 243
   d) Drama 371 and Drama 372
   e) Six of Drama 251, 252, 253, 254, 255, English 362, 363.
   f) Drama 409
   g) Drama 499 (See Note 3).
   h) Any three other Drama courses or other approved courses in related departments.

Note 1

See Faculty of Arts requirements for other required classes.

Note 2

The Honours BA programme in Drama will enable the student to proceed towards the Ontario College of Education Type A Certificate provided at least four term course equivalents in another teaching subject are acquired (see current calendar requirements).

Note 3

For a description of Drama 499 see Course Descriptions.


**Joint Honours Programmes, Drama and Theatre Arts**

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

**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.

**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 Drama classes. If the other department does not have a Senior Seminar requirement then the student may elect to take Drama 499 or two other Drama classes. For a description of Drama 499, see Course Descriptions.

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

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**Economics**

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

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

Students in Year 1 are required to notify the department of their intention to go into either of the Chartered Accountancy or Management Accounting Options by December 15 of the 1A term. However, those for the Applied Economics Option must notify their intention by March 15.

**Advanced Standing Examinations**
Early in the fall term the Department of Economics administers a test in Economics 101/102 for students who have completed Economics in Grade 13 and also Economics 191/192 for students who have completed Accounting in Grade 13. Any student who scores at least 70 per cent in either of these tests will be exempted, without any credit accumulated, from Economics 101/102 and/or Economics 191/192 respectively and may register for Economics 201/202 and/or Economics 291/292.

**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 or 100a/100b, 201, 202, 231 plus either 211 or 221 and at least four term courses in Economics at the 300 level or above.

**Honours Programmes**

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

**Honours Economics (Regular, Non Co-op)**
Forty term course equivalents are required for the degree. Of these, a minimum of eighteen term course equivalents must be in Economics. The required Economics courses are Economics 101/102, or 100a/100b, 201, 202, 211, 221, 231, 301, 302, 401, 402. In addition students must select one of Economics 191, 241, 263 or 281, and an additional term course in Economics from courses numbered above 300.
Recommended Programme

Year 1
Economics 101/102 or 100a/100b
The equivalent of eight additional term courses*

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

Year 2
Economics 201, 202, 231
The equivalent of three additional term courses in Economics
The equivalent of four term courses.

Year 3
Economics 301, 302
The equivalent of four additional term courses in Economics.
The equivalent of four additional term courses.

Year 4
Economics 401, 402
The equivalent of two additional term courses in Economics.
The equivalent of six additional term courses.

Honours Programmes with Special Options

Honours Economics with Applied Economics Option (Co-op)
Forty-four term course equivalents are required. The required Economics courses are:
Economics 101/102 or 100a/100b, 191/192 or 281/282, 201, 202, 221, 231, 241, 263, 301, 302, 303, 321, 401, 402, 421, 422. In addition students are required to do two additional term courses numbered above 300.

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

Recommended Programme

Year 1
Economics 101/102, 191/192 or 281/282
Computer Science 112, 115
English 109 or 150
Math 120A
The equivalent of two additional term courses.

Year 2A
Economics 201, 221, 231
Math 124b
The equivalent of two additional term courses.

Year 2B
Economics 202, 241
The equivalent of four additional term courses.

Year 3A
Economics 263, 302, 321
Statistics 300
The equivalent of two additional term courses.

Year 3B
Economics 301, 303, 421
The equivalent of three additional term courses.

Year 4A
Economics 401, 422
The equivalent of three additional term courses.

Year 4B
Economics 402, 403
The equivalent of three additional term courses.

Honours Economics with Chartered Accountancy Option (Non Co-op and Co-op)
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. Forty-four term course equivalents 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 are required to take one additional term course in Economics at the 300 level.
AtiS
Departmental Programmes
Economics

Recommended Programme

Year 1
Economics 101/102, 191/192, 193/194
Computer Science 112, 115
English 109
The equivalent of two additional term courses.

Year 2A
Economics 201, 221, 231, 291, 294
The equivalent of one additional term course.

Year 2B
Economics 202, 211, 292, 293
The equivalent of two additional term courses.

Year 3A
Economics 301, 301
The equivalent of four additional term courses.

Year 3B
Economics 302, 392, 341
The equivalent of three additional term courses.

Year 4A
Economics 393, 491, 493
The equivalent of three additional term courses.

Year 4B
Economics 394, 492
The equivalent of four additional term courses.

Honours Economics Management Accounting Option (Non Co-op and Co-op)
Students specializing in management 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.

Forty-four term-course equivalents are required for the degree.

The following are the required courses in Economics and Accounting:

Analytical Economics: Economics 101, 102, 201, 202, 211, 221, 231, 301, 302, plus two term courses numbered above 300.

Principles of Accounting and Management:
Economics 191, 192, 291, 292, 293, 294, 391, 392, 393, 394, 491, 492, 493.
In addition students will be required to take Management Science 44.

Recommended Programme

Year 1
Economics 101/102, 191/192
Computer Science 112, 115
English 109
The equivalent of five additional term courses.

Year 2A
Economics 201, 221, 231, 291, 294
The equivalent of one additional term course.

Year 2B
Economics 202, 211, 292, 293
The equivalent of two additional term courses.

Year 3A
Economics 301, 391
The equivalent of three term courses.

Year 3B
Economics 302, 392
Management Sciences 44
The equivalent of three additional term courses.

Year 4A
Economics 393, 491, 493
The equivalent of three additional term courses.

Year 4B
Economics 394, 492
The equivalent of four additional term courses.

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

In addition, students must meet the requirements of the other department, as well as the Faculty of Arts Groups A and B requirements. Selection of courses will be made with the assistance of the appropriate undergraduate officers. For Joint-Honours Programmes, 44 term course equivalents are required.

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

Note 1
Economics and Geography
The degree requirements of the Faculty of Arts must be met for the BA Degree and those of the Faculty of Environmental Studies for the BES Degree. Students must take Economics 221 or Environmental Studies 271 and the above core courses.
Note 2
Students are advised to consult the undergraduate officer of both Departments before formulating their 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.

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

English

General Programme
To fulfil the requirements for a General degree in English, a student must gain a total of 15 year courses or equivalent, of which at least 6 must be English Major credits, as follows:

1) 101 or 102 (or equivalent) (See Note 1)
2) 251 (Practice and Theory of Criticism) (See Note 2)
3) one year course equivalent from 310, 350, 362, 363 (Major Figures)
4) one year course equivalent from 305, 373, 375 (Language and Early Literature)
5) one year course equivalent from 330, 410, 430, 451 (Periods of British Literature)
6) one year course equivalent from 201, 202, 203, 204, 211, 212, 230, 231, 232, 233 (Genres and Themes)
7) one year course equivalent from 313, 314, 315, 316, 415, 343, 344, 345, 346, 347 (North American Literature)
8), 9) and 10) three other English Major year course equivalents (See Notes 3, 4, and 5)

Honours Programme; Regular
An English Honours student must earn a minimum of 20 year course equivalents before graduation, and these must include at least 10 English Major year course equivalents. These 10 year course equivalents, usually divided 1:3:3:3 among the four years, are as follows:

1) 101 or 102 (or equivalent) (See Note 1)
2) 251 (Practice and Theory of Criticism) (See Note 2)
3) one year course equivalent from 310, 350, 362, 363 (Major Figures)
4) one year course equivalent from 305, 373, 375 (Language and Early Literature)
5) one year course equivalent from 330, 410, 430, 451 (Periods of British Literature)
6) one year course equivalent from 201, 202, 203, 204, 211, 212, 230, 231, 232, 233 (Genres and Themes)
7) one year course equivalent from 313, 314, 315, 316, 415, 343, 344, 345, 346, 347 (North American Literature)
8), 9) and 10) three other English Major year course equivalents (See Notes 3, 4, and 5)

Honours Programme: Co-operative
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 communication 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 BA 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 are essentially those of the regular Waterloo Honours BA 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 been employed in areas in which they intend to pursue their careers. They will have had the opportunity to choose appropriate elective courses or groups of courses in areas relevant to their careers. Finally, they will have qualified for a University of Waterloo Honours BA Degree in English.
Joint Honours Programmes

An English Joint Honours student must earn at least 22 year course equivalents in all, of which at least 8 must be English Major courses as follows:

1) 101 or 102 (or equivalent) (See Note 1)
2) 251 (Practice and Theory of Criticism) (See Note 2)
3) 4) and 5) one year course equivalent from each of three of the following categories:
   a) 310, 350, 362, 363 (Major Figures)
   b) 305, 373, 375 (Language and Early Literature)
   c) 330, 410, 430, 451 (Periods of British Literature)
   d) 201, 202, 203, 204, 211, 212, 230, 231, 232, 233 (Genres and Themes)
6) 7), and 8) three other English Major year course equivalents (See Notes 3, 4, and 5)

Minor Programme for Students in Other Disciplines

Five year course equivalents in English are required, as follows:

1) 101 or 102 (or equivalent) (See Note 1)
2) 251 or 150 and 151 (See Note 2)
3) one year course equivalent from 305, 310, 330, 350, 362, 363
4) and 5) two other English Major year course equivalents.

Note 1

Although 101 or 102 is recommended for the first year, a student may gain English Major credit from the following English courses instead of 101 or 102 without formal permission from the Department: 108, 190, 211, 212, 230, 231. A student may use only one English year course equivalent from courses at the 100-level to fulfill the minimum English requirements. Some English courses do not count for English Major credit; in other words they do not fulfill the English requirements for a degree in English (see English Undergraduate Course Descriptions).

Note 2

English 251 is strongly recommended for second year.

Note 3

An English Honours student must earn at least 6 English Major year course equivalents numbered 300 or above. English Joint Honours students must gain at least 4 English Major year course equivalents numbered 300 or above, and 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 an average of at least 75% in both areas of specialization combined. An English Honours student whose major average is below 74.5% at the end of the third year will normally be advised to graduate with a General degree, provided the requirements for it have been met.
Of these six term courses:
  one (1) from Fine 212, 213, 216, 217
  two (2) from Fine 210, 211, 316, 317.
  Fine 319 and one from Fine 313, 319A, 319B

4 term courses in major area of printmaking,
painting, sculpture, or additional drawing including
Fine 490/491
electives - 12 term courses or equivalent

Honours Programme (Art History Option)
40 term courses or equivalent
A and B requirements – 8 term courses or equivalent
Fine 120/121 and 2 additional studio term courses
Fine 110/111 and 12 additional term courses in art
history
  Of these 12 term courses:
    three (3) from Fine 212, 213, 216, 217
    three (3) from Fine 210, 211, 316, 317
    Fine 390A and two from Fine 313, 319, 319A, 319B
Fine 490/491
electives - 12 term courses or equivalent

Honours Programme (Film Studies Option)
40 term courses or equivalent
A and B requirements – 8 term courses or equivalent
Fine 110/111, 120/121
Fine 470/471, 490/491
10 term courses in film history, the following six
term courses are required:
  Fine 244/245, 370/371, 344A/345A
electives - 14 term courses or equivalent

Note
Two term courses in film-making are recommended
for students taking the Film Studies Option (See:
Wilfrid Laurier Course Offerings). Other film history
courses available on campus are strongly
recommended.

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

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

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

French

General Programme in French
Students in the three year general programme in
French must complete six year course equivalents in
French of which at least three year course
equivalents are on the 300 or 400 levels.

Honours Programme in French
Students in the honours programme in French must
complete before graduation the equivalent of ten
year course equivalents in French of which at least
six year course equivalents are on the 300 or 400
levels.

Recommended Programme

Year 1
French 192
Four additional year course equivalents

Note:
Students taking this course who wish to major or
honour in French are strongly urged to enroll in Fr
195/196 as well.

Year 2
A minimum of French 250H or its equivalent, French
231, French 253, French 274, plus another term
course in French
Two additional year course equivalents

Year 3
A minimum of French 300 or its equivalent, French
342, French 363, French 375, plus an additional
term course in French
Two additional year course equivalents

Year 4
A minimum of French 401/402 or their equivalent,
plus two additional year course equivalents in
French
Two additional year course equivalents

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

Note 2
With the permission of the department, the student
may spend the third year enrolled in an acceptable
university in France or in the Province of Quebec.

Note 3
A total of 20 year course equivalents 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.

French in Joint Honours Programmes
The Department of French recognizes combined honours programmes with 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.

Students registered in a Joint Honours Programme involving French must complete the equivalent of eight year course equivalents in French (in the case of Political Science only seven are required) of which at least 4 in French are on the 300 or 400 levels.

Recommended Programme

Year 1
French 192
Four additional year course equivalents

Note:
Students taking this course who wish to major or honour in French are strongly urged to enroll in Fr 195/196 as well.

Year 2
A minimum of French 250H or its equivalent, French 231, French 253, French 274, plus another term course in French

Year 3
A minimum of French 300 or its equivalent, French 342, French 363

Year 4
A minimum of French 401/402 or their equivalent plus one additional year course equivalent in French

Note 1
A total of 22 year course equivalents must be successfully completed before graduation.

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

Minor Programme in French
A minor programme in French will consist of five year course equivalents in French Language and/or Literature. Students must demonstrate written and oral ability in French equal to that expected in French 300.

Minor Programme in Business French
A minor programme in Business French will consist of a minimum of five year course equivalents in French. Students must demonstrate written and oral ability in French equal to that expected in French 300.

Recommended Programme

Year 1
French 192

Year 2
French 255
French 210
a minimum of one year course equivalent from French 250, French 205, French 206, French 207, French 208

Year 3
French 300
French 310
French 311

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. Participants in Geography programs will not normally be permitted to switch faculties after they have entered second year.

General Geography

Year 1
Geog 102 Introduction to Physical Geography
Geog 110 Tutorial in Geography
and one but no more than two of:
Geog 101 Introduction to Human Geography
Geog 125R Introduction to the "Third World"
Geog 126R Development in the "Third World"
Geog 127 Regional Problems of Europe
Env St 195B Introduction to Environmental Problems
Additional electives to make a maximum of no more than 6 credits in all.
Year 2
Env St 200 Field Ecology
Geog 201 Some Basic Topics of Physical Geography
Geog 202 Some Basic Topics of Economic and Urban Geography
and one of:
Geog 203 Some Basic Topics of Cultural and Regional Geography
Geog 204 Soviet Union
Geog 205 Africa
Geog 220 World Regional Geography
and additional credits so that a student should have completed by the end of the second year 11 full credits.

Year 3
Geog 381 The Nature of Geography
Additional credits so that a student will have completed at least 16 credits of which at least 6 are in Geography and 4 are outside the Faculty of Environmental Studies.

Note 1
A minimum of six course credits in Geography and Environmental Studies, of which five must be designated as Geography courses, constitutes a Geography major.

Honours Geography

Year 1
Geog 102 Introduction to Physical Geography
Geog 110 Tutorial in Human Geography

and one of but no more than two of

Geog 101 Introduction to Human Geography
Geog 125R Introduction to the "Third World"
Geog 126R Development in the "Third World"
Geog 127 Regional Problems of Europe
Env St 195B Introduction to Environmental Problems

Additional credits should be chosen after consultation with the department so that the student has 6 full credits.

Year 2
Env St 200 Field Ecology
Geog 201 Some Basic Topics of Physical Geography
Geog 202 Some Basic Topics of Economic and Urban Geography
Geog 260 Introduction to Cartography and Map Analysis
Geog 275 Introductory Air Photo Analysis and Remote Sensing
Env St 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, 12 full credits.

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

and one of

Geog 316 Multivariate Statistics
Geog 317 Nonparametric Statistics
Geog 318 Spatial Analysis
One credit of Geography electives.
Three credits chosen after consultation with the Department.

Year 4
Geog 490A and B Senior Honours Research Essay and additional course credits so that a student should have a minimum of 24 full credits of which at least 5 should be outside the Faculty of Environmental Studies and at least 11 in Geography and Environmental Studies.

Note 1
A student must complete at least 9 credits in courses designated as Geography courses (i.e., pg. 324).

Geography Joint Honours Programmes
Joint Honours Programmes have been arranged between Geography and several other disciplines in the University. Detailed programmes have been worked out with Anthropology, Economics, English, French, German, History, Man-Environment Studies, Mathematics, Political Science, Recreation and Russian. The programmes "Geography with Biology", "Geography with Canadian Studies", and "Geography with Earth Sciences" are not Joint Honours Programmes. 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:
BES or BA
Joint Geography with:
Anthropology
Canadian Studies
Economics, English, French
German, History
Man-Environment Studies
Political Science
Recreation
Russian

BES or BA
or BMath
Mathematics

BES or BSc
Biology
Earth Sciences

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

Geography core requirements in joint programmes are identical with those of the Geography Honours Regular Programme above, with the exception that where both Departments participating in the programme require specific courses of similar content, a student shall meet that requirement in one Department only. This might be expected to apply in the cases of technique courses, field research and the Senior Honours Essay.

Further information concerning Joint Honours Programmes may be obtained from the Undergraduate Officer of the Department.

Students intending to qualify for anHonour Specialist Qualification for teaching secondary school require a minimum of nine credits in Geography, or if offering 2 subjects, 14 credits in those subjects, of which a minimum of six must be offered in each subject.

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German

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

Honours Programme in German
Joint Honours Programme in German
General Programme in German
Minor Programme in German
German and Russian/Scientific Translation Programme

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

Stream A
Students with little or no knowledge of German

First Year
Ger 101/102 or Ger 121/122
Ger 111/112

Second Year
Ger 201/202 or Ger 211/212
Ger 231/232

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

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

Note 3
Ger 271/272, Ger 275/276, Ger 355, and Ger 391/392 are open to all students. However, these courses will normally count toward the Major or Honours requirement for Stream A students only.

Honours German
Eligibility for graduation in the Honours German Programme includes fulfilment of the following requirements:

1) Successful completion of a minimum of 20 year course equivalents, of which at least 10 year course equivalents must be in German.
2) An overall cumulative average of 60% and a cumulative average of 75% in the German courses.

3) Completion of the Faculty of Arts Group requirements.

With the permission of the Department a student may spend one of the senior years at a university of a German-speaking country, preferably at the University of Mannheim in the “Waterloo in Germany” Programme.

**Waterloo in Germany Programme**
The Department offers a yearly programme of studies at the University of Mannheim on the Rhine. The programme is open to students entering third and fourth year courses. In exceptional cases second year students will also be considered. Students of all disciplines may apply, provided they have an adequate knowledge of German. The application deadline for students who wish to begin studies in Mannheim in the Winter Semester (October 15 to February 15) is April 1. The application deadline for those who wish to begin their studies in the Summer Semester (April 15 to July 15) is February 1. Applications should be submitted to “Waterloo in Germany”, Department of Germanic and Slavic Languages and Literatures, University of Waterloo, Waterloo, Ontario. N2L 3G1.

**German Joint Honours Programmes**
Eligibility for graduation in a German Joint Honours Programme includes fulfilment of the following requirements:

1) Successful completion of a minimum of 22 year course equivalents, of which at least 8 year course equivalents must be in German.

2) An overall cumulative average of 60% and a cumulative average of 75% in each of the two Honours disciplines.

3) Completion of the Faculty of Arts Group Requirements.

A Joint Honours Programme in German may be taken in combination with any other discipline in which an Honours Programme is offered, subject to approval by the Departments concerned. Some representative Joint Honours Programmes are:

- German and Economics
- German and English
- German and French
- German and Geography
- German and History
- German and Russian

**General Programme in German**
Eligibility for graduation in the General Programme in German includes fulfilment of the following requirements:

1) Successful completion of a minimum of 15 year course equivalents, of which at least 6 year course equivalents must be in German.

2) An overall cumulative average of 60% and a cumulative average of 65% in the German courses.

3) Completion of the Faculty of Arts Group Requirements.

**Minor Programme in German**
Students of all departments may elect German as a minor field of studies in consultation with the Department of Germanic and Slavic Languages and Literatures. A minor requires the completion of a minimum of 5 year course equivalents in German with an overall cumulative average of at least 65% in those courses, of which:

a) not more than 2 year course equivalents may be chosen from courses on the 100 level, and

b) at least one year course equivalent must be chosen from courses above the 200 level.

**German and Russian/Scientific Translation Programme**
German and Russian/Scientific Translation is a four-year General Programme designed for students who wish to specialize in the field of translation of scholarly texts in the arts and sciences. Eligibility for graduation in this programme includes fulfilment of the following requirements:

1) Successful completion of a minimum of 20 year course equivalents, of which:
   a) 7 year course equivalents must be approved courses in German,
   b) 4 year course equivalents must be approved courses in Russian,
   c) 6 year course equivalents must be in the sciences and/or mathematics.

2) An overall cumulative average of 60% and a cumulative average of 65% in the primary and secondary languages.

3) Completion of the Faculty of Arts Group Requirements.

**Greek (see Classical Studies)**
History

General Programme
Students choosing a three-year General programme in History must fulfill the degree requirements set out early in this chapter (7). They will complete at least ten term courses in History, normally choosing two from the 100 level, two from the 300 level and the remainder from either the 200 or 300 level. The exact programme of each student should be worked out with an History departmental advisor.

Honours Programme
Students choosing the Honours programme in History will fulfill the degree requirements set out early in this chapter (7) (note 2, below). In addition, they will work out their individual programme in consultation with a departmental advisor in line with the following recommendations and notes.

Recommended Programme

Year 1
Any first year programme that fulfills the general Faculty of Arts requirements is acceptable.
We recommend:
Either (i) History 100 and one History 102A, 102B, 102C, 1020.
Eight other term courses, or equivalent.

Year 2
Six term courses in History.
Six other term courses, or equivalent (see note 2).

Year 3
Six term courses in History (see note 1).
Four other term courses, or equivalent (see note 2).

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

Note 1
All Honours History candidates must complete sixteen term courses and two Senior Seminars in History with a B average (75.0 percent). Normally only one History course is chosen from the 100 level. To ensure breadth at least two term courses must be in pre-modern European history and at least two must be in Third World history. Each programme should include an appropriate proportion of survey courses and more advanced courses.

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 Group A and B requirements with the following variation: one non-history course or equivalent in humanities (Group A) must be above the 1st year level. The foreign language substitute (culture course - Group Aii - alternative) 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.

History Joint Honours Programmes
1) Students choosing a Joint Honours Programme involving History must complete the equivalent of 44 term courses (22.0 year course equivalents) including 10 term courses and two Senior Seminars (2.0 course credits) in History.
2) The requirements indicated in note 1 and note 2 appended to the notes on Honours History (above) will normally be observed in developing each candidate's programme.
3) Combined programmes presently exist with Anthropology, Canadian Studies, Classical Studies, English, Fine Arts, French, Geography, German, Peace and Conflict Studies, Philosophy, Political Science, Psychology, Religious Studies, Sociology. The History Department is prepared to consider others for keenly interested students, who otherwise meet Honours standards.
4) Not all joint Honours programmes fulfill the Ministry of Education's requirements for an Ontario Teacher's Certificate. Students should consult with the departmental advisor.

Minor Programme
The Department offers a minor programme in History. Any student interested in planning a sequence of ten term course equivalents to complement a programme in another faculty or Arts discipline is encouraged to consult the Undergraduate Officer in the Department of History. The 10 term courses of a minor programme may only include 2 term courses at the 100 level.
Italian

Minor Programme
A minor programme in Italian is available. Interested students should see the Advisor for Italian at St. Jerome's College.

Latin (see Classical Studies)

Medieval Studies

Students interested in an interdisciplinary approach to university education and to an examination of the Middle Ages may take either a General or an Honours B.A. in Medieval Studies. Such a degree 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 pursuit of a graduate degree.

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

The General Programme
For the core of a Medieval Studies Programme, each student must take seven year course equivalents from a list of approved courses; including at least one year course equivalent from each of four of the eight subject fields specified.

The Honours Programme
For the core of the Medieval Studies Programme, each student must take eight year course equivalents from a list of approved courses; including at least one year course equivalent from each of five of the eight subject fields specified.


Music

General Programme
30 term courses
A & B requirements - 10 term courses
Music courses - 14 term courses

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

Honours Programme
40 term courses
A & B requirements - 10 term courses
Music courses - 20 term courses.

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

Minor Programme
10 term courses in Music.

Joint Honours Programme
44 term courses.
A & B requirements - 10 term courses.
16 term courses in Music.
Specific requirements for each honours programme are available from the Department.
Peace and Conflict Studies

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

Program Options

There are three different options open to students participating in the PACS Programme: 1) General Program, 2) Honours, and 3) Minor. Successful completion of either of the first two permits the student to add the subtitle (Peace and Conflict Studies) to the name of the degree earned.

All students in the PACS Programme will take the PACS Core Courses as well as a specified number of "PACS Content Courses" offered by their own and other departments. In every case students must fulfill all the requirements for the major in their own department.

1) The General Arts Degree (Peace and Conflict Studies)

In addition to fulfilling the requirements for the major (normally including at least five year course equivalents in the major field), the general arts student must meet the following PACS requirements:

- a) PACS 201, 202, 301, and 302.
- b) Six term course equivalents chosen from the PACS Content Courses offered by either the department in which the student majors, or any other departments.

The general arts degree option in Peace and Conflict Studies is available to those majoring in any department in the Faculty of Arts, including non-participating departments. (See note)

2) Honours Programme (Peace and Conflict Studies)

A student may choose straight or joint honours in any of the participating departments. The student is granted, upon completion of his 22 year course equivalent programme (23 year course equivalents if joint honours), an Honours B.A. in his subject area with the subtitle Peace and Conflict Studies.

In addition to fulfilling the degree requirements in his department, each student must meet the following PACS requirements in his 4-year period of study:

- a) PACS Core Courses 201, 202, 301, 302, 498, 499. (The PACS 498 requirement may be met by the successful completion of any Honours Research Course which fulfills the requirement for an Honours Degree in a participating department, if the research is in an approved PACS-related field of inquiry)
- b) Six term course equivalents chosen from among the PACS Content Courses offered by the student's department (eight term course equivalents if joint honours). These courses may also be used to meet the department's honours requirements if approved as such by the department. (See note 1).
- c) Three term course equivalents chosen from among the PACS Content Courses offered in any department. Students should use their first year to take lower-level prerequisites for PACS Content Courses in those departments where they have special interests.

3) Honours Minor in Peace and Conflict Studies

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

Note

Each of the participating departments has designated certain course offerings as Peace and Conflict Studies content courses. These courses are listed in Chapter 15 of the Calendar. Many of the 300 and 400 level courses have specific prerequisites. Students planning to pursue study in these upper level courses should use their electives wisely to ensure that the prerequisites for these courses are met.
Arts
Departmental Programmes
Philosophy/Political Science

Philosophy

General Degree in Philosophy
Fifteen year course equivalents (30 term courses) of which five year course equivalents must be in Philosophy including:
- a) one of 140, 145, 241, 242, 243, OR 340
- b) 221
- c) one year course equivalent from 280/281, 282/283, 284/285, or 390/391

Students registered at St. Jerome's in General Philosophy must take fifteen year course equivalents (30 term courses) of which five year course equivalents must be in Philosophy including:
- a) one of 200J, 140, 145, 241, 242, 243, or 340
- b) 218J or 221
- c) one year course equivalent from 280/281, 282/283, 284/285, or 390/391

Minor
Five year course equivalents (10 term courses) in Philosophy approved by the Department

Honours Degree in Philosophy
Twenty year course equivalents (40 term courses) are required of which ten year course equivalents must be in Philosophy including:
- a) one of 241, 242, 243, or 340
- b) 221J/222
- c) 280/281, 282/283
- d) 499

Students registered at St. Jerome's in Honours Philosophy must take twenty year course equivalents ten of which must be in Philosophy including:
- a) one of 241, 242, 243, or 340
- b) 218J or 221, and 222
- c) 280/281, and 282/283
- d) 499J or 499
- e) College students are expected to take 450J

Philosophy Joint Honours Programmes
These usually consist of seven year course equivalents in Philosophy and seven year course equivalents in the other subject. A total of twenty-two year course equivalents is required. The Philosophy courses ordinarily include:
- a) one or two of 140, 241, 242, 243, or 340 (depending on the Programme)
- b) 221/222
- c) 280/281, 282/283
- d) a Philosophy course which is relevant to the other subject (e.g. Aesthetics for Philosophy and English)
- e) A senior honours essay is written in either Philosophy 499 or in the other subject.

Political Science

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

- Political Science 101/102
- Economics 101/102 or Economics 100a/100b
- Sociology 102/205
- History - the equivalent of one year course
- One other year course equivalent, 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)
Departmental Programmes
Political Science

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. PSci 291, 292, 293 are non-
programme courses (see Note, p. 114).

1) General Programme
Students choosing a three-year General programme
in Political Science will normally complete, before
graduation, the equivalent of five year courses in
Political Science beyond the 100 level, of which there
must be at least one term course from each of four
different fields of the discipline as defined above. At
least two year course equivalents must be taken at
the 300 level or higher.

2) Honours Programme
Students choosing an Honours programme in
Political Science must complete, before graduation,
the equivalent of nine year courses in Political
Science beyond the 100 level, of which four must be
from different fields of the discipline as defined
above. At least two year course equivalents must be
taken at the 400 level.

Honours Political Science
Recommended Programme

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

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

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

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

Note
Among the nine Political Science year course
equivalents above the 100 level, students must
select four year course equivalents from the
different fields of the discipline and two year course
equivalents must be taken at the 400 level.

Honours Political Science
(Administrative Studies Option)

This programme consists of courses which would
ordinarily lead to an Honours degree in Political
Science, together with the following core courses:
1) Economics 101/102 or Economics 100a/100b
2) Economics 191 or Economics 281
3) Economics 192 or Economics 282
4) Psychology 333 or Management Science 44 or
Sociology 231
5) English 210

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

Various Continuations of Honours Political Science
(Administrative Studies Option) after Year 1

Year 2
1 term course
Economics 191 or Economics 281
1 term course
English 210
3 year course equivalents
from the major subject, one of which must be in
a designated Administrative Studies course
2 year course equivalents
electives
Total 6 year course equivalents

Year 3
1 term course
Economics 192 or Economics 282
1 term course
Psychology 333 or Sociology 231 (unless Man-
agement Sciences 44 is to be taken in Year 4)
3 year course equivalents
from the major subject, one of which must be in
a designated Administrative Studies course.
2 year course equivalents
electives, one chosen from designated
Administrative Studies courses not in the major
subject.
Total 6 year course equivalents
Year 4
1 term course
Management Science 44 (unless Psychology 333 or Sociology 231 was taken in Year 3)
3 year course equivalents
from the major subject: one of which must be in a designated Administrative Studies course.
3 term courses
electives, one chosen from designated Administrative Studies courses not in the major subject.
Total 5 year course equivalents

Total year course equivalents in the programme: 22

3) Co-operative Programme in Honours Political Science
The programme leading to the Degree of Bachelor of Arts in Honours Political Science (co-operative programme) is designed for students who intend to enter careers in government, the mass media, business, political parties, or public opinion organizations. Qualified students will ordinarily be admitted to the programme after completion of their first two academic terms. The programme consists of six further academic terms and a minimum of four paid work terms with participating employers.

The academic requirements of the co-operative programme are identical with those of the regular Honours programme in political science. The programme is open to students enrolled in either the regular Honours Political Science programme or Honours Political Science (Administrative Studies Option).

The first work term of the co-operative programme occurs after the successful completion of Year 2 courses. At the beginning of the third year students will have the option of either continuing the pattern of alternating work terms or working for a full year basis before returning to campus for the last two academic terms.

Joint Honours Programme
Students who wish to combine a study of Political Science with a broad training in a related discipline such as Sociology or History, or in fact in any other discipline in which they are interested, can do so in a joint honours 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 year courses in Political Science beyond the 100 level of which there must be at least one term course from each of four different fields of the discipline as defined above.

Political Science Joint Honours Programme
Recommended Programme

Year 1
Political Science 101/102
Introductory year course equivalent in the other discipline
The equivalent of three other year courses

Year 2
The equivalent of two year courses in Political Science (see note)
The equivalent of two year courses in the other discipline
The equivalent of two other year courses

Year 3
The equivalent of two year courses in Political Science (see note)
The equivalent of two year courses in the other discipline
The equivalent of two other year courses

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

Note
Among the six Political Science year course equivalents above the 100 level, students must select at least one term course in each of four different fields of the discipline. For further information on this please consult the Department.
Joint Honours Political Science
(Administrative Studies Option)
The programme consists of the successful completion of courses which would ordinarily lead to a Joint Honours degree in Political Science and another discipline and the following core courses:

1) Economics 101/102 or Economics 100a/100b
2) Economics 191 or Economics 281
3) Economics 192 or Economics 282
4) Psychology 333 or Management Science 44 or Sociology 231
5) English 210

In addition a Joint Honours Programme with the Administrative Studies Option must include:

1) The equivalent of at least three year 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 year 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 Joint Honours Political Science (Administrative Studies Option)

Year 2
1 term course
   Economics 191 or Economics 281
1 term course
   English 210
4 year course equivalents
   Two in each of the major subjects; one of each major subject must be an Administrative Studies course
1 year course equivalent
   elective
Total 6 year course equivalents

Year 3
1 term course
   Economics 192 or Economics 282
1 term course
   Psychology 333 or Sociology 231 (unless Management Science 44 is to be taken in Year 4)
4 year course equivalents
   Two in each of the major subjects; one of each major subject must be an Administrative Studies course
1 year course equivalent
   elective, chosen from designated Administrative Studies courses, not in the major subjects.
Total 6 year course equivalents

Year 4
1 term course
   Management Science 44 (unless Psychology 333 or Sociology 231 was taken in Year 3).
4 year course equivalents
   two in each of the major subjects; one of each major subject must be an Administrative Studies course
3 term courses
   electives, one chosen from designated Administrative Studies courses not in the major subjects.
Total 6 year course equivalents.

Total year course equivalents in the programme: 23

5) Minor Programme
Any student in an honours programme may qualify for a minor in Political Science by completing the equivalent of 5 year courses in Political Science before graduation with a cumulative average of 65 (C) or better. Courses must be selected to meet the following requirements:
   a) at least one term course in each of three different fields of the discipline;
   b) the equivalent of at least one year course above the 200 level.

Students interested in a minor in Political Science are advised to consult with the Department's Undergraduate Officer. In addition, it is now possible for students in co-op studies in Arts, Mathematics, Science, Engineering, or Recreation to add a wide range of Political Science courses to their programmes.

Note
No student in a general, honours, joint honours or minor programme in Political Science may use PSci 291, 292, or 293 to meet programme requirements.

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 year courses and a thesis, or the equivalent of three year courses and a cognate essay, or four year course equivalents. 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.
Psychology

General Programme
Students choosing a three-year programme in Psychology must complete thirty term courses of which 10 must be in Psychology including:
Psych 101, 102
Psych 200
one of Psych 203, 206, 207, 261, 271
one of Psych 211, 253, 355, 357
one of Psych 212, 331, 333, 334, 335
plus four additional term courses in Psychology

Honours Programme
Students choosing the Honours programme in Psychology must complete, before graduation, the equivalent of 18 term courses in Psychology. Before entering the fourth year of the programme, all students must complete Psych 201, 202, 301 and one course from each of the following groups:

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

In the fourth year, all students must complete Psychology 498 or 499. A recommended programme is outlined below.

Recommended Programme

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<thead>
<tr>
<th>Year 1</th>
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<tbody>
<tr>
<td>Psych 101/102</td>
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<td>The equivalent of 8 additional term courses</td>
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<tr>
<th>Year 2</th>
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<tbody>
<tr>
<td>Psych 201/202</td>
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<td>The equivalent of two additional term courses in Psychology (see note 1)</td>
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<td>The equivalent of six additional term courses</td>
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<tr>
<td>Psych 301</td>
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<tr>
<td>The equivalent of three additional term courses in Psychology (see note 1)</td>
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<tr>
<th>Year 4</th>
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<tr>
<td>Psych 498 or 499</td>
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<tr>
<td>The equivalent of three additional term courses in Psychology (see note 2)</td>
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<tr>
<td>The equivalent of four additional term courses</td>
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Note 1
Honours students are required to complete one course 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.

Honours Psychology Cooperative Programme
The Department of Psychology offers a Cooperative Honours Programme in Psychology, in which academic studies are combined with relevant work experience. Generally, students are placed as research assistants or administrative assistants in such work settings as government and private research organizations, personnel departments, management training programmes, correctional institutions, and other educational and/or treatment institutions.

The co-op programme consists of six academic terms beyond the first year and four paid work terms. Each work term is of four months duration. Additionally, co-op seminars are conducted during the on-campus terms; these seminars assist students in defining their career objectives, in assessing their interests, strengths, and aptitudes, and in selecting appropriate elective courses and job placements.

Application for admission to the Co-operative Honours Programme is normally made in November of the second year, with admission interviews taking place before the end of the fall term. However, interested students are advised to consult with the co-op faculty advisor when planning their second-year programmes.

Honours Psychology with Early Childhood Education and Care Option
Students choosing the Honours Psychology Programme with Early Childhood Education and Care Option 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: Psych 101, 201, 202, 203 or 207, 211, 212, 293 or 295, 301, 311, 312, 322, 323, 341, 393, and Health 140. In the fourth year students must complete Psych 422, 423, 453, 498 or 499, Dance 364 and Soc 216. Before graduation each student must complete a minimum of forty-two term courses. Of these forty-two courses a minimum of twenty term courses must be in Psychology with letter grades (Psych 323 and 423 are offered on a pass-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

Psych 101/102
The equivalent of 8 additional term courses

Year 2
Psych 211, 203 or 207, 212, 301, 202
Health Studies 140
The equivalent of 3 additional term courses

Year 3
Psych 301, 311, 341, 322, 323, 393, 293 or 295
The equivalent of 3 additional term courses

Psychology Joint Honours Programmes
Students choosing a Joint Honours Programme involving Psychology must complete the equivalent of fourteen term courses in Psychology and an Honours thesis course. Unless other arrangements are approved by the Department, all students in Joint Honours Programmes must complete the following courses before entering the fourth year.

Psych 201, 202, 301 and one course from each of the following groups:

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

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

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

Approved joint honours programme presently exist with Anthropology, Classical Studies, Drama, Economics, English, French, Geography, German, History, Man-Environment, Mathematics, Philosophy, Political Science, Religious Studies, Russian, Social Development Studies, Sociology, Spanish, and Statistics.

Honours Psychology with a BSc Degree
An Honours Psychology degree programme is also available in the Faculty of Science. See Chapter 14.

Minor Programme
Students choosing a Minor programme in Psychology must complete 10 term courses in Psychology including:

Psych 101, 102
Psych 200
one of Psych 203, 206, 207, 261, 271
one of Psych 211, 253, 355, 357
one of Psych 212, 331, 333, 334, 335
plus four additional term courses in Psychology

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.

The course offering of the Religious Studies Department fall into the following five areas:

1) World Religions
2) History of the Christian tradition
3) Biblical studies
4) Theology - Philosophy - Ethics
5) Religion, Society and Culture.

Note:
Areas of Religious Studies to which courses belong are indicated by the number below the course description.

The following programmes are available in Religious Studies.

A) General degree in Religious Studies
Requirements:
successful completion (65% average) of a minimum of 5 year course equivalents in Religious Studies including

a) one year course equivalent from the Religious Studies 100A-K sequence
b) Religious Studies 200 (term course – half credit)
c) one term course from four of the five Religious Studies areas, above the 100 level.
d) one and one-half year course equivalents of electives of which at least one year course equivalent must be at or above the 200 level.

Total number of year course equivalents for the degree, fifteen.

B) Four-Year General degree in Religious Studies

Requirements:
successful completion (65% average) of a minimum of 7 year course equivalents in Religious Studies, including: a), b), and c) as in the General degree above and d) three and one half year course equivalents of electives of which two year course equivalents must be at or above the 200 level.

Total number of year course equivalents for the degree, twenty.

C) Honours BA Minor in Religious Studies

Requirements: same as General degree in Religious Studies (A)

D) Honours Degree in Religious Studies

Requirements:
successful completion (75% average) of a minimum of 10 year course equivalents in Religious Studies including:
a) one year course equivalent from the RS 100A-K sequence
b) RS 200 (term course - half credit)
c) one term course from each of the five Religious Studies areas
d) five year course equivalents of electives, of which at least two and a half year course equivalents must be at or above the 300 level.
e) RS 490 (year course - one credit)

Total number of year course equivalents for the degree, twenty.

E) Joint Honours Programme in Religious Studies

The Religious Studies Department offers Joint Honours Programmes with the following Departments: Classical Studies, English, Fine Arts, Germanic and Slavic, History, Philosophy, Psychology, Social Development Studies and Sociology. The Total number of year course equivalents for the degree, twenty-two.

The requirements in Joint Honours Programmes are the same as the Honours Programme, except the overall number of Religious Studies courses is 7, instead of 10 year course equivalents.

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.
2) An overall cumulative average of 60% and a cumulative average of 75% in each of the two Honours disciplines.
3) Completion of Faculty of Arts Group Requirements.

A Joint Honours Programme in Russian may be taken in combination with any other discipline in which an Honours Programme is offered, subject to approval by the Departments concerned. Some representative Joint Honours Programmes are:

- Russian and Drama
- Russian and Economics
- Russian and English
- Russian and French
- Russian and German
- Russian and History
- Russian and Mathematics
- Russian and Political Science

**General Programme in Russian**

Eligibility for graduation in the General Programme in Russian includes fulfillment of the following requirements:
1) Successful completion of 15 year course equivalents, of which at least 6 year course equivalents must be in Russian.
2) An overall cumulative average of 60% and a cumulative average of 65% in the Russian courses.
3) Completion of Faculty of Arts Group Requirements.

**Minor Programme in Russian**

Students of all departments may elect Russian as a minor field of studies in consultation with the Department of Germanic and Slavic Languages and Literatures. A minor requires the completion of a minimum of 5 year course equivalents in Russian with an overall cumulative average of at least 65% in those courses, of which:
- a) not more than 2 year course equivalents may be chosen from courses on the 100 level, and
- b) at least one year course equivalent must be chosen from courses above the 200 level.

**Russian and German/Scientific Translation Programme**

Russian and German/Scientific Translation is a four-year General Programme designed for students who wish to specialize in the field of translation of scholarly texts in the arts and sciences. Eligibility for graduation in this programme includes fulfillment of the following requirements:
1) Successful completion of a minimum of 20 year course equivalents, of which a) 7 year course equivalents must be approved courses in Russian
- b) 4 year course equivalents must be approved courses in German
- c) 6 year course equivalents must be in the sciences and/or mathematics.
2) An overall cumulative average of 60% and a cumulative average of 65% in the primary and secondary languages.
3) Completion of the Faculty of Arts Group Requirements.

**Social Development Studies**

Social Development Studies are integrated multidisciplinary programmes providing a liberal education with concentration in certain pure and applied social sciences. The inter-related courses of the programme are used to help the student develop an appreciation of the interdependence of the social sciences and a facility in applying material and perspectives from one discipline to questions in other areas of study. As part of the programme the College offers its own courses in Interdisciplinary Social Science, Psychology, Social Work and Sociology. Students select other courses from the departments of the University or the other colleges to serve particular needs and interests. In the programme particular attention is given to the development of human personality in the context of the major social institutions and our major traditions and to the study of the development of certain contemporary social problems. Courses in Social Work provide an opportunity to study various types of social intervention. The College assists the students to find places as volunteers in a number of local agencies. Through this volunteer work students are given an opportunity to increase the experience which they can bring to their studies and to test and apply their theoretical understanding in practical settings.

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

**The General Programme**

The general programme normally extends over six academic terms (usually three years) of full-time study but may also be completed by part-time students. Courses are available in both day and evening periods. Students registered in the
programme must complete:

1) A minimum of 15 year course equivalents in total;
2) The normal Group A and B requirements of the Faculty of Arts;
3) A minimum of 7 year course equivalents from the core areas courses listed below with the following stipulations:
   a) In the first year a student must register in the fall term for the introductory courses (120 level) in Sociology, Psychology and Interdisciplinary Social Science. In the winter term which follows, the student must register in SocWk 120R, ISS 121R and Psych 121R. 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 year course equivalents from the list in each year that he/she is registered in the three-year programme.
   b) The 7 year course equivalents must be distributed over at least 3 of the 4 core areas with a maximum of 3 year course equivalents 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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<tr>
<td>ISS 120R</td>
<td>SocWk 120R</td>
<td>Soc 120R</td>
<td>Psych 120R</td>
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<td>ISS 121R</td>
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<td>Psych 121R</td>
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<tr>
<td>ISS 220R</td>
<td>SocWk 220R</td>
<td>Soc 220R</td>
<td>Psych</td>
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<tr>
<td>ISS 221R</td>
<td>SocWk 221R</td>
<td>Soc 221R</td>
<td>220R</td>
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<tr>
<td>ISS 250R</td>
<td>SocWk 250R</td>
<td>Soc 225R</td>
<td>Psych</td>
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<tr>
<td>ISS 251R</td>
<td>SocWk 221R</td>
<td>Soc 226R</td>
<td>221R</td>
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</tbody>
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The Social Work Stream

Within the programme of studies for the Bachelor of Arts degree with a Major in Social Development Studies, the College has developed a stream to meet the particular needs of students who plan to pursue graduate studies in Social Work or to follow vocations in Social Work or the related helping professions. The courses in this stream meet the Faculty of Arts requirements for the BA, the College's requirements for the Major and in addition include a range of courses particularly appropriate to the needs of such students. It is recommended that the courses taken to satisfy programme requirements in this stream include Psych 322R, Psych 323R, Soc Wk 220R, P Sci 260, and Soc Wk 221R or 222R.

Diploma in Social Work

Students registered for a major in Social Development Studies may additionally register for the Diploma in Social Work awarded by the College. To qualify for the Diploma, students must satisfactorily participate in a practicum.

The Honours Programme

The honours programme normally extends over eight academic terms (usually four years) of full-time study.

Requirements for the honours programme are:

1) a minimum of 21 year course equivalents in total while maintaining an overall average of at least 60% and a cumulative average of 75% in the core area courses of the programme;
2) the normal "Group A and B" requirements of the Faculty of Arts, University of Waterloo;
3) a minimum of 9 year course equivalents within the core areas of the programme;
4) a minimum of four year course equivalents related to one of the multidisciplinary theme areas. (see note 1)
Year 1

Fall: ISS 120R, Psych 120R, Soc 120R
Winter: Soc Wk 120R, Psych 121R, ISS 121R.
The equivalent of two additional year courses.

Year 2

ISS 250R/251R
At least two term courses from among:
ISS 220R, 221R
Soc Wk 220R, 221R, 222R
Soc 220R, 221R, 102(R)
The equivalent of two year courses from chosen theme areas.
The equivalent of 1.5 additional year courses.

Year 3

ISS 320R, Soc W 326R
At least two term courses from among:
Psych 322R, 323R, 334 (R), 369R
The equivalent of two year courses from chosen theme area.
The equivalent of 1.5 additional year courses.

Year 4

ISS 469R, 499R
The equivalent of three additional year courses.

Note 1

Students in the Honours Social Development Studies Programme are required to complete four year course equivalents 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 term courses in the core area:
   ISS 120R, Psych 120R, Soc 120R, Soc Wk 120R;
2) Methodology: ISS 250R/251R;
3) ISS 320R, plus 2.5 year course equivalents at the 200 level or above;
4) A Senior Seminar, ISS 469, or a Senior Honours Essay, ISS 499R.

Note

The student will be expected to develop an elective theme area of three year course equivalents. There is a joint honours programme with Religious Studies, Psychology and Philosophy.

The requirements for the joint honours programme with Psychology vary in that Psych 101 and Psych 102 may be substituted for Psych 120R and Psych 121R; ISS 250R for Psych 201; ISS 251R for one of Psych 393, 395 or 397. In 4th year ISS 469R is required plus one of ISS 499R, Psych 498 or Psych 499.

Minor Programme

A minor in Social Development Studies consists of five year course equivalents taken from among the courses approved for the programme. Courses may be selected to fill the needs of the individual student, but course selection should only be made after consultation with the Undergraduate Officer for Social Development Studies. The following requirements apply to all minors in Social Development Studies:

a) ISS 120R, ISS 121R, Soc Wk 120R;
b) 3.5 year course equivalents beyond the first year level including at least one year course equivalent in each of two different disciplines.

Of the five year course equivalents for the minor, no more than three may be taken in any one discipline.

Note:

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

Sociology

General Sociology

Students who take the three year general programme with a major in Sociology must successfully complete the following ten term courses in Sociology:

A term course introduction to Sociology (Soc 101)
A term course in sociological methods (one of Soc 281, 380, 381)
A term course in sociological theory (one of Soc 271, 405, 406)
At least seven additional term courses in Sociology

Students are strongly encouraged to elect Sociology 280, Social Statistics and Social Indicators, although this is not required.
Honours Sociology

Recommended Programmes

Year 1
Soc 101
One other term course in Sociology
Eight term course equivalent electives

Year 2
Soc 280
Four term courses in Sociology
Four term course equivalent electives

Year 3
Soc 281/282
Four term courses in Sociology
Four term course equivalent electives

Year 4
Soc 405/406
Soc 499
Six term course equivalent electives

Note 1
Students may elect Honours Sociology (Canadian Studies) or Honours Sociology (Peace and Conflict Studies) by fulfilling the Honours requirements in Sociology and the requirements listed under Canadian Studies or Peace and Conflict Studies in this Calendar.

Note 2
The Department of Sociology is a participating Department in the Co-operative Programme in the Behavioural Sciences. This is an Honours programme into which students may be admitted at the start of the Winter term of their second year. Students interested in applying for admission to this programme should consult with the Department’s Co-op advisor sometime in their first year so that they may select their courses to maximum advantage.

Sociology Joint Honours Programmes

Sociology has joint honours programmes with the following:
Anthropology, Economics, English, French, History, Philosophy, Political Science, Psychology, Spanish, Mathematics and Recreation. The usual recommended programme in Sociology for joint honours is fifteen term course equivalents distributed as follows: a term course in introductory Sociology (101); a term course in statistics (280); two term courses in research methods (281/282); two term courses in sociological theory to be chosen from 271, 405, 406; the equivalent of seven term courses of electives in Sociology; and an honours thesis course (499) or the equivalent in the related department.

Arts
Departmental Programmes
Spanish

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, Soc 280 may be replaced by an elective in Sociology.

Spanish

(Jointly mounted with Wilfrid Laurier University)

Note:
By agreement, students at the University of Waterloo and Wilfrid Laurier University can be expected to take courses in Spanish at either university. While most language courses are taught concurrently every year at both universities, most other courses are taught either at one university or the other, and a few courses may rotate from year to year. Please check with Undergraduate Officer in Spanish and note cross-registration procedures on pg. 17 of the Calendar.

General Spanish
Students in the three year General Programme must complete 10 term course equivalents in Spanish beyond the introductory level, of which 6 term course equivalents are language and two term courses are Survey of Spanish Literature.

Honours Spanish
Students in the Honours Programme must complete twenty term course equivalents in Spanish, of which at least six term courses are language, two term courses are Survey of Spanish Literature, one term course is Golden Age, and one term course is Spanish American Literature. Students may be required to take a comprehensive examination at the end of their last year.

Recommended Programme

Year 1
Span 201A/201B. (Students with little or no Spanish will take Span 101/102 in the first year and Span 201A/201B in the second year.)
Eight additional term course equivalents

Year 2
A minimum of six term courses in Spanish, including Span 251A/251B, 205/206, or 201A/201B.
Four additional term course equivalents
Year 3
A Minimum of six term courses in Spanish, including Span 351A/351B, 326 or 327, or 251A/251B
Four additional term course equivalents

Year 4
A minimum of six term courses in Spanish, including one term course in Spanish American Literature
Four additional term course equivalents

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

Other combinations may be arranged by consultation between the student and the Departments concerned.

Students in the Spanish Joint Honours Programme must complete sixteen term course equivalents in Spanish, of which at least six term courses are language, two term courses are Survey of Spanish Literature, one term course is Golden Age, and one term course is Spanish American Literature. Students may be required to take a comprehensive examination at the end of their last year.

Recommended Programme

Year 1
Span 201A/201B. (Students with little or no Spanish will take Span 101/102 in the first year and Span 201A/201B in the second year.)
Eight additional term course equivalents

Year 2
A minimum of four term courses in Span 251A/251B, 205/206, or 201A/201B.
Six additional term course equivalents

Year 3
A minimum of six term courses in Spanish, including 351A/351B, 326 or 327, or 251A/251B
Six additional term course equivalents

Arts
Departmental Programmes
Spanish

Year 4
A minimum of four term courses in Spanish, including one term course in Spanish American Literature
Six additional term course equivalents

Notes for Honours and Joint Honours Spanish

Note 1
Before graduation students must complete the requirements of their home university and faculty.

Note 2
For Honours Spanish, a minimum of 40 term course equivalents must be successfully completed before graduation, of which 20 term course equivalents must be in Spanish.
For Joint Honours, a minimum of 44 term course equivalents, of which 16 term course equivalents must be in Spanish.

Note 3
With the permission of the Department, students may spend the third year enrolled in an acceptable university in Spain or in Spanish America.

Note 4
Students in Years 3 and 4 must have the permission of the home Department to enroll in Spanish courses on the lower levels.

Minor in Spanish
Students in an Honours Programme interested in Spanish as a complement to the major field of study will be expected to complete ten term course equivalents in Spanish, beyond the introductory level. Please consult the Undergraduate Officer in Spanish for Minor in Spanish.
Studies In Personality and Religion

Studies in Personality and Religion (SIPAR) is an inter-disciplinary programme which may be chosen by students in conjunction with a major in some other department. It provides a course of study for those who have a special interest in the processes of religious growth and development. The SIPAR option is also appropriate for those considering careers in the ministry or other service-oriented vocations. The programme is administered by St. Paul's College, in co-operation with an advisory committee representing four departments in the University of Waterloo. The participating departments presently include Philosophy, Psychology, Religious Studies and Sociology.

The Core Course Curriculum

The core course curriculum contains the essential material to serve adequately as an introduction to the field of Studies in Personality and Religion. The goals of the core course programme are to give the student a base of knowledge, a familiarity with the subject and an understanding of the concepts involved.

There are four half courses in the core. Two of these courses (RS-270 Psychology of Religion, and RS 271 Personality and Religion) are taught by the faculty of St. Paul's College as part of the curriculum of the Religious Studies Department. The other two courses are described below.

The core courses include an historical survey of Studies in Personality and Religion, a study of a variety of religious experience from a psychological point of view, an examination of personality theory and its relationship to religious development and growth, and finally, a study of how the various disciplines involved in this programme (psychology, philosophy, sociology, religious studies) come to know and understand human behaviour.

Programme Options

There are two different options open to students participating in the SIPAR programme. The first is open to students in a general programme; the second, to students in an honours programme only.

1) General Programme

Successful completion permits the student to add the subtitle "Studies in Personality and Religion" to the name of the degree earned.

All students in the SIPAR programme will take the SIPAR Core Courses as well as a specified number of SIPAR Content Courses offered by their own and other departments. In every case, students must fulfill all the requirements for the major in their own departments.

2) Honours Minor in Personality and Religion

A minor in SIPAR is available to students pursuing an honours degree in any faculty (including non-Arts faculties). This minor consists of ten term course equivalents chosen from among the courses approved for SIPAR credit in any participating department, and must include the SIPAR Core Courses, Arts 202P, RS 270, RS 271, Arts 302P.

Note:

Each of the participating departments has designated certain course offerings as Studies in Personality and Religion content courses. Many of the 300- and 400-level courses have specific prerequisites. Students planning to pursue studies in these upper-level courses should use their elective courses wisely to ensure that the prerequisites for these courses are met.
Canadian Studies Programme

Campus scene
The Option in Canadian Studies

The Canadian Studies option allows students to gain a broad insight into the nature of Canadian culture and society in three areas. Students take courses about Canada in their selected discipline. They take courses about Canada in other departments outside of their discipline, and take core, interdisciplinary courses offered by the Canadian Studies Programme Centre at St. Paul’s United College.

The General and Honours Option in Canadian Studies

Students in Anthropology, Economics, English, French, Geography, History, Political Science, Sociology or Urban and Regional Planning who have a particular interest in the study of Canada should consider taking either a General or an Honours option in Canadian Studies.

Year I
At Waterloo, students declare their area of study in the second year and therefore there are no Canadian Studies requirements in the first year. However, it is recommended that students who intend to take the Canadian Studies option, take a course in French language in the first year. Otherwise, students should proceed with the usual first year programme set out by their Faculty.

Once students have declared their home discipline among one of the nine listed above, then they can also choose the option in Canadian Studies. Those taking a three-year General degree can do the General option in Canadian Studies. Those taking the Honours degree should declare an Honours option in Canadian Studies. Both options are identical except that Honours students do the fourth year.

Year II
Canadian Studies 201/202 given at the Canadian Studies Programme Centre at St. Paul’s College.
One full or two half-courses in your home discipline chosen from courses dealing specifically with Canada.
One full or two half-courses chosen from outside your discipline. These courses deal specifically with Canada and are to be selected from the list of approved courses provided in the Canadian Studies section of Chapter fourteen of the Calendar (See Note 1).
The equivalent of two full courses chosen to meet your Honours requirement in your home discipline.

Year III
Canadian Studies 301/302 given at the Canadian Studies Programme Centre at St. Paul’s College.
One full or two half-courses in your home discipline chosen from courses dealing specifically with Canada.
One full or two half-courses chosen from outside your discipline. These courses deal specifically with Canada and are to be selected from the list of approved courses provided in the Canadian Studies section of Chapter fourteen of the Calendar.

General degree students will graduate at the end of this third year with a degree in their home discipline with the Canadian Studies option shown on their diploma.

Year IV
Canadian Studies 400 given at the Canadian Studies Programme Centre at St. Paul’s College.
One full or two half-courses in your home discipline chosen from courses dealing specifically with Canada.
One full or two half-courses chosen from outside your discipline. These courses deal specifically with Canada and are to be selected from the list of approved courses provided in the Canadian Studies section of Chapter 15 of the Calendar.
The equivalent of two full courses chosen to meet your Honours requirements in your home discipline.

Note 1 It is possible to do a double Honours Programme and also take the Canadian Studies option. In this case, students take a full course or two half-courses in each of the Honours areas and take the core Canadian Studies courses. They do not need to take the courses listed outside of their Honours areas in other departments.

The Minor in Canadian Studies

Any Honours student may do a minor in Canadian Studies regardless of his/her faculty or department. To do so, he/she must put together a package equivalent of five full courses. The student takes the Canadian Studies core courses, 201/202 and 301/302. The student also takes the equivalent of three full courses from the approved list of courses listed in the Canadian Studies section of Chapter 15.
Faculty of Engineering

Students at work in an Engineering laboratory session.
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 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."

The engineering curricula at the University of Waterloo provides 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 (BASc) 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 (MASc) and Doctor of Philosophy (PhD) are also awarded in Engineering. For further details, consult the Graduate Studies Calendar and the list of the particular courses in graduate work in the various departments.

Admission

All Year 1 students enrol in September. These Year 1 students spend the Fall term together at the University, after which they are divided into two groups. They also complete the last term of the 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. Precise dates for the beginning and end of the various terms are shown in the academic calendar on pages 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.

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 Grade 13
Applicants must present 6 credits; five of those must be: Relations and Functions, Calculus, Algebra, as well as Chemistry and Physics in their overall Grade 13 programme. Applicants with high overall standing who are missing one or two of the five specific Grade 13 requirements must contact the Admissions Officer no later than January (for September admission). Applicants will be evaluated and advised on possible courses of action required to meet our specific requirements.

Admission as an Adult Student
It is recommended that applicants attempt to obtain standing in Ontario Grade 13 Mathematics and Science courses or their equivalent. The university has developed special pre-university mathematics and science courses which can be taken by correspondence and which are recommended for adult students. To discuss admissibility and appropriate qualifying work applicants are advised to contact the Admissions Officer for the Faculty of Engineering.
Admission to Advanced Standing
Because of the co-operative nature of the Engineering 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

Note: The Faculty of Engineering has revised its examination and promotions procedures and the following regulations went into effect beginning with those students entering Year 1 Engineering in the Fall 1978 term. Students who entered the Engineering programme prior to September 1978 will be governed by the regulations as laid out in the 1977-78 calendar. New students will be governed by the regulations which apply to the class to which they are admitted.

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

- Promoted - proceed to next term
- Promoted (Aegrotat) - proceed to next term
- Proceed on Probation - proceed to next term
- Required to Repeat Term - No Penalty - may repeat in next available term
- Required to Repeat Term - must stay out 2 terms before repeating
- Voluntary Withdrawal - readmission possible only through letter of application to Admissions Committee at any time after the term in which the student withdraws
- Must Withdraw from Engineering - readmission possible only through application to Admissions Committee after at least 3 terms out and with new evidence of ability to succeed in programme
- Decision Deferred - may not proceed until status cleared

Recommended for BASc Degree at (Spring/Fall) Convocation - (First/Second/Third) Class Honours
- programme successfully completed

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

The procedures through which promotion decisions are made are as follows:

At the end of each term, examining faculty members submit grades for that term's courses. Each department then reviews the performance of students registered in that department and makes promotion recommendations to the Examinations and Promotions Committee. The Engineering Examinations and Promotions Committee considers the evidence on which the departments have based their promotions recommendations and assigns the official academic decision which may be reviewed by the Engineering Faculty Council. All academic decisions and grades are reported to the students through the Registrar's Office. All recommendations to award degrees must be approved by Senate.

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

1) To continue in the degree programme, a student must have a term average of 50% or better. Except in 1A, a student receiving an average below 50% who has never before in the programme had an average below 60% will have the academic decision deferred for two months to allow the student an opportunity to bring forward evidence of extenuating circumstances which affected the term performance.

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

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

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

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

6) A student on a repeat term who does not achieve an unconditional promotion will be required to withdraw from the programme.
7) A student may withdraw voluntarily from the programme at any time prior to four weeks before the commencement of the final exam period in the term by giving written notification of the withdrawal. Students in 1A may withdraw at any time in that term.

8) A student may be required to withdraw from the programme at any time if, in the opinion of the Faculty, the student is unlikely to benefit from further participation in the programme or if the student leaves the programme without notification and fails to write examinations.

9) Students who have successfully met all the requirements of the programme and have been recommended for a BASc degree will have First, Second or Third Class Honours standing designated according to the cumulative 3A - 4B average.

10) Grades for courses that are in addition to the degree requirements will not be included in the term average but will be reported on the student's transcript.

11) Courses taken by students during work terms will not be included in the average for any term. The grades for courses taken at the University of Waterloo, however, will be reported on a student's transcript. Normally students will be expected to register for the minimum number of courses specified by the calendar for the appropriate term.

12) There are no supplemental examinations except in the last term of the programme. 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.

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

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

   AEG - Aegrotat - Student was ill according to medical evidence but has satisfactory understanding of the course.
   CR - Credit Granted - Performance was satisfactory.
   NCR - No Credit Granted - Performance was unsatisfactory.

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

16) Changes to a student's original registration form may be permitted at the discretion of a student's department. All such arrangements must be indicated and approved before the end of the normal "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.

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

INC - Incomplete - The course work is incomplete and the student has permission to extend the work beyond the term. If six months have elapsed since the end of the term, a grade must be submitted.

DNW - Did Not Write - The student did not withdraw from the course and was not eligible for an Incomplete grade, and did not submit sufficient of the necessary assignments, tests and examinations and was not eligible for an Incomplete grade, and did not submit sufficient of the necessary assignments, tests and examinations for an evaluation to be made.

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

<table>
<thead>
<tr>
<th>Grade</th>
<th>Numerical Grade</th>
</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>
Undergraduate Co-operative Work Term Reports

Satisfactory work reports and work terms are recognized formally as part of the requirements for the Bachelor’s degree. The regulations related to work term reports are:

1) Prior to graduation each Engineering student is required to submit a minimum of four satisfactory work reports which must be related to the work of the term reported and must have identifiable analytic content. For those students admitted to advanced standing into 2B or 3A with only 3 work terms remaining, only 3 satisfactory work reports would be required.

2) Work reports are due seven days after the first official day of lectures of the academic term directly following the work term on which the report is based. Reports submitted after the deadline are considered unacceptable.

3) Work reports shall be compulsory for all students in their first work term. The reports and evaluation forms shall be returned to the students and copies of the evaluation forms shall be placed in the students’ files in the Department of Co-ordination.

4) Three additional work reports shall be submitted for the remaining five work terms. Students are encouraged to reserve a report for their final work term. If students wish, they may submit the additional reports and the evaluations of these reports will be added to their work term record.

5) Work reports, other than those completed by first year students, shall be evaluated by the Engineering Faculty following the same procedure suggested in Item 3. This shall include reports marked by employers.

6) Work reports rated as unsatisfactory may be 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.

7) Students with an “NCR” designation on any work report will not be promoted until they have cleared this condition. (see booklet on Regulation & Procedures for co-operative programmes).

The General Studies Programme in Engineering

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

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

Students in the Faculty of Engineering, beginning with the class entering in Fall, 1977, must complete, as a part of the BASc requirements, a programme consisting of five courses in humanities and social sciences, to be selected from course lists published by the Faculty, such that at least two of the courses are advanced level courses in the same, or closely related, subject area.

The course lists, published each year, will be divided into: List A – introductory, no-prerequisite courses; List B (Options) – recommended sequences in a range of coherent options, containing at least two advanced level courses; List B (Other Courses) – other advanced level courses from among which students may devise their own appropriate sequence. Any choices other than those from the published lists require the approval of the student’s departmental advisor.

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. In addition a wide variety of elective courses are available from which optional programmes may be developed under the guidance of faculty advisors.

For further enlargement of the programmes, refer to the Faculty chapter in this calendar.

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 Engineering
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 enrolling in General Engineering must register in the courses indicated in the following table:

**Term 1A**
- Mathematics 110A (see course description on page 370)
- Mathematics 114 (see course description on page 370)
- Ch E 102 (see course description on page 270)
- Physics 121 (see course description on page 419)
- Gen E 115 (see course description on page 323)

**Term 1B**
- Mathematics 110b (see course description on page 370)
- Gen E 114 (see course description on page 323)
- Gen E 121 (see course description on page 323)
- Gen E 122 (see course description on page 323)
- One technical option from the following:
  - Civ E 176 (see course description on page 274)
  - El E 116 (see course description on page 298)
  - ME 116 (see course description on page 395)
- One General Studies elective to be chosen from the list of recommended course which will be published each year.

Students enrolling in Chemical Engineering register for the same course as above except in the 1A term they take Ch E 100 (see course description on page 270) in lieu of Gen E 115, and Ch E 101 in the 1B term.

Students enrolling in Systems Design should refer to page 466 for the Systems Design course listings.

Students in Chemical Engineering and Systems Design may transfer to Civil, Electrical or Mechanical Engineering (see booklet entitled Admissions Information '80 for conditions of transfer and make-up requirements).

**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 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.

**Note**
Detailed course descriptions commence in Chapter 15. Courses beginning with Gen E (General Engineering) can be found on page 323.
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
Odd numbers: second term

A) Core Courses (Beyond Year 1)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ch E 220</td>
<td>Applied Mathematics 1</td>
</tr>
<tr>
<td>Ch E 230</td>
<td>Physical Chemistry 1</td>
</tr>
<tr>
<td>Ch E 232</td>
<td>Inorganic Chemistry 1</td>
</tr>
<tr>
<td>Chem 26</td>
<td>Organic Chemistry 1</td>
</tr>
<tr>
<td>Math 210</td>
<td>Calculus 2 (For Chemical Engineers)</td>
</tr>
<tr>
<td>Ch E 211</td>
<td>Transport Processes 1 (Fluid Mechanics)</td>
</tr>
<tr>
<td>Ch E 231</td>
<td>Physical Chemistry 2</td>
</tr>
<tr>
<td>Ch E 233</td>
<td>Chemical Engineering Laboratory</td>
</tr>
<tr>
<td>Chem 36</td>
<td>Organic Chemistry 2</td>
</tr>
<tr>
<td>Math 216</td>
<td>Differential Equations</td>
</tr>
<tr>
<td>Ch E 312</td>
<td>Transport Processes 2 (Heat Transfer)</td>
</tr>
<tr>
<td>Ch E 320</td>
<td>Applied Mathematics 2</td>
</tr>
<tr>
<td>Ch E 330</td>
<td>Chemical Engineering Thermodynamics</td>
</tr>
<tr>
<td>Ch E 332</td>
<td>Inorganic Chemistry 2</td>
</tr>
<tr>
<td>Ch E 334</td>
<td>Instrumental Methods of Chemical Analysis</td>
</tr>
<tr>
<td>Ch E 313</td>
<td>Transport Processes 3 (Mass Transfer)</td>
</tr>
<tr>
<td>Ch E 315</td>
<td>Chemical Engineering Laboratory</td>
</tr>
<tr>
<td>Ch E 331</td>
<td>Chemical Reaction Engineering</td>
</tr>
<tr>
<td>Ch E 420</td>
<td>Process Dynamics and Control 1</td>
</tr>
<tr>
<td>Ch E 422</td>
<td>Engineering Economics</td>
</tr>
<tr>
<td>Ch E 482</td>
<td>Technical Seminar and Process Design</td>
</tr>
<tr>
<td>Ch E 007</td>
<td>General Awareness Seminar</td>
</tr>
</tbody>
</table>

B) Elective Courses
In addition to the core courses listed above, a minimum of 13 elective courses must be taken beyond Year 1. The usual sequence of technical (T) and General Studies (GS) electives is as follows:

<table>
<thead>
<tr>
<th>Term</th>
<th>GS</th>
<th>T</th>
<th>Free (GS or T)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2A</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2B</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3A</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3B</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4A</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4B</td>
<td>4*</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

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

Four to six of these courses may be chosen from social sciences, humanities, languages and other non-technical subjects. Four of the courses together with the general studies course in the 1B term must satisfy the General Studies Programme requirements described on pg. 131.

The remaining seven to nine courses must be technical electives which must include either the seventh option group listed below or one of the first six option groups listed plus one of Ch E 583 or Ch E 585. The other technical electives may be chosen from other Chemical Engineering courses or from other science or engineering courses according to interest, but the choice must be approved by the Associate Chairman (Undergraduate Studies).

The three technical electives for each of the seven Chemical Engineering option groups are identified below. Within each option group, the first course is normally taken in the 3B or 4A term and the other two courses are normally taken in the 4B term.

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

2) Mathematical Analysis and Control
Ch E 520 Chemical Engineering Analysis
Ch E 521 Process Dynamics and Control 2
Ch E 523 Process Control Laboratory

3) Polymer Science and Engineering
Ch E 540 Introduction to Polymer Science
Ch E 541 Physical Chemistry of Polymers
Ch E 543 Polymer Laboratory

4) Extractive and Process Metallurgy
Ch E 550 Introduction to Extractive Metallurgy
Ch E 551 Metallurgical Chemistry
Ch E 553 Principles of High Temperature Extractive Metallurgy
5) Biochemical and Food Engineering
Ch E 560 Introduction to Biochemical Engineering
Ch E 561 Fermentation Operations
Ch E 563 Food Processing

6) Pollution Control Engineering
Ch E 570 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

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

A student may acquire a BASc in Chemical Engineering with an option in Management Sciences by taking eight specific M Sci courses as electives (see listing under equivalent with M Sci 21 and M Sci 23, respectively).

The six other courses use 6 of the minimum 13 elective course choices (3 GS and 3 T). The student must achieve a grade of at least 50% in each of the 8 courses and must obtain an average of 60% or more in these courses in order to receive recognition for satisfactorily completing the Option.

Academic Programme for Each Term (1980-81)

Year 2A, Fall and Winter
Math 210, Chem 26, Ch E 220, Ch E 230, Ch E 232, Ch E 007, General Studies elective

Year 2B, Spring and Fall
Math 216, Chem 36, Ch E 211, Ch E 231, Ch E 233, Ch E 007, General Studies elective

Year 3A, Winter and Spring
Ch E 312, Ch E 320, Ch E 330, Ch E 332, Ch E 334, Ch E 007, General Studies elective

Year 3B, Fall and Winter
Ch E 313, Ch E 315, Ch E 331, Technical elective, Ch E 007, General Studies elective

Year 4A, Spring and Fall
Ch E 420, Ch E 422, Ch E 482, Ch E 007, 2 Technical electives, Free elective.

Year 4B, Winter
Either Ch E 007, Free elective, 2 Technical electives, Ch E 561; or Ch E 007, Free elective, 3 Technical electives, Ch 3 583 or Ch E 585.

Detailed course descriptions are given in Chapter 7b.

Civil Engineering

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

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

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

a) Structural Engineering - intended for students primarily interested in design and construction of structures; emphasis is placed on a broad foundation in mechanics and behaviour of materials.
b) Environmental Health Engineering - the major attention in this option is given to studies of water and air resources supply, treatment and disposal, industrial hygiene, radiation protection, control of communicable diseases and environmental sanitation and design of municipal facilities.

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

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

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

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

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

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

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

It is difficult to give a simple definition of what a civil engineer is and does. Essentially the profession is principally involved with the creation, operation and maintenance of structures associated with water resources, transportation, power generation, and a wide range of industrial, commercial and institutional buildings and complexes including whole urban structures. The activities include investigation, planning, design, construction and evaluation. VOCATIONALLY a civil engineer may specialize in any of the foregoing. He or she may also specialize in biomechanics, solid mechanics, fracture mechanics, elasticity, building structures, bridges, hydrology, hydraulics, sanitation (public health), industrial wastes, water resource structures, irrigation and drainage, inland waterways, harbours, aerospace, highways (roads and streets), railroads, pipelines, geology, meteorology, soil mechanics, foundations, tunnelling (rock mechanics), surveying and cartography, urban and regional planning and overall project planning. The list is by no means complete. For example, some of our graduates are involved in aquaculture. Civil engineering may also be combined with another discipline or profession such as engineer-cost analyst, engineer economist, engineer-sociologist, engineer-lawyer, engineer-biologist, engineer-psychologist, engineer-medical doctor, etc. The civil engineer, regardless of whether he or she is a generalist or a specialist, draws heavily upon the work of the physical and social sciences, other professions and other branches of engineering. Moreover, as engineers have become involved in many interdisciplinary activities over the last decade, the job demarcation between boundaries of engineering has become much less restrictive. Certainly one of the advantages of completing a civil engineering program is that it allows professional registration while simultaneously providing a basis for further study and professional development in a large variety of specialized fields.

A) Core Programme

a) Credit Courses

Civ E 116 Engineering Concept 2
Civ E 200 Civil Engineering Project 1
Civ E 203 Statics
Civ E 204 Dynamics
Civ E 205 Mechanics of Deformable Solids 1
Civ E 221 Calculus
Civ E 222 Differential Equations
Civ E 224 Probability and Statistics
Civ E 265 Structure and Properties of Materials
Civ E 266 Fluid Mechanics
Civ E 291 Survey Camp
Civ E 292 Engineering Economics
Civ E 294 Thermal Sciences
Civ E 300 Civil Engineering Project 2
Civ E 303 Structural Analysis 1
Civ E 304 Structural Analysis 2
Civ E 313 Structural Concrete Design 1
Civ E 342 Transport Engineering 1
Civ E 343 Transport Engineering 2
Civ E 353 Soil Mechanics
Civ E 354 Foundation Engineering
Civ E 381 Hydraulics
Civ E 400 Civil Engineering Project 3
Civ E 413 Structural Steel Design
Civ E 453 Engineering Geology
b) Non Credit Courses
Civ E 298  Civil Engineering Seminars
Civ E 299  Civil Engineering Seminars
Civ E 398  Civil Engineering Seminars
Civ E 399  Civil Engineering Seminars
Civ E 498  Civil Engineering Seminars
Civ E 499  Civil Engineering Seminars

The above represent seminars and discussions arranged by the department on topics of general interest to civil engineers.

B) Electives
a) Technical Electives†
Elective courses may be selected from the following list, in accordance with the academic programme for the term, and in consultation with the Civil Engineering Faculty advisor.
Civ E 306  Mechanics of Deformable Solids 2
Civ E 344  Urban and Regional Engineering
Civ E 383  Water Distribution and Collection Systems
Civ E 403  Structural Analysis 3
Civ E 404  Structural Analysis 4
Civ 3 405  Structural Dynamics and Stability
Civ E 414  Structural Concrete Design 2
Civ E 415  Structural Systems
Civ E 430  Experimental Mechanics
Civ E 440  Urban Traffic Management
Civ E 442  Pavement Structural Design
Civ E 444  Urban Transport Planning
Civ E 454  Geotechnical Engineering
Civ E 472  Wastewater Treatment
Civ E 473  Pollution in the Aquatic Environment
Civ E 480  Basic Principles of Water Resources
Civ E 493  Engineering in the Canadian North
Civ E 496  Project Management
Civ E 497  Engineering Optimization and Analysis

b) Non Technical Electives
Four courses, together with the general studies course in the 1B term must satisfy the General Studies Programme requirements described on pg. 131. A number of elective courses may be taken from the offerings of other departments. Each student is responsible for selecting his own programme of electives, in keeping with his ultimate career objective after graduation.

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

C) Other Courses
Civ E 110†, Urban Transport Problems and Prospects
†Civ E 110 is not intended for Civil Engineering students at any level. The offering of this course is contingent upon sufficient demand and/or teaching resources.

Academic Programme for Each Term

Year 1B (Winter and Spring Terms)
Civ E 116, plus other Year courses

Year 2A (Fall and Winter Terms)
Civ E 203, Civ E 204, Civ E 221, Civ E 224, Civ E 265, Civ E 292, Civ E 298, Civ E 291†

Year 2B (Spring and Fall terms)
Civ E 200, Civ E 205, Civ E 222, Civ E 294, Civ E 299; one general studies elective, Civ E 291†

Year 3A (Winter and Spring terms)
Civ E 303, Civ E 313, Civ E 342, Civ E 353, Civ E 381, Civ E 398; one general studies elective

Year 3B (Fall and Winter terms)
Civ E 300, Civ E 304, Civ E 343, Civ E 354, Civ E 375, Civ E 399; one elective chosen from Civ E 306, Civ E 344 or Civ E 383

Year 4A (Spring and Fall terms)
Civ E 413, Civ E 453, Civ E 486, Civ E 498; two electives chosen from Civ E 403, Civ E 414, Civ E 440, Civ E 472 or Civ E 496; one general studies elective

Year 4B (Winter term)
Civ E 400, Civ E 491, Civ E 499; three electives chosen from Civ E 404, Civ E 405, Civ E 415, Civ E 430, Civ E 442, Civ E 444, Civ E 454, Civ E 473, Civ E 480, Civ E 493 or Civ E 497; one general studies elective
†Civ E 291 Survey Camp is taken at the commencement of the Fall Term, preceding either 2A or 2B

Civil Engineering with an Option in Management Sciences†
A student may acquire a BASc in Civil Engineering with an Option in Management Sciences by taking 8 M Sci courses (see pg. 362) as electives. Note that M Sci 21 and M Sci 23 are equivalent to Civ E 224 and Civ E 292, respectively, for the purposes of this Option. The student must achieve a grade of at least 50% in each of the 8 courses and must obtain an average of 60% or more in these courses.

†A student who wishes to follow the Management Science Option, must declare his intent before embarking on his 2B term and must obtain the approval of the Civil Engineering Department.
Electrical Engineering

The curriculum in Electrical Engineering is designed to teach those fundamental physical and engineering sciences which form the basis of the work of electrical engineers. After the common Year 1 programme in Engineering, the programme in Electrical Engineering consists of prescribed core courses and a minimum of nine technical electives (taken during the last two terms); these technical electives include the possibility of working on a design or research project. In addition, students must satisfy Faculty of Engineering general studies requirements by choosing suitable elective courses.

The normal recommended programme shown below involves a course load (excluding seminars) of five or six courses per term. Laboratory exercises are compulsory where they form part of a course.

The normal rules of the co-operative 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 Year 1) unless admitted to advanced standing, as defined in the Calendar (see page 129).

Permission to carry more than the normal load in any one term will normally be given only if the student holds an A average in the previous term. The promotion criteria will be as laid down in the Faculty rules (see page 129).

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 pg. 362) as electives. Credit for M Sci 21 is equivalent to Credit for E1 E 316. The student must achieve a grade of at least 50% in each of the 8 courses and must obtain an average of 60% or more in these courses in order to receive recognition for satisfactorily completing the option.

Academic Programme 1980/81.

Note 1

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

Note 2

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

Term 2A, Fall and Winter

<table>
<thead>
<tr>
<th>Course</th>
<th>No.</th>
<th>Name</th>
<th>C</th>
<th>T</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1 E 201</td>
<td>Seminar</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>E1 E 205</td>
<td>Advanced Calculus for (Math 211) Electrical Engineers 1</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>E1 E 222</td>
<td>Introduction to Digital Computers</td>
<td>2</td>
<td>1</td>
<td>2*</td>
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</tr>
<tr>
<td>E1 E 233</td>
<td>Physical Electronics</td>
<td>3</td>
<td>1</td>
<td>-</td>
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</tr>
<tr>
<td>E1 E 241</td>
<td>Electric Networks 1</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>E1 E 293</td>
<td>Instrumentation &amp; Measurement 1</td>
<td>1</td>
<td>-</td>
<td>4*</td>
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</tr>
<tr>
<td>M E 23</td>
<td>Engineering &amp; Managerial Economics</td>
<td>3</td>
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Term 2B, Fall and Spring

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<th>Name</th>
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<tbody>
<tr>
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<td>Seminar</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>E1 E 206</td>
<td>Advanced Calculus for (Math 212) Electrical Engineers 2</td>
<td>2</td>
<td>2</td>
<td>-</td>
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<tr>
<td>E1 E 261</td>
<td>Energy Processing &amp; Conversion</td>
<td>3</td>
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<tr>
<td>E1 E 271</td>
<td>Electric &amp; Magnetic Fields</td>
<td>3</td>
<td>1</td>
<td>-</td>
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</tr>
<tr>
<td>E1 E 294</td>
<td>Instrumentation &amp; Measurement 2</td>
<td>1</td>
<td>1</td>
<td>3*</td>
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<tr>
<td>M E 250</td>
<td>Thermodynamics</td>
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General Studies elective

Term 3A, Winter and Spring

<table>
<thead>
<tr>
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<th>Name</th>
<th>C</th>
<th>T</th>
<th>L</th>
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<tr>
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<td>1</td>
<td>-</td>
<td>-</td>
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</tr>
<tr>
<td>E1 E 316</td>
<td>Probability &amp; Statistics</td>
<td>2</td>
<td>2</td>
<td>-</td>
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<tr>
<td>E1 E 323</td>
<td>Principles of Digital Circuits and Systems</td>
<td>3</td>
<td>-</td>
<td>1**</td>
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</tr>
<tr>
<td>E1 E 342</td>
<td>Electric Networks 2</td>
<td>2</td>
<td>2</td>
<td>-</td>
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<tr>
<td>E1 E 362</td>
<td>Electronic Devices</td>
<td>2</td>
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<td>E1 E 362</td>
<td>Energy Conversion</td>
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General Studies elective

Term 3B, Fall and Winter

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<td>Seminar</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>E1 E 317</td>
<td>Signal Analysis Methods</td>
<td>3</td>
<td>-</td>
<td>1**</td>
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</tr>
<tr>
<td>E1 E 352</td>
<td>Electronic Circuits</td>
<td>2</td>
<td>1</td>
<td>3*</td>
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</tr>
<tr>
<td>E1 E 372</td>
<td>Transmission Lines &amp; Electromagnetic Fields</td>
<td>2</td>
<td>1</td>
<td>3*</td>
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</tr>
<tr>
<td>E1 E 380</td>
<td>Introduction to Systems &amp; Control</td>
<td>2</td>
<td>1</td>
<td>3*</td>
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Non-technical elective
Management Sciences

Introduction
The Department of Management Sciences, Faculty of Engineering, was established in 1969 as a graduate department and has subsequently extended its activities to undergraduate programmes. The management sciences are concerned with the application of scientific methods in the resolution of complex problems facing management of both private and public sector organizations.

The present activities of the department are: (1) the pursuit of advanced research in selected fields of the management sciences, (2) the provision of post-graduate courses of instruction, including part-time studies in Waterloo and Oakville, for people who want to achieve high professional qualifications, and (3) the provision of undergraduate courses in the management sciences for students registered in the Faculty of Engineering.

Active faculty engagement in advanced research, as well as experience in professional practice, is considered essential to the development of adequate courses of instruction. The boundaries between pure research, applied research and professional practice become indistinct when the aim is to discover imaginative new ways to solve complex management problems. The research activities of the faculty members fall into major categories: operations research, and organizational behaviour. A major aim of the Department is to strengthen and develop these fields of study.

Degrees Conferred
The department confers degrees only at the graduate level (the MASc and PhD). At the undergraduate level it provides, for a student progressing to a BASc in any other department of the Faculty of Engineering, the opportunity to take an option in Management Sciences.

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

Chemical Engineering
Civil Engineering
Electrical Engineering
Mechanical Engineering
Systems Design

The Option in Management Sciences is structured to provide an understanding of the issues, concepts and techniques related to managerial problems,
particularly those concerned with the management of technology. It aims to impart a training that will be useful for problem-solving capability in the long run; also, it lets the student acquire certain skills which should help widen the scope of his immediate employment. Students taking the Option may advance to the MASc in Management Sciences within three academic terms following the completion of the BASc.

The Option consists of eight courses (see course descriptions in Chapter 15), two in each of the following areas:

a) Probability and Statistics
   M Sci 21 Probability and Statistics 1
   M Sci 31 Probability and Statistics 2

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

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

d) Decision Analysis and Organizational Behaviour
   M Sci 44 Organizational Behaviour 1
   M Sci 53 Organizational Behaviour 2

**Option in Management Sciences**

<table>
<thead>
<tr>
<th></th>
<th>2A Fall</th>
<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>
<th>4B Winter</th>
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<tr>
<td>ChEA</td>
<td>ChE220*</td>
<td>MSci44</td>
<td>MSci31</td>
<td>MSci46</td>
<td>MSci47</td>
<td>ChE422†</td>
<td>MSci43</td>
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<tr>
<td>ChEB</td>
<td>CHE220*</td>
<td>MSci44</td>
<td>MSci46</td>
<td>MSci47</td>
<td>MSci43</td>
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<td>CivE292†</td>
<td>MSci44</td>
<td>MSci46</td>
<td>MSci47</td>
<td>MSci43</td>
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<tr>
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<td>CivE292†</td>
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<td>MSci46</td>
<td>MSci47</td>
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<td>MSci47</td>
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<td>MSci23</td>
<td>MSci44</td>
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<td>SyDeB</td>
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<td>SyDe333X</td>
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<td>MSci53</td>
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</table>

*Prerequisites are listed under course descriptions in Chapter 15.*

The designation of an Option in Management Sciences will be shown on the student’s transcript when he achieves a grade of at least 50% in each of all eight courses (see above) or their equivalents as specified by the department of Management Sciences, and obtains an average of 60% or more in these courses.

A student may take any number of courses in the Option as electives, provided that the appropriate prerequisites are satisfied. However, the designation of an Option in Management Sciences will not be shown on the transcript of a student who does not take all the eight courses specified above.

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

In order to facilitate the taking of all eight courses in the Option the student should proceed according to the following schedule beginning in the 2A term:

*Equivalent with MS21
† Equivalent with MS23
x Equivalent with MS31
Mechanical Engineering

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

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

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

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

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

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

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

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

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

a) Credit Courses

- M E 201 Advanced Calculus
- M E 203 Ordinary Differential Equations
- M E 204 Numerical Analysis
- M E 212 Dynamics
- M E 215 Mechanics of Deformable Solids 1
- M E 220 Mechanics of Deformable Solids 2
- M E 230 Control of Properties of Materials
- M E 250 Thermodynamics
- M E 305 Partial Differential Equations
- M E 321 Partial Differential Equations
- M E 322 Mechanical Design 1
- M E 340 Manufacturing Processes
- M E 351 Fluid Mechanics 1
- M E 353 Heat Transfer 1
- M E 354 Thermodynamics 2
- M E 360 Introduction to Control Systems
- M E 362 Fluid Mechanics 2
- M E 462 Instrumentation
- M E 482 Mechanical Engineering Projects
- M Sci 21 Probability and Statistics (Equivalent to M E 202)
- M Sci 23 Managerial and Engineering Economics 1
- El E 14 Electrical Engineering 1
- El E 32 Electrical Engineering 2

b) Non Credit Courses

- M E 200 Introduction to Mechanical Engineering 1
- M E 300 Introduction to Mechanical Engineering 2
- M E 400 Introduction to Mechanical Engineering 3

B) Elective Courses

a) General Studies Electives

Students entering the programme will take three General Studies electives in non technical subjects. The marks obtained in these courses will be included in the calculation of term averages. These courses are organized on a Faculty basis and detailed in this calendar under the section General Studies in the Faculty of Engineering.

b) Technical Electives.

Eight technical elective courses are required in addition to the core courses listed above to fulfill the requirements of the Mechanical Engineering programme. Each student will, in addition, select and complete a two-term project (M-E 482) under the direct supervision of a Professor. The project requires the student to demonstrate initiative and assume responsibility. Each student is responsible for selecting his own programme of electives, and project, in keeping with his ultimate career objective. During the term, certain faculty members are designated to give advice to students and to approve their final selection by signing their pre-registration form. A student who has an unusual career goal in mind should discuss his choices with one of the designated faculty members, since it is possible to combine courses from different options, to take courses from other departments and in some circumstances take graduate-level courses. Students who are contemplating graduate study are particularly urged to discuss their plans with the designated faculty member. The designated faculty member must be convinced of the validity of the student's selection of electives. If he refuses to sign the pre-registration form the student must reconsider his selection or else he must discuss his choices with the Associate Chairman for Undergraduate Studies.

As a guide, typical lists of electives for the five option areas available from within the department of Mechanical Engineering are given below:

a) Fluid Mechanics and Thermodynamics Option:

- M E 452 Energy Transfer in Buildings
- M E 456 Heat Transfer 2
- M E 459 Energy Conversion
- M E 463 Tribology 1
- M E 557 Combustion 1
- M E 563 Turbomachines
- M E 565 Gas Dynamics
- M E 566 Fluid Mechanics 3
- M E 568 Noise Analysis and Control
- M E 569 Fluid Mechanics-Design Topics

b) Environmental Fluid Mechanics

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

c) Machine Design and Solid Mechanics Option

- M E 423 Mechanical Design 2
- M E 435 Industrial Metallurgy
- M E 463 Tribology 1
- M E 524 Advanced Dynamics and Stress Analysis in Design
- M E 525 Mechanical Vibrations in Machines
- M E 527 Mechanics of Deformable Solids 3
- M E 544 Welding
- M E 568 Noise Analysis and Control
- M E 626 Fatigue and Brittle Fracture

(See Graduate Calendar)
The Mechanical Engineering Undergraduate Program

<table>
<thead>
<tr>
<th>Term</th>
<th>Courses</th>
</tr>
</thead>
</table>

F-Fall term, W-Winter Term, S-Spring term

The Mechanical Engineering curriculum structure is summarized in the following table.
Systems Design

Introduction
In recent years it has become increasingly apparent that effective solutions to complex 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 evaluated, but the economic, social, human and political parameters must be given equally careful attention. The rapid growth and complexity of industry have, indeed, created unusual problems; however, underlying the complexities of modern civilization and technology are similarities which make it possible to approach problems in many diverse fields with essentially the same concepts, theories and techniques. Systems science has emerged as a scientific discipline for quantitative analysis, design and control of large classes of problems in engineering and social sciences.

When large scale problems are under study, few people can be knowledgeable in the complete span of factors and parameters which must be considered. For these cases, solutions must be arrived at by interdisciplinary teams where each member contributes his or her own special expertise. In order to work effectively on this team, each member needs to be aware of the fundamental systems and design aspects of the problem.

The 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.

The Engineering Profession
Systems Design Engineering is a unique engineering discipline which is formally accredited by the Association of Professional Engineers of the Province of Ontario (APEO). With two years of work experience beyond graduation (BASc)\(^1\), the Systems Design Engineer may apply for registration as a Professional Engineer. If a Masters degree (MASc)\(^2\) in Systems Design is also obtained only one year of work experience is required before application.

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

The Systems Design programme is specifically oriented towards developing graduates who can solve problems lying at the interface of technology and the human environment. Therefore, if you are technically oriented and also have a strong parallel interest in social and human problems, Systems Design Engineering may be the right programme for you.

The Systems Design programme is quite challenging. It is not easy to acquire the tools for solving the problems of complex systems. Moreover, these tools are becoming more and more sophisticated. Thus, the average student in Systems Design is expected to work at least 50 hours per week as he or she increases in awareness of the theories of human communication, makes progress in the areas of Systems Theory, Human Systems Engineering, and Socio-Economic Systems, and absorbs the implications of the tremendous growth of electronic computing systems.

Further information is available from:
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Associate Chairman for Undergraduate Studies
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High School Liaison Officer
Department of Systems Design
University of Waterloo
Waterloo, Ontario, N2L 3G1
(519) 885-1211 Ext. 3113

Footnotes
\(^1\)BASc Bachelor of Applied Science
\(^2\)MASc Master of Applied Science
Employment Opportunities
Graduates of Systems Design Engineering will find employment opportunities in a number of diverse fields. To some extent, the technical and option area chosen by the student in the third and fourth year determine more specifically what he or she does upon graduation. The following is a list of general areas of activity for Systems Design Engineering graduates:

- Chemical Engineering Systems (process control and instrumentation; etc.)
- Civil Engineering Systems (transportation; water resources; waste disposal systems; etc.)
- Computer Science (advanced computer applications; system simulation; analysis and design; etc.)
- Electrical and Electronic Systems (control systems; system analysis; etc.)
- Human Engineering Systems (design applications; human factors in industrial management; biomedical engineering)
- Industrial Engineering Systems (production design; production and inventory systems; management systems; etc.)
- Mechanical Engineering Systems (production design; manufacturing processes; etc.)

Undergraduate Curriculum in Systems Design

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 sciences and systems theory
- socio-economic systems
- human systems engineering
- computer systems and applications

Throughout these three years the student’s ability to grasp real engineering problems is enhanced by courses in Systems Design Methodology and Systems Behaviour followed by a series of challenging problem solving experiences in the Systems Design Workshop. It is here that a focus is given to the whole curriculum and the student learns to apply his lecture material, to develop skills in solving problems that cut across the traditional disciplines, and to develop design, planning and organizational abilities.

These first three years of the programme are followed by one year in which the problem solving capabilities of the student are applied with emphasis in one particular area of technology. This provides the required background for a future year of advanced study to the MASc degree, or for a rewarding career in industry or government with the Bachelor’s degree (BASc).

System Design Undergraduate Core Curriculum
Listing by Terms

1A (Fall Term)
- Sy De 101 Tutorial
- Sy De 111 Calculus 1
- Sy De 113 Linear Algebra
- Sy De 121 Digital Computation
- Sy De 131 Engineering Economics
- Sy De 161 Systems Behaviour
- Sy De 181 Statics
- Sy De 183 Graphics and Design

1B (Spring Term)
- Sy De 102 Tutorial
- Sy De 112 Calculus 2
- Sy De 114 Theory and Application 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 201 Tutorial
- Sy De 211 Applicable Mathematics for Systems Design 1
- Sy De 213 Theory and Applications of Statistics
- Sy De 221 Numerical Analysis and Computation
- Sy De 261 Systems Design Workshop 1
- Sy De 281 Mechanics of Deformable Solids
- 1 General Studies Programme elective

2R (Fall Term)
- Sy De 202 Tutorial
- Sy De 212 Applicable Mathematics for Systems Design 2
- Sy De 252 Physical Systems 1
- Sy De 262 Systems Design Workshop 2
- Sy De 282 Thermodynamics
- Sy De 284 Fluid Mechanics
- Sy De 292 Systems Design Laboratory 1
- 1 General Studies Programme elective

3A (Spring Term)
- Sy De 301 Tutorial
- Sy De 311 Systems Operations 1
- Sy De 361 Systems Design Workshop 3
- Sy De 381 Materials Engineering
- Sy De 383 Introduction to Biochemical and Polymer Systems
Sy De 391 Systems Design Laboratory 2
1 technical elective
1 free elective (technical or General Studies Programme elective)

3B (Winter Term)
Sy De 302 Tutorial
Sy De 322 Computer Simulation of Systems
Sy De 354 Introduction to Linear Control Systems
Sy De 362 Systems Design Workshop 4
Sy De 392 Systems Design Laboratory 3
1 technical elective
1 free elective (technical or General Studies Programme elective)

4A (Fall Term)
Sy De 401 Tutorial
Sy De 421 Computer-Aided Design 1
Sy De 461 Systems Design Workshop 5
3 technical electives
1 General Studies Programme elective

4B (Winter Term)
Sy De 402 Tutorial
Sy De 458 Large Scale Engineering Systems
Sy De 462 Systems Design Workshop 6
3 technical electives
1 General Studies Programme elective

Technical Options in Systems Design
Each undergraduate student in Systems Design must choose a technical option by the 3A term. At present the department regularly offers option programmes in
Design & Human Systems
Socio-Economic Systems
and Physical & Computer Systems

Additionally there is an option programme called Management Sciences which is offered in conjunction with the Management Sciences Department of the Faculty. Students who elect this option will receive a final academic transcript from the University with a statement that the Option in Management Sciences has been successfully completed.

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

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

Summary of The Systems Design Technical Options

Design and Human Systems Option
The Design and Human Systems option embraces in whole or in part a wide spectrum of "professional" areas known as human factors engineering, human engineering, ergonomics, 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 of consumer products used in recreation and normal living
- design involving human engineering
- human aspects of engineering ecology
- design of human "micro-environments"
- problems of ergonomics and industrial hygiene
Socio-Economic Systems Option
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 this option core, techniques are taught for analyzing socio-economic situations by the use of statistics, operations research, game theory and the social sciences. Through additional electives, a student may pursue further topics in the social sciences and operations research.

Physical and Computer Systems Option
In this option the student is given the opportunity to study in some depth Physical Systems Theory as it has evolved as a discipline over the last decade and to gain additional background and expertise in the application of electronic computers to the analysis, simulation and design of systems.

Students who take the Physical and Computer Systems option will be able to solve 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 this 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 in Management Sciences
The Management Science Department of the Engineering Faculty has a course package available whereby a student from another engineering department, such as Systems Design, can obtain a background in Management Science in addition to his or her engineering degree. The Management Science programme for a Systems Design student consists of the following optional courses:

<table>
<thead>
<tr>
<th>Term</th>
<th>Option in Management Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>F</td>
</tr>
<tr>
<td>1B</td>
<td>S</td>
</tr>
<tr>
<td>2A</td>
<td>W</td>
</tr>
<tr>
<td>2B</td>
<td>F</td>
</tr>
<tr>
<td>3A</td>
<td>S, Sy De 333</td>
</tr>
<tr>
<td>3B</td>
<td>W, M Sci 43</td>
</tr>
<tr>
<td>4A</td>
<td>F, Sy De 411</td>
</tr>
<tr>
<td>4B</td>
<td>W, M Sci 53</td>
</tr>
</tbody>
</table>

In order to successfully complete this option, students must obtain at least 50% in each of the option courses and an overall average in them of at least 60%.

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

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

Note
Transitional graduate courses (numbered in the 500's) are available for credit to senior undergraduate students registered in departments other than Systems Design.
Planning Faculty and Students discussing a Planning report
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 courses from across the whole University.

Degrees

The Faculty of Environmental Studies offers two undergraduate degrees: a Bachelor of Environmental Studies (BES), and a Bachelor of Architecture (BArch). At the graduate level a Master of Arts (MA) and a PhD Degree may be obtained in both Geography, and Regional Planning and Resource Development. In addition, the Geography and Man-Environment Studies Departments offer joint honours programmes with many other departments in the University (see programmes for other details).

Degrees may be obtained in the following programme areas:

BES - Pre-professional Architecture (3 years), on rotating work/study co-operative scheme.
BArch - Professional Architecture (2 years, with co-operative work terms following completion of BES Pre-professional Architecture).
BES - Honours Geography (4 years)
BES - Honours Co-operative Geography (5 years with rotating work/study terms)
BES - Major in Geography (3 years).
BES - Honours Man-Environment Studies (4 years)
BES - Honours Urban and Regional Planning (4 years).
MA - Geography
MA - Regional Planning and Resource Development
PhD - Geography
PhD - Regional Planning and Resource Development

The student should apply to the unit most suited to his/her interests. There is considerable freedom to transfer to other faculties after year one, depending upon the student's academic record and programme. Ease of transferring between the units of the Faculty of Environmental Studies varies. Transfer to the School of Urban and Regional Planning is not normally permitted above Year 2.

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

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

The admission requirements and procedures for all 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 Grade 13 Mathematics course for admission to programmes in Environmental Studies; Grade 13 Geography is similarly recommended for those applying to the Geography Department. For applicants to the school of Architecture, Functions and Relations, Calculus, Physics and English (Français) at the Grade 13 level are required.

Interviews

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

Transfer Credit

Generally transfer credit is given for courses in which a grade of 60% or better was obtained. Students transferring from other institutions may have their transferred courses count toward the University of Waterloo degree; 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 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. Further details concerning University Examination Regulations can be found in Chapter 1, page 18.

A maximum of eight first year credits will be counted towards a BES. For other requirements, see the programme section for the Department/School.

Students should note that the Faculty of Environmental Studies operates under a "course system" in which student progress is measured by courses successfully completed rather than by years. Students who passed fewer than five courses will be considered Year 1 students; those who have passed at least five courses but fewer than ten will be considered Year 2 students; those with at least ten but fewer than sixteen, Year 3, and those with sixteen or more, Year 4.

1) Final Examinations

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

b) Failure to write an examination is ordinarily considered a failure to pass. A student who defaults a final examination, except for a properly certified reason, shall have no make-up examination privileges and may be required to repeat the work in class. If a student fails to write, for medical reasons, a Doctor's certificate covering the precise period of absence must be filed in the Registrar's Office within one week of the set examination date.

c) A student will be eligible for make-up examinations only when failure to pass is attributable to extraordinary circumstances. In addition, students

1) must have attended a reasonable number of lectures in the course in which they propose to write, and must have satisfied all term work requirements;

2) must have secured the permission of the professor concerned.

d) Appeals against departments/schools decisions are handled at three progressive levels. (1) Disputes between students and instructors...
Environmental Studies
Examination and Standings

should be fully discussed at that level, (2) problems not resolved to either party's satisfaction should be referred to the department/school Undergraduate Affairs Committee, (3) lack of mutual satisfaction at that level would involve the dispute being forwarded to the Associate Dean, Undergraduate Affairs, for discussion at the Faculty Undergraduate Affairs Committee.

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 courses 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-. In the School of Urban and Regional Planning, this grade cannot be changed without a student appeal to the School.

d) To be considered in good standing in the Honours programmes, a student must maintain a cumulative overall average of at least B - (70.0) and an average in the chosen field of specialization as specified in the regulations of the relevant department/school. If an Honours 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, may be considered as 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 (65) in Geography. If at any time a student's average falls below C - (60.0) or the average in Geography below C (65), the individual may be granted conditional status for one year, during which period he/she must make reasonable progress toward obtaining good standing or he/she will be asked to withdraw. A student whose cumulative overall average falls below D (55) may continue only with the permission of the Undergraduate Affairs Committee.

f) The only general programme in the Faculty is the General Geography Programme. The BES 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) If a student receives a "Failed, Required to Withdraw" decision, he/she must withdraw from that program for a year; that student is entitled to apply to any other program; if the reasons for withdrawal include disciplinary problems, a statement should be placed in the student's file.

3) Additional Regulations, School of Architecture
Examinations and Promotions

In order to proceed unconditionally from one term* to the next in the BES and BArch programmes, the student must satisfy each of the following requirements:

a) Maintain a minimum cumulative overall average of C- (60.0) calculated at the end of each term of study.

b) Pass the studio course.

c) Not fail** more than one half course or equivalent (excluding studio) in any single term.

* A term of study refers to a particular four month (13 week) period of registration including the 1A, 4A and 5A terms.

** A minimum passing grade in any course is D-(50.0).

While the School reserves the right to make exceptional academic decisions for students who...
require exceptional consideration, the Promotions Committee will be guided by the following:

Students who satisfy at least two of the above requirements in a given term may be permitted to continue conditionally in the programme as outlined in notes 1, 2, 3, 4 and 5. Promotions decisions for students who satisfy only one of these requirements in any given term will be made on an individual basis by the Promotions Committee.

Students who satisfy none of the above requirements in a given term will normally receive the decision "Failed - Required to Withdraw".

Note 1
Students who fail to maintain the minimum cumulative overall average requirement but who satisfy the other two requirements will receive the academic decision "Must satisfy cumulative average requirement before proceeding". At the discretion of the Promotions Committee such students must raise their cumulative average to a minimum of C- (60.0) by repeating the term or by repeating courses which are detrimental to their average and/or by taking approved elective courses before enrolling in the next higher level core or studio courses. The minimum cumulative average must be attained within the next calendar year. Failing this, the student will be required to withdraw. Failure to maintain the minimum cumulative average of C- (60.0) by the end of the next higher level term will result in the academic decision "Failed - Required to Withdraw".

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

Note 3
Students who fail more than one half elective course (0.5 credit) or equivalent in any single term (but who pass studio and maintain the minimum cumulative overall average) will receive the academic decision "Proceed on probation". Failed elective courses or their equivalents must be repeated and passed by the end of the next term of study (which includes the higher level studio and core course(s)). Should the student fail more than one half course or equivalent in the next term, the student will receive the academic decision "Failed - Required to Withdraw".

Note 4
Students who fail two or more one term (0.5 credit) core courses or equivalent in any single term (but who pass studio and maintain the minimum cumulative overall average) will receive the academic decision "May not proceed until failed core courses are cleared". The failed core courses or equivalent must be repeated and passed before the student may register in any higher level studio or core courses. Should the student fail two or more one term (0.5 credit) courses or equivalent in the next term, the student will receive the academic decision "Failed - Required to Withdraw".

Note 5
Notwithstanding the provisions of Notes 1-4, students who have been granted conditional status on two occasions during the course of the BES (Pre-professional) programme will be required to withdraw if at any subsequent time they fail to meet any one or more of the three basic requirements for unconditional promotion as stated in 3) a, b, c, above.

Similarly, students who have been granted conditional status on one previous occasion during the course of the BArch programme will be required to withdraw if at any subsequent time they fail to meet any one or more of the three basic requirements for unconditional promotion stated in 3) a, b, c, above.

Note 6
Normally students of the School are permitted to take only one more or one fewer half-courses (academic weight 0.5) than that prescribed for the particular year and term in which they are registered. 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
See Faculty procedures item D) page 147 under final examinations.
Academic Programmes

Students who have not determined the field or subject in which they wish to concentrate should study the Calendar carefully. After examining the suggested departmental 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. Students should consult their High School Guidance Officer, Chairperson or Undergraduate Officer of any University department, or the Registrar, by letter or in person for additional clarification and information.

Course and Programme Changes

a) Students may freely add and drop half courses during the first two weeks of the Fall, Winter and Spring terms.

b) Students may add and drop full-year courses during the first two weeks of the Fall term.

c) After these periods, students will be allowed to add and drop 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 November 1 (Fall term), March 1 (Winter term), July 1 (Spring term).

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 November 1 (Fall term), March 1 (Winter term), July 1 (Spring term) will receive a grade and be counted in the student’s average.

The Faculty of Environmental Studies offers two Faculty Options for students enrolled in Honours programmes: Environmental and Resources Management Option and Regional Development Option. These are comprised of groups of courses correlated with the theme area. If a student passes all these courses with the required standing (B), the Option will be noted on their transcript.

Environmental and Resources Management Option

1) Required Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Env St 195A</td>
<td>Introduction to Environmental Studies</td>
</tr>
<tr>
<td>Env St 200</td>
<td>Field Ecology</td>
</tr>
<tr>
<td>Env St 401</td>
<td>Environmental Law</td>
</tr>
<tr>
<td>Geog 356</td>
<td>Resources Management</td>
</tr>
<tr>
<td>Geog/Plan 357</td>
<td>Conservation and Resource Management</td>
</tr>
<tr>
<td>M Env 320</td>
<td>Environmental Economics</td>
</tr>
<tr>
<td>Env St 444</td>
<td>Introduction to Quantitative Research Methods</td>
</tr>
</tbody>
</table>

2) Some Electives

a) Techniques/Methods (Minimum of 2)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Env St 271</td>
<td>Introduction to Quantitative Research Methods</td>
</tr>
<tr>
<td>Plan 255</td>
<td>Planning Surveys and Analysis</td>
</tr>
<tr>
<td>Plan 307</td>
<td>Social Survey Techniques</td>
</tr>
<tr>
<td>Plan 319</td>
<td>Economic and Social Techniques for Regional Planning</td>
</tr>
<tr>
<td>Geog 260</td>
<td>Introduction to Cartography and Analysis</td>
</tr>
<tr>
<td>Geog 275</td>
<td>Introductory Air Photo Analysis and Remote Sensing</td>
</tr>
<tr>
<td>M Env 250</td>
<td>Environmental Issues: Methods &amp; Techniques</td>
</tr>
</tbody>
</table>

b) Content Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Env St 358</td>
<td>Environmental Pollution and its Control</td>
</tr>
<tr>
<td>Env St 417</td>
<td>Land Use History and Landscape Change 1</td>
</tr>
<tr>
<td>Env St 418</td>
<td>Land Use History and Landscape Change 2</td>
</tr>
<tr>
<td>Geog 102</td>
<td>Introduction to Physical Geography</td>
</tr>
<tr>
<td>Geog 201</td>
<td>Some Basic Topics of Physical Geography</td>
</tr>
<tr>
<td>Geog 300</td>
<td>Geomorphology and the Southern Ontario Environment</td>
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<td>Geog 315</td>
<td>Agricultural Geography</td>
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<td>Geog 408</td>
<td>Special Topics in Climatology and Natural Hazards</td>
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<td>Geog 410</td>
<td>Recreation Geography</td>
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<td>Geog 411</td>
<td>Resource Studies</td>
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<tr>
<td>Geog 414</td>
<td>Resources Management Workshop</td>
</tr>
<tr>
<td>Geog 461</td>
<td>Land Dereliction &amp; Rehabilitation 1</td>
</tr>
</tbody>
</table>
Plan 156  Introduction to Urban and Regional Planning Concepts
Plan 256  Principles of Environmental Design
Plan 370  Land Development Planning
M Env 375E  Land and Leisure: Concepts and Methods in Recreational Land Use
Arch 223  Human Ecology
Arch 244  History of Gardens of Europe and Western Asia
Arch 245  Survey of Contemporary Architecture

M Env 320  Environmental Economics
M Env 247  Urban Anthropology
M Env 445  Technology Assessment and Policy Analysis
Hist 204C  Canadian Urban History
Plan 332  The Sociology of Regions
Plan 333  The Sociology of Regional Planning
Plan 360  Technology in Urban and Regional Planning
Plan 430  Social Policy Planning
Plan 456*  Political and Administrative Processes in Urban and Regional Planning
Soc 242  Industrial Sociology
Econ 333  Inter-regional Economics
Econ 335  Economic Development
Econ 343  Urban Economics

*Available to Planning students only.

Courses in the Natural Resources - Ecology Theme
The following 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
Env St 200  Field Ecology
Env St 201  Introduction to Environmental and Planning Law
Geog/Plan 357  Conservation and Resource Management
Arch 385  Resources & Design
Biol 111  Introductory Biology 1
Biol 112  Introductory Biology 2
Biol 250  Ecology
Env St 401  Environmental Law
Env St 417  Land Use History and Landscape Change 1
Env St 418  Land Use History and Landscape Change 2

Physical
Geog 102  Physical Geography
Geog 201  Physical Geography
Geog 300  Geomorphology and the Southern Ontario Environment
Geog 301  Climatology
Geog 302  Geomorphology
Geog 303  Water
M Env 356  Canadian Non-Renewable Resources Hazards
Geog 408  Geog
461/462  Land Dereliction and Rehabilitation
Earth 121  Introductory Geology 1
Earth 122  Introductory Geology 2
Earth 438  Engineering Geology

Regional Development Option
Required Courses (7 half-course credits)
Plan 156  Introduction to Urban and Regional Planning Concepts
Geog 101  Introduction to Human Geography
Geog 202  Some Basic Topics of Economic and Urban Geography
Geog 350  Regional Urban Systems 1
Plan 319  Economic and Social Techniques for Regional Planning
one of
Plan 356*  Regional Planning and Development
Plan 222  Canadian Regional Issues
or
Geog 322  Geographical Study of Canada

Elective Courses (3 half-course credits minimum)
Civ Eng 110  Contemporary Issues in Canadian Public Policy
Geog 203  Some Basic Topics of Cultural and Regional Geography
Geog 315  Agricultural Geography
Geog 349  The City as a System 1
Geog 352  The Rural-Urban Fringe of Canadian Cities
Geog 412  Geography of Manufacturing Firms and Industries
Geog 449  The City as a System 2
Geog 450  Regional Urban Systems 2
Geog 452  Problems of Rural Land Use
Applied Environmental Methods

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

A new methods area has been established where printed output and CRT terminals, a graphics terminal, map digitizer, plotter, and thermal copies are located in a research room, graphics lab, tutorial/lecture room and student work room. Computer access and associated consulting support is available to students.

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

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

Courses in the Social Sciences

To deal adequately with environmental problems it is becoming increasingly essential that students have some understanding of the data and methods of the social sciences. There is at present no official "social science theme" within the Faculty, since the particular combinations of social science courses will vary from one school or department to another, and will change according to different vocational needs on the part of students. However, a wide range of appropriate courses in the concepts and skills of the social sciences exists both within the Faculty of Environmental Studies and elsewhere in the University. Guidance about particular courses for different student career paths is available from any member of the Social Science Framework Committee, which is charged with monitoring social scientific aspects of the curriculum. Faculty members of this committee are: C. Knapper (Chairman), T. Bunting, K. Izumi, B. Mitchell, G. Priddle, A. Schrecker, and S. Lerner.

As part of their undergraduate programme, students may become involved in gathering data from human subjects – for example by means of interviews or surveys. All projects that involve the gathering of such human data must receive the approval of the Committee on Research Involving Human Subjects, and students should ensure that their instructor or supervisor has requested and obtained such approval.

The following statements outline the objectives and nature of the four programmes in the Faculty of the Environmental Studies.

School of Architecture

Nature of the Programme

Architects decide how spaces within and about buildings shall be organized. It is they who determine the shape the total building will take and how it is to be built. They design at major scale with awareness of the demands of society. They design in detail with attention to the needs and aspirations of individuals and groups. They show understanding of structural technique, construction detail and the sound use of materials. They determine the way in which the building shall be built and supervise the construction process.

Architecture is a vast spread of concerns about people and their surroundings, their history, cultures, resources, disciplines and contradictions. The School's primary concern is the development of design skills in architecture, and it stresses awareness of cultural background and existing environment.

The five-year 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 five years of architectural studies are made up of: a pre-professional, three-year Bachelor of Environmental Studies programme leading to 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 (BES Pre-Professional Architecture). This degree indicates appropriate preparation for four subsequent academic terms of study and two co-operative work terms*, each of four months duration, leading to the degree, Bachelor of Architecture (BArch).

*See Chapter 5 on co-operative programmes.

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 BES 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 an historical process. The programme aims to build up knowledge and expertise in various aspects of building and architectural design.

1) the design studio, theories and methods, and practice of architectural design
2) studies of systems and measures including computer, physical and material sciences
3) cultural history in the human environment
4) environmental studies, including natural and human ecology.

See Recommended Core Programme for course arrangement, page 154. See chapter 15 for course descriptions.

Bachelor of Architecture Programme
The Bachelor of Architecture programme increases the emphasis on architectural design and professional aspects of architecture. There are opportunities for students to develop their own areas of interest, and the final two terms of the programme are normally devoted to a design thesis.

Note
Students are expected to defray costs of materials in connection with studio projects.

See Recommended Core Programme for course arrangement, page 154. See Chapter 15 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 four months each. The work terms must be approved by the Department of Coordination and Placement.

Note
The "off-term" in the Bachelor of Environment Studies pre-professional programme follows the first two terms of study (from September to April) in Year 1. Students may use the "off-term" as a vacation period or they may seek temporary employment. Any employment arrangements made for the "off-term" are the student's own responsibility.

The terms are arranged as indicated on the 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 practicing architect today.

Work opportunities are developed in private architectural departments, and construction and development companies. Drafting abilities, methods of construction, division of sub trades, construction supervision, real problem solving, and the disciplines of time and money will be learned during the work terms.

At the completion of the work terms the student who has taken full advantage of the opportunities offered will have a thorough understanding of the current methods and procedures used in the design and construction of 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)

<table>
<thead>
<tr>
<th>Year/Term</th>
<th>Systems and Measures</th>
<th>Ecology</th>
<th>Culture</th>
<th>Design</th>
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<tbody>
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<td>Theme Area</td>
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<td>Fall</td>
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<tr>
<td>Sept-Dec</td>
<td>Arch 175</td>
<td>Env St 195A</td>
<td>Arch 142</td>
<td>Arch 192</td>
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<td></td>
<td>Math</td>
<td>Introduction to</td>
<td>Iconography 1</td>
<td>Design Fundamentals</td>
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<td></td>
<td>CS 116 (Arc)</td>
<td>Environmental Studies</td>
<td>(1 credit)</td>
<td>(1-1/2 credits)</td>
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<td>Introduction to Computers</td>
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<td>Jan-Apr</td>
<td>Arch 103</td>
<td>Arch 143</td>
<td>Arch 193</td>
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<td>Statistics</td>
<td>Iconography 2</td>
<td>Design Fundamentals</td>
<td>and Studio</td>
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<td>May-Aug</td>
<td>Arch 163</td>
<td>Arch 192</td>
<td>Arch 194</td>
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<td>Statistics</td>
<td>Design and Studio</td>
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<tr>
<td>Sept-Dec</td>
<td>Arch 212*</td>
<td>Env St 200**</td>
<td>Arch 246</td>
<td>Arch 292</td>
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<td>Computer Science</td>
<td>Field Ecology</td>
<td>Foundations of</td>
<td>Design Concepts</td>
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<td>Europe</td>
<td>and Studio</td>
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<td>Co-op Work Term 1</td>
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<td>Winter Jan.-Apr.</td>
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<td>Arch 262</td>
<td>Arch 293</td>
<td>Arch 293</td>
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<td>Strength of Materials</td>
<td>Design Concepts and Studio</td>
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<td>May-Aug</td>
<td>Arch 213*</td>
<td>Arch 247</td>
<td>Arch 293</td>
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<td></td>
<td>Design or FE</td>
<td>to Revolution</td>
<td>and Studio</td>
<td>(1-1/2 credits)</td>
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<td>Arch 263</td>
<td>Arch 293</td>
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<td>Theory of Structures 1</td>
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<td>Co-op Work Term 2</td>
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<td>Fall Sept-Dec</td>
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<td>Arch 372</td>
<td>Arch 392</td>
<td>Arch 392</td>
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<td>F.E.*</td>
<td>Design Concepts and Studio</td>
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<td>Arch 346*</td>
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<td>Romanticism and 20th Century</td>
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<td>Co-op Work Term 3</td>
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<td>Spring May-Aug</td>
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<td>Arch 303*</td>
<td>Arch 393</td>
<td>Arch 393</td>
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<td>Economics or FE</td>
<td>Design Concepts and Studio</td>
<td>(2 credits)</td>
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<td>Arch 313*</td>
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<td>Design or FE</td>
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<td>Theory of Structures 2</td>
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</tbody>
</table>

A student is free to use the off-term as he wishes. The Department of Co-ordination does not provide their normal services to arrange employment for students in this term. (see chapter 5 on co-operative programmes).

The type of experience a student may obtain in this term includes assisting in design presentation and model building; minor drafting assignments, etc.

The type of experience a student may obtain in this term includes design research; detailed design developments; design presentation; assisting in preparation of site plans, floor plans elevations, building cross-sections, etc.
Programme for the Degree of Bachelor of Architecture

<table>
<thead>
<tr>
<th>Year/Term</th>
<th>Systems and Measures Theme Area</th>
<th>Ecology Theme Area</th>
<th>Design Theme Area</th>
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</thead>
<tbody>
<tr>
<td>Co-op Work Terms</td>
<td>This period of 8 months may serve many objectives. A student after the first degree programme has time in which he may travel and decide about his future goals before returning to the School for the second degree programme. During that time a student may continue the co-op terms wherein he obtains experience in design research; in assisting in the development of conceptual designs and schematics, preparation of site plans and details, floor plans, elevations, cross-sections and standard details; in assisting the site architect or construction superintendent; etc.</td>
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<table>
<thead>
<tr>
<th>Year/Term</th>
<th>Systems and Measures Theme Area</th>
<th>Ecology Theme Area</th>
<th>Design Theme Area</th>
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<tbody>
<tr>
<td>Fall</td>
<td>Specifications</td>
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<td>Design Studio (2 credits)</td>
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<tr>
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<td></td>
<td>Arch 472 Mechanical Systems 2</td>
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<tr>
<td>Winter</td>
<td>Arch 455* Management and Estimating or FE</td>
<td>Arch 423** Urban Planning or TE</td>
<td>Arch 493 Design Studio (2 credits)</td>
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<tr>
<td></td>
<td>Arch 463 Structural Synthesis 2</td>
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<tr>
<td>Co-op Work Terms</td>
<td>This is the last co-op term of 8 months before the final year of study. On the basis of previous experience in a variety of jobs, a student is capable of handling somewhat advanced work in professional offices such as: design research; preparation of design schematics and small project design; preparation of site plans and details; development of special details; co-ordination of consultants work and site architect on small projects, and assisting construction superintendent on large projects; etc.</td>
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<tr>
<td>Fall</td>
<td>Arch 554* Development and Financing or FE</td>
<td>Arch 592 Design Studio (3 credits)</td>
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<td>Arch 555 Architectural Practice</td>
<td>Arch 593 Design Studio (3 credits)</td>
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<td>Spring</td>
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</tbody>
</table>

* 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.
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 human need, how patterns of human activities are structured over space, and how these are influenced by environmental factors. Geography is considered both a natural and social science and flourishes in an academic organization where the multi-disciplinary approach is emphasized.

The Bachelor of Environmental Studies (BES) programme in Honours Geography provides students with almost unlimited freedom to choose supporting electives from across the whole University. Thus, in consultation with professors, students will be able to have a tailor-made programme to suit their particular needs, whether they are primarily interested in physical or human geography, regional or systematic topics, or a combination of these. Certain approved options may be designated on a student's transcript; these are specified on pg. 160. The Department has Joint Honours programmes with a number of other departments on campus. (see page 162).

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. The technique courses include field methods, remote sensing, cartography, statistical analysis, and computer use. The fourth year includes a research project known as the Senior Honours Essay.

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 Architecture, Urban and Regional Planning and Man-Environment Studies.

Graduating students acquire a variety of jobs in education, in government, industry and planning agencies.

Although the programme is broad in scope, six major aspects of the discipline have been formalized into options. The Honours student can take one of these options, as specified on p.160 though this is not in any way required. Further concentration is possible by careful selection of courses from related fields in other parts of the University. However, should a student wish to design his/her programme along other lines of specialization, or to pursue a non-specialized programme the Department will be pleased to assist.

The Department of Geography also offers an Honours Co-operative Programme. Students are admitted to the Co-operative Programme only after first year. Since competition occurs for places in the Co-op Programme, admittance is based on academic standing and interviews. The Co-op Programme provides for alternate terms of practical work experience and academic study. Co-op Geography students will enter their first work term in the Winter of the second year. Entry into the Honours Co-operative Programme requires specific courses in the first year (see page 158). The minimum number of successful work terms required for a Co-operative degree is normally four. Co-op Geography students are required to specialise in one of the theme areas outlined for the Co-op programme (pg. 158). Inquiries for additional information regarding Co-operative studies should be directed to the Associate Chairman.

A programme of correspondence courses is being developed which will allow a student to complete a BES or BA in Geography. Upon successful completion, students taking the geography programme in the Faculty of Environmental Studies will receive a BES (Bachelor of Environmental Studies) degree and those in the Faculty of Arts will receive a BA (Bachelor of Arts) degree. The Co-op Geography Programme is not available in the Faculty of Arts.

The Department of Geography offers both Master's (MA) and PhD graduate programmes. At the graduate level course work and research is concentrated on a specific subfield of Geography. Areas of research specialization include applied physical geography, air photo interpretation and remote sensing, urban and economic geography, agricultural geography and rural development, regional planning and development, resources management, and Europe.
Bachelor of Environmental Studies

Undergraduate Geography Courses

Note 1
All courses are open to any student from any Faculty or School of this University whenever prerequisites are met and space permits.

Note 2
The Department of Geography offers General and Honours programmes both in the Faculty of Environmental Studies (BES) and the Faculty of Arts (BA). Joint honours programmes with most departments in the University may be arranged subject to approval. For further discussion of these programmes see pg. 162.

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.

Note 5
Courses designated “Environmental Studies” (p.310) are included with geography courses in the calculation of the major average.

Note 6
Courses with a laboratory component of 2 hours or more are given a credit weight of 0.75.

Bachelor of Environmental Studies
General Geography Programme

| Year 1 | | | |
|---|---|---|
| Geog 102 | Introduction to Physical Geography | |
| Geog 110 | Tutorial in Geography | |
| and one of, but not more than two of: | | |
| Geog 101 | Introduction to Human Geography | |
| Env St 195A | Introduction to Environmental Studies | |
| or: | | |
| Env St 195B | Introduction to Environmental Problems | |
| Geog 125R | Introduction to the Third World | |
| Geog 126R | Development in the Third World | |
| Geog 127 | Regional Problems of Europe | |
| and additional credits to a maximum of six. | | |

Year 2

| Env St 200 | Field Ecology | |
| Geog 201 | Some Basic Topics of Physical Geography | |

Honours Geography

A) Regular Programme

| Year 1 | | | |
|---|---|---|
| Geog 102 | Introduction to Physical Geography | |
| Geog 110 | Tutorial in Geography | |
| and one of, but not more than two of: | | |
| Geog 101 | Introduction to Human Geography | |
| Env St 195A | Introduction to Environmental Studies | |
| or: | | |
| Env St 195B | Introduction to Environmental Problems | |
| Geog 125R | Introduction to the Third World | |
| Geog 126R | Development in the Third World | |
| Geog 127 | Regional Problems of Europe | |
| Electives: see below. | | |
Year 2
Env St 200 Field Ecology
Geog 201 Some Basic Topics of Physical Geography
Geog 202 Some Basic Topics of Economic and Urban Geography

two of:
Geog 260 Introduction to Cartography and Map Analysis
Geog 275 Introductory Air Photo Analysis and Remote Sensing
Env St 2/1 Introduction to Quantitative Research

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

Electives: see below.

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

one of:
Geog 260 Introduction to Cartography and Map Analysis
Geog 275 Introductory Air Photo Analysis and Remote Sensing
Env St 271 Introduction to Quantitative Research

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

Electives: see below

Year 4
Geog 490A

and B Senior Honours Research Essay

Electives: see below

B) Co-operative Programme

Year 1

Fall Term Core Courses
Geog 102 Introduction to Physical Geography
Geog 110 Tutorial in Geography
Math 105 Math for Environmental Studies (if no Grade 13 math)

and one of:
Geog 101 Introduction to Human Geography
Geog 125R Introduction of the Developing World
Geog 126R The Emerging "Third World"
Geog 127 Regional Problems of Europe
Env St 195A Introduction to Environmental Studies
or:
Env St 195B Introduction to Environmental Problems

and one of:
Geog 260 Introduction to Cartography and Map Analysis
Geog 275 Introductory Air Photo Analysis and Remote Sensing
Env St 271 Introduction to Quantitative Research Methods

Theme Courses
one course in one of the following areas chosen to complement the programme of study in Geography - Business, Economics, Languages, Earth Sciences, Biology. Note: that in the term 28 students must identify a continuing theme (see page 159).

Electives: see below

Winter Term Core Courses
Either
Geog 201 Some Basic Topics of Physical Geography

or
Geog 202 Some Basic Topics of Economic and Urban Geography

Plan 156 Introduction to Urban and Regional Planning Concepts

One of:
Geog 260 Introduction to Cartography and Map Analysis
Geog 275 Introductory Air Photo Analysis and Remote Sensing
Env St 271 Introduction to Quantitative Research Methods

Theme Courses
same as Fall term

Electives: see below
Environmental Studies

Year 2
Fall Term 2A Core Courses
Env St 200 Field Ecology

Either
Geog 201 Some Basic Topics of Physical Geography

or:
Geog 202 Some Basic Topics of Economic and Urban Geography

One of:
Geog 260 Introduction to Cartography and Map Analysis
Geog 275 Introductory Air Photo Analysis and Remote Sensing
Env St 271 Introduction to Quantitative Research Methods

Theme Courses
none

Electives: see below

Winter Term
Work Term 1

Spring Term 2B Core Courses
Engl 210 Report Writing

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
There are five theme courses in the Co-op programme; techniques, applied physical geography, urban geography, economic geography, resource management. Detailed outlines are provided by the Co-op advisors. Students must identify one of these five as a continuing theme in consultation with a Co-op advisor. In the 2B term students must take at least three theme courses of which one must be in the continuing theme.

Electives: see below

Fall Term
Work Term 2

Year 3
Winter Term 3A Core Courses
Geog 381 The Nature of Geography
Env St 272 Computer Programming in Environmental Studies

One of:
Geog 316 Multivariate Statistics
Geog 317 Nonparametric Statistics
Geog 318 Spatial Analysis

Theme Courses
As above. Three courses of which two courses must be in the continuing theme.

Electives: see below

Spring Term
Work Term 3

Fall Term 3B Core Course
Geog 390 Senior Honours Research Essay Proposal

Theme Courses
same as Winter Term 3A

Electives: see below

Year 4
Winter Term
Work Term 4

Spring Term 4A Core Course
Geog 490A Senior Honours Research Essay

Theme Courses
As above. At least two courses of which a maximum of one course is in the continuing theme.

Electives: see below

Fall Term
Work Term 5

Winter Term 4B Core Course
Geog 490B Senior Honours Research Essay

Theme Courses
same as 4A

Electives: see below

Electives
Such additional credits as are necessary to ensure that by the time of graduation a student has a minimum of 24 credits.
Notes on Honours Programme (Regular and Co-op)

Note 1
Twenty-four full credits is the minimum requirement for the degree Bachelor of Environmental Studies (Honours Geography – Regular and Co-op). Honours Geography students must therefore ensure that, in addition to the courses required for the degree as outlined above, they take additional courses as electives to average at least six credits per academic year.

Note 2
Students are required to take a minimum of eleven credits in Geography. Two of these credits may be courses designated as Environmental Studies (pp.310-312).

Note 3
Students must take a minimum of five credits in Faculties other than the Faculty of Environmental Studies.

Note 4
To enter Year 2 of the Honours Geography programme, a student must achieve in Year 1 a minimum overall average of B- (70.0) and an average of B (75.0) in Geography and Environmental Studies courses. In subsequent years, a student must continue to achieve an overall average of B (70.0) and an average of B (75.0) in Geography and Environmental Studies Courses.

Note 5
For students wishing to specialize, the Department offers a series of options as detailed below. Students meeting the requirements of an option (which are additional to the core requirements identified above), will have that option designated on their official university transcript.

Note 6
Since many departments doing graduate work in Geography demand proficiency in a foreign language, students’ intent on graduate work should consider taking at least one credit in a foreign language.

Note 7
Students intending to teach in Secondary Schools are advised to take at least two credits of Regional Geography.

Note 8
This programme prepares students for graduate study in Geography or in Planning, for entry to Secondary School teaching, or for research positions in industry, commerce and government.

Note 9
All Geography students in the regular programme are encouraged to take summer employment which will provide experience useful to a geographer. Where possible, the Environmental Studies Placement Office will provide information and assistance in securing such summer employment. Co-op Geography students will gain appropriate employment experience as part of their degree requirements.

Note 10
For some courses, participating students may be expected to make a financial contribution to defray heavy equipment/travel costs, e.g. Geog 391 (Field Camp), which is mandatory for all third year regular honours students. Statements on fees, where required, will be found with the course description (p.324)

Note 11
No more than one and one-half credits may be taken as reading courses in Geography.

Honours Geography Options
The following options represent recognised fields of specialization within the Honours Programmes. Students may elect One option, which will be designated on their transcript upon satisfactory completion of the requirements.

- All students must fulfill their regular requirements for the honours degree and are responsible for meeting prerequisite courses.
- Students electing to graduate with a recognized Geography Option will be required to fill out a Geography Option’s Schedule at the time they file an Intent to Graduate. Inquiries about any of these options programmes should be directed to the office of the Undergraduate Officer.

Applied Physical Geography Option
Earth 121  Introductory Geology 1
Earth 122  Introductory Geology 2
Biol 231  Concepts of Ecology
Geog 301  Climatology
Geog 302  Geomorphic Processes
Geog 303  Physical Basis and the Geography of Water
Geog 375  Air Photo Interpretation
Geog 376  Environmental Remote Sensing
Geog/Plan 357  Conservation and Resource Management
Geog 407  Field and Lab Techniques in Geomorphology
Geog 451  Soils Geography
Urban Geography Option

Plan 156 Introduction to Urban and Regional Planning Concepts
Geog 311 Regional Industrial Development
Geog 349 The City as a System 1
Geog 350 Regional Urban Systems 1
Geog 449 The City as a System 2
Geog 450 Regional Urban Systems 2

3 of:
Geog/Plan 307 Social Survey Techniques
Geog/Plan 316 Multivariate Statistics
Geog/Plan 317 Nonparametric Statistics
Geog/Plan 318 Spatial Analysis
Geog/Plan 319 Economic and Social Techniques for Regional Planning

2 of:
Plan 370 Land Development Planning
Env St 402 Planning Law
Civ Eng 543 Land Use Models

Regional Geography Option

Students are expected to take one course from the list below in their first year, and 2 courses in each subsequent year. A further 3 courses of selected electives must be selected in consultation with an advisor. These will normally represent either themes and techniques from within geography relevant to the individual's particular interests, or related studies in disciplines other than geography. Students concentrating on Canada should consider doing the joint programme Geography with Canadian Studies (see page 162).

The regional courses will be selected from the following list:
Geog 127 Regional Problems of Europe
Geog 125R Introduction to the Third World
Geog 126R Development in the Third World
Geog 225R Urbanization in the Third World
Geog 226R Food and Agriculture, and integrated Rural Development in the Third World
Geog 204 Soviet Geography
Geog 205 Africa
Geog 220 World Regional Geography
Geog 321 The United States
Geog 322 Geographical Study of Canada
Geog 323 Comparative Regional Problems
Geog 325R Special Topics in Study of "Third World" Development
Geog 326R Special Topics in Development of the Third World
Geog 341 Historical Geography of Canada 1

Geog 342 Historical Geography of Canada 2
Geog 421 Europe and the Mediterranean
Geog 422 Canada
Geog 423 Central and Eastern Europe
Geog 424 Soviet Geography
Geog 425 Africa
Geog 426-432 Selected World Regions
Geog 430 Field Research in Regional Geography

Environmental and Resources Management Option

Env St 195A Introduction to Environmental Studies
Env St 401 Environmental Law
Env St 444 Land Evaluation and Resources Management
Env St 445 Environmental Economics
Geog 316 Multivariate Statistics
Geog 317 Nonparametric Statistics
Geog 356 Resources Management
Geog/Plan 357 Conservation and Resources Management
Geog 375 Air Photo Interpretation

or:
Geog 376 Environmental Remote Sensing

three of:
Geog 358 Water Planning and Management: Strategies and Experiences
Geog 410 Recreation Geography
Geog 411 Resources Studies
Geog 414 Resources Management Workshop

Urban and Regional Development Option

Geog 101 Introduction to Human Geography
Plan 156 Introduction to Urban and Regional Planning Concepts
Geog 311 Regional Industrial Development
Geog 315 Agricultural Geography
Geog/Plan 319 Economic and Social Techniques for Regional Planning
Plan 332 The Sociology of Regions
Geog 350 Regional Urban Systems 1
Plan 358 Regional Planning and Development
Plan 370 Land Development Planning

two of:
Geog/Plan 317 Nonparametric Statistics
Geog/Plan 318 Spatial Analysis
Geog/Plan 316 Multivariate Statistics
Geographical Techniques Option

Env St 272 Computer Programming in Environmental Studies
Geog 360 Preparation of Maps and Illustrations
Geog 375 Air Photo Interpretation
or:

Geog 376 Environmental Remote Sensing

three of:
Geog/Plan 307 Social Survey Techniques
Geog/Plan 316 Multivariate Statistics
Geog/Plan 317 Nonparametric Statistics
Geog/Plan 318 Spatial Analysis
Geog/Plan 319 Economic and Social Techniques for Regional Planning
two of:
Geog 403 Advanced Cartography 1
Geog 404 Advanced Cartography 2
Geog 470 Applied Air Photo Interpretation
Geog 471 Advanced Remote Sensing

three of:
Any options not taken from courses listed above or any of:
Plan 159 Graphics for Planning
Arch 212 Computer Science Simulation
Arch 214 An Introduction to Landscape Design
Plan 225 Planning Surveys and Analysis
Env St 252 Media Tools for Environmental Studies
Env St 253 Media Tools for Environmental Studies (Advanced)
Plan 256 Principles of Environmental Design
M Env 361 Contemporary Media of Communication and Human Environments
Geog 407 Field and Lab Techniques in Geomorphology
M Env 445 Technology Assessment and Policy Analysis

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, Economics, English, French, German, History, Man-Environment Studies, Mathematics, Political Science, Recreation and Russian. The programmes "Geography with Canadian Studies", "Geography with Biology" and "Geography with Earth Sciences" are not joint honours programmes. These programmes lead to degrees in 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 faculty in which the student is registered, the following degrees may be awarded:

BES or BA Joint Geography with:
Anthropology
Canadian Studies (see Note 1)
Economics, English, French
German, History
Man-Environment Studies
Political Science
Recreation
Russian

BES or BA Mathematics

BES or BSc Earth Sciences
or BMath

BES or BSc Biology

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

Geography core requirements in joint programmes are identical with those of the Geography Honours Regular Programme above, with the exception that where both Departments participating in the programme require specific courses of similar content, a student shall meet that requirement in one Department only. This might be expected to apply in the cases of technique courses, field research and the Senior Honours Essay. Further information concerning Joint Honours Programmes may be obtained from the Undergraduate Officer of the Department.

Note 1
Students choosing the programme Geography with Canadian Studies are referred to the regulations of that programme (p. 123). In addition, the Department of Geography recommends that course selections include the following:

At least three of:
Geog 251 Cities in Canada
Geog 322 Geographical Study of Canada
Geog 341 Historical Geography of Canada 1
Geog 342 Historical Geography of Canada 2
Geog 411 Resource Studies
Geog 422 Canada
At least three of:
Anth 203 Prehistoric Man in North America
or:
Anth 205 Anthropology of Race
Econ 263 Contemporary Canadian Problems 1
Plan 222 Canadian Regional Issues
P Sci 260 Canadian Government and Politics 1
Soc 201 Canadian Society: Structure and Development
M Env 356 Canadian Non-Renewable Resources
or:
Sci 350 Canadian Non-Renewable Natural Resources

Geography Minor for Honours Students in Other Faculties
The requirements are the same as those noted for the General Geography Programme, i.e. core requirements plus electives to make 6 credits in Geography.

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 interrelationships 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 interrelationships, 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 BES degree in Man-Environment Studies have found employment in a range of government agencies in fields such as natural resources management, pollution control, social services planning, and urban affairs as well as with private corporate and consulting firms in the communications industry and environmental design; with other universities as full-time teaching or research personnel, and with community agencies in various social 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
The formal admission requirements of the programme are listed beginning on page 24 of this calendar. No specific Grade 13 courses are required, but some science or mathematics would be helpful. An English Language Proficiency Examination is written in early September by each student new to the programme to assess competency in English composition. Applicants who have been out of school for a number of years are considered on their work and travel experiences as well as their past academic record.

About one half of the 22 courses required for the BES degree are designated as a core of required courses. The remainder are free electives chosen by each student to develop the mix of subjects and skills best suited for achieving individual educational or career preparation objectives.

Most required courses are taken in the first two years. The first year introductory courses examine major environmental themes from the viewpoints of the natural and social sciences. They also introduce techniques for investigating environmental questions and provide experience in conducting a systematic enquiry through the device of small group projects. In the second year, further work in natural ecology and social sciences helps to introduce other perspectives and themes running through man-environment studies such as a systems mode of understanding relationships and the “futures” implications of the problems considered. Additional course work on research design, methodology, and information or data handling is required and each student also conducts an individual or group project selected from a wide range of possible topics and problem areas.

The core requirements for years three and four are also project-oriented, comprising a “seminar-workshop” and senior honours assignment respectively. Arrangements to receive extra credit for project work have been provided for those who learn most effectively through undertaking self-directed work under the guidance of faculty and other advisers. The fourth year also requires participation in one from among several honours seminars which provide the occasion for students to draw together what they have learned and direct it to one of the broad sub-areas within man-environment studies.

The stress given to project-oriented learning within the 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 practise skills in problem definition, information and data gathering, analysis and synthesis of material, and presentation of results in a suitable format using the most appropriate communications media. Skills of this nature can be refined, adapted and applied in whatever context or situations students choose during and after their university years. An increasing number of students incorporate work with 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. A "minor" can be in any area such as Anthropology, Canadian Studies, Chemistry, Psychology, etc.

c) Students may develop a coherent sequence of courses from electives offered by the Department in combination with courses offered elsewhere to concentrate on one of several possible sub-areas emerging within man-environment studies, i.e. human and community studies, resource and environmental management, policy and decision-making at the interface of technology and society. (see pages 150-152)

d) Students may choose instead to explore whatever range of subjects interests them in addition to Environmental Studies.

In each case students should give careful consideration to their choices in terms of the educational goals and possible careers they may wish to pursue after obtaining a BES degree. They would also do well to seek information and advice on the kind of undergraduate courses favoured by 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 for the first two years and five full credits or their equivalent 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); an average of B (75.0) must be maintained in M-Env/Env St courses. There are several evaluation techniques used to determine grades.

The programme is as follows:

**Year 1**
- Env St 195A Introduction to Environmental Studies
- M Env 130(F) Environmental Issues 1
- M Env 131(W) Environmental Issues 2
- M Env 150(F) Environmental Methods & Techniques 1
- M Env 151(W) Environmental Methods & Techniques 2
- M Env 190(F) Seminar-Workshop
- M Env 191(W) Seminar-Workshop

Electives: Two and a half full credits: five half-year courses or equivalent

**Year 2**
- Env St 200 Field Ecology
- M Env 241 Social Change, or other half-credit 200 level or above course in one of the 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
- M Env 295(Y) Development of Environmental Thought

plus electives for a total of 6 credits for the year; 200, 241, 271, and/or 295 may be taken in years other than year 2

**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)

One of the following Honours Seminars:
- M Env 410(Y) Environmental Management
- M Env 445(Y) Technology Assessment and Policy Analysis
- M Env 450(Y) Environmental Design
- M Env 470(Y) Environmental Teaching and Learning
- M Env 480(Y) Special Topics Seminar

Electives: One to three full credits or equivalent
Joint Honours
Joint programmes have been approved between the Department of Man-Environment Studies and the Departments of Economics, Geography, Germanic and Slavic Languages and Literature (for Russian), Philosophy, Political Science, Psychology, Recreation, Sociology and Anthropology. Joint programme arrangements have also been made with the Faculty of Mathematics and a special Honours Man-Environment Studies (with Biology Option) programme has been arranged with the Department of Biology.

These programmes lead to degrees from the Faculty in which the student is registered. Students from other departments choosing one of these joint programmes must complete the equivalent of seven full courses in Man-Environment Studies. The Department of Man-Environment Studies is prepared to work out other programmes for interested students who meet honours standing.

School of Urban and Regional Planning

Bachelor of Environmental Studies (Honours Urban and Regional Planning Programme)

Nature of the Programme
The emphasis of the programme is on planning as a process, conceived in terms broad enough to include policy-making, research and decision making. The subject focus is regional; that is, the integrated planning of regions, large and small, with both their urban and rural components, including urban-centred or core regions, in which the policy emphasis is on environmental issues and other regional contexts, typical of the Canadian scene, in which resource potentials are not yet realized, and where development issues and problems of human adjustment are in the forefront.

In order to implement this approach, the School of Urban and Regional Planning has gathered a team of faculty with diverse academic backgrounds and various kinds of planning experience.

The broad educational aim of the School is to prepare the student for active participation in the planning process. This leads to an approach which gives equal emphasis to the ‘why’ and ‘how’ of planning. To make this effective, and vital, has required that a style be adopted that strives for a continuum between classroom and field experience, between planning studies and related disciplines, and between academic studies and future professional practice. Realizing this concept requires the integration within the programme of selected elements from the discipline of Geography and from other sciences, social sciences and applied sciences. For this purpose, the School of Urban and Regional Planning has been located in a Faculty with an interdisciplinary approach to a wide range of environmental issues.

The programme gives a well-rounded preparation for a wide variety of professional or graduate work in urban planning, regional planning and resource development. Courses on the theory, methods and philosophy of planning provide an integrating framework. The student is also given an opportunity to pursue a special interest in economic, social, and ecological issues in planning, or in planning methodology. This is done through the selection of elective courses. Students are also encouraged to select Senior Honours Essay Topics from these special fields of interest.

The integration of planning experience into the programme is considered an important part of the education process. Students are expected to gain planning experience during the summer period. The School endeavours to help students find suitable work, particularly between their second and third, and third and fourth years. It is hoped that through the work of the Professional Liaison Officer, the student will be brought into direct contact with the profession and will be exposed to problems typical of those encountered in practice, as well as being introduced to projects and operations far beyond the scope of any university laboratory.

Appropriate experience provides the maturing prospective planner with an opportunity for gaining a better understanding of the discipline and allows for the testing of personal interests, learning and aptitudes. In seeking assistance for finding meaningful planning experience, students will be asked to give permission for the release of their marks to employers.

Because of the importance placed upon effective communication, incoming students are expected to have a demonstrated proficiency in English writing skills. All incoming undergraduate planning students are required to take the English Language Proficiency Examination offered by the English Department at the start of the fall term and, if indicated by the examination, to take the appropriate remedial work in addition to normal course and credit requirements. With an increased emphasis in the profession on quantitative analytical techniques, it is highly recommended that students take at least one Grade 13 math course. Students with deficiencies in these areas can elect to take equivalent or remedial courses in their first year of the programme. Students with advanced standing will be considered for admission to Year 2.
Honours Urban and Regional Planning Recommended Programme

<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>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td><strong>Plan 100</strong> 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><strong>Plan 159</strong> 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 full credits—all courses to be at the first year level.</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>1 Ecology</th>
<th>4 Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Biol 130</strong> or <strong>131</strong> Introduction to Biology</td>
<td><strong>Anth 101B</strong> Human Ecology and Adaptability</td>
</tr>
<tr>
<td><strong>Earth 121/122</strong> Introductory Geology</td>
<td><strong>Env St 195A</strong> Introduction to Environmental Studies</td>
</tr>
<tr>
<td><strong>Geog 102</strong> Introduction to Physical Geography</td>
<td><strong>Geog 107</strong> Introduction to Human Geography</td>
</tr>
<tr>
<td><strong>Sci 100</strong> Introduction to the Geology of Canada</td>
<td><strong>Rec 100</strong> Introduction to the Study of Leisure and Recreation</td>
</tr>
</tbody>
</table>

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<tr>
<th>2 Administration</th>
<th>5 Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>P Sci 101</strong> Introduction to Politics 1</td>
<td><strong>Anth 103</strong> Nature of Language</td>
</tr>
<tr>
<td><strong>P Sci 102</strong> Introduction to Politics 2</td>
<td><strong>Anth 104</strong> Language Learning</td>
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</tbody>
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<tr>
<th>3 Design</th>
<th>8 Philosophy</th>
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<tbody>
<tr>
<td><strong>Arch 142</strong> Iconography 1</td>
<td><strong>Arts 122G</strong> Quest for Meaning in the 20th Century</td>
</tr>
<tr>
<td><strong>Arch 194</strong> Visual Interdisciplinary Language</td>
<td><strong>Engl 108B</strong> Utopia and Anti-Utopia</td>
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<tr>
<td><strong>Fine 120</strong> Fundamentals of Visual Art</td>
<td><strong>Engl 108H</strong> Isolation and Alienation</td>
</tr>
<tr>
<td><strong>Plan 159</strong> Graphics for Planning</td>
<td><strong>Hist 101R</strong> Western Civilization</td>
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<tr>
<td></td>
<td><strong>Hist 102R</strong> Western Civilization</td>
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<tr>
<td></td>
<td><strong>Hist 105</strong> The Meaning of Civilization</td>
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<tr>
<td></td>
<td><strong>Phil 125</strong> Fundamentals of Social and Political Philosophy</td>
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<td></td>
<td><strong>Phil 140</strong> Fundamentals of Logic</td>
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<td></td>
<td><strong>Phil 145</strong> Critical Thinking</td>
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<td></td>
<td><strong>Phil 150</strong> Knowledge and Reality</td>
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<td></td>
<td><strong>Pacs 201</strong> Peace and Conflict Studies 1</td>
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<tr>
<td>Year</td>
<td>Required Planning Courses</td>
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<tr>
<td>------</td>
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</tr>
</tbody>
</table>
| Year 2 | Env St 200-Field Ecology  
Plan 256-Principles of Environmental Design  
Env St 271-Introduction to Quantitative Research Methods  
Plan 307-Social Survey Techniques  
(Prerequisite: Env St 271) | 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 |
| | 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 307-Social Survey Techniques  
Plan 391-Field Research Methods and Projects | Two full credits from list of Required Elective Courses (see following page) | Geog 352-Rural Urban Fringe of Canadian Cities  
Plan 301-Planning Design  
Plan 316-Multivariate Statistics  
Plan 317-Nonparametric Statistics  
Plan 318-Spatial Analysis  
Plan 319-Economic and Social Techniques for Regional Planning  
Plan 330 Urban Social Planning  
Plan 332-The Sociology of Regions  
Plan 333-The Sociology of Regional Planning  
Plan 344-Principles of Recreational 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 480-The Philosophy and Methodology of 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 401-Environmental Law  
Env St 402-Planning Law  
Plan 414-Housing Policies  
Plan 430-Social Policy Planning  
Plan 431-Citizen Involvement Social Action strategies, and Social Change  
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 |
<table>
<thead>
<tr>
<th>Year 2-4 Required Elective Courses</th>
<th>Urban Theme</th>
<th>Regional Theme</th>
<th>Resource Theme</th>
</tr>
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<tr>
<td><strong>Urban Theme</strong></td>
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<td>These courses are subject to availability</td>
<td>These courses are subject to availability</td>
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<td><strong>Year 2</strong></td>
<td>Plan 230 The Small Group in the Planning Process</td>
<td>Plan 222 Canadian Regional Issues Planning Process</td>
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<td>Anth 247 Urban Anthropology</td>
<td>Econ 233 Regional Economics</td>
<td>Econ 201 Some Basic Topics of Physical Geography</td>
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<td>Geog 202 Some Basic Topics of Economic and Urban Geography</td>
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<td>Hist 204C Canadian Urban History</td>
<td>Hist 265B Canadian History 2</td>
<td>Sci 256 Environmental Geology</td>
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<td>Soc 240 Collective Behaviour</td>
<td>Soc 241 Social Movements</td>
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<td>Plan 301 Planning Design</td>
<td>Plan 301 Planning Design</td>
<td>Plan 332 The Sociology of Regions Planning</td>
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<td>Plan 360 Technology in Urban and Regional Planning</td>
<td>Plan 317 Nonparametric Statistics</td>
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<td>Plan 370 Land Development Planning</td>
<td>Plan 318 Spatial Analysis</td>
<td>Econ 335 Economic Development</td>
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<td>Civ E 342 Urban Transport Planning 1</td>
<td>Plan 319 Economic and Social Techniques for Regional Planning</td>
<td>Geog 300 Geomorphology and the Southern Ontario Environment</td>
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<td>Civ E 393 Environmental Engineering</td>
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<td>Geog 301 Climatology</td>
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<td>Econ 343 Urban Economics</td>
<td>Plan 333 The Sociology of Regional Planning</td>
<td>Geog 315 Agricultural Geography</td>
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<td>Geog 350 Regional Urban Systems 1</td>
<td>Plan 344 Principles of Recreation Planning</td>
<td>Geog 352 Rural-Urban Fringe of Canadian Cities</td>
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<td>P Sci 343 Urban Politics 1</td>
<td>Plan 360 Technology in Urban and Regional Planning</td>
<td>Geog 366 Resources Management</td>
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<td>P Sci 344 Urban Politics 2</td>
<td>Civ E 343 Transportation Engineering</td>
<td>Rec 302 Travel and Tourism</td>
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<td>Soc 301 Urban Sociology</td>
<td>Econ 335 Economic Development</td>
<td>Rec 334 Park Management</td>
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<td>Geog 349 The City as a System 1</td>
<td>Geog 350 Regional Urban Systems 1</td>
<td>Geog 349 The City as a System 1</td>
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<td><strong>Year 4</strong></td>
<td>Plan 414 Housing Policies</td>
<td>Plan 430 Social Policy Planning</td>
<td>Env St 401 Environmental Law</td>
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<td>Plan 430 Social Policy Planning</td>
<td>Env St 401 Environmental Law</td>
<td>Env St 402 Planning Law</td>
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<td>Plan 470 Concepts and Ideas in Contemporary Urban Planning</td>
<td>Env St 402 Planning Law</td>
<td>Geog 408 Special Topics in Climatology and Natural Hazards</td>
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<td>Env St 401 Environmental Law</td>
<td>Geog 412 Industrial Geography</td>
<td>Geog 410 Recreation Geography</td>
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<td>Geog 450 Regional Urban Systems</td>
<td>Geog 422 Canada</td>
<td>Geog 411 Resources Studies</td>
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<td>Arch 554 Development and Financing</td>
<td>Geog 450 Regional Urban Systems 2</td>
<td>Geog 414 Resources Management Workshop</td>
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<tr>
<td></td>
<td>Civ E 543 Land Use Models</td>
<td>Geog 452 Problems of Rural Land Use</td>
<td>M Env 410 Honours Seminar</td>
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<tr>
<td></td>
<td>Geog 449 The City as a System 2</td>
<td>Civ E 543 Land Use Models</td>
<td>Environmental Management</td>
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<tr>
<td></td>
<td>Plan 450 Canadian Urban and Regional Planning: (Part 2)</td>
<td></td>
<td>Rec 410 Planning of Recreation Facilities</td>
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<tr>
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<td></td>
<td>Rec 434 Advanced Park Management</td>
</tr>
</tbody>
</table>
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 minimum 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/she 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.

Should the student be permitted to continue on the basis of "Conditional due to Average", and, subsequently, if the required averages are not met this second time, withdrawal from the programme is automatic.

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 24-1/2 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 may be taken in Year 2 or Year 3 provided that the Env St 271 prerequisite has been met.

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 (Seminars/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 in either Year 2 or 3.

Note 13
Leave of absence may be negotiated with the approval of the undergraduate officer.

Note 14
A variety of items are covered in the Undergraduate Affairs Policy Manual available from the undergraduate officer. Policy areas covered include: Admission, Courses, Examination, Records and Transfers, Registration, Appeals and Discipline, Academic Standing.
Faculty of Human Kinetics and Leisure Studies

Students and faculty involved in recreation facility planning
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 Health Studies, the Department of Kinesiology, the Department of Recreation, and the Dance Group offer academic programmes and conduct research, whereas the Department of Athletics administers 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. Eight 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. At the same time elective courses were introduced into each department making it possible for students to pursue in some depth an area of Kinesiology, Dance, Health Studies or Recreation in which they had a special interest. The future promises even greater opportunities for specialized study by the individual students.

Dance Programme

The programmes in Dance offer students the unique opportunity of studying dance from the perspectives of the humanities, the social sciences, and the biological sciences, as well as that of the performing arts. This orientation represents a marked departure from the strictly performance oriented approach which is taken in most programmes of dance at universities in Canada and the United States. Career choices for graduates include positions as dance critics, choreographers, company managers, performers and teachers.

Health Studies Programme

Health Studies is a four-year university honours programme leading to the Bachelor of Science (BSc) degree. Students in the programme study important health problems and their causes. Of primary interest are diseases in which behaviour is an important contributing cause, such as lung cancer and smoking or heart disease and diet. Also of interest are health problems which occur because people do not use preventive health-care services, such as periodic health examinations, vaccinations, and screening procedures, or because they do not comply with prescribed medical treatment.

Opportunities for employment exist in community and government health agencies, community and school health education, and other areas where an understanding of health and health behaviour is required. Graduates also pursue graduate studies in medicine, public health, health administration, environmental health, health education, naturopathic medicine, and related fields.

Kinesiology Programme

The Kinesiology programme at Waterloo examines the hows and whys of human physical activity through a unique blend of theoretical, laboratory, and practical courses and experiences. How is one able to learn and perform the intricate and controlled movements demanded of sportspersons, musicians or users of prosthetics? What are the psychological and social implications of physical activity? In seeking and learning the answers to such questions, the student becomes well equipped to enter any of a variety of exciting and challenging careers such as exercise therapy, rehabilitative medicine, equipment design, gerokinesiatrics (exercise therapy for the elderly) coaching, lab technology, graduate studies and as well, the more traditional field of teaching.

Recreation 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 specialization 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, private agencies, municipalities, schools, national and provincial parks, youth agencies, and university graduate programmes.

Degrees

Health Studies graduates receive an Honours Bachelor of Science degree. 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, an Honours Bachelor of Arts Degree or a General Bachelor of Arts Degree.

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 and Placement of the University which provides the liaison between the campus and the field situation. Students should refer to Chapter 5 of the Calendar for further details concerning the co-operative programme.

**Regular System**
In regular programmes students attend school for two consecutive four month terms each year for three or 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 Grade 13**
Applicants to any of the Kinesiology programmes are advised to select a Grade 13 programme which includes four or more of the following courses: Biology, Chemistry, Physics, Functions and Relations, Algebra, Calculus.

Applicants to the Recreation programme are advised to include a Grade 13 Mathematics course in their programme.

**Advanced Standing**
It is not unusual for students transferring to HKLS 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 and Placement.

**English Language Proficiency Programme**
The Faculty of Human Kinetics and Leisure Studies feels that a student in any of their programmes should be able to demonstrate competency in writing. Therefore, all students entering an HKLS programme must write the English Language Proficiency Examination (scheduled during registration week). Students may demonstrate their competence in writing by achieving a mark of 50% on this examination or by successfully completing the assignments of the University of Waterloo Writing Clinic or by achieving a passing grade in English 109.

**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 10 term courses will be considered Year 1; those who have passed at least 10 term courses but fewer than 21 will be considered Year 2; those with at least 21 but fewer than 32, Year 3; and those with 32 or more, Year 4.

1) **Final Examinations**

a) In all courses each student is required to submit in such form and at such time as may be determined by the instructor, evidence of satisfactory participation in term work. The marks obtained for work during the term are used, in part, in determining standing. The ratio in which marks for term work and written examinations are combined is at the discretion of the individual departments. To pass a course, a student must obtain a minimum of D- in the combined term and examination marks. At the discretion of the chairman of the department concerned and of the Dean, a student may be barred from the final examination if the course requirements are not completed to the satisfaction of the instructor. Some courses and/or instructors may not require final examinations; in such cases term work only will be used in determining a final grade.

b) Students absent from examinations, except for properly certified reasons, do not have make up privileges, and must repeat the entire course. If a student has a Doctor’s certificate covering the precise period of absence, with legitimate medical grounds, it must be submitted to the Chairman of the Undergraduate Affairs Committee within one week of the scheduled examination.

c) All examinations which receive a failing grade are automatically re-read.
d) Examination results are issued to individual students by the Registrar. Appeals against faculty decisions made under these regulations should be made in writing to the Chairman, Undergraduate Affairs Committee within one month of publication of the official mark reports. Additional regulations concerning examinations may be found in Chapter 1, pg. 18.

2) Standing
   a) The Faculty has endorsed the letter grade system outlined on page 18 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 Honours</td>
<td>C</td>
<td>C+</td>
</tr>
<tr>
<td>Kinesiology General</td>
<td>D</td>
<td>C-</td>
</tr>
<tr>
<td>Recreational Honours</td>
<td>C-</td>
<td>B-</td>
</tr>
<tr>
<td>Dance Honours</td>
<td>C-</td>
<td>C+</td>
</tr>
<tr>
<td>Dance General</td>
<td>C-</td>
<td>C</td>
</tr>
</tbody>
</table>

Kinesiology, Health Studies and Dance students who receive a grade report with one of F, INC, DNW or NMR in any one academic year are placed on probation for the following academic year. Students who receive a grade report with two or more of any combination of the following F, INC, DNW or NMR in any one academic year are designated as "May not proceed in the 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 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 normally take 5 term courses in both Fall and Winter terms. In subsequent terms, a student will normally take at least 5 term courses.

Part-time studies or reduced 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 of Undergraduate Affairs and the Department concerned. Normally, no first year programme for a full-time student may be reduced below the 10 courses minimum except in very exceptional circumstances.

Course and Programme Changes
   a) Up to the end of the first three weeks of lectures, the student may drop or add any course without approval, provided he or she does not predetermine a section.
   b) After the first three weeks of classes any course may be dropped provided the course instructor initials the drop, and either the Associate Chairman or the Associate Dean for Undergraduate Affairs signs the registration form. This policy will permit course drops only up to the date which is 8 weeks from the beginning of lectures.

Academic Programmes
Dance

Dance is investigated as an entire field of academic and creative study and not solely as a performing art. It can be viewed as being either expressive (movement that communicates the thoughts and emotions of a culture), or instrumental (movement that serves a societal function such as socialization). Expressive dance and instrumental dance can be studied within the context of both Western and non-Western culture. Hence, four possible foci for the study of dance exist. The Dance Group recognizes each and has designed their curriculum in such a way that each of their three degree programmes provides exposure to the four foci. The two areas offered in greatest depth are within Western Expressive Dance. One of these areas focuses on the dancer, while the other focuses on the dance as a work of art. Each of these areas is further subdivided into two orientations: theoretical and applied.

The Degree Programmes
Based upon the necessary curricular experiences that have been identified, it would appear that the theoretical study of the dancer is best accomplished
through a programme which is heavily science oriented, whereas the theoretical and practical study of dance as a work of art is best accomplished from the perspective of the arts and humanities. The applied aspects of the preparation of the dancer could draw upon both perspectives.

To accomplish these various pursuits, the Dance Group offer programmes which lead to three different degrees: The Honours Bachelor of Science Degree, The Honours Bachelor of Arts Degree, and the General Bachelor of Arts Degree. Students do not enroll in one of these particular degree programmes initially. Rather, they accumulate required course credits in their area(s) of interest throughout their 4 years at the end of which their credits are interpreted as satisfying the requirements for either the Honours BSc or the Honours BA degrees. Students pursuing a three year plan of study are eligible for the General BA degree.

Course Requirements
To be eligible for the Honours BSc degree or the Honours BA degree in Dance, students must successfully complete 44 term courses, and maintain an overall cumulative average of 60% and a cumulative average of 67% in their dance courses.

To be eligible for the General BA degree, students must successfully complete 30 term courses and maintain an overall cumulative average of 60% and a cumulative average of 65% in their dance courses.

Honours Bachelor of Science Degree Programme
A) Required Dance Courses (14)
   Dance 110, 111, 346, 347, 364, 410, 411, 412,
   Two of Dance 220, 221, 225
   Two of Dance 230, 231, 233
   Two of Dance 241, 242, 341, 342
B) Required Outside Courses (9)
   Biol 230, 233; CS 118; Math 106; Phys 103; Music 150G; 151G; Psych 101, Anth 102A or Soc 101
C) Required Kinesiology Courses (10)
   Kin 102, 200, 222, 255, 300, 321, 330, Plus 3 additional courses in the bio-physical area of Kinesiology.
D) *Dance Electives (4)
   Four term courses in Dance.
E) Outside Electives (7)
   At least three of the seven term course electives must be selected from the offerings of the Faculty of Science.

Suggested Course Sequences

<table>
<thead>
<tr>
<th>Year</th>
<th>Dance 110</th>
<th>Dance 111</th>
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<tbody>
<tr>
<td></td>
<td>Music 150G</td>
<td>Music 151G</td>
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<tr>
<td></td>
<td>Math 106</td>
<td>CS 118</td>
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<td></td>
<td>Kin 102</td>
<td>Soc 101 or Anth 102A</td>
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<th>Biol 230</th>
<th>Biol 233</th>
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<tr>
<td></td>
<td>Kin 200</td>
<td>Phys 103</td>
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<td>Kin 222</td>
<td>Kin 255</td>
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<td></td>
<td>Dance 241 or 242</td>
<td>Dance 341 or 342</td>
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<tr>
<td></td>
<td>Elective</td>
<td>one of Dance 220, 221, 225</td>
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<th>Kin 321</th>
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<td>Elective</td>
<td>Kin 330</td>
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<td>Dance 364</td>
<td>one of Dance 220, 221, 225</td>
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<td></td>
<td>Elective</td>
<td>Dance 346</td>
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<tr>
<td></td>
<td>Dance 412</td>
<td>Dance 347</td>
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</tbody>
</table>

Honours Bachelor of Arts Degree Programme
A) Required Dance Courses (10)
   Dance 110, 111, 336, 410, 411, 412
   Two of Dance 220, 221, 225
   Two of Dance 230, 231, 233
B) Required Outside Courses (10)
   Hist 105, Music 150G, 151G, Psych 101, Anth 102A or Soc 101; Kin 200; two term courses from Drama and/or Fine Arts and the equivalent of one full language course or two of Dance 241, 242, 341, 342.
C) Dance Electives (8)
   Eight term courses in Dance
D) Outside Electives (16)
   At least eight of the 16 term course electives must be taken within the Faculty of Arts.

Suggested Course Sequences

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<thead>
<tr>
<th>Year 1</th>
<th>Dance 110</th>
<th>Dance 111</th>
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<tbody>
<tr>
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<td>Music 150G</td>
<td>Music 151G</td>
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<td></td>
<td>Psych 101</td>
<td>Hist 105</td>
</tr>
<tr>
<td></td>
<td>Drama 101 or Fine Arts</td>
<td>Soc 101 or Anth 102A</td>
</tr>
<tr>
<td></td>
<td>Dance Elective</td>
<td>Dance elective</td>
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<tr>
<td></td>
<td>Elective</td>
<td>Elective</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Year 2</th>
<th>Dance 230</th>
<th>Dance 231 or 233</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Kin 200</td>
<td>one of Dance 220, 221, 225</td>
</tr>
<tr>
<td></td>
<td>Dance 241 or 242</td>
<td>Dance 341 or 342</td>
</tr>
<tr>
<td></td>
<td>Dance elective</td>
<td>Dance elective</td>
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<td></td>
<td>Elective</td>
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<td></td>
<td>Elective</td>
<td>Elective</td>
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</tbody>
</table>
General Bachelor of Arts Degree Programme

A) Required Dance Courses (7)
   Dance 110, 111, 336
   Two of Dance 220, 221, 225
   Two of Dance 230, 231, 233
B) Required Outside Courses (9)
   His 105; Music 150G, 151G; Psych 101; Anth 102A
   or Sot 101; two term courses from Drama and/or
   Fine Arts and the equivalent of one full language
   course or two of Dance 241, 242, 341, 342.
C) Dance Electives (6)
   Six term courses in Dance
D) Outside Electives (8)
   Of the eight term course electives at least 4 must
   be taken within the Faculty of Arts.

Suggested Course Sequences

Year 1
Dance 110           Dance 111
Music 150G          Music 151G
Psych 101           Soc 101 or Anth 102A
Dance elective      Hist 105
Elective            Dance elective

Year 2
Dance 230           Dance 231 or 233
Elective            one of Dance 220, 221, 225
Drama or Fine Arts  Drama or Fine Arts
Dance 241 or 242    Dance 341 or 342
Elective            Elective

Year 3
Dance 336           Dance elective
Dance elective      one of Dance 220, 221, 225
Elective            Dance elective
Elective            Elective
Elective            Elective

Technique Courses
Technique is a highly valuable tool for students in
all areas of dance. Ballet, Modern and Jazz
Techniques are offered from beginning to advanced
levels. Students may pursue these classes to the
technical level of their interest and need. All
technique courses are granted .25 credit. Students
may apply 2.0 credit in technique courses towards
any degree in dance.

Note
Students should plan their programme with a
faculty advisor so that courses are elected in the
appropriate sequence.

Academic Programmes
Department of Health Studies

In Health Studies the knowledge from several
traditional disciplines is combined and focused on
the study of health and disease. Courses provide
students with an understanding of (a) What
diseases are, (b) their causes, (c) behavioural
factors that contribute to disease, and (d) ways in
which health behaviour can be changed.

The curriculum has four core areas:

1) Health Sciences – the scientific facts and
   principles pertinent to personal and community
   health. Specific subject areas include: (a) an
   introduction to health sciences, (b) determinants
   of disease (epidemiology), (c) environmental
   health, (d) nutrition, and others.

2) Behavioural Sciences – introductions to
   psychology and sociology, determinants of
   health behaviour, and health behaviour
   modification.

3) Biological Sciences – the basic principles of
   biology, anatomy, physiology and biochemistry.

4) Evaluation and Research – the principles of
   statistics and research design aimed at
   developing sufficient competencies to enable
   students to evaluate and interpret the findings
   of health-related research.

Students may apply for admission directly into the
Honours Health Studies Programme, co-op or
regular.

In order to receive the honours BSc degree the
student must successfully complete 44 term
courses including the following requirements:
Degree Requirements

a) Required Health Studies Courses: (15)

b) Required Kinesiology Courses: (5)
   Kin 116, 200, 222, 317, 330

c) Required Courses from other departments: (5)
   Biol 230, 233, 239
   Psych 101; Soc 101

d) Restricted electives: (4)
   One of: Math 106/107, CS 316, CS 118
   (recommended in Year 3 or 4)
   One of: Phil 226, 258 (recommended for Year 4)
   Two of: Biol 211, 240, 241, 340, 345
   Health 302, 303

e) Free electives:
   Fifteen (15) term courses selected in consultation with the student’s advisor.

Course Sequence

<table>
<thead>
<tr>
<th>Year 1 (Co-op and Regular)</th>
<th>Fall</th>
<th>Winter</th>
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</thead>
<tbody>
<tr>
<td>Health 140</td>
<td>Health 141</td>
<td></td>
</tr>
<tr>
<td>Psych 101</td>
<td>Biol 233</td>
<td></td>
</tr>
<tr>
<td>Biol 230</td>
<td>Kin 116</td>
<td></td>
</tr>
<tr>
<td>2 electives</td>
<td>Soc 101</td>
<td></td>
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<tr>
<td>1 elective</td>
<td>1 elective</td>
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</tbody>
</table>

Regular Programme

<table>
<thead>
<tr>
<th>Year 2</th>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health 245</td>
<td>Health 241</td>
<td></td>
</tr>
<tr>
<td>Kin 200, 222, 317</td>
<td>Health 346</td>
<td></td>
</tr>
<tr>
<td>1 elective</td>
<td>Kin 330</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Biol 239</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 electives</td>
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</table>

<table>
<thead>
<tr>
<th>Year 3</th>
<th>Fall</th>
<th>Winter</th>
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</thead>
<tbody>
<tr>
<td>Health 340</td>
<td>Health 344</td>
<td></td>
</tr>
<tr>
<td>Health 349</td>
<td>Health 348</td>
<td></td>
</tr>
<tr>
<td>Health 410</td>
<td>4 electives</td>
<td></td>
</tr>
<tr>
<td>3 electives</td>
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<table>
<thead>
<tr>
<th>Year 4</th>
<th>Fall</th>
<th>Winter</th>
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<tbody>
<tr>
<td>Health 431</td>
<td>Health 432</td>
<td></td>
</tr>
<tr>
<td>Health 442</td>
<td>Health 443</td>
<td></td>
</tr>
<tr>
<td>4 electives</td>
<td>Health 445</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 electives</td>
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</tbody>
</table>

Co-operative Programme

<table>
<thead>
<tr>
<th>Year 2</th>
<th>Fall</th>
<th>Winter</th>
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<tbody>
<tr>
<td>Health 245</td>
<td>Health 241</td>
<td></td>
</tr>
<tr>
<td>Kin 200, 222, 317</td>
<td>Health 346</td>
<td></td>
</tr>
<tr>
<td>1 elective</td>
<td>Health 349</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kin 330</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 electives</td>
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</tbody>
</table>

Health Studies/Kinesiology Joint Honours Degree Programme

There are significant numbers of students within Human Kinetics and Leisure Studies whose interests potentially encompass both the Kinesiology and Health Studies programmes. The following Joint Honours Programme in Health Studies/Kinesiology is offered through both the Regular and the Co-operative format of study to accommodate those students and to best prepare them for jobs that require backgrounds in both Kinesiology and in Health.

Degree Requirements for Joint Honours include:

A. 44 term courses including -
   - Kinesiology required courses (15):
     - Kin 102, 103, 116*, 200, 222, 252, 255, 300, 317, 321, 330, 335, 354, 431, 432, 470
   - Health Studies required courses (8):
     - Health 140, 141, 241, 245, 348, 349, 442, 445
   - Outside Required (8):
     - Biol 230/233, CS 118 or 316, Math 106 or 107, Phys 103, Phys 105, Psych 101, Soc 101
   - Electives (13)
     - Kinesiology - 4 term courses chosen from those electives available in Kinesiology
     - Health Studies - 3 of Health 340, 344, 346, 410, 443, 1 of Phil 226, 258
     - Free* - 5 term courses chosen from any department within the University
     - (* If Kin 116 is taken, it counts as a free elective)

B. An overall average and major average of 70% is required in the Joint Honours Health Studies/Kinesiology programme.
**Academic Programmes**  
**Department of Kinesiology**

Listed below are the course combinations leading to the Honours and General degrees in Kinesiology. Students are encouraged to make full use of the advisory system of the Department in planning their programmes.

**Degree Requirements**  
**Honours Programme**  
Successful completion of 44 term courses is necessary in order to obtain the Honours BSc degree in Kinesiology. The co-op programme must be completed in 7 years. The regular programme must be completed in 6 years.

a) Required Kinesiology courses: (14) Kinesiology 102, 103, 200, 222, 252, 255, 300, 317, 321, 330, 335, 354, 431 or 433, 470.

b) Required courses from other departments: (8) Physics 103, Physics 105, Biology 230 and 233, Mathematics 106 or 107 (see note), Computer Science 118, Psychology 101, and Sociology 101.

**Note**  
In the case of Physics 103 and Mathematics 106 or Mathematics 107 students may elect to take full year courses in either subject in the appropriate department. Mathematics 106 is for students not presenting Grade 13 Calculus. Mathematics 107 is for students who have taken Grade 13 Calculus.

c) Kinesiology Electives: (10) Ten courses from those offered in the Department in addition to the required courses. As part of their Kinesiology elective package, those students who wish to do so may specialize in one of the streams designated by the Department.

(Kin 116 is required for all students not presenting Grade 13 Chemistry for admission. When taken, Kin 116 is counted as a Kinesiology elective.)

d) Electives: Of the remaining twelve (12) term courses, six (6) must be chosen from outside the Department of Kinesiology.

Students should choose electives in consultation with their Faculty advisor.

**General Programme**  
The general degree is offered on a regular basis only and may be taken by part time study.

In order to receive the general BSc degree a student must successfully complete 40 term courses including the following requirements:

a) Required Kinesiology Courses (11) 102, 103, 200, 222, 300, 317, 321, 330, 335, 354.

b) Required Courses from other departments (8)  

c) Kinesiology Electives (9)  
Nine elective courses in Kinesiology.

d) Electives (12)  
Of the remaining twelve (12) term courses six (6) must be chosen from outside the Department of Kinesiology.

**Course Sequence - Honours and General Programmes**

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
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</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td><strong>Winter</strong></td>
<td><strong>Fall</strong></td>
<td><strong>Winter</strong></td>
</tr>
<tr>
<td>Kin 102</td>
<td>Kin 116 (if necessary)</td>
<td>Kin 200</td>
<td>Kin 252</td>
</tr>
<tr>
<td>Kin 103</td>
<td>Kin 255</td>
<td>Kin 222</td>
<td>Kin 321</td>
</tr>
<tr>
<td>Biol 230</td>
<td>Biol 233</td>
<td>Soc 101</td>
<td>Kin 335</td>
</tr>
<tr>
<td>Math 106 or 107</td>
<td>Phys 103</td>
<td>Phys 105</td>
<td>Kin 354</td>
</tr>
<tr>
<td>Psych 101</td>
<td>Elective*</td>
<td>Elective*</td>
<td>Elective</td>
</tr>
</tbody>
</table>
* Students may choose CS 118 in place of an Elective in Year 1. If CS 118 is not chosen in Year 1 it must be completed by the end of 3A or 3N.

**Regular Programme**

<table>
<thead>
<tr>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td><strong>Winter</strong></td>
<td><strong>Fall</strong></td>
</tr>
<tr>
<td>Kin 300</td>
<td>Kin 330†</td>
<td>Kin 431 or 433†</td>
</tr>
<tr>
<td>Kin 317</td>
<td>Kin 470†</td>
<td>5 Electives</td>
</tr>
<tr>
<td>4 Electives</td>
<td>5 Electives</td>
<td>5 Electives</td>
</tr>
</tbody>
</table>
Co-Operative Programmes

2A Fall 2B Spring
Kin 200  Kin 252
Kin 222  Kin 321
Soc 101  Kin 335
Phys 105  Kin 330 t
Elective  Kin 354

3A Winter 3B Fall
5 Electives  Kin 300
          Kin 317
          3 Electives

4A Spring 4B Winter
Kin 431 or 433  Kin 470 t
5 Electives  5 Electives

*Note
All students in Year 1 are honours students.
†for honours students only.

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 Geography, Man Environment Studies and Sociology have been developed. A Business Option with Wilfrid Laurier is also offered.

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):

   Leisure Studies: Rec 200, 300, 301, 302, 306.
   Therapeutic Recreation: Rec 200, 252, 253, 254, 361.
   Recreation Administration: Rec 312, 316, 320, 334, 410.
   Outdoor Recreation: Rec 316, 332, 334, 432, 434.

2) Recreation Electives:
   Each student must complete additional recreation electives to meet the required total of 22.

B) Courses outside the Department of Recreation

1) Required: (8)
   - Psych 101 and Soc 101
   - Any two of Engl 109, 140, 141, 150, 151, 209, 210
   - Any four of Business 121, a physical or natural science course, Econ 101, Geog 101/Env St 195, Plan 156 or a course in the Fine or Performing Arts.

2) Non Recreation Electives: (14)

Course Sequence (co-operative and regular)

Year 1
Rec 100, 101, 230, 250
Psych 101
Soc 101
Electives
Two of:
Engl 109, 110, 140, 141, 150, 151, 209, 210
Four of:
Business 121
A physical or natural science course
Econ 101
Geog 101/Env St 195
Plan 156
A course in the Fine or Performing Arts

Year 2
Rec 201, 210, 270
3 Recreation electives
6 electives

Year 3
Rec 371
5 Recreation electives
4 electives

Year 4
Rec 400, 470, 471
3 Recreation electives
4 electives

Honours Recreation and Sociology
The Joint Honours programme in Recreation and Sociology has the following requirements:

Required Recreation Courses (11)

Required Sociology Courses (5):
Soc 101 Introduction to Sociology
321 Research Methods 1
322 Research Methods 2
425 Sociological Theory
426 Sociological Theory
Non-Departmental Required Courses (6):
Psych 101 Introductory Psychology
Two of
Engl 109, 140, 141, 150, 151, 209, 210
Three of:
Business 121
A biological or physical science course
Econ 101
Geog 101/Env St 195
Plan 156
A course in Fine Arts or Performing Arts

Recreation Electives (9):
Students must elect any nine advanced courses in Recreation.

Sociology Electives (9):
Students must elect any nine advanced courses in Sociology.

Non-Departmental Electives (4):
Students must elect any four courses outside of Recreation or Sociology which relate to their major area of study.

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.
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, 75% in their Man-Environment courses, and 70% overall.

Students must include the following in their programme:

Required Recreation Courses (8-11)
Rec 100, 101, 201, 210, 230, 250, T270, 371, 400, T470, T471.

Required Man/Environment Courses (13-16)
130/131 Environmental Issues and the Social Sciences
150/151 Environmental Issues Methods and Techniques
190/191 Seminar Workshops
241 Social Change, or other half-year course in social sciences at the year 2 level
T271 Introduction to Quantitative Research Methods or one other introductory methods course approved by the Department

T Note
A student may elect to take either Recreation 470-471 or Man Environment 490. Likewise, a student may elect Rec 270 or Env St 271.

Recreation Electives (7)
Students must elect seven advanced courses in recreation.

Man Environment Electives (2)
Students must elect one of the Senior honours seminars offered by the Department of Man-Environment Studies.

Non-Departmental Required Courses (7)
- Soc 101 and Psych 101
- Any two of Eng 109, 140, 141, 150, 151, 209, 210
- Any four of Business 121, a biological or a physical science, Econ 101, Geog 101/Env St 195, Plan 156, or a course in Fine or Performing Arts.

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 cumulative average of 70% in their recreation courses, 75% in their Geography courses and 70% overall.

Students must include the following in their programme:

Required Recreation Courses (8-11)
Rec 100, 101, 201, 210, 230, 250, T270, 371, 400, T470, T471.
Required Geography Courses (14-17)
One of Geog 101, 125R, 126R, 127, Env St 192 A or B.
Geog 102 Introduction to Physical Geography
Env St 200 Field Ecology
Geog 201 Some Basic Topics of Physical Geography
Geog 202 Some Basic Topics of Economics and Urban Geography
One of Geog 203, 204, 205, 220.
Geog 260 Introduction to Cartography and Map Analysis
Env St 271 Introduction to Quantitative Research Methods
Geog 275 Introduction to Air Photo Analysis and Remote Sensing
Geog 316 Multivariate Statistics
Geog 317 Nonparametric Statistics
Geog 318 Spatial Analysis
Geog 390 Senior Honours Essay Research Proposal
(For Students who plan to register in Geog 490)
Geog 391 Field Research, or other half-year courses in Geography
Geog 381 The Nature of Geography
T490(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 (11)
Students must elect eleven advanced courses in recreation.

Non-Departmental Required Courses (7)
- Soc 101 and Psych 101
- Any two of Engl 109, 140, 141, 150, 151, 209, 210
- Any three of Business 121, a biological or physical science course, Econ 101, Plan 156, or a course in Fine or Performing Arts.
Projects form a major part of many students' programmes in Integrated Studies.
**An Opportunity for the Individual to Develop an Independent Programme of Study**

Integrated Studies, an undergraduate programme of less than 100 students, was established within the University of Waterloo in 1969 for students who desire to create their own programmes of study. While students may apply their studies toward a baccalaureate degree (it is an option, not a requirement), the Programme's emphasis is to provide individuals with the opportunity to explore their learning interests.

Integrated Studies is distinctive in that the students are encouraged to engage in independent study and to develop a perspective beyond that of a single discipline. At the same time, the daily life of the Programme reflects the broad diversity of the people within it. This community promotes a degree of interaction and sharing seldom found in a university setting, including much spontaneous learning, debates, discussions and plain fun. Finally, the students play the primary role in the operation of the overall programme.

**Self Government**

The students, in conjunction with the Resource Persons and staff, are responsible for the government of Integrated Studies through their participation in Operations Council. Council normally meets every second week to receive reports and recommendations from its committees, composed of members of the Programme, and to decide on all matters affecting the Programme's operation, with the exception of the BiS degree. Standing committees are concerned with such items as admission of students, budget development, hiring of personnel, student project assistance and year end reviews.

Through Council, Integrated Studies attempts to foster the students' development by making a wide variety of resources accessible to them. This includes providing financial assistance for individual travel, conference and research expenses, allocating computer time, sponsoring seminars and conferences, and hiring Resource Persons.

**Resource Persons**

The Programme's Resource Persons serve as tutors and advisors in the students' formulation and pursuit of their studies. As the Resource Persons are normally broadly experienced in transdisciplinary study, they are able to identify connections among areas of knowledge. From their experience in the University and the community they direct students to specialized areas of expertise or particular facilities to further their study and expand their interests.

The current Resource Persons are: Ian Angus, Carol Brooks, Richard Clarke, Anne Dagg, Mac Jamieson, Larry Kendall, Hugh Miller

**Approach to Resources**

In designing their own studies, the students have access, not only to the Programme's resources, but also to those of the community and the University, including its full array of courses. They decide which resources they require and what approach they wish to pursue. The students often work on an individual basis with faculty or graduate students from the many University departments or with people within the Programme. They may audit several courses and take some for credit, or perhaps take no courses at all. An interest in community affairs leads some students to involvement in such areas as the court system, mental retardation and development centres, public and alternative schools, and environmental groups, to name but a few. In addition, they are also free to pursue studies privately utilizing the library and other facilities.

The diverse interests and perspectives in the Programme's composition continually foster an enthusiastic exchange of information among the students and the Resource Persons. This activity has promoted a variety of seminars (for example, on evolution, creative writing, and communities) and, on a larger scale, has resulted in the recent sponsorship of two productive conferences - one a Writers' Workshop which brought together a number of successful writers, publishers and aspiring authors within the University, the other a Women's Studies Conference which attracted participants from throughout the province.

**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 on this development. It is suggested that they indicate the nature of their studies, resources used (personnel, facilities and materials), provide a critical evaluation of their educational year indicating particular achievements and difficulties, and perhaps include examples of their work and evaluation by others.

**Degree Process**

While students may take and receive grades for regular University courses, the degree awarded through this Programme is not based on the accumulation of course credits but on the evidence of competence achieved. The Bachelor of Independent Studies (BiS) degree is at least equivalent to a regular general baccalaureate degree. However, it is neither a three year nor a four year degree. Each degree 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.

The responsibility students in this Programme must assume for their studies ensures that graduates will possess a high level of organizational skills, self-discipline and motivation, combined with their attested educational development. These capabilities have prepared them well for further endeavours and have proven advantageous in their search for employment. Moreover, graduates have been remarkably successful in gaining admission to teachers college, law, business, medicine, and other professional and graduate programmes.

Current members of the Academic Board are: M. L. Breedenbaugh (Psychology), T. E. Bunting (Geography), G. R. Francis (Man Environment), R. H. Holmes (Philosophy), S. M. (Biology), D. M. R. Taplin (Mechanical Engineering).

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 those currently involved in its operation. In addition, members of Integrated Studies would be happy to visit schools or groups of students to discuss the Programme.

For further information, including a copy of the current handbook, contact Bill Smyth, Co-ordinator, at extension 3437 in room 1054 in the Psychology (PAS) building.

Examples of Individual Study

Laurie entered the Programme directly from high school with the intention of pursuing studies in child psychology. As the year developed she shifted her emphasis to special education, focussed part of her studies on feminism and spent a great deal of time on nutrition, relating it to learning and behaviour. She took four courses each term, did volunteer work at a centre for the mentally retarded, served as a teacher's aide in a local public school, worked with a Programme Resource Person toward developing her knowledge of French, and participated in IS seminars. One of the highlights of her year was attending, with financial support from IS, a conference in Montreal sponsored by the Quebec Association for Children with Learning Disabilities. This experience gave her an improved perception of special education and put her in contact with some of the most knowledgeable people in the field.

David's study of the science of music led him into such areas as systems design, psychology, computer science and electrical engineering. He took courses, completed a wide range of projects, prepared musical compositions, and gave public recitals. He attended conferences (presenting a paper at one of them) and gave a course of his own to the University community.

The purpose of Shirley's degree programme was, according to her description: 'to extend and make formal the assessment by qualified people of my competence in literature studies, and to increase my competence in the kinds of literary analysis which contribute to the development of my creative writing and my teaching of English language and literature Working under the supervision of faculty from the English and History departments, she taught at the University's Writing Clinic helping individuals with their writing problems, took literature courses, and prepared major papers. Other activities included working with IS Resource Persons, participating in the Programme's writers' group, continuing to write poetry and short stories, and organizing an informal conference which was attended by writers, both aspiring and successful, by several publishers and by a variety of people from the Kitchener-Waterloo area.

While Shelagh initially engaged in an independent study of alternative energy, she broadened her programme to include courses in physics, biology and mathematics, and work with a Resource Person on
political thought in the 19th and early 20th centuries
and on social Darwinism. Finally, she participated in the
Programme's seminar on co-operatives.

Before entering Integrated Studies Marty had
considerable work experience as a consultant to
individuals and groups involved with social service
agencies and the courts. He designed a programme
which coupled intervention work in the criminal courts
with related academic study in such areas as sociology
and political science. Relevant courses were used
primarily as skill's training in community organizing.
During his degree year he was involved in child
advocacy work under the supervision of faculty in the
departments of Planning and Psychology and a judge of
the family court where he served his field placement.

Inspired by the ageless curiosity of children and by
the relatively recent challenge taken by women, Beth's
programme is a continuation of her writing from a
feminist perspective. A newly acquired interest in verbal
communication, particularly spoken verse, has led her
into a number of workshops both within the Integrated
Studies Programme and the community Working with
Resource Persons, professors and public school
teachers, Beth is currently writing poems and short
stories for children.

Werner had a number of years experience as a
carpenter before coming to Integrated Studies. From
the outset he structured his programme to prepare
himself to become a teacher of technical subjects. After
an initial exploration of a number of areas, he focussed
his studies in mathematics and science, and engaged in
a major examination of the design of roof trusses.

Working with the assistance of the Programme’s
Resource Persons and other faculty of the University,
Gary began with a general interest in education,
sociology, German and philosophy, but gradually made
philosophical scepticism his primary study concern.
During his degree year he was awarded a scholarship to
the University of Oslo which enabled him to continue
his study of scepticism with one of Norway's leading
philosophers.

Anthropology and philosophy provided the
framework for Rachel's study of women's cognition of
themselves and their attempts to organize their world.
Her method consisted of credited courses and
individual work with fellow students, Resource Persons
from IS and other faculty from the University and the
Ontario Institute for Studies in Education. Further, she
was one of the principal organizers of the Programme's
Women's Studies conference.

On entering IS after having completed a regular
baccaulaureate degree in Manitoba, Jamie pursued his
study of man through philosophy and anthropology. He
engaged in a weekly tutorial with an IS Resource Person
who compiled a reading list introducing him to the
sociology of knowledge and assisted his study of
phenomenology and contemporary literature. While
working occasionally with other Resource Persons he
also made contact with faculty in the anthropology and
philosophy departments. In order to gain some
continuity while becoming accustomed to independent
research, he registered in philosophy and history
courses. In addition, he participated in a number of IS
seminars.

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.

Susan's major paper on "The cognitive effects of
learning an alternate mode of communication by
non-verbal children" was the concluding work in her
undergraduate programme, which included two years
at the University of Toronto and two years in Integrated
Studies. Her recent study in psycholinguistics consisted
of courses at OISE and at the University of Waterloo,
observational research carried out over a six month
period in a special class for language handicapped
retarded children, and an independent study of the
pertinent literature under the guidance of her degree
supervisors. Susan is currently in the Educational
Psychology programme at OISE.

Joe joined the IS programme with the intention of
studying alternative schools in the USA and Canada.
While doing this study he developed an interest in the
history of the American labor movement. This led him to
visit old-time union organizers throughout the USA and
Canada and to produce a number of taped interviews
on the oral history of the Industrial Workers of the World
(IWW). Subsequently, he undertook a study of the
Industrial Revolution and the development of the work
ethic while at the University of Waterloo. His blend of
individual research and travel offered him many
alternative approaches to historical study at an
undergraduate level. Most of his university centered
work was performed in conjunction with Resource
Persons in association with other IS students. He then
moved to Spokane, Washington where he studied the
skid row area, and, upon his return, produced a thesis
on the hobo's attitude toward work.

Mark entered Integrated Studies after working with
computers in high school and in England, and did
independent work on many of the computer systems in
use at this University. He also attended many of the
computer science courses offered by the Math faculty
and served as a tutor for a first year computing course.
He found that the freedom of Integrated Studies
provided a needed alternative to the traditional
mathematically oriented approach to computer science.
In addition, he did readings and took courses in a
number of subjects such as philosophy, logic,
international relations, economics and literature, mostly
for their own sake but also with a view to exploring
possible non-business/math applications of computers.
Faculty of Mathematics

A view of the Mathematics and Computer building
Faculty of Mathematics

Prior to 1967, Honours and General Mathematics programmes were offered through the Faculties of Arts and Science. The continued growth and development of these programmes led to the formation of the Faculty of Mathematics as a separate faculty in January, 1967. The Faculty is comprised of the departments of Applied Mathematics, Combinatorics and Optimization, Computer Science, Pure Mathematics and Statistics (including Actuarial Science). The degree Bachelor of Mathematics (BMath) is awarded upon successful completion of three-year Pass, four-year General and four-year Honours programmes.

Honours and General programmes are available on both the regular (i.e. conventional September to April academic year) and co-operative (i.e. alternating four-month academic and work terms) systems of study. The co-operative system is described in detail in Chapter 5. The Pass programme is not available on the co-operative system. Students may also register in regular (not co-operative) programmes through St. Jerome’s College.

The Faculty also offers graduate programmes leading to the following degrees: Master of Mathematics (MMath), Master of Philosophy (MPhil) and Doctor of Philosophy (PhD). Detailed information is contained in the University of Waterloo Graduate Studies Calendar.

Brochures
The Faculty of Mathematics publishes a brochure specifically designed for Ontario high school students as well as individual pamphlets describing each of the Faculty’s programmes. Copies of these are available in school guidance offices or on request from either the Director of Undergraduate Affairs or the Assistant Registrar, Faculty of Mathematics.

Department of Applied Mathematics
Traditionally, Applied Mathematics has been almost synonymous with Mathematical Physics but times change and today Applied Mathematics, while retaining its interest in the physical sciences, is broadening its scope and is becoming concerned with the applications of mathematics to the social and biological sciences. To handle the types of problems that arise in these areas the Applied Mathematician requires two things: a firm background in mathematics with a mastery of techniques and an ability to understand a problem when that problem is stated in the language of biology, economics, engineering, chemistry, physics or business.

With these considerations in mind, the Honours Applied Mathematics programme has been developed as follows. In the first two years the student takes essentially the same programme as every other Mathematics student and acquires a basic mathematical background. In year three he/she studies the mathematics needed by an applied mathematician. In the fourth year, in addition to broadening his/her mathematical background, the student can apply his/her acquired mathematical skills to problems in various fields such as: Fluid Mechanics, Differential Equations, Quantum Mechanics and General Relativity.

It is our belief that a graduate from this programme will be able to turn his hand to many things such as meteorology, oceanography, seismic exploration, supersonic flow, the problems of navigation in space, control problems, ecological population studies and the study of epidemics.


For those students who wish a strong emphasis on Physics, the Department offers the programme “Honours Applied Mathematics with Physics Minor.”

Department of Combinatorics and Optimization
Combinatorics is the mathematics of discretely structured problems. Although its boundaries are not easily defined, Combinatorics includes the theories of graphs, enumeration, designs, and polyhedra. It is a very old subject which in the past was studied principally for its aesthetic appeal. Today’s modern technology with its vital concern for the discrete has given Combinatorics new challenges and a new seriousness of purpose. In particular, since computers require discrete formulations of problems, Combinatorics has become indispensable to modern Computer Science.

Optimization, or mathematical programming, is the study of maximizing and minimizing functions subject to specified boundary conditions, or constraints. The functions to be optimized arise in engineering, the physical and management sciences, and in various branches of mathematics. With the emergence of the computer age, Optimization experienced a dramatic growth as a mathematical theory, enhancing both Combinatorics and classical analysis. In its applications to the management and engineering sciences, Optimization forms an important part of the discipline Operations Research.

Both Combinatorics and Optimization have long been special interests of Canadian mathematicians. Indeed, Waterloo was the first university in the world to have a Department of Combinatorics and Optimization, and it continues to be a leading centre for teaching and research in the theories and applications of these disciplines.
Department of Computer Science

Computer Science is the science of information. It is concerned with the nature and properties of information, its structure and classification, its storage and retrieval, and the various types of processing to which it can be subjected. It is also concerned with the physical machines that perform these operations, with the elemental units of which the machines are composed, with the organization of the units into efficient information processing systems, and with the exploration of the limits of the abilities of the machines.

Computer Science is well recognized as an independent discipline with an inherently mathematical nature. Its activity ranges from theoretical areas such as automata theory, formal languages, and computability theory, to applied areas such as numerical analysis, programming languages, software and hardware systems, and logic design. More specialized areas such as computer graphics, data base management, artificial intelligence, and automatic theorem-proving are also studied with hands-on experience playing an important role in most courses.

The advent of the computer has lead to a systems approach to solving many problems in science, business and industry. There is currently a great demand for information analyst to define what functions these systems will perform, systems analysts to determine how the systems will perform these functions, and programmers to actually implement the systems on computers. The demand for such software specialists should remain robust for many years.

The Computer Science programme at Waterloo is designed to prepare the student for the challenges of a career in this rapidly evolving technological environment. Considerable emphasis is placed on learning fundamental principles in the early part of the programme. Later, the student has the opportunity to explore the ways in which these principles are exploited in current and future areas of application.

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 endeavor.

The special interests of the Department include: Algebra (group theory, representation theory, ring theory, lattice theory, universal algebra, linear and multilinear algebra); Analysis (generalized integrals, real and complex analysis, functional analysis); Geometry (algebraic topology, homotopy theory, differential geometry); Number Theory; Functional Equations and their applications (e.g. to information theory, probability, engineering, science and social science); Logic and Foundations.

Besides the regular Pure Mathematics Honours Programme, the Department offers two programmes for regular and stream 4 co-operative students, Pure Mathematics with Computer Science Minor and Pure Mathematics with Statistics Minor. These programmes give the student an opportunity to obtain skills in an applied area while keeping a strong background in Mathematics.

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 and important part of the Statistics curriculum. Often the purpose for collecting data is to assist in reaching a decision, so the field of Decision Theory is also a part of Statistics.

Many other areas of pure and applied mathematics find applications in Statistics. Calculus and linear algebra are used extensively in the undergraduate programme; abstract algebra, combinatorics, difference and differential equations, analysis, and measure theory are required in more advanced work. Most statistical analyses involve the
computer, so a good background in Computer Science is highly desirable.

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 policies relate specifically to the Faculty of Mathematics.

**Admission as an Adult Student**

Any student who has been away from formal education for more than two years and who does not possess the minimum requirements for admission may apply as an adult student. The applicant should have covered the material of the Ontario Grade 13 mathematics courses (Calculus, Functions and Relations, Algebra), either through a local high school or through the Correspondence Branch of the Ontario Ministry of Education, and should provide evidence of being able to profit from a mathematics 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 relevant courses previously taken if (i) a mark of at least 60% or equivalent has been obtained, (ii) a mark of at least 50% has been obtained in a non-mathematics University of Waterloo course or in a University of Waterloo mathematics course specifically designated for mathematics students. A transfer failure will normally be assigned if the mark is less than 50%.

A mark of 50-59% in a mathematics course equivalent to a course required for a BMath degree could give the student exemption from that requirement but not a credit toward the degree.

A maximum of twelve transfer half-credits per academic year previously taken will normally be given.

Students admitted with a previous Bachelors degree will normally be given a maximum of twelve elective (non-math) half-credits, with a possibility of exemptions in certain math courses.

**Note**

*Students transferring from other post-secondary institutions or other University of Waterloo faculties require at least twelve University of Waterloo Mathematics half-credits that may be taken for credit by a student in the Faculty of Mathematics.*

2) **Cumulative Averages**

Grades in courses taken at the University of Waterloo prior to a student's admission to the Faculty of Mathematics will normally be included in overall and mathematics cumulative averages if the courses are ones that a student registered in the Math Faculty might take for credit toward a BMath degree. Otherwise, the grades are only considered for transfer credit purposes and not included in averages.

Grades in courses taken at other institutions prior to a student's admission to the Math Faculty will not be included in cumulative averages.

3) **Co-operative 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 courses required of University of Waterloo mathematics students. Past experience has indicated that very few places in 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 at least four half-credit 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 BMath degree requirements.

The BMath Pass degree may be obtained entirely by part-time studies; the BMath General degree requires at least two terms on campus; the BMath 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 the University of Waterloo Correspondence Programme. (See page 17 for more details of this programme; a separate brochure is available.)

Fees, Financial Assistance
See Chapters 3 and 4.

Academic Programmes/ Degree Requirements

General Remarks
The Faculty of Mathematics offers undergraduate programmes leading to the following Bachelor of Mathematics degrees: BMath Honours, BMath General, BMath Pass. The Honours Programme is designed for students who wish a heavy concentration of study in some area of the Mathematical Sciences. The General Programme, on the other hand, is more suitable for students with a definite interest in mathematics but who wish to avoid the intense specialization of the Honours Programme. The Pass Programme is a relatively non-specialized course of study intended primarily for students who wish to pursue a more general education and include a larger number of non-Math electives in their programmes. It could also be chosen by those wishing to take a substantial number of mathematics courses but who, for one reason or another, wish to complete their degrees in three years.

Recognizing the diversity of freshman backgrounds, interests and abilities, the Faculty of Mathematics offers its required core courses (not only in Year 1) at three levels of difficulty: advanced, honours and general. The advanced level courses are intended for exceptionally gifted students in an Honours programme.

The Honours Programme is more demanding than either the General or Pass Programme. In addition to requiring that the Honours versions of Faculty core courses be taken, the normal course load for an Honours student beyond first year is six compared to five for General and Pass. Further, the BMath Honours degree requires a higher graduating average and a greater degree of specialization than the BMath General and Pass degrees. Students who enrol in a General programme are not required to meet specific departmental requirements in upper years that must be satisfied by those in Departmental Honours programmes.

The commonality of curriculum (particularly in the first two years) permits considerable flexibility for students to change from one academic programme to another within the Faculty of Mathematics. In fact, if non-mathematics electives are judiciously chosen, this flexibility extends to many programmes in other faculties.

English Writing Skills: In recent years, the Faculty of Mathematics has become increasingly concerned about the lack of writing skills in many of its students. Accordingly, the Faculty intends to introduce an English writing skills requirement which would apply to all degree candidates, both full and part-time, whose initial registration in the Faculty of Mathematics is September/80 or later. The details of this requirement will be made public when finalized.

The following tables and accompanying descriptions outline in detail the degree requirements and typical course load for each year (i.e. two four-month academic terms) of all undergraduate programmes in the Faculty of Mathematics. Except where noted, Honours and General programmes may be taken on either the regular or co-operative system of study. The Pass programme is available only in the regular system. The academic requirements of corresponding co-operative and regular programmes are identical.

Additional requirements for co-op students are summarized in booklets entitled ‘Regulations and Procedures for Co-operative Programmes’ and ‘Co-op Math – Handbook for Students in the Co-operative Mathematics Programme – University of Waterloo’. Both publications are available from the Department of Co-ordination and Placement in Needles Hall.

Under the Math Faculty’s credit system, the onus is on the student to be aware of all regulations pertaining to his/her programme of study. When all requirements for the particular BMath degree being sought have been met, it is the student’s responsibility to submit an ‘Intention to Graduate Form’ to the Registrar’s Office.
### Table 1 - (a) Degree Requirements

<table>
<thead>
<tr>
<th>(a) Degree Requirements</th>
<th>(b) Typical Course Loads</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Honours Programme</strong></td>
<td><strong>General Programme</strong></td>
</tr>
<tr>
<td>Minimum Credits Required</td>
<td>thirty math half-credits;</td>
</tr>
<tr>
<td></td>
<td>twelve elective half-credits;</td>
</tr>
<tr>
<td></td>
<td>six elective or math half-credits.</td>
</tr>
<tr>
<td>Minimum Math Average</td>
<td>70% on thirty math half-credits</td>
</tr>
<tr>
<td>Maximum Course Attempts</td>
<td>sixty half-credits</td>
</tr>
<tr>
<td>(or equivalent)</td>
<td></td>
</tr>
<tr>
<td>Maximum Failures</td>
<td>eight half-credits</td>
</tr>
<tr>
<td>(or equivalent)</td>
<td></td>
</tr>
<tr>
<td>Minimum Complete</td>
<td>four</td>
</tr>
<tr>
<td>Terms Required</td>
<td></td>
</tr>
</tbody>
</table>

#### (b) Typical Course Loads

<table>
<thead>
<tr>
<th>(a) Degree Requirements</th>
<th>(b) Typical Course Loads</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Honours Programme</strong></td>
<td><strong>General Programme</strong></td>
</tr>
<tr>
<td>Year 1</td>
<td>Math 130a/b;</td>
</tr>
<tr>
<td></td>
<td>Math 134a/b;</td>
</tr>
<tr>
<td></td>
<td>two of CS 140, 180, 240, 250;</td>
</tr>
<tr>
<td></td>
<td>six elective half-credits.</td>
</tr>
<tr>
<td>Year 2</td>
<td>Math 230a/b;</td>
</tr>
<tr>
<td></td>
<td>Math 231a/b or 234a/b;</td>
</tr>
<tr>
<td></td>
<td>Stat 230, 231;</td>
</tr>
<tr>
<td></td>
<td>two math half-credits;</td>
</tr>
<tr>
<td></td>
<td>two elective half-credits;</td>
</tr>
<tr>
<td></td>
<td>two elective or math half-credits.</td>
</tr>
<tr>
<td>Year 3</td>
<td>eight math half-credits;</td>
</tr>
<tr>
<td></td>
<td>two elective half-credits;</td>
</tr>
<tr>
<td></td>
<td>two elective or math half-credits.</td>
</tr>
<tr>
<td>Year 4</td>
<td>eight math half-credits;</td>
</tr>
<tr>
<td></td>
<td>two elective half-credits;</td>
</tr>
<tr>
<td></td>
<td>two elective or math half-credits.</td>
</tr>
</tbody>
</table>

**Note**

Table 1 describes the general framework and core courses applicable to all programmes in the Faculty of Mathematics. Degree requirements and recommendations which are programme dependent are described beginning on page 194.

Some flexibility exists to permit the scheduling of courses in a different manner than that shown in Table 1, provided that course pre-requisites have been met. In certain cases, substitutions among corresponding advanced, honours, and general level courses may be made in the Faculty core. More details are given on pages 201 and 368.
The Faculty of Mathematics is in the midst of implementing curriculum changes in its Linear and Abstract Algebra core courses. Accordingly, Maths 224a/b, 234a/b, 244a/b, 324a/b and 334a/b will be phased into the Math Faculty's course offerings over the next two years. Maths 221a/b, 231a/b, 241a/b, 321a/b and 331a/b will be phased out over the same period. Students with at least one half-credit from the sequence of courses to be phased out must continue to choose courses from that sequence. (Students in this category should plan their courses carefully to ensure that all course requirements in the 'old' sequence have been met before the phasing process is complete.) Otherwise, courses must be chosen from the new sequence.

Footnotes to Table 1
1) The term 'math half credit' includes courses with abbreviations AM (Applied Mathematics), C&O (Combinatorics and Optimization), CS (Computer Science), Math (non-departmental faculty courses), PMath (Pure Mathematics), and Stat (Statistics, including Actuarial Science). The term 'elective half-credit' refers to courses offered by other UW faculties as well as those with the abbreviation MTHEL. A two-term (i.e. eight-month) course is equivalent to two one-term (i.e. four-month) courses.
2) Some honours programmes require fewer than thirty math half-credits (e.g. Joint Programmes with other faculties, Chartered Accountancy and Management Accounting options). See detailed programme descriptions on the following pages. Note that students transferring from other post-secondary institutions or other U of W faculties require at least 12 U of W math half-credits that may be taken for credit by a student in the Faculty of Mathematics.
3) All Faculty and Departmental courses required for a particular degree will be included in the Math Average. For Honours programmes requiring more than 30 math half-credits (e.g. Double Honours), all such credits will be included in the Math Average. For Honours programmes which require fewer than 30 half-credits (e.g. Joint Honours Programmes with other faculties may require as few as 24), only those required credits will be included in the average. Also see page 199.
4) There are two deadline dates each term, one for adding courses (this includes changing sections) and a second for dropping courses. The last day to add a course is 2 weeks after the official beginning of lectures. The last day to drop a course is 6 weeks after the official beginning of lectures in the term the course terminates. (These deadline dates apply only to Math Faculty students.)

A course attempt refers to a course registration not formally cancelled with the Registrar's Office before the drop deadline in the term in which the course is taken. Further, if a two-term course registration is cancelled after the drop deadline in the first term of the course but before the drop deadline in the second term of the course, the course will be recorded as a half-credit course attempt.
5) A course attempt not successfully completed constitutes a course failure. Further, a two-term course registration cancelled between drop deadlines (see 4 above) constitutes an unsuccessfully completed half-credit course attempt, hence a half-credit failure.
6) A complete term (i.e. 4 months) is normally one in which a student successfully completes at least five half-credits on campus, at least two of which must be Mathematics courses. For purposes of satisfying the requirements for a complete term, each term of a two-term course will be regarded as a successfully completed half-credit, provided the student successfully completes the two-term course.

Dean's Honours List
To recognize outstanding academic performance each term, the designation "Dean's Honours List" will be awarded to undergraduate Mathematics students in an Honours programme whose term averages (both math and overall) ≥ 85%, based on at least 6 half-credits. This designation will be reflected on end-of-term grade reports and official university transcripts. Note that in the first 'N' such terms, a student must enrol in the appropriate advanced level algebra and calculus courses, i.e. Maths 140a/b, 144a/b, 240a/b, 244a/b. (Normally N = 4; however, a student with advanced standing who begins with Math 240a, 244a, for example, would be an exception.)

Those with outstanding academic records throughout their undergraduate careers who qualify for a BMath Honours degree will "Graduate on the Dean's Honours List" if their cumulative averages (both math and overall) ≥ 85%, based on all courses taken. In addition to an appropriate notation on their official university transcript, those who "Graduate on the Dean's Honours List" will have their names displayed in gold in the Faculty Colloquium Room.
Faculty General and Pass Programmes: Requirements and Recommendations

As indicated earlier, the General and Pass Programmes are intended for students with an interest in the mathematical sciences who do not want the intense specialization required in Honours Programmes. Although there are no formal departmental programmes in Pass or General, students in these programmes may associate themselves with a department at the beginning of Year 3. This procedure allows Pass or General students to turn to departmental undergraduate officers for advice but does not subject them to departmental degree requirements.

General Mathematics
Faculty core requirements as outlined in Table 1 and:
Math 321a/b;
One of Math 322a, CS 370, 371;
Math 322b.

Pass Mathematics (Regular only)
Faculty core requirements as outlined in Table 1.

Departmental Honours Programmes: Requirements and Recommendations

Honours Actuarial Science
Faculty core requirements as outlined in Table 1 and:
Math 331a/b or PMath 341a/b;
Math 332b or PMath 352a;
One of Math 332a, CS 370, 371, PMath 351a;
Stat 273, 284, 374, 384, 475, 477, 487;
Two of Stat 373, 383, 470, 471, 472, 474, 476, 480, 481, 482, 486;
A total of at least sixteen 300 or 400 level math half-credits, at least eight of which are at the 400 level. MTHEL 305a/b is recommended for co-op students in Year 1 and for regular students in Year 1 or 2.

Honours Applied Mathematics (Regular only)
Faculty core requirements as outlined in Table 1 and:
Math 331a/b or PMath 341a/b;
One of Math 332a, CS 370, 371, PMath 351a;
Math 332b or PMath 352a;
A minimum of eight Applied Math half-credits at the 300 or 400 level, at least two of which must be at the 400 level.
AM 260, 270 are recommended.

Recommended elective courses for Honours Applied Mathematics with Physics minor are: Physics 121/122 or 162/163, 253/254, 255, 354, 362/363, 358/359, 441 and Chemistry 121/122.

Honours Applied Mathematics with Computer Science Minor
Faculty core requirements as outlined in Table 1 and:
AM 371, 381, 391;
CS 240, 250, 340, 360, 370, 371;
Three of CS 350, 369, 472, 474, 476, 478, 487;
Math 332b, 331a;
Five additional Applied Math half-credits with at least two at the 400 level.
AM 260 and 270 are recommended.

Honours Applied Mathematics (with electives in Engineering) (Co-operative only)
Faculty core requirements as outlined in Table 1 (with CS 140, 250 required in Year 1) and:
AM 260, 270, 371, 381, 391, Math 332b;
Four of AM 340, 362, 365, CS 340, 370, 371, C&O 331a, 340, 341, Stat 333, 334, Math 331a, 332a, 380a, 380b;
A minimum of eight Applied Math half-credits at the 300 or 400 level with at least two at the 400 level.

Electives required include Physics 121/122 or 162/163 in Year 1 and two half-credits each year (one each term) beyond Year 1 from options A, B, C, D, E, or F.

<table>
<thead>
<tr>
<th>Option</th>
<th>Required Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>ME 219, 220, CE 303, 304, ME 527 and/or ME 525; One or more of CE 518, 522, 526, ME 626.</td>
</tr>
<tr>
<td>B</td>
<td>Sy De 282, 555, Sy De 281 and/or 543; Three or more of Sy De 352, 372, 434, 442, 468, 536, 544, 565, 567.</td>
</tr>
<tr>
<td>C</td>
<td>ME 219, 250, 351; Three or more of ME 353, 354, 452, 456, 459, 469, 557, 563.</td>
</tr>
<tr>
<td>D</td>
<td>EL E 271, 233 and/or 241; Four or more of EL E 342, 351, 352, 372, 418, 419, 434, 435, 436, 453, 454.</td>
</tr>
<tr>
<td>E</td>
<td>EL E 241, 261, 362, 380; Two or more of EL E 342, 372, 463, 464, 465, 481, 482.</td>
</tr>
<tr>
<td>F</td>
<td>Ch E 100, 101, 211, 230, 231, 312, 313, 331, 420. Optional courses: Ch E 232, 330, 332, 422; Chem 26, 36.</td>
</tr>
</tbody>
</table>
Honours Combinatorics and Optimization
Faculty core requirements as outlined in Table 1 and:
Math 331a/b or PMath 341a/b;
One of Math 332a; CS 370, 371, PMath 351a;
Math 332b or PMath 352a;
A minimum of twelve additional 300 or 400 level math half-credits. These must include at least two math half-credits from one or more of the other four departments and at least five half-credits from the C&O department. The five C&O half-credits must include at least two of C&O 331a, 331b, 332, 360, 362, 370a, 370b and at least two of C&O 431a through C&O 472b.

Honours Computer Science
Faculty core requirements as outlined in Table 1 (with CS 140 required in Year 1) and:
CS 240, 250, 340, 350, 360, 369, 370, 371;
Four additional CS half-credits from those labelled CS 440 or higher.
At least five half-credits chosen from the following list:
Math 331a (or PMath 341a)*, Math 331b (or PMath 341b), Math 332a (or PMath 351a/b), Math 332b (or PMath 352a/b), Stat 333, 334, AM 381, 391, C&O 360, 370a/b, PMath 430a/b (or PMath 432a/b), or any fourth year (non Computer Science) course for which one of these or CS 340, 350, 360, 369, 370, 371 is an explicit pre-requisite.

* Students without Math 234b are required to take Math 331a (or PMath 341a).

Honours Pure Mathematics (Regular only)
Faculty core requirements as outlined in Table 1 and:
PMath 341a/b, 351a/b, 352a/b, 367;
Eight 400 level math half-credits, at least four of which must be Pure Mathematics.

Honours Pure Mathematics with Computer Science Minor
Faculty core requirements as outlined in Table 1 (with CS 140 required in Year 1) and:
PMath 341a/b, 351a/b, 352a/b, CS 240, 250, 340, 350, 360, 369, 370, 371;
Two half-credits from PMath 352b, 367, C&O 370a/b, Math 380a/b;
Four half-credits (at least two PMath) from 400 level PMath course or CS courses labelled 440 or higher.
Students will normally delay taking some 300 level required courses until fourth year.

Honours Pure Mathematics with Statistics Minor
Faculty core requirements as outlined in Table 1 and:
PMath 341a/b, 351a/b, 352a;
Stat 333, 350, 351, 452, 454; Stat 334 or 450;
Three half-credits from PMath 352b, 367, 443, 451a/b, Math 380a/b, one of which must be at the 400 level;
Three additional 400 level PMath half-credits. Students will normally delay taking some 300 level required courses until fourth year.

Honours Statistics
Faculty core requirements as outlined in Table 1 and:
Math 331a/b or PMath 341a/b;
Math 332b or PMath 352a;
One of Math 332a, CS 370, 371, PMath 351a;
Stat 333, 334, 350, 351, 450, 451, 452, 454;
At least two additional 400 level and two more 300 or 400 level math half-credits.
Those interested in the degree requirements for Cooperative Honours Statistics-Economics Option should consult with the Statistics Undergraduate Officer.

Double Honours Programmes within the Faculty of Mathematics
A student who has satisfied the requirements for any two single departmental Honours programmes may elect to have both areas named on his/her 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 with Computer Science
Computer Science requirements are CS 140, 240, 250, 370, 371, 330, 331. In exceptional circumstances, these courses may be replaced by other upper-level half-credits in Computer Science.

Actuarial Science with Statistics
Statistics requirements are Stat 350 or 330, 351 or 331, 333, 354 or 332, plus one additional 300 or 400 level Statistics half-credit.

Computer Science with Actuarial Science
Actuarial Science requirements are MTHEL 305a, Stat 273, 284, 374, 384, 475.

Computer Science with Statistics
Statistics requirements are at least five half-credits in Probability and Statistics at the 300 or 400 level, including Stat 331 or 351; Stat 332 or 454; Stat 333; Stat 430 or 452.
Statistics with Actuarial Science
Actuarial Science requirements are MTHEL 305a, Stat 273, 284, 374, 384, 477, 487.

Statistics with Computer Science
Computer Science requirements are CS 140, 240, 250, 370, 371, 446, plus one additional 300 or 400 level Computer Science half-credit.

Joint Honours Programmes with other Faculties are described on page 199.

Non-Departmental Honours and General Programmes: Requirements and Recommendations

Business Administration, Chartered Accountancy and Management Accounting Options
The constantly increasing complexity of business organizations has created a demand for persons trained in analyzing business and accounting problems from a mathematical point of view. The Faculty of Mathematics, in co-operation with the School of Business and Economics at Wilfrid Laurier University and the Department of Economics at Waterloo, offers three unique programmes combining Mathematics with Business Administration, Chartered Accountancy, and Management Accounting. Each of these is designed so that students gain an appreciation for the applications of mathematics to commerce and gain experience in areas such as banking, marketing, production control, accounting, auditing, etc. All three options are available in both the regular and co-operative systems of study.

The Chartered Accountancy and Management Accounting options are offered in co-operation with the Institute of Chartered Accountants of Ontario and the Society of Management Accountants of Ontario, respectively. Graduates of the Chartered Accountancy option will normally have completed all formal university course work required by the Institute. The other principal requirements for the CA designation include two or three years work experience in public accounting and successful completion of the national Institute's uniform final examinations. The Management Accounting option is structured so that successful completion of the programme qualifies a student for twelve RIA exemptions and also to write three of the Society's six Uniform National Examinations.

Co-operative work terms are accepted by both the Institute and the Society as part of their respective internship requirements. Thus, co-op graduates are able to complete all Institute or Society requirements in as little as one year after graduation. Graduates of the regular programme are able to complete all such requirements in as little as two years after graduation.

Note that, in the requirements and recommendations which follow, courses labelled BUS are offered by Wilfrid Laurier's Business School. These courses are:
- Bus 111W - Introduction to Business Organization
- Bus 121W - Functional Areas of the Organization
- Bus 231W - Business Law
- Bus 352W - Introduction to Marketing
- Bus 357W - Taxation
- Bus 362W - Marketing Functions
- Bus 388W - Organizational Behaviour
- Bus 398W - Administrative Practices
- Bus 477W - Auditing
- Bus 481W - Business Policy
- Bus 491W - Management Policy

The WLU academic calendar should be consulted for complete course descriptions and pre-requisites.

Honours Mathematics/ Business Administration Option
Faculty core requirements as outlined in Table 1 (with CS 140, 180 required in Year 1) and:
* Two of CS 250, 283, Stat 270;
* CS 330, 331, Stat 331;
* One of Stat 330, 332, 333;
* Two of C&O 331a, 331b, 340, 341, 443a, 443b, 447a, 447b, 448, 449;
A total of at least twelve 300 or 400 level math half-credits, at least four of which are at the 400 level;

* Substitutions may be made with special permission.

Notes
1. This programme requires a total of 48 half-credits, 28 of which must be math half-credits.
   This is normally accomplished by including 3 math half-credits each term in Year 4, rather than 4 as implied by Table 1.
2. The minimum average of 70% referred to in Table 1 will be based on 28 math half-credits (including those required).

General Mathematics/ Business Administration Option
Faculty core requirements as outlined in Table 1 (with CS 140, 180 required in Year 1) and:
- Stat 220, 221;
* Two of CS 250, 330, 331;
* Two of Stat 270, 330, 331, 332, 333;
* Two of C&O 283, 331a, 331b, 340, 341, 443a, 443b, 447a, 447b, 448, 449;

* Substitutions may be made with special permission.

Honours Mathematics/Chartered Accountancy Option
Faculty core requirements as outlined in Table 1 (with CS 140, 180 required in Year 1), one of the packages listed below and:
Two additional math half-credits;
Elective half-credits required include Econ 101, 102, 191, 192, 291, 292, 391, 392, 393, 394, (491 or 492), Bus 111W, 121W, 231W, 357W, 477W.
C&O 283, CS 498F, Stat 273 are recommended.

a) Information Systems Package
CS 240, 250, 330, Stat 331;
* Three additional 300 or 400 level CS half-credits including CS 331 or (CS 340 and CS 448); CS 432 or (CS 340 and CS 482) or CS 498F;
Two of C&O 331A, 340, 447a;
One of Stat 332, 333, 442, 466. (*Credit may be granted for only one of CS 331, 448 and only one of CS 432, 482, 498F.)

b) Optimization Package
C&O 331a, 331b, 340, 447a, CS 330, 331, Stat 331;
Two of C&O (433a or 443a), 442a, 447b, 449;
One of Stat 332, 333, 442, 466.

c) Statistics Package
Stat 330 or 350, 331 or 351, 332, 442, 466, CS 330, 331;
Two of C&O 331a, 340, 447a;
One additional 300 or 400 level Stat half-credit chosen in consultation with the Statistics Undergraduate Officer.

Notes
1. This programme requires a total of 48 half-credits, 24 of which must be math half-credits. This is normally accomplished by including 3 math half-credits each term in Years 2, 3, 4, rather than 4 as implied by Table 1.
2. The minimum average of 70% referred to in Table 1 will be based on 24 math half-credits (including those required) and the 16 required elective half-credits.

General Mathematics/Chartered Accountancy Option
Faculty core requirements as outlined in Table 1 (with CS 140, 180 required in Year 1) and:
Stat 220, 221;
* Two of CS 250, 330, 331;
* Two of Stat 270, 330, 331, 332, 333;
* Two of C&O 283, 331a, 331b, 340, 341, 443a, 443b, 447a, 447b, 448, 449;
Elective half-credits required include Econ 101, 102, 191, 192, 291, 292, 391, 392, 393, 394, 491*, Bus 111W, 121W, 357W, 388W, 477W.

* Substitutions may be made with special permission.

Honour Mathematics/Management Accounting Option
Faculty core requirements as outlined in Table 1 (with CS 140, 180 required in Year 1), one of the packages listed below and:
Two additional math half-credits;
Elective half-credits required include Econ 101, 102, 191, 192, 291, 292, 391, 392, 393, 394, (491 or 492), Bus 111W, 121W, 231W, 357W, 388W, 477W.
C&O 283, CS 498F, Stat 273 are recommended. Bus 398W and Econ 492 are also recommended.

a) Information Systems Package
CS 240, 250, 330, Stat 331;
* Three additional 300 or 400 level CS half-credits including CS 331 or (CS 340 and CS 448); CS 432 or (CS 340 and CS 482) or CS 498F;
Two of C&O 331a, 340, 447a;
One of Stat 332, 333, 442, 466. (*Credit may be granted for only one of CS 331, 448 and only one of CS 432, 482, 498F.)

b) Optimization Package
C&O 331a, 331b, 340, 447a, CS 330, 331, Stat 331;
Two of C&O (433a or 443a), 442a, 447b, 449;
One of Stat 332, 333, 442, 466.

c) Statistics Package
Stat 330 or 350, 331 or 351, 332, 442, 466, CS 330, 331;
Two of C&O 331a, 340, 447a;
One additional 300 or 400 level Stat half-credit chosen in consultation with the Statistics Undergraduate Officer.

Notes
1. This programme requires a total of 48 half-credits, 24 of which must be math half-credits. This is normally accomplished by including 3 math half-credits each term in Years 2, 3, 4, rather than 4 as implied by Table 1.
2. The minimum average of 70% referred to in Table 1 will be based on 24 math half-credits (including those required) and the 16 required elective half-credits.
Mathematics
Non-Departmental Honours and General Programmes:

C&O 331a, 331b, 340;
Two of C&O 431a through C&O 449;
Two of CS 330, 331, 370, 371, 437, 472, 474, 482;
Two of Stat 331, 332, 333, 334, 430, 431, 442;
A total of at least sixteen 300 or 400 level math half-credits;

(Courses labelled BUS are offered by Wilfrid Laurier's Business School. They are described by title on page 196.)

Teaching Option (Co-operative only)
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 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.

Honours Mathematics Teaching Option
Faculty core requirements as outlined in Table 1 and:
Math 331a/b or PMath 341a/b;
Math 332b or PMath 352a;
One of Math 332a, CS 370, 371, PMath 351a;
At least five of Stat 270, C&O 282, 283, 384, 385, 487, 488;
A total of at least four Computer Science half-credits;
A total of at least fourteen 300 or 400 level math half-credits, at least six of which must be at the 400 level.
Elective half-credits required include MTHEL 206a, Psych 212 and Psych 312 in Year 2, and Soc 207G, Phil 311 and Phil 312 in Year 3.
### General Mathematics Teaching Option
Faculty core requirements as outlined in Table 1 and:
Stat 220, 221;
At least five of Stat 270, C&O 282, 283, 384, 385, 487, 488;
A total of at least four Computer Science half-credits.

**Elective half-credits required** include MTHEL 206a, Psych 212 and Psych 312 in Year 2, and Soc 207G, Phil 311 and Phil 312 in Year 3.

### Note
The Faculty of Education at the University of Western Ontario requires that Psych 212, 312 and Phil 311, 312 be part of the BEd degree. As a result, four additional half-credits are required for the BMath degree; that is, Honours students must complete a minimum of 52 half-credits and General students must complete a minimum of 46. To achieve this, Honours students normally take seven half-credits each term in Years 2 and 3; General students normally take six.

### Joint Honours Programmes with other Faculties leading to a degree in Mathematics
Joint Honours programmes exist between any one of the departments in the Faculty of Mathematics and any one of the following: Anthropology, Economics, English, French, Geography, German, Music, Philosophy, Psychology, Russian, and Sociology.

Students may take these programmes in either faculty in Years 1 and 2. In Year 3 they must register in a department of the Faculty of Mathematics.

The number of math half-credits required may be reduced from 30 to 24, provided the faculty and departmental requirements for a single Honours Departmental programme outlined earlier in this section are satisfied. These programmes must be approved by both departments involved.

Requirements in the second-named subject are as follows:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anthropology</strong></td>
<td>Fourteen half-credits in anthropology, twelve of which must be at the 200-level or above; these must include one half-credit in an advanced (200-level or above) course in each of the four sub-disciplines within anthropology (socio-cultural anthropology, archaeology, linguistics, and physical anthropology), as well as two half-credits in anthropological theory (400-level theory oriented courses). Anth 103 or Anth 104 meet the linguistics portion of these requirements.</td>
</tr>
<tr>
<td><strong>Economics</strong></td>
<td>101, 102, 201, 202, 231, 301, 302, 311, 321, 401, 402, 421, 422, one additional Economics half-credit.</td>
</tr>
<tr>
<td><strong>English</strong></td>
<td>Sixteen English Major half-credits as outlined under &quot;Joint Honours Programmes.&quot;</td>
</tr>
<tr>
<td><strong>French</strong></td>
<td>191 or 192; fourteen additional half-credits in French with six at the second year level, four at the third-year level, and four at the fourth-year level.</td>
</tr>
<tr>
<td><strong>Geography</strong></td>
<td>A minimum of 14 half-credits (or equivalent) in Geography (up to 1.5 credits designated Environmental Studies may be counted for credit as Geography courses). Required courses are: Geography 102, 201, 202, 260, 275, 361, 391; Environmental Studies 200; one of Geography 203, 204, 205, 220; one of Geography 101, 110, 125R, 126R, 127, Environmental Studies 195b.</td>
</tr>
<tr>
<td><strong>German</strong></td>
<td>one of the following pairs 101/102, 105/106, 111/112, 121/122, 151/152; and four German half-credits in each of Years 2, 3, 4.</td>
</tr>
<tr>
<td><strong>Philosophy</strong></td>
<td>221, 222, 280, 281, 282, 283, 340, 358, 359; four additional half-credits in Philosophy.</td>
</tr>
<tr>
<td><strong>Psychology</strong></td>
<td>101, 102, 499; ten additional half-credits in Psychology chosen in consultation with the Psychology Department to fulfill their research requirements.</td>
</tr>
<tr>
<td><strong>Russian</strong></td>
<td>101, 102; four half-credits in Russian in each of Years 2, 3, and 4.</td>
</tr>
<tr>
<td><strong>Sociology</strong></td>
<td>101, 320, 321, 322, 425, 426, 481, 499; seven additional half-credits in Sociology.</td>
</tr>
</tbody>
</table>
Joint Honours leading to a degree with another Faculty

Joint Honours programmes exist between the Faculty of Mathematics and any one of the following: Economics, French, Geography, German, Man Environment Studies, Philosophy, Psychology, Russian, 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 of Environmental Studies, and have their programmes approved by that department.

The Mathematics requirements are:

*Maths 120a/b, 124a/b, 220a/b, (221alb or 224alb);
At least six additional Math half-credits which would be acceptable toward a BMath degree.
A minimum average of at least 70% on these fourteen Math half-credits is required.

* Some substitutions are permitted. See the note following Table 1 on page 192-3.

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.

Standings and Promotions

The Standings & Promotions Committee consists primarily of Mathematics faculty members. Other areas represented include the Math Society, Department of Coordination & Placement and the Registrar's Office. The main purposes of the Committee are to administer the rules and regulations pertaining to undergraduate studies in the faculty, to make recommendations on student performance before end-of-term grade reports are issued to students by the Registrar and to consider all requests for special consideration or appeals in matters within its jurisdiction.

All regulations described in this section apply except under "exceptional" circumstances.

Exceptions to normal faculty policies under the jurisdiction of the Standings & Promotions Committee may only be authorized by that Committee. Requests or appeals of this nature must be made in writing to the Committee's Secretary (the Assistant Registrar, Mathematics, in Needles Hall). Unless the Committee feels that the circumstances outlined in writing justify their giving an individual student special treatment that others would not receive, such requests are usually refused.

It is often advantageous to discuss this type of situation with a faculty advisor before formally approaching the Standings & Promotions Committee. Committee meetings are normally scheduled every other week.

The following regulations apply to all undergraduate degree candidates in the Faculty of Mathematics.

a) Required Withdrawal from Co-op

A student will normally be allowed to remain in a co-operative math programme if he/she has satisfied all of the following requirements.

(i) an overall cumulative average ≥ 60.
(ii) no more than 2 half-course failures in any one term.
(iii) no more than 3 half-course failures in any two consecutive full-time academic terms.
(iv) no more than 8 half-course failures in total.

Continuation in a Co-operative programme is also contingent upon satisfactory performance on work terms and work reports.

b) Required Withdrawal from Honours

When an Honours student has exceeded 8 half-credit 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 below), he/she will still be eligible to pursue a Pass or General degree. In such instances, however, the student will not normally be permitted to take an Honours level course when there is a corresponding General level course available.

c) Required Withdrawal from Mathematics

A student will normally be required to withdraw from the Math Faculty if he/she is in one or more of the following categories:

(i) exceeded 10 half-credit failures (or equivalent)
(ii) failed to satisfy all requirements for the BMath Pass degree by the end of the first term in which the student has accumulated 44, or more half-credit attempts (or equivalent).
(iii) is unlikely to profit from further study in the Math Faculty (in the opinion of the Standings & Promotions Committee).

A student who has been required to withdraw from the Math Faculty will not normally be readmitted to a degree programme in Mathematics at any point in the future.

d) 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.

e) Illness or Incapacity

Normally, failure to write a required final examination in any course in which a student is officially registered, or failure to complete such a course for some other reason, will result in a DNW, NMR or INC grade being recorded for the course. All of these grades are considered as failures for the purpose of course attempt and failure counts and count zero in overall cumulative average calculations.

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

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

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

f) Voluntary Withdrawal

A student may withdraw from the Faculty of Mathematics within the first six weeks of classes in a term without incurring any academic penalty. (A special ‘Withdrawal Form’, available in the Mathematics Undergraduate Office or the Registrar’s Office, must be completed.) A student who withdraws after this date will normally be held responsible for that term’s courses in the sense that such courses will be permanently recorded with grades of DNW and will subsequently be counted as course attempts and failures. Students in this category may still be eligible for tuition and residence fee rebates, depending of course, upon the date of withdrawal.

g) Grade Appeals

Any student wishing to appeal a grade may do so by contacting the Secretary of the Standings & Promotions Committee (the Assistant Registrar, Faculty of Mathematics, in Needles Hall). Such an appeal must (i) be made in writing within one month of the official release of that term’s grades, (ii) specify the course(s), instructor(s) and grade(s) involved together with reasons why the appeal is being made, (iii) include $5.00 per grade appealed (which is refunded if the grade is raised). Please note, however, that a grade may be lowered if a re-examination leads to the discovery of an earlier error in the student’s favour.

h) Grade Designations/Averages

In addition to marks from the numerical scale 0-100, the designations INC (Incomplete course work, no credit granted), AEG (Aegrotat, credit granted due to illness), CR (Credit granted), NMR (No mark reported) and DNW (Did not write examination, no credit granted) may be used from time to time. Courses recorded as AEG or CR will count as credits but have no numerical grade for average purposes. Those recorded as INC, NCR, NMR and DNW will count as failures for the purpose of course-attempt and failure counts. (INC, NMR, DNW count as zeroes in overall cumulative average calculations.)

The average displayed on end-of-term ‘Student Examination Reports’ are intended only to give an indication of student progress. They do not correspond exactly to the average requirements for a BMath degree as outlined earlier in this section. (For example, the only average referred to in the discussion on degree requirements is the “graduating math average”, which obviously cannot be calculated until all required Math courses have been successfully completed.) The overall average includes all marks displayed on the mark report (counting zero from DNW, NMR, INC). Two math averages are displayed. One includes the marks of all ‘math’ courses taken, whether passed or failed. The other includes only the marks of successfully completed ‘math’ courses. Only the best mark is used if ‘math’ courses have been repeated. (‘Math’ refers to courses with the following subject abbreviations: AM, CS, C&O, MATH, PMATH, STAT.)

i) Advanced/Honours/General Equivalents

Certain core subjects are offered at three different levels. The advanced level courses are intended for exceptionally gifted students in an Honours programme. A student pursuing an Honours degree may substitute the corresponding Advanced level course(s) for any required Honours level course(s).

A student pursuing a Pass or General degree may substitute the corresponding Honours level course(s) for any required General level course(s),
unless the student has been required by the Standings & Promotions Committee to switch from an Honours programme to General or Pass. In this case, the student must enrol in General courses.

j) Course Upgrading
A student who takes the General version of a course instead of the Honours version (e.g. Math 220a instead of 230a), but later decides to pursue an Honours degree, may petition the Standings & Promotions Committee for special consideration. In the past, in a few rare instances where the academic record of the student in question was of very high calibre, the Committee has permitted the student to count the General course toward an Honours degree. In other cases, the Committee may permit the student to write a special final examination in the Honours course without submitting all the written work normally required during the term. In such cases the grade obtained will be treated in the same manner as if the student had registered in the course and obtained that final mark. Otherwise, the student must formally take the Honours course. (Special provisions apply to Math 120a/b, 124a/b: A grade of at least 80% in one of these courses will count as satisfying the corresponding Honours level course requirement.)

k) Failed Courses
The minimum passing mark in all courses is 50%. If a student fails a course, he/she may either retake the same course (and this will be the case if the course is required for the degree being sought) or replace it by another course. The failed course remains a permanent part of the student's record at the university, regardless of whether he/she passes the same course on a subsequent attempt, and it is included in course-attempt and failure counts. However, the failing grade will not be included in the Math Average required for the degree in question. Note that supplemental examinations are not available for students in the Math Faculty.

l) 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 degree requirements.

m) Maximum Course Load
No student may pre-register for more than 6 courses per term. Students in Year 3 and 4 may add additional courses, to a maximum of 8, during the two-week course-change period at the beginning of term if their academic record justifies a heavier course load. 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 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 half-credits (N) achieved to date according to the scheme below.

<table>
<thead>
<tr>
<th>Year</th>
<th>0 ≤ N &lt; 10</th>
<th>10 ≤ N &lt; 20</th>
<th>20 ≤ N &lt; 32</th>
<th>32 ≤ N</th>
</tr>
</thead>
<tbody>
<tr>
<td>first year</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>second year</td>
<td></td>
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<tr>
<td>third year</td>
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</tr>
<tr>
<td>fourth year</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

n) Part-time/Full-time
A student registering for one or two courses per term is considered to be part-time and fees are assessed exclusively on a per-course basis. A student registering for more than two courses is considered to be full-time and fees include extra provisions for an incidental fee (student federation membership, athletics, etc.) and a co-op fee (for students in co-operative programmes).

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.

o) No Credit/Overlap Courses
Some courses offered within the university may not normally be taken for credit toward a BMath degree. The mathematical content which these courses often contain has usually been designed with the academic needs and background of students in faculties other than Mathematics in mind.

Other courses offered by various departments throughout the university sometimes deal with similar subject matter. In such instances, at most one entry from a group of 'overlapping' courses may count for credit toward a BMath degree.

A list of such courses is maintained in the Mathematics Undergraduate Office and is published from time to time.

p) Letters of Permission
Students in good academic standing (i.e. at least 60% cumulative overall average) are normally permitted to take elective courses at other universities on a part-time basis during terms off campus to count as credits toward a Bachelor of
Mathematics 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, Faculty of Mathematics. Please note that permission must be obtained before taking the course. The Committee will not normally approve a course taken elsewhere for Waterloo degree credit if prior approval was not obtained.

All courses taken on “letters of permission” at other institutions will be treated as if they had been taken at Waterloo (for Standings & Promotions purposes). Note that, while on a work-term, Co-op students normally are limited to one half-credit course (see r in this section).

Care should be exercised in the selection of courses to be taken on a letter of permission to eliminate unnecessary duplication in course material covered and to ensure adequate preparation for subsequent courses the student is planning to take in future years at the University of Waterloo.

Once the Faculty has approved a request to take a course on a letter of permission, the student will be held responsible for it. It will be his/her responsibility to ensure that an official transcript is sent to the Registrar’s Office within two months of the completion of the course. Otherwise, a grade of DNW (which counts as a failure) will be automatically submitted. Any changes a student wishes to make to an authorized letter of permission must be approved by the Standings & Promotions Committee.

q) Correspondence Courses
The Correspondence Programme at the University of Waterloo offers a large variety of courses each term for part-time students. However, concurrent registration by full-time BMath degree candidates in on-campus and correspondence courses will not normally be permitted. The Mathematics Faculty feels that the Correspondence Programme should normally be restricted to part-time students who are not able to attend classes on campus.

Correspondence courses offered in the fall term do not generally begin until late October and normally (i.e. assuming no postal service problems, for example) have their final exams at the beginning of the following February. In regard the Mathematics Faculty has adopted a policy whereby a student with less than a 70% overall average in his/her most recent complete academic term may not normally take a correspondence course on a part-time basis during the fall term if he/she will be registered full-time during the winter term. This policy is intended to limit this type of situation to students who should be able to cope with the overlap involved with studying for and writing final examinations in fall-term correspondence courses while simultaneously carrying a full-time load of on-campus winter courses.

Correspondence courses may not normally be used to satisfy explicitly stated course requirements for an Honours programme. It is the intent of this policy to require that all such degree requirements be satisfied entirely by on-campus courses. Any additional courses, whether mathematics or non-mathematics, may be taken on a part-time basis by correspondence for Honours degree credit. It should also be noted that this policy applies only to Honours programmes. No such restriction applies for General or Pass programmes.

Subject to the limitations described in earlier paragraphs, correspondence courses may be taken on a part-time basis by regular and co-op students during terms off campus. Interested students are encouraged to discuss correspondence course selections with their “on campus” faculty advisor, but the actual paperwork to pre-register for Correspondence courses involves completely separate application forms available only in the Correspondence Programme Office (Physics Building, Room 375).

r) Co-op Regulations
Co-operative mathematics students are expected to follow the academic/work term sequence appropriate to their programme from admission through to graduation.

Requests to alter this sequence must be directed to the Assistant Registrar, Mathematics, on special forms available from the Registrar’s Office, Department of Co-ordination or Mathematics Undergraduate Office. Such a request will normally be approved if all of the following criteria are met: (1) The student’s academic performance to date is of sufficiently high calibre that he/she should not suffer academically from being off campus for any eight-month work terms which might be involved in the request. (2) The student’s employer supports the request in writing. (3) There is no obvious indication that the stream requested will result in serious course selection difficulties for the student. (4) The request does not reduce the number of work terms remaining for the student at the time of his/her request. (5) The request does not result in the student having more than two consecutive work terms. (6) The requested change does not result in a work term following the completion of the academic requirements for the programme. (Any request which has such a work term scheduled is considered to be one which will violate criterion (4).) (7) The request is properly documented.
Unless supported in writing by his/her employer, the Standings & Promotions Committee is not prepared to consider a co-op student's request to take more than one half-credit course while on a work term.

While registered for an academic term on campus, Co-op Math students are normally expected to maintain a full-time course load. In the case of the 'graduating' term, enrolment need only be maintained in those courses needed to satisfy degree requirements.

s) 'Inactive' Status
A BMath degree candidate who has been 'inactive' for more than 4 consecutive academic terms must apply for re-admission by writing to the Secretary of the Mathematics Admissions Committee (the Assistant Registrar, Mathematics, in Needles Hall). A resume covering the 'inactive' period, including official transcripts from any post secondary institutions attended, must accompany the letter requesting re-admission. No special application form is required. When re-admitted, such a student would be subject to faculty policies in effect at the time of re-admission.

('Inactive' is taken to mean that the student has not been registered at the University of Waterloo or on an approved Letter of Permission as a BMath degree candidate.)
Faculty of Science

Faculty and students involved in a Chemistry laboratory project
Faculty of Science

Introduction
The first students were enrolled in the Faculty of Science in the autumn of 1959. There are now approximately 2,000 full-time students including 200 graduate students, taking programmes within the Faculty.

The Faculty of Science has five teaching departments: Biology, Chemistry, Earth Sciences, Physics, and the School of Optometry. Programmes studies through the Biology, Chemistry, Earth Sciences, and Physics departments lead to a Bachelor of Science (BSc) degree in either 3 or 4 years depending upon the programme taken. The School of Optometry offers a four year professional programme leading to a Doctor of Optometry (OD) degree.

Biology, Chemistry, Earth Sciences and Physics are also available on a Co-operative System of Study where the student alternates four month study terms on campus with four month work terms in industry, business or government in an area related to his or her studies.

For those students whose leanings are more towards administration than research or teaching there is a General Science and Business programme. A programme leading to an Honours BSc in Psychology is also available.

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 (BSc) 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 BSc will be awarded on completion of the General Science Programme in either the three or four-year option. The honours degree, BSc (Honours), will be awarded on completion of any of the honours programmes. MSc and PhD degrees are discussed in the Graduate Calendar.

Upgrading of BSc Degree
A student who has graduated with a 3-year General degree from this University only, may successfully complete the requirements of the 4-year degree with an official major field designation and exchange the old diploma for a new one. Normally a student may not upgrade a General BSc or its equivalent to a Waterloo Honours BSc. However, from time to time such conversion privileges may be allowed in exceptional cases on the recommendation of the Department(s) concerned and with the approval of the Examinations and Standings Committee.

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.

Applicants from Ontario Grade 13
Satisfactory completion of six Grade 13 credits with a 60% overall average as well as 60% overall average in Math (Calculus and one of Relations and Functions or Algebra) and two Sciences (one of which must be Physics or Chemistry). Co-op Physics requires 70% average in Math and Physics. Co-op Chemistry requires 70% in Chemistry and Math.

Co-operative students
Students applying to co-operative programmes in the Faculty of Science will not normally be admitted above the Year 2 Term B level.

Transfer students
Students will be accepted for transfer from other programmes in the University or from other universities. Their programmes will be evaluated in terms of the number of credits allowed and the number remaining for a degree. Normally students will be required to complete the equivalent of two years work while registered in the Faculty of Science. Credits will be transferred without a cumulative average and only for courses with a 60% or better mark.

Admission as an Adult Students
It is recommended that applicants obtain standing in at least one Ontario Grade 13 Mathematics and one Science course or their equivalent in order to have the proper background for first year University courses in these areas. To discuss admissibility and appropriate qualifying works, applicants are advised to contact the Assistant Registrar, Faculty of Science.

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. Further details concerning University Examination Regulations can be found in Chapter 1 page 18.

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

1) Final Examinations
a) The faculty constitutes the examining body for all examinations. All examination results are considered by the Examinations and Standings Committee and subsequently by the Faculty Council. After the results have been considered by these bodies, they will be issued to individual students by the Registrar. Appeals against faculty decisions made under these regulations should be made in writing to the Registrar's Office within one month of the official announcement of term or year marks.

b) Final examinations in one-term courses are held in December, April, or August. Final examinations for all full year courses are held in April, and cover 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 examination; in such cases term work only will be used in determining a final grade.

d) Failure to write an examination is considered a failure to pass. A student who defaults a final examination, except for a properly certified reason, shall have no make-up examination privileges and must repeat the work in class. If a student fails to write for health reasons, a Doctor's certificate, covering the precise period of absence, must be filed in the Registrar's Office within one week after the examination should have been written.

e) In cases where a course (failed or passed) is repeated, both marks will be used in calculating the student's cumulative overall average. If a passing grade is achieved more than once in the same course, it will still only count as one course passed towards the total necessary for graduation. Students in good standing will not normally repeat courses they have passed. 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) 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).

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 obtain will not be counted in determining cumulative average (i.e. the original mark will normally be the mark which counts).

3) 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:

a) Evaluation in Year 1 will be made at the end of term 1B on the entire year's work. In order to proceed to term 2A students must have obtain a 60% overall average, 60% or better in their major field and passed all core courses. Those not meeting these requirements may be transferred to the General programme (non-co-op) in good standing, if possible.

b) 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. Assessment made in terms of 2A and 3A will be on the basis of
marks in all courses taken; for assessments in terms 2B and 3B, marks given for the second half of a full-year course will be the final mark for the course and will replace the A term mark for average purposes. Terms 4A and 4B will normally be assessed as a unit at the end of the 4B term when both terms are taken consecutively from September to April. Students from any co-operative 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.

c) A student is expected to follow the work-term sequence from the point of entry, subject to the minimum requirements for graduation within the individual programmes.
   The minimum number of related work terms required is normally four.
   The minimum number of satisfactory work reports is normally four.

4) Standing

Grades
Marks in individual courses will be reported as numerical marks on the scale 0 to 100. A mark of 50 or better is necessary to pass and receive credit for a course. For Science students, the lowest mark to be recorded and averaged will be 32, equivalent to the weighting factor for the F- on the common grading system.

Grade Appeals
Any student wishing to appeal a course grade should submit a formal written appeal either through the Registrar’s Office or the Science Undergraduate Affairs Office. Appeal forms are available in both locations.

   Normally a formal appeal must be submitted within one month of the official release of the term’s grades.

Required to Withdraw
Students required to withdraw from the Faculty of Science may be eligible to apply for re-admission only after one year’s absence.

Terminology
INC (either term work, lab work, examination, etc., are incomplete). AEG (aegrotat - signifying the student’s work or examination was incomplete for some acceptable reason (such as illness) and 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 acceptable).

NCR (credit is not granted where performance was unsatisfactory but no specific mark is given).

DNW (final examination not written in a course that has not been dropped officially whether the course has been attended or not).

AEG or CR will count as a course passed towards the total necessary but will not count in the overall average. 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.

“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).

Course
A course may refer to a lecture course, a laboratory course, or a lecture-laboratory course which includes both lecture and laboratory.

   Laboratory courses are designated by the letter L following the course number.

Credit
Credits are assigned for lecture and laboratory courses as designated in the course descriptions (also see page 238).

Dean’s Honours List
Beginning in 1979, the Faculty of Science introduced a Dean’s Honours List for full-time Honours students who have completed second year studies or higher during the previous twelve months.

   The list of nominations will not exceed 10% of the number of such students in each Department. To be eligible for consideration a student must have a
cumulative average and an overall average for the completed year of at least 80%.

The award will be noted on the student transcript, and the student will receive a congratulatory letter from the Dean.

Academic Programmes

General Programmes - 3 year General and 4 year General (Major)
The 4 year General Programme begins at the Year 2 level, admission to which requires a 50% overall average as well as 60% or better in the field of specialization.

To continue in the general programmes a full-time student carrying the normal 5 lecture course load must maintain a cumulative average of 50% with a minimum of 3.0 lecture credits obtained per academic year and no more than 2.0 failed. Failure to meet these requirements could result in a Conditional Standing or a requirement to withdraw. A Conditional Standing may be allowed the first time depending upon the circumstances.

Of the total 15 credits required in the 3 year General programme at least 14 must be lecture credits. No more than 2.1 attempts will be allowed.

Of the total credits required in the 4 year General programme (20 or greater) at least 18 must be lecture credits the number dependent on the programme. No more than 6 attempts over and above the number of credits required will be allowed. Not more than 4 credits offered under the "Science" label may be applied to any general degree.

All 4 year General students must take Year 4 of the programme through the University of Waterloo.

Honours Programmes

Introduction
Admission to the Co-operative Biology, Chemistry, Earth Sciences, 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. Year 4 of the programme must be taken at the University of Waterloo.

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 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 credits be allowed per academic year and normally a minimum of 3.0 lecture credits must be obtained. Not more than 4 credits offered under the "Science" label may be applied to any Honours Programme.

Honours Major Programmes
Honours Biology - regular and co-operative
Honours Biology and Chemistry - regular
Honours Chemistry - regular and co-operative applied
Honours Earth Sciences - regular and (Geology or Geography) and co-operative applied (Geology or Geotechnical)
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 Optometry programme a student who fails to demonstrate clinical competence as evidenced by a failing grade in a clinical course may not continue in the programme.
In the Honours Earth Sciences (Geography) programme a cumulative average of 75% must be maintained in the Geography courses, and a cumulative average of 60% in the other courses.
In the Honours Psychology 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.
A student who fails one of the credits in the field of specialization may be placed on probation in order to clear that requirement. Failure of more than one such course could result in requirement to withdraw from that programme.
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.
Academic Programme Selection

Students entering first year in the Faculty of Science are essentially enrolled in a common year. Students in Year 1 Co-operative Biology, Chemistry, Earth Sciences and Physics are labelled as such but all other students are officially in Year 1 regular Science. Essentially the same courses are available to all first year students and any student may enter most Year 2 programmes in Science provided he or she has taken the necessary courses in Year 1 and has achieved the necessary passing average; the notable exception to this is in the Optometry programme where enrolment is limited to 60.

1) 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 per term, 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 required and recommended Year 1 selections for various Year 2 Honours or General Science-Major programmes can be found in the table which follows.

2) 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 with adequate cause but not after November 1 or July 1 for Fall and spring one-term courses. The permission of the instructor and the appropriate undergraduate officer or the Associate Dean must be obtained. Courses which have not been dropped officially will receive a DNW grade.

d) Students may withdraw from the University as late as the official course drop date without penalty on their record. If however, a student chooses to withdraw to avoid a number of failures, he or she will likely be disqualified for readmission.

3) Correspondence Courses
Only in exceptional cases should correspondence courses be taken by a student in a semester in which he or she is a full-time student.

4) Enrolment in a Graduate Course
A student may obtain credit toward a graduate degree in the Faculty of Science for normally not more than a one term graduate course taken during the fourth year of an undergraduate programme provided this course is not used for credit toward his undergraduate degree. Prior approval of the Faculty Graduate Studies Committee must be obtained for students wishing to do so.

Credit for the graduate course toward a graduate degree will not be given unless the student attains an “A” average in his/her major subjects in the fourth year.

5) Reduced 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. A student in good standing who “stops out” of an Honours Programme for more than a year must have Department approval before returning to that Programme.

Only in exceptional circumstances may a first year programme for a full-time student be reduced below the 5 lecture-course minimum.

Ontario Teacher’s Certificate
Admission to the programme leading to an Ontario Teacher’s Certificate at an Ontario Faculty of Education requires an acceptable university degree (3 or 4 years, general or honours, B.A. or B.Sc. or equivalent). Specialization in certain subject areas is attained by completing the requirements for an Honour Specialist Qualification (HSQ). The HSQ requires an Honours Bachelor’s degree or equivalent and appropriate course background: for one specialty the minimum is nine year course equivalents, for two specialties a total of fourteen year course equivalents is required with no less than six in each subject area. In all cases, a B average is required to progress to the HSQ. The Honour Specialist Qualification is required to teach in a publicly supported high school.

Future Regulations
Normally, students will be given advanced warning of changes in regulations but the faculty reserves the right to make changes without notice where necessary.
## Year 1 Science Programme Selections Leading to Year 2 Honours or Major Programmes

### Regular Programmes

<table>
<thead>
<tr>
<th>Major Field of Study</th>
<th>Required Courses in Year 1</th>
<th>Recommended Electives in Year 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology (see Note 6)</td>
<td>Two 200 level term courses in Biology, Chemistry 123-124 and 123L-124L</td>
<td>Physics 111-112, AM 101-111 or Math 113, Earth Sciences 121-122, CS 118</td>
</tr>
<tr>
<td>Biology and Chemistry (see Note 6)</td>
<td>Two 200 level term courses in Biology, Mathematics 113, Chemistry 123-124 and 123L-124L, a first year Physics course</td>
<td>Chemistry 123-124 and 123L-124L, Mathematics 113, Physics 121-122 and 121L-122L</td>
</tr>
<tr>
<td>Chemistry (see Note 2)</td>
<td>Chemistry 123-124 and 123L-124L, Mathematics 113, Physics 121-122 and 121L-122L</td>
<td>Biology 111-112, 111L-112L or two 200 level term courses in Biology, Earth Sciences 121-122, Environmental Studies 195 or a Computer Science course</td>
</tr>
<tr>
<td>Chemistry (Mathematics Option (see Note 2))</td>
<td>Chemistry 123-124 and 123L-124L, Mathematics 113, Physics 121-122 and 121L-122L, a first-year Algebra course</td>
<td>A Computer Science course</td>
</tr>
<tr>
<td>Chemistry (Physics Option (see Note 2))</td>
<td>Chemistry 123-124 and 123L-124L, Mathematics 113, Physics 121-122 and 121L-122L or 162-163 and 162L-163L</td>
<td>A full-year Algebra course</td>
</tr>
<tr>
<td>Earth Sciences (see Note 4)</td>
<td>Earth Sciences 121-122, Chemistry 123-124 and 123L-124L, a first year Physics course with labs, Math 113</td>
<td>Biology 111 112 or two 200 level term courses in Biology, Computer Science 118, or Arts elective</td>
</tr>
<tr>
<td>Earth Sciences (Geography Option)</td>
<td>Earth Sciences 121-122, Chemistry 123-124 and 123L-124L, Geography 102 and one of: Geography 101, 125R, 126R, 127 or Environmental Studies 195</td>
<td>Computer Science 118</td>
</tr>
<tr>
<td>Optometry (see Note 3, page 212 and consult page 228 for full list of prerequisite for admission to Optometry.)</td>
<td>Mathematics 113, Biology 230 and 211, Physics 121-122 and 121L-122L, Psychology 101</td>
<td>Chemistry 123-124 and 123L-124L, Psychology 102 or Sociology 101</td>
</tr>
<tr>
<td>Physics (see Note 1)</td>
<td>Mathematics 111a-111b and 113, Physics 121-122 and 121L-122L or 162-163 and 162L-163L</td>
<td>A computer course</td>
</tr>
<tr>
<td>Psychology (see Note 6)</td>
<td>Two 200 level term courses in Biology, Chemistry 123-124 and 123L-124L, Physics 111-112 or 121-122 and 121L-122L, Mathematics 113, Psychology 101-102</td>
<td>Chemistry 123-124 and 123L-124L</td>
</tr>
<tr>
<td>General Science &amp; Business (see pg. 236)</td>
<td>2.0 Science lecture credits from the Year 1 departmental courses, Mathematics 113, Economics 101, 102, Computer Science 118 and 119 (see pg. 236)</td>
<td></td>
</tr>
</tbody>
</table>
# Year 1 Science Programme Selections Leading to Year 2 Honours or Major Programmes

## Co-operative Programmes

<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><strong>Applied Chemistry</strong> (see Note 2 and 5)</td>
<td>Chemistry 123-124 and 123L-124L, Mathematics 115a-115b, Physics 121-122 and 121L-122L</td>
<td>A Computing Course</td>
</tr>
<tr>
<td><strong>Applied Physics</strong> (see Note 1)</td>
<td>Mathematics 111a-111b, 115a-115b, Physics 121-122 and 121L-122L or 162-163 and 162L-163L</td>
<td>Chemistry 123-124 and 123L-124L</td>
</tr>
<tr>
<td><strong>Applied Earth Sciences (Geology Option)</strong> (see Note 4)</td>
<td>Earth Sciences 121-122, Chemistry 123-124 and 123L-124L, a first year physics course with labs, Mathematics 113</td>
<td>Biol 111-112 or two 200 level term courses in Biology, Computer Science 118, or Arts elective</td>
</tr>
<tr>
<td><strong>Applied Earth Sciences (Geotechnical Option)</strong></td>
<td>Earth Sciences 121-122, Mathematics 110a-110b, 114, Phys 011 and Phys 112-112L, Chemistry 123-124 and 123L-124L, Computer Science 118, one term arts elective</td>
<td></td>
</tr>
<tr>
<td><strong>Co-operative Biology</strong> (see Note 6)</td>
<td>Two 200 level term courses in Biology, Chemistry 123-124 and 123L-124L</td>
<td>Physics 111-112, AM 101-111, Earth Sciences 121-122 and Computer Science 118</td>
</tr>
</tbody>
</table>

### Note 1

Co-op Physics students and those planning to enroll in Honours Physics in Year 2 are advised to select Math 130a-130b instead of Math 113 or 115a-115b, and may select Math 134 instead of Math 111 if they have an 80% average in Grade 13 Mathematics and Physics.

Students desiring the Biophysics option of the Honours Physics programme are advised to include Biology 111-112, 111L-112L in their programme.

Students desiring the geophysics option of the Honours Physics programme are advised to include Earth 121-122 and Chem 123-124 in Year 1.

Students wishing any of the Business Administration options are advised to select Econ 101-102.

Students wishing the elective programme with EE are advised to select Sy De 183 or GenE 115 (Fall term) and CS 118 (Winter term).

### Note 2

The year 2 honours chemistry programmes (including Co-op Applied Chemistry) are normally limited to the 100 best qualified students. Those who have failed core courses should not expect to proceed in an honours chemistry programme.

### Note 3

Students planning to apply for admission to Year 1 Optometry should have a sound background in Chemistry. Chem 123-124 and 123L-124L is strongly recommended. Phys 162-163 and 162L-163L may be taken instead of Phys 121-122 and 121L-122L.

### Note 4

By the end of Year 2 students, must have completed Phys 111-112 and Phys 111L-112L, General Physics, or Physics 121-122 and 121L-122L, Math 113, Calculus; and an introductory course in computer sciences.

### Note 5

Students in the co-operative Applied Chemistry and Physics programmes 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. So 100, a one-term introductory geology course, is available in the Fall and Winter terms.

### Note 6

The Department of Biology offers ten introductory courses which provide a thorough and broadly based foundation in biology. Areas of biology that are covered include botany, cell biology, ecology, genetics, microbiology, physiology and zoology. First-year students must take any two of these courses (and may take three), along with Year 1 Chemistry, as prerequisites for entering Year 2 of a Biology-major programme. Students entering First Year are advised to choose courses from different areas of biology. Students from other faculties and departments are provided with a wide selection of introductory courses in diverse fields of biology from which they may choose those most suitable for their programme or area of interest.

In Year 2, students pursuing the Honours Biology program must take the remaining 8 (or 7) biology courses and complete the Calendar requirements in Chemistry and Statistics. Students who proceed into Years 3 and 4 of the Honours
Biology programme may then specialize in those areas of biology most closely related to their needs and interest.

For students who do not intend to major in Biology or enter the School of Optometry and wish to obtain a general introduction to Biology, Biol 111 and 112 (and labs) are available. These courses will emphasize basic principles.

See course descriptions on page 238.

A brief discussion of the above courses and some other courses available for selection is given below. See Course Descriptions, Chapter 15 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.

Biology
(see Note 6 on pg. 212 and course description on pg. 238).

Earth Sciences
Earth 121-122
Introductory Geology.

These courses are ideal electives for first year students who are not familiar with this area. It is not necessary to have a Geography course or other specific high school background for this course. Students with potential interest in Geology, Geochemistry, or Geophysics should select these courses.

Chemistry
Chem 123-124
Chemical Reactions, Equilibria and Kinetics (123) and Organic Chemistry 1 (124)
(with the associated laboratories 123L-124L) are the introductory Chemistry courses for those wishing to major in Chemistry, or those electing a first year Chemistry course.

Physics
Physics 111-112, Physics for the Life Sciences, is a course sequence offered for students intending to major in Biology. The associated laboratories, Phys 111L-112L, are recommended for students who want some practical experience to complement their theoretical studies or to fulfill the entrance requirements of certain medical or dental schools. (Students obtaining better than minimum marks in Phys 111-112 and 111L-112L may be admitted to a Physics major programme, at the discretion of the Physics Department). Physcs 121-122, Introductory Physics, is the normal course sequence for students wishing to major in Physics. Science students taking Phys 121-122 must also take Phys 121L-122L. Physics 162-163, Enriched Introductory Physics, is a course sequence offered for students who prefer, and have sufficient preparation for, an enriched and more challenging course. Science students taking Phys 162-163 must take Phys 162L-163L.

Prereq: Phys 111-112 and 121-122, only the Ontario Grade 13 courses required for admission to Science. Physics 162-163; at least 75% average in Ontario Grade 13 Physics. Functions and Relations and Calculus.

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, CS 118 is suggested. CS 118 (Introduction to Computing) and CS 250 (Introduction to Computer Science) are offered by the Faculty of Mathematics. Only students who are above average in Mathematics (i.e. approximate 70% or better in at least two Grade 13 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, 108, 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 211.)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introductory Invertebrate Zoology</td>
<td>0.5</td>
</tr>
<tr>
<td>Introductory Vertebrate Zoology</td>
<td>0.5</td>
</tr>
<tr>
<td>Plant Biology 1 - The Living Plant</td>
<td>0.5</td>
</tr>
<tr>
<td>Plant Biology 2 - The Diversity of Plants</td>
<td>0.5</td>
</tr>
<tr>
<td>Genetics</td>
<td>0.5</td>
</tr>
<tr>
<td>Fundamentals of Microbiology</td>
<td>0.5</td>
</tr>
<tr>
<td>Introduction to the Microbial World</td>
<td>0.5</td>
</tr>
<tr>
<td>Ecology</td>
<td>0.5</td>
</tr>
<tr>
<td>Organic Chemistry A</td>
<td>0.5</td>
</tr>
<tr>
<td>Organic Chemistry Laboratory</td>
<td>0.25</td>
</tr>
<tr>
<td>or</td>
<td></td>
</tr>
<tr>
<td>Introductory Biochemistry</td>
<td>0.5</td>
</tr>
<tr>
<td>Introductory Biochemistry Laboratory</td>
<td>0.25</td>
</tr>
<tr>
<td>Elementary Statistics for Biologists</td>
<td>0.5</td>
</tr>
<tr>
<td>One non-Biol elective (half credit)</td>
<td>0.5</td>
</tr>
</tbody>
</table>

**Year 2†**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>Biol 331 Vertebrate Zoology</td>
<td>0.5</td>
</tr>
<tr>
<td>Biol 332 Anthropod Zoology</td>
<td>0.5</td>
</tr>
<tr>
<td>Biol 333 Invertebrate Zoology</td>
<td>0.5</td>
</tr>
<tr>
<td>Biol 334 The Flowering Plants</td>
<td>0.5</td>
</tr>
<tr>
<td>Biol 335 Identification and Variety of Microorganisms</td>
<td>0.5</td>
</tr>
<tr>
<td>Biol 337 Microorganisms in Foods</td>
<td>0.5</td>
</tr>
<tr>
<td>Biol 338 Plant Anatomy &amp; Morphogenesis</td>
<td>0.5</td>
</tr>
</tbody>
</table>

**Year 3‡**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>At least two full credits from</td>
<td></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.)

**Note regarding Electives**

A listing of Science and other electives is found on page 233. 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.

**Co-operative Biology**

The University of Waterloo now offers a co-operative Biology programme designed to equip the graduating student with two years of work-related experience as well as a degree in Honours Biology. Applicants for Co-op Biology must fulfill the normal admission requirements for the Faculty of Science. The programme has academic and work terms scheduled as shown on page 59 in Chapter 5.
In-course academic requirements are the same as for Honours Biology. During the work terms, students are assessed on their performance and are also required to write work reports. The programme is aimed at making the student competitive in the job market without precluding entry into graduate school.

**Honours Biology and Chemistry**

<table>
<thead>
<tr>
<th>Year</th>
<th>Course Titles</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal Year 1</td>
<td>Science (see page 211) in which Chem 123-124, 123L-124L, two 200 level term courses in Biology (see Note 6 on pg. 212), a first year Physics course and Math 113 are required; (Course weight is shown in parentheses)</td>
<td></td>
</tr>
<tr>
<td><strong>Year 2</strong></td>
<td>Two full Biology credits from</td>
<td></td>
</tr>
<tr>
<td>Biol 210</td>
<td>Introductory Invertebrate Zoology (0.5)</td>
<td></td>
</tr>
<tr>
<td>Biol 211</td>
<td>Introductory Vertebrate Zoology (0.5)</td>
<td></td>
</tr>
<tr>
<td>Biol 220</td>
<td>Plant Biology 1 - The Living Plant (0.5)</td>
<td></td>
</tr>
<tr>
<td>Biol 221</td>
<td>Plant Biology 2 - The Diversity of Plants (0.5)</td>
<td></td>
</tr>
<tr>
<td>Biol 239</td>
<td>Genetics (0.5)</td>
<td></td>
</tr>
<tr>
<td>Biol 240</td>
<td>Fundamentals of Microbiology (0.5)</td>
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</tr>
<tr>
<td>Biol 241</td>
<td>Introduction to the Microbial World (0.5)</td>
<td></td>
</tr>
<tr>
<td>Biol 250</td>
<td>Ecology (0.5)</td>
<td></td>
</tr>
<tr>
<td><strong>Plus</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chem 212</td>
<td>Structure and Bonding (0.5)</td>
<td></td>
</tr>
<tr>
<td>Chem 220</td>
<td>Introductory Analytical Chemistry (0.5)</td>
<td></td>
</tr>
<tr>
<td>Chem 220L</td>
<td>Analytical Chemistry Laboratory 1 (0.25)</td>
<td></td>
</tr>
<tr>
<td>Chem 221</td>
<td>Analytical Chemistry of Multi-Component Systems (0.5)</td>
<td></td>
</tr>
<tr>
<td>Chem 221L</td>
<td>Analytical Chemistry Laboratory 2 (0.5)</td>
<td></td>
</tr>
<tr>
<td>Chem 264</td>
<td>Organic Chemistry 1 (0.5)</td>
<td></td>
</tr>
<tr>
<td>Chem 264L</td>
<td>Organic Chemistry Laboratory 1 (0.25)</td>
<td></td>
</tr>
<tr>
<td>Elective</td>
<td>One credit (1.0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Math 215 (0.5) and one other term course recommended)</td>
<td></td>
</tr>
<tr>
<td><strong>Year 3†</strong></td>
<td>Two full Biology credits from</td>
<td></td>
</tr>
<tr>
<td>Biol 331</td>
<td>Vertebrate Zoology (0.5)</td>
<td></td>
</tr>
<tr>
<td>Biol 332</td>
<td>Arthropod Zoology (0.5)</td>
<td></td>
</tr>
<tr>
<td>Biol 333</td>
<td>Invertebrate Zoology (0.5)</td>
<td></td>
</tr>
<tr>
<td>Biol 334</td>
<td>The Flowering Plants (0.5)</td>
<td></td>
</tr>
<tr>
<td>Biol 335</td>
<td>Identification and Variety of Microorganisms (0.5)</td>
<td></td>
</tr>
<tr>
<td>Biol 337</td>
<td>Microorganisms in Foods (0.5)</td>
<td></td>
</tr>
<tr>
<td>Biol 338</td>
<td>Plant Anatomy and Morphogenesis (0.5)</td>
<td></td>
</tr>
<tr>
<td>Biol 340</td>
<td>Molecular Biology (0.5)</td>
<td></td>
</tr>
<tr>
<td>Biol 341</td>
<td>Cell Physiology (0.5)</td>
<td></td>
</tr>
<tr>
<td>Biol 343</td>
<td>Histology and Cytology (0.5)</td>
<td></td>
</tr>
<tr>
<td>Biol 345</td>
<td>Plant Physiology (0.5)</td>
<td></td>
</tr>
<tr>
<td><strong>Plus</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biol 346</td>
<td>Population Ecology 1 (0.5)</td>
<td></td>
</tr>
<tr>
<td>Biol 347</td>
<td>Mycology 1 (0.5)</td>
<td></td>
</tr>
<tr>
<td>Biol 348</td>
<td>Vertebrate Physiology 1 (0.5)</td>
<td></td>
</tr>
<tr>
<td>Biol 349</td>
<td>Vertebrate Physiology 2 (0.5)</td>
<td></td>
</tr>
<tr>
<td>Biol 350</td>
<td>Environmental Toxicology 1 (0.5)</td>
<td></td>
</tr>
<tr>
<td>Chem 332-333</td>
<td>Biochemistry 1 (0.5) and 2 (0.5)</td>
<td></td>
</tr>
<tr>
<td>Chem 356-357</td>
<td>General Physical Chemistry 1 (0.5) and 2 (0.5)</td>
<td></td>
</tr>
<tr>
<td>Chem 364</td>
<td>Organic Chemistry 2 (0.5)</td>
<td></td>
</tr>
<tr>
<td>Chem 365</td>
<td>Organic Chemistry 3 (0.5)</td>
<td></td>
</tr>
<tr>
<td>Chem 356L-357L</td>
<td>General Physical Chemistry Laboratory 1 (0.25) and 2 (0.25)</td>
<td></td>
</tr>
<tr>
<td>Chem 364L</td>
<td>Organic Chemistry Laboratory 2 (0.5)</td>
<td></td>
</tr>
<tr>
<td><strong>†Note</strong></td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td><strong>Year 4††</strong></td>
<td>Any three credits from 400-level courses offered in Biology or Any two credits from 400-level courses offered in Biol and Chem 492</td>
<td></td>
</tr>
<tr>
<td>Chem 312</td>
<td>Transition Element Chemistry (0.5)</td>
<td></td>
</tr>
<tr>
<td>Chem 419</td>
<td>Biological Aspects of Inorganic Chemistry (0.5)</td>
<td></td>
</tr>
<tr>
<td>Chem 432-433</td>
<td>Biochemistry 3 (0.5) and 4 (0.5)</td>
<td></td>
</tr>
<tr>
<td>Chem 432L-433L</td>
<td>Biochemistry 3 (0.25) and 4 (0.25)</td>
<td></td>
</tr>
<tr>
<td><strong>††The Biochemistry 432L and 433L laboratory courses are compulsory except for students who elect to do a biochemistry 492 project. These students may choose not to do 432L/433L but, if so, they must take an extra 0.5 credit course chosen from upper level biology or chemistry courses and approved by an undergraduate officer in the appropriate department.</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Honours Chemistry Programmes**

All students intending to graduate as honours chemists - either Co-op or regular - should seriously consider taking several of the courses listed below as electives in order to get a broader background. Such electives are recommended by industrial advisors. Stat 204-205 or Chem Eng 220 - Statistics and Experimental Design Sci 209 - Information M Env 320 and M Env 357 - Environmental
Conservation and Resource Management.
Env St 401/402 or ME 100 - (MTHEL 100) - Econ 294 - Law
Business courses from Wilfred Laurier such as Bus 352, 362, 382, 383. Economics courses from Waterloo such as Econ 101/102; 191/192; 193/194; 201/202.

Honours Chemistry
This programme fulfills the academic requirements for professional membership in the Chemical Institute of Canada.

Year 1
Normal Year 1 Science (see page 211) including Chem 123-123L, 124-124L, Math 113 and Phys 121-122, 121L-122L.

Year 2
Fall Term
Chem 10 Chemistry Seminar
Chem 212 Structure and Bonding (0.5)
Chem 220 Introductory Analytical Chemistry (0.5)
Chem 220L Analytical Chemistry Laboratory 1 (0.25)
Chem 254 Physical Chemistry 1 (0.5)
Math 215 Differential Equations (0.5)
One elective (0.5)

Winter Term
Chem 10 Chemistry Seminar
Chem 221 Analytical Chemistry of Multi-Component Systems (0.5)
Chem 221L Analytical Chemistry Laboratory 2 (0.50)
Chem 255 Physical Chemistry 2 (0.5)
Chem 264 Organic Chemistry 1 (0.5)
Chem 264L Organic Chemistry Laboratory 1 (0.25)
Phys 243 Electricity and Magnetism (0.5)
Phys 243L Electricity and Magnetism Laboratory (0.25)
One elective (0.5)

Year 3
Fall Term
Chem 10 Chemistry Seminar
Chem 312 Transition Metal Chemistry (0.5)
Chem 314L Inorganic Chemistry Laboratory 1 (0.25)
Chem 355 Physical Chemistry 3 (0.5)
Chem 355L Physical Chemistry Laboratory 1 (0.25)
Chem 364 Organic Chemistry 2 (0.5)
Chem 364L Organic Chemistry Laboratory 2 (0.5)
Two electives† (1.0)

Winter Term
Chem 10 Chemistry Seminar
Chem 313 Main Group Chemistry (0.5)
Chem 315L Inorganic Chemistry Laboratory 2 (0.5)
Chem 356 Physical Chemistry 4 (0.5)
Chem 358L Physical Chemistry Laboratory 2 (0.5)
Chem 365 Organic Chemistry 3 (0.5)
Two electives† (1.0)

Year 4
Chem 10 Chemistry Seminar
Chem 492 Advanced Laboratory (1.5)
Eight one-term electives† (4.0)

† 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 course 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 and 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
(Odd years; next offered Fall 1981) Chem 442

Winter Term
(Off years; next offered Winter 1981) Chem 409, 416, 458

Winter Term
(Even years; next offered Winter 1980) Chem 351, 359, 362, 417

Co-operative Applied Chemistry (Honours)
Information about the Co-op work terms and the Coordination 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 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 3R Winter term, when a wider selection of courses is available. (see table on following page)

This programme fulfills the academic requirements for professional membership in the Chemical Institute of Canada.

Year 1
Normal Year 1 Science (see page 211) including Chem 123-123L, 124-124L, Math 113 and Phys 121-122 and 121L-122L.

Honours Chemistry (Environmental Studies Option)
This programme is designed to combine the core of the Honours Chemistry Programme with selected courses which provide knowledge of environmental problems, approaches to their solution, environmental law and resource management. Conceivably a graduate from the programme could serve as a chemist working on problems of pollution and the environment. Such a graduate should have familiarity with legal, economic, and social aspects of the problems encountered.

This programme fulfills the academic requirements for professional membership in the Chemical Institute of Canada.

Year 1
Normal Year 1 Science (see page 211) including Chem 123-123L, 124-124L, Math 113, and Phys 121-122, 121L-122L. Biol 111-112 or two 200 level Biology term courses. Earth 121-122, Env St 195, or a Computer Science course are considered desirable electives.

Year 2

| Fall Term | | | | |
|---|---|---|---|
| Chem 10 | Chemistry Seminar | | |
| Chem 212 | Structure and Bonding (0.5) | | |
| Chem 220 | Introductory Analytical Chemistry (0.5) | | |
| Chem 220L | Analytical Chemistry Laboratory 1 (0.25) | | |
| Chem 254 | Physical Chemistry 1 (0.5) | | |
| Math 215 | Differential Equations (0.5) | | |
| Winter Term | | | |
| Chem 10 | Chemistry Seminar | | |
| Chem 221 | Analytical Chemistry of Multi-Component Systems (0.5) | | |

| Year 3 | | | |
|---|---|---|
| Fall Term | | |
| Chem 10 | Chemistry Seminar | |
| Chem 312 | Transition Metal Chemistry (0.5) | |
| Chem 314L | Inorganic Chemistry Laboratory 1 (0.25) | |
| Chem 355 | Physical Chemistry 3 (0.5) | |
| Chem 355L | Physical Chemistry Laboratory 1 (0.25) | |
| Chem 364 | Organic Chemistry 2 (0.5) | |
| Chem 364L | Organic Chemistry Laboratory 2 (0.5) | |
| Stat 204 | Statistics for the Sciences (0.5) | |
| Winter Term | | |
| Chem 10 | Chemistry Seminar | |
| Chem 313 | Main Group Chemistry (0.5) | |
| Chem 315L | Inorganic Chemistry Laboratory 2 (0.5) | |
| Chem 356 | Physical Chemistry 4 (0.5) | |
| Chem 358L | Physical Chemistry Laboratory 2 (0.5) | |
| Chem 365 | Organic Chemistry 3 (0.5) | |
| Stat 205 | Statistics for the Sciences (0.5) | |

The following courses are suitable for completing the requirements for the Environmental Studies Option. Eight one-term courses are required to complete the degree. All courses are one semester courses (0.5 credit) except M Env 410 (1.0 credit).

| Year 4 | | | |
|---|---|---|
| Fall Term | | |
| Chem 10 | Chemistry Seminar | |
| Chem 492 | Advanced Laboratory (1.5) | |
| Env St 201 | Environmental Law (0.5) | |
| Four one-term Chem courses | (Recommended courses include: Chem 311, 320-320L, 332-332L, 419, 420, 455) | |
| Winter Term | | |
| Env St 195B | Introduction to Environmental Problems | |
| Env St 200 | Field Ecology (2nd, 3rd, or 4th year) | |
| Env St 358 | Environmental Pollution and its Control | |
| M Env 320 | Environmental Economics | |
| M Env 356 | Canadian Non-Renewable Resources | |
| M Env 375H/475H | Man-Made Environmental Health Hazards | |
| M Env 375N | Environmental Nutrition: Man and His Food | |

continued on pg. 219
Co-operative Applied Chemistry (Honours) Stream 8 Years 2-4

For course details see Hons. Chem. (page 216)

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year 2A</strong></td>
<td><strong>Work Term</strong></td>
<td><strong>Year 2B</strong></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>
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<td>One Elective</td>
</tr>
<tr>
<td><strong>Work Term</strong></td>
<td><strong>Year 3A</strong></td>
<td><strong>Work Term</strong></td>
</tr>
<tr>
<td>Chem 10, 313, 314L, 355</td>
<td></td>
<td></td>
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<tr>
<td>355L, 364, 364L</td>
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<td></td>
</tr>
<tr>
<td>Two Electives†</td>
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Co-operative Applied Chemistry (Honours) Stream 4 - Years 2-4

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
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</thead>
<tbody>
<tr>
<td><strong>Work Term</strong></td>
<td><strong>Year 2A</strong></td>
<td><strong>Work Term</strong></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>
<tr>
<td><strong>Year 2B</strong></td>
<td><strong>Work Term</strong></td>
<td><strong>Year 3A</strong></td>
</tr>
<tr>
<td>Phys 243, 243L</td>
<td></td>
<td>One Elective†</td>
</tr>
<tr>
<td>One Elective</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Work Term</strong></td>
<td><strong>Year 3B</strong></td>
<td><strong>Work Term</strong></td>
</tr>
<tr>
<td>Chem 10, 313, 315L, 358, 358L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Three Electives†</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Year 4
Chem 10, 492
Eight Electives†

†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, 363, 416, 420, 421, 422, 453, 454, 455, 456, 457, Other electives may be chosen from the Chemistry Electives list on page 216.
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 216). A first year course in Algebra is also required and at least one term of Computer Science is recommended.

Year 2
Fall Term
Chem 10 Chemistry Seminar
Chem 212 Structure and Bonding (0.5)
Chem 220 Introductory Analytical Chemistry (0.5)
Chem 220L Analytical Chemistry Laboratory 1 (0.25)
Chem 254 Physical Chemistry 1 (0.5)
Math 215 Differential Equations (0.5)
or CS 370 Introduction to Scientific Computation (0.5)
One of:
Math 220a, 221a, 231a, 213a (0.5)

Winter Term
Chem 10 Chemistry Seminar
Chem 221 Analytical Chemistry of Multi-Component Systems (0.5)
Chem 221L Analytical Chemistry Laboratory 2 (0.50)
Chem 255 Physical Chemistry 2 (0.5)
Chem 264 Organic Chemistry 1 (0.5)
Chem 264L Organic Chemistry Laboratory 1 (0.25)
Phys 243 Electricity and Magnetism (0.5)
Phys 243L Electricity and Magnetism Laboratory (0.25)
One of:
Math 220b, 221b, 231b, 213b (0.5)

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 216) but the first year Phys course selected should be 121-121L, 122-122L, or 162-163L, 163-163L. One credit in Algebra and at least one half-credit of Computer Science is recommended.

Year 2
Fall Term
Chem 10 Chemistry Seminar
Chem 212 Structure and Bonding (0.5)
Chem 220 Introductory Analytical Chemistry (0.5)
Chem 220L Analytical Chemistry Laboratory 1 (0.25)
Chem 254 Physical Chemistry 1 (0.5)
Math 210 Calculus 2 (0.5)
Phys 222 or 252 Electricity and Magnetism 1 (0.5)
Phys 222L or Electricity and Magnetism Laboratory 1 (0.25)

**Winter Term**

Chem 10 Chemistry Seminar
Chem 221 Analytical Chemistry of Multi-Components Systems (0.5)
Chem 221L Analytical Chemistry Laboratory 2 (0.50)
Chem 255 Physical Chemistry 2 (0.5)
Chem 264 Organic Chemistry 1 (0.5)
Chem 264L Inorganic Chemistry Laboratory 1 (0.25)
Math 215 Differential Equations (0.5)
Phys 223 or Electricity and Magnetism 2 (0.5)
Phys 223L or Electricity and Magnetism Laboratory 2 (0.25)

**Year 3**

**Fall Term**

Chem 10 Chemistry Seminar
Chem 312 Transition Metal Chemistry (0.5)
Chem 314L Inorganic Chemistry Laboratory 1 (0.25)
Chem 355 Physical Chemistry 3 (0.5)
Chem 355L Physical Chemistry Laboratory 1 (0.25)
Chem 364 Organic Chemistry 2 (0.5)
Chem 364L Organic Chemistry Laboratory 2 (0.5)
Phys 324 Atomic and Nuclear Physics 1 (0.5)
One Elective† (0.5)

**Winter Term**

Chem 10 Chemistry Seminar
Chem 313 Main Group Chemistry (0.5)
Chem 315L Inorganic Chemistry Laboratory 2 (0.25)
Chem 358 Physical Chemistry 4 (0.5)
Chem 358L Physical Chemistry Laboratory 2 (0.5)
Chem 365 Organic Chemistry 3 (0.5)
Phys 325 Atomic and Nuclear Physics 2 (0.5)
One Elective† (0.5)

**Year 4**

Chem 10 Chemistry Seminar
Chem 492 Advanced Laboratory (1.5)
Two one-term Chemistry courses which must be at the 400-level. (1.0)
Four one-term Physics courses at the 300- or 400 level. (2.0)
Two one-term electives. (1.0)

†Year 3 electives may be chosen from Phys 352-353 plus 352L-353L, 362-363, 364-365, Math 221a-221b, 222b, CS370.

**Honours Earth Sciences**

Completion of this programme requires a total of 24.0 credits (including Year one). Of these at least two elective credits must be from the Faculty of Arts and at least two elective lecture credits must be non-Earth Sciences courses from the faculties of Science and Mathematics. (There are two exceptions. Earth 355 is considered only as a Science/Mathematics elective; Physics 368-369 are not considered as Science/Mathematics electives). In addition, attendance on two field trips is required (Earth 390-490).

(See Undergraduate Course Descriptions, Ch. 15)

A list of recommended Science and Mathematics electives is given on page 221.

**Year 1**

(For a complete discussion of Year 1, see page 211)

**Year 2**

Earth 221 Geochemistry 1 (0.5)
Earth 231 Mineralogy (0.5)
Earth 232 Petrography (0.5)
Earth 235 Stratigraphy (0.5)
Earth 236 Principles of Paleontology (0.5)
Earth 260 Introductory Structural Geology (0.5)
Electives Three credits, normally two from courses in Science and/or Mathematics, and one from Arts.

**Note**

By the end of Year 2, students must have completed Phys 111-112 and Phys 111L-112L, General Physics (or an equivalent physics course), Math 113, Calculus, and an introductory course in computer programming equivalent to CS 118 or Gen E 121.

**Year 3**

Earth 331 Igneous Petrology (0.5)
Earth 332 Metamorphic Petrology (0.5)
Earth 333 Sedimentology (0.5)
Earth 336 Paleontology (0.5)
Earth 342 Geomorphology (0.5)
Earth 345 Historical Geology (0.5)
Earth 360 Applied Geophysics 1 (0.5)
Earth 370 Economic Geology (0.5)
Earth 390 Field Camp
Electives Two credits, normally one from courses in Science and/or Mathematics, and one from Arts.

**Year 4**

Earth 490 Field trip
Earth 436 Thesis (1.0)
Earth 427 Crustal Evolution (0.5)

Seven half-credits from:

Earth 421 Geochemistry 2 (0.5)
Earth 432 Precambrian Geology (0.5)
### Science

#### Academic Programmes

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth 433</td>
<td>Applied Sedimentology</td>
<td>0.5</td>
</tr>
<tr>
<td>Earth 434</td>
<td>Biostratigraphy</td>
<td>0.5</td>
</tr>
<tr>
<td>Earth 435</td>
<td>Advanced Structural Geology</td>
<td>0.5</td>
</tr>
<tr>
<td>Earth 438</td>
<td>Engineering Geology</td>
<td>0.5</td>
</tr>
<tr>
<td>Earth 439</td>
<td>Hydrogeology</td>
<td>0.5</td>
</tr>
<tr>
<td>Earth 440</td>
<td>Quaternary Geology</td>
<td>0.5</td>
</tr>
<tr>
<td>Earth 456</td>
<td>Numerical Methods in Geoscience</td>
<td>0.5</td>
</tr>
<tr>
<td>Earth 461</td>
<td>Applied Geophysics 2</td>
<td>0.5</td>
</tr>
<tr>
<td>Earth 470</td>
<td>Metallic Mineral Deposits</td>
<td>0.5</td>
</tr>
</tbody>
</table>

**Electives**

*One credit, not from Earth Sciences.*

---

1. Upon programme approval by the Undergraduate Officer, a student may take six half-credits from the above list to allow freedom to take courses in the faculties of Engineering, Mathematics or Science.

   Students who plan to do graduate work in hydrogeology and who have not taken the Geotechnical Option are advised to take Math 210 or Civ E 221 during their fourth year.


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**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.

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**Honours Earth Sciences (Geography Option)**

This programme combines the basic courses of Honours Earth Sciences with Geography. Successful completion requires 13.5 credits from the Faculty of Science and 11 one-term credits from the Faculty of Environmental Studies. Students must maintain a 75% average in all Geography courses.

**Year 1**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth 121</td>
<td>Introductory Geology 1</td>
<td>0.5</td>
</tr>
<tr>
<td>Earth 122</td>
<td>Introductory Geology 2</td>
<td>0.5</td>
</tr>
<tr>
<td>Geog 102</td>
<td>Introduction to Physical Geography</td>
<td>0.75</td>
</tr>
<tr>
<td>Chem 123</td>
<td>Chemical Reactions, Equilibria &amp; Kinetics</td>
<td>0.5</td>
</tr>
<tr>
<td>Chem 123L</td>
<td>Chemical Reaction Laboratory</td>
<td>0.25</td>
</tr>
</tbody>
</table>

**Electives**

*Three one-term equivalents including one of:*

- Geog 201 Some Basic Topics of Physical Geography | 0.75 |
- Geog 202 Some Basic Topics of Economic and Urban Geography | 0.5 |

**Year 2**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth 221</td>
<td>Geochemistry 1</td>
<td>0.5</td>
</tr>
<tr>
<td>Earth 231</td>
<td>Mineralogy</td>
<td>0.5</td>
</tr>
<tr>
<td>Earth 232</td>
<td>Petrography</td>
<td>0.5</td>
</tr>
<tr>
<td>Earth 235</td>
<td>Stratigraphy</td>
<td>0.5</td>
</tr>
<tr>
<td>Earth 236</td>
<td>Principles of Paleontology</td>
<td>0.5</td>
</tr>
<tr>
<td>Earth 260</td>
<td>Introductory Structural Geology</td>
<td>0.5</td>
</tr>
<tr>
<td>Env St 200</td>
<td>Field Ecology</td>
<td>0.75</td>
</tr>
<tr>
<td>Geog 201</td>
<td>Some Basic Topics of Physical Geography</td>
<td>0.75</td>
</tr>
<tr>
<td>Geog 202</td>
<td>Some Basic Topics of Economic and Urban Geography</td>
<td>0.5</td>
</tr>
</tbody>
</table>

**Electives**

*Three one-term equivalents including one of:*

- Geog 203 Some Basic Topics of Cultural and Regional Geography | 0.75 |
- Geog 220 World Regional Geography | 1.5 |

**Note**

By the end of year 2, students must have completed an introductory course in computer programming equivalent to CS 118 or Gen E 121.

**Year 3**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth 331</td>
<td>Igneous Petrology</td>
<td>0.5</td>
</tr>
<tr>
<td>Earth 332</td>
<td>Metamorphic Petrology</td>
<td>0.5</td>
</tr>
<tr>
<td>Earth 333</td>
<td>Sedimentology</td>
<td>0.5</td>
</tr>
<tr>
<td>Earth 336</td>
<td>Paleontology</td>
<td>0.5</td>
</tr>
<tr>
<td>Earth 342</td>
<td>Geomorphology</td>
<td>0.5</td>
</tr>
<tr>
<td>Earth 345</td>
<td>Historical Geology</td>
<td>0.5</td>
</tr>
<tr>
<td>Earth 370</td>
<td>Economic Geography</td>
<td>0.5</td>
</tr>
<tr>
<td>Geog 381</td>
<td>The Nature of Geography</td>
<td>0.5</td>
</tr>
<tr>
<td>Earth 390</td>
<td>Field Camp</td>
<td></td>
</tr>
<tr>
<td>Geog electives</td>
<td>Two one-term equivalents</td>
<td></td>
</tr>
</tbody>
</table>

**Elective**

*One credit (1.0)*

**Year 4**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth 436</td>
<td>Honours Thesis</td>
<td>1.0</td>
</tr>
<tr>
<td>Earth 490</td>
<td>Field Camp</td>
<td></td>
</tr>
<tr>
<td>Earth Electives</td>
<td>Three credits (3.0)</td>
<td></td>
</tr>
<tr>
<td>Geog Electives</td>
<td>Two one-term equivalents</td>
<td></td>
</tr>
<tr>
<td>Elective</td>
<td>One credit (1.0)</td>
<td></td>
</tr>
</tbody>
</table>
Co-operative Applied Earth Sciences

The co-operative programmes in Earth Sciences are Honours programmes designed to satisfy the requirements 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 212. The co-operative Earth Sciences programmes operate as a single co-operative stream. The first work term begins in the Summer term following Year 1 and thereafter academic and work terms alternate until the end of term 3B when a double work term commences. Students then take terms 4A and 4B as a full academic year, graduating the following Spring. At least one work report must have been satisfactorily completed by the beginning of academic term 3A. All four work reports must have been submitted within one month of the beginning of academic term 4A.

General features and conditions of the co-operative plan at the University of Waterloo are given in Chapter 5.

The normal progress of a student entering co-operative Earth Sciences in the Fall of 1980 is shown in the table page 59, Chapter 5. There are two programmes available: the Geology and the Geotechnical options. Students contemplating careers in engineering geology or hydrogeology are advised to take the Geotechnical Option.

Geology option

Completion of this course requires a total of 24.0 credits (including year one). Of these at least 2 lecture-credits (excluding required courses) must be non-Earth Sciences courses from the faculties of Science and Mathematics and 2 credits must be from the Faculty of Arts. (There are two exceptions. Earth 355 is considered only as a Science/Mathematics elective; Physics 368-369 are not considered as Science/Mathematics electives.) In addition, attendance is required on two field trips (Earth 390, Earth 490) (see Undergraduate Course Descriptions, Ch. 15). A list of recommended Science and Mathematics electives is given on page 221.

Year 2A
Earth 231 Mineraology (0.5)
Earth 235 Stratigraphy (0.5)
Earth 236 Principles of Paleontology (0.5)
Electives Three half credits, normally two from courses in Science and/or Mathematics and one from Arts.

Year 2B
Earth 221 Geochemistry 1 (0.5)
Earth 232 Petrography (0.5)
Earth 260 Introductory Structural Geology (0.5)
Electives Three half credits, normally two from courses in Science and/or Mathematics and one from Arts.

Note
By the end of Year 2, students must have completed Phys 111-112 and Phys 111L-112L, General Physics (or an equivalent physics course), Math 113, Calculus, and a course involving computer programming equivalent to CS 118 or Gen E 121.

Year 3A
Earth 332 Metamorphic Petrology (0.5)
Earth 333 Sedimentology (0.5)
Earth 345 Historical Geology (0.5)
Earth 370 Economic Geology (0.5)
Earth 390 Field Camp
Electives Two half credits, normally one from Science or Mathematics and one from Arts.

Year 3B
Earth 331 Igneous Petrology (0.5)
Earth 336 Paleontology (0.5)
Earth 342 Geomorphology (0.5)
Earth 360 Applied Geophysics 1 (0.5)
Electives Two half credits, normally one from Science or Mathematics and one from Arts.

Year 4A, 4B Identical to regular programme in Honours 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 and the geotechnical professions in mind. As such it also provides a good undergraduate background for fields such as engineering geology and hydrogeology. The number of students admitted to this programme is limited.

In addition to the prescribed course work, attendance is required on two Earth Sciences field trips (Earth 390-490) (see Undergraduate Course Description, Ch. 15) and in Civ E 291, a non-credit field course in surveying. Civ E 291 may be taken immediately prior to either the 2A, 3B or 4A terms.

Year 1A
Earth 121 Introductory Geology 1 (0.5)
Math 110A Calculus 1a (0.5)
Math 114 Algebra and vector geometry (0.5)
Phys 011 Mechanics (0.5)
Chem 123 & 123L Chemical Reaction, Equilibria and Kinetics (0.75)
Science
Academic Programmes

**Year 1B**
- Earth 122: Introductory Geology 2 (0.5)
- Math 110b: Calculus 1b (0.5)
- Phys 112 & 112L: Physics for the Life Sciences (0.75)
- Chem 124 & 124L: Organic Chemistry 1 (0.75)
- Comp 118: Computer Programming (0.5)

*Phys 112 & 112L should be replaced in the Earth Science stream by Gen. E. 122 if timetabling permits.*

**Year 2A**
- Gen E 115: Eng Concepts 1 (0.75)
- Earth 231: Mineralogy (0.5)
- Earth 235: Stratigraphy (0.5)
- Civ E 203: Statics (0.5)
- Civ E 221: Calculus (0.5)

(one-half credit Arts elective) (0.5)

**Year 2B**
- Civ E 205: Mechanics of Deformable Solids (0.5)
- Civ E 222: Diff Equations (0.5)
- Earth 221: Geochimistry 1 (0.5)
- Earth 232: Petrography (0.5)
- Earth 260: Structural Geology (0.5)

(one-half credits Arts elective) (0.5)

(Recommended - a course in report writing)

**Year 3A**
- Civ E 353: Geology and Soil Mechanics (0.5)
- Civ E 292: Engineering Economics (0.5)
- Earth 338: Rock Mechanics (0.5)
- Earth 332: Metamorphic Petrology (0.5)
- Earth 333: Sedimentology (0.5)
- Earth 370: Economic Geology (0.5)
- Earth 390: Field Methods

**Year 3B**
- Civ E 200: Civil Engineering Project (0.5)
- Civ E 354: Foundation Engineering (0.5)
- Earth 331: Igneous Petrology (0.5)
- Earth 360: Applied Geophysics 1 (0.5)
- Earth 438: Engineering Geology (0.5)
- Earth 439: Hydrogeology (0.5)
- Civ E 291: Survey Camp (0.5)

**Year 4**
- Earth 436: Thesis/Geotechnical Project (1.0)
- Civ E 224: Probability and Statistics (0.5)
- Civ E 280: Fluid Mechanics (0.5)
- Earth 435: Advanced Structural Geology (0.5)
- Earth 440: Quaternary Geology (0.5)
- Earth 490: Field Trip
- Earth 345: Historical Geology
- Earth 427: Crustal Evolution (0.5)
- Civ E 204: Dynamics (0.5)

three one-half credit Arts electives (1.5)

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**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 electives, a student can deepen his or her 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 credits (including Year one). It is recommended that students intending to take an Honours Physics programme should take six lecture 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 15.

**Year 1**
(For a complete discussion of Year 1, see page 211).

**Year 2**
- Core
  - Phys 10: Physics Seminar (0.0)
  - Phys 256: Wave Motion and Optics (0.5)
  - Phys 256L: Physical Optics Lab (0.25)
  - Phys 254: Thermal Physics and Properties of Matter (0.5)
  - Phys 253: Electricity and Magnetism (0.5)
  - Phys 253L: Electricity and Magnetism Lab (0.25)
  - Phys 255: Quantum Physics (0.5)
  - Math 213a-213b: Advanced Calculus (1.0)
  - Math 216: Differential Equations (0.5)

**Note 1**

In order to satisfy core requirements, another 0.25 credit lab must be elected from Phys 270, 271, and 259L.

**Year 3**
- Core
  - Phys 10: Physics Seminar (0.0)
  - Phys 360A: Intermediate Laboratory (0.25)
  - Phys 360B: Intermediate Laboratory (0.25)
  - Two of Phys 371A, 371B, 352L or 353L
  - Phys 362: Classical Mechanics 1 (0.5)
  - Phys 363: Classical Mechanics 2 (0.5)
  - Phys 364: Mathematical Physics 1 (0.5)
  - Phys 365: Mathematical Physics 2 (0.5)
  - Phys 354: Atomic and Molecular Physics (0.5)
  - Phys 358: Thermodynamics (0.5)
  - Phys 359: Statistical Mechanics (0.5)

**Note**

Students desiring Phys 444 must elect Phys 355
### Year 4 Core
- Phys 10: Physics Seminar (0.0)
- Phys 434A: Introductory Quantum Mechanics (0.5)
- Phys 441: Electromagnetic Theory (1.0)
- Phys 355: Nuclear and Particle Physics (if not taken in Year 3) (0.5)
- Phys 433: Experimental Research Project (1.0)
  or
- Phys 437A: Theoretical Physics Project (0.5)

### 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 credits. All suggested programmes are subject to timetable restrictions.

**Ex 1 Honours Physics**
(with extra emphasis on experimental physics)

<table>
<thead>
<tr>
<th>Year</th>
<th>Core</th>
</tr>
</thead>
</table>
| 2    | Core plus: Year 2  
Phys 259, 259L, 270-271, CS 210 and CS 240. |
| 3    | Core plus: Year 3  
Phys 352-353, 352L-353L, 371A, 371B |
| 4    | Core plus: Year 4  
Phys 432, 433, 435, 464, 465  
Two of: Phys 442, 443, 445, 452, 453 |

**Ex 2 Honours Physics**
(epecially suitable as preparation for secondary school teaching)

<table>
<thead>
<tr>
<th>Year</th>
<th>Core</th>
</tr>
</thead>
</table>
| 2    | Core plus: Year 2  
| 3    | Core plus: Year 3  
Phys 352, 352L, 371A-371B, 353, 353L |
| 4    | Core plus: Year 4  
Phys 436, Sci 400, Arts Electives |

**Ex 3 Honours Physics**
(with Biophysics)

<table>
<thead>
<tr>
<th>Year</th>
<th>Core plus: Year 2</th>
</tr>
</thead>
</table>
| 2    | Stat 220  
Three of: Chem 254, 255, 266., 267, Biol 245, 246 |
| 3    | Core plus: Year 3  
Three of: Phys 352, 352L, 353, 353L, 380, 381  
One of: Biol 341, 343, 239, Chem 356, 357, 332, 333, 353 |
| 4    | Core Plus: Year 4  
Phys 434B, 435, 480, 481  
2.0 credits from: Biol 434, 448, 449, Chem 432, 433, 434, 453, 454, 457 |

**Ex 4 Honours Physics**
(with Computing)

<table>
<thead>
<tr>
<th>Year</th>
<th>Core plus: Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Phys 259, 259L, CS 210, CS 240, Arts Elective</td>
</tr>
</tbody>
</table>
| 3    | Core plus: Year 3  
Phys 352, 352L, 353, 353L  
Two of: Stat 220, CS 340, 350, CS370, 371 |
| 4    | Core plus Year 4  
Phys 435, 452, 453, Ed E 222, Elective |

**Ex 5 Honours Physics**
(with Chemistry)

<table>
<thead>
<tr>
<th>Year</th>
<th>Core plus: Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Chem 218-219, 254-255, CS 210 or CS 240</td>
</tr>
</tbody>
</table>
| 3    | Core plus: Year 3  
Phys 352, 352L, 371A, Chem 266-267, Elective |
| 4    | Core plus: Year 4  
2.0 credits from Phys 434B, 435, Chem 350, 355, 358, 312, 311, Elective |

**Ex 6 Honours Physics**
(with Astrophysics)

<table>
<thead>
<tr>
<th>Year</th>
<th>Core plus: Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Phys 250, 251, 270, CS 210, CS 240</td>
</tr>
</tbody>
</table>
| 3    | Core plus: Year 3  
| 4    | Core Plus: Year 4  
Phys 434B,  
Ex 7 Honours Physics  
**Business Administration Option**  
See comments regarding Business Administration Option under General Science and Business on page 235-6.

Core plus: Year 1 Special Requirements  
Econ 101/102, CS 118 or CS 116

Core plus: Year 2  
Econ 201/202, 281/282

Core plus: Year 3  
Econ 391/392, Stat 204/205, M Sci 44 (Phys 360A and 360B are not normally taken with this option)

Core plus: Year 4  
Econ 393/394, Bus (WLU) 454/464, Bus (WLU) 352/362, M Sci 46

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  

Ex 9 Honours Physics  
(with Electrical Engineering)

Core plus: Year 1 Special Requirements  
Sy De 183 or Gen E 115 (Fall term), and CS 140 (Winter term)

Core plus: Year 2  
Phys 259, 259L, El E 222, 241

Core plus: Year 3  
Phys 362, 363, 362L, 353L, El E 316 and one or two of El E 323, 380, 261

**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 435, 453, El E 418, 419, 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  

**Note**  
Students interested in this programme are advised to take a computing course in Year 1 to ensure having the necessary prerequisites for later year Mathematics courses. Suggested Mathematics electives are the following: CS 370, 371, 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 interest where possible. Many work term experiences, especially in the upper years, provide the student with a deeper insight into the meaning and methods of research as well as an incentive to develop course work. Such experience provides a contribution to the development of a scientist which cannot be earned in lecture courses, and helps prepare an individual to apply a fundamental physics background to the solution of practical problems.

Further information about the co-operative work terms and the Co-ordination Department can be found starting in Chapter 5, pg. 58. The normal progress of students in the Applied Physics programme is shown on pg. 59.

The programme must include a total of twenty-four credits (including Year 1). It is recommended that students intending to take an honours physics programme should take six lecture 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 15.

Year 1
(For a complete discussion of Year 1, see page 212).

Year 2A Core (8 Stream)
Phys 10 Physics Seminar (0.0)
Phys 256 Wave Motion and Optics (0.5)
Phys 254 Thermal Physics and Properties of Matter (0.5)
Math 213A Advanced Calculus (0.5)
Math 216 Differential Equations (0.5)

Year 2A Core (4 Stream)
Phys 10 Physics Seminar (0.0)
Phys 253 Electricity and Magnetism (0.5)
Phys 255 Quantum Physics (0.5)
Math 220A* Advanced Calculus (0.5)
Math 215* Differential Equations (0.5)

Year 2B Core (8 Stream)
Phys 10 Physics Seminar (0.0)
Phys 253 Electricity and Magnetism (0.5)
Phys 255 Quantum Physics (0.5)
Math 213B Advanced Calculus (0.5)

Year 2B Core (4 Stream)
Phys 10 Physics Seminar (0.0)
Phys 256 Wave Motion and Optics (0.5)
Phys 254 Thermal Physics and Properties of Matter (0.5)

*Note
Students may elect to take Math 230A and B and AM 260.

Note
In order to satisfy core requirements, another 0.25 credit lab must be elected from Phys 270, 271, 258, and 259L, in 2A or 2B.

Year 3A Core
Phys 10 Physics Seminar (0.0)
Phys 354 Atomic and Molecular Physics (0.5)
Phys 358 Thermodynamics (0.5)
Phys 360A Intermediate Laboratory (0.25)
Phys 362 Classical Mechanics 1 (0.5)
Phys 364 Mathematical Physics 1 (0.5)
One of: Phys 371A, 371B, 353L (Laboratory) (0.25)

Year 3B Core
Phys 10 Physics Seminar
Phys 360B Intermediate Laboratory (0.25)
Phys 359 Statistical Mechanics (0.5)
Phys 363 Classical Mechanics 2 (0.5)
Phys 365 Mathematical Physics 2 (0.5)
One of: Phys 371A, 371B, 353L (Laboratory) (0.25)

Note
Students desiring Phys 444 must elect Phys 355 in third year.

Year 4A-4B Core
Phys 10 Physics Seminar
Phys 434A Introductory Quantum Mechanics (0.5)
Phys 441 Electromagnetic Theory (1.0)
Phys 355 Nuclear and Practical Physics (if not taken in Year 3) (0.5)

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 credits.

Ex 1 Co-op Applied Physics
(Solid State)
Core plus: Year 2A
Phys 270, CS 210

Core plus: Year 2B
Phys 259, 259L, 271, Chem 311 or CS 240

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
1.0 credit from Chem 254, 266, BIOL 245, 233, 341, 239, Phys 380
Core plus: Year 2B
1.0 credit from: Chem 255, 267, 332, 353

Core plus: Year 3A
1.0 credit from: Chem 332, 353, Phys 352, 352L, 371A

Core plus: Year 3B
1.0 credit from: Chem 255, 267, 333, 357, Biol 246, 343, Phys 353, 353L, 355, 381

Core plus: Year 4A and 4B

Ex 5 Co-op Applied Physics
(with Chemistry)

Core plus: Year 2A
Chem 254, 212

Core plus: Year 2B
Chem 254, 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 6 Co-op Applied Physics
(with Computing)

Core plus: Year 2A
Math 221A, CS 210

Core plus: Year 2B
Math 221B, CS 240, Phys 259, 259L

Core plus: Year 3A
CS 340, Phys 352, 352L

Core plus: Year 3B
CS 350, Phys 353, 353L

Core plus: Year 4A
CS 472, Phys 435, 452, 464

Core plus: Year 4R
CS 474, Phys 453, 465

Ex 5 Co-op Applied Physics
-Business Administration Option

See comments regarding Business Administration Option under General Science and Business on page 235-6.

Core plus: Year 1 Special Requirements
Econ 101/102, CS 118 or CS 116

Core plus: Year 2
Econ 201/202, 281/282

Core plus: Year 3
Econ 391/392, Stat 204/205, M Sci 44 (Phys 360A and 360B are not normally taken with this Option).

Core plus: Year 4
Econ 393/394, Bus (WLU) 454/464, Bus (WLU) 352/362, M Sci 46

Ex 6 Co-op Applied Physics
(with Electrical Engineering)

Core plus: Year 1 Special Requirements
Sy De 183 or Gen E 115 (Fall term), and CS 118 (Winter term).

Core plus: Year 2A
E1 E 222

Core plus: Year 2B
Phys 259, 259L, El E 316

Core plus: Year 3A
Phys 352, 352L

Core plus: Year 3B
Phys 353, 353L, El E 241 and one or two of El E 323, 380

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 4A and 4B
Phys 433, 435, 453, El E 418, 419, 435, 436

Honours Psychology

Year 1
is a normal Year 1 programme of the Faculty of Science (see page 211) with Mathematics 113, Physics 111-112 or 121-122 and 121L-122L, Biol 111-112, 111L-112L or two 200 level term courses, Chemistry 123-124 and 123L-124L, Psychology 101-102
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
Applicants should satisfy the Admissions Committee that they are well-prepared academically for entry to the School of Optometry. A good background in Science and Mathematics is required and the disciplines of Biology/zoology, Calculus, Chemistry, Physics and Psychology should be represented. At the University of Waterloo the following programme or equivalent is recommended to students planning to apply to the first professional year: Biol 230, Cell Biology; Biol 211, Vertebrate Zoology; Biol 201, Human Anatomy, Histology, Embryology; Biol 240, Fundamentals of Microbiology; Chem 123, Chemical Reaction, Equilibria and Kinetics; Chem 124 and 266, Organic Chemistry; Chem 237, Biochemistry; Phys 121, 122, General Physics; Phys 246, Physical Optics; Psych 101, Introductory Psychology; Psych 201, Statistics; Math 113, Calculus. Laboratory courses must be completed where given with the above courses. To complete the two-year pre-professional programme, additional courses in the behavioural sciences, social sciences and the humanities are recommended.

The Admissions Committee will consider applications from superior students who have completed other academic programmes. In the event that applications from such students are successful, they may be expected to remedy specific deficiencies either during the summer preceding admission or during the regular professional programme.

Selection Factors
All applicants should note that enrolment in the first professional year is limited to sixty and that in 1979 there were approximately three hundred and fifty applications for those places. Consequently, neither acceptance to nor successful completion of the pre-professional 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.

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. 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.
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. 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. In January an interview with the admissions committee will be arranged for the student. Students who have completed the pre-professional programme at another university must apply through the Ontario Universities Application Centre (OUAC). Such applicants should obtain the appropriate OUAC application form from the Registrar of the University of Waterloo. These forms will not ordinarily be available from the Registrar prior to October 15, 1980. The completed OUAC form should reach the Centre in Guelph no later than April 1, if the copy is to reach the Registrar at Waterloo by the deadline of May 1. After the OUAC form has been processed by the Centre the applicant will receive a supplementary application package from the Registrar of the University of Waterloo. This will contain details on required transcripts, letter 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 pre-professional programme 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 admission decision had been made.

Appointments for interviews can be made by phone or letter to the Admissions Officer of the School of Optometry.
Academic Programme

Year 1: First Professional Year. First offered 1980-1981.

Fall Term
- Optom 100 History and Orientation (0.5)
- Optom 104 Anatomy of the Eye and Associated Structures (0.5)
- Optom 105 General Pathology (0.5)
- Optom 106 Geometric Optics (0.5)
- Biol 301 Vertebrate Physiology (first term) (0.5)

Winter Term
- Optom 111 Physiological Optics (0.5)
- Optom 114 Anatomy of the Eye and Associated Structures (0.5)
- Optom 115 General Pathology (0.5)
- Optom 116 Optometrical Optics (0.5)
- Biol 301 Vertebrate Physiology (second term) (0.5)

Year 2: Second Professional Year. This programme will be revised after 1980-1981.

Fall Term
- Biol 301 Vertebrate Physiology (first term) (0.5)
- Optom 301 Physiological Optics (0.5)
- Optom 302 Clinical Optometry (0.5)
- Optom 305 General Pathology (0.5)
- Optom 306 Optometrical Optics (0.5)
- Optom 309 Light and Illumination (0.5)

Winter Term
- Biol 301 Vertebrate Physiology (second term) (0.5)
- Optom 311 Physiological Optics (0.5)
- Optom 312 Clinical Optometry (0.5)
- Optom 315 General Pathology (0.5)
- Optom 316 Optometrical Optics (0.5)
- Psych 206 Perceptual Processes (0.5)

Year 3: Third Professional Year. This programme will be revised after 1981-1982.

Fall Term
- Optom 401 Physiological Optics (0.5)
- Optom 402 Clinical Optometry (0.5)
- Optom 404 Physiology of Visual Systems (0.5)
- Optom 405 Ocular Pathology (0.5)
- Optom 406 Optometrical Optics (0.5)
- Optom 407 Optometric Specialties: Contact Lenses (0.5)
- Optom 408 Optometry Clinic (0.5)

Winter Term
- Optom 411 Physiological Optics (0.5)
- Optom 412 Clinical Optometry (0.5)
- Optom 414 Physiology of Visual Systems (0.5)
- Optom 415 Ocular Pathology (0.5)
- Optom 408 Optometry Clinic (0.5)

Science
Optometry
Academic Programmes

Year 5: Fourth Professional Year. This programme will be revised after 1982-1983.

Fall Term
- Optom 500 Optometrical Jurisprudence and Praxis (0.5)
- Optom 501 Physiological Optics (0.5)
- Optom 502 Advanced Clinical Optometry (0.5)
- Optom 504 Ocular Pharmacology (0.5)
- Optom 508 Optometry Clinic (0.5)
- Optom 357 Psychopathology (0.5)

Winter Term
- Optom 510 Optometrical Jurisprudence and Praxis (0.5)
- Optom 511 Physiological Optics (0.5)
- Optom 512 Advanced Clinical Optometry (0.5)
- Optom 513 Optometric Communication (0.5)
- Optom 514 Genetics for Optometrists (0.5)
- Optom 518 Optometry Clinic (0.5)
- Optom 519 Community Health Optometry (0.5)
- Optom 599 (A-E) Comprehensive Examinations

Note
Students with a particular interest in and an aptitude for research in physiological optics may substitute Optom 501-511 for Psych 357 and Optom 513. A student is required to complete one or the other of these alternatives.

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.
A 60% cumulative overall average in all Faculty of Science courses is required in programme (1) outlined below; a 60% cumulative average in the field of specialization for all other programmes. This is the same as for all honours programmes in the Science Faculty.

All programmes require the successful completion of 22 or more credits, 20 of which must be lecture credits, the number depending on the respective programme, including at least 14 Faculty of Science credits.

No more than 4 credits offered under the “Science” label may be applied to any programme.

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)

Year 1
5 lecture credits, exclusive of laboratory credits. At least two of these must be Science, courses chosen from: Biol 111-112 or two 200 level term courses; Chem 123-124 + labs; Earth 121-122; Phys 111-112 or Phys 121-122 + labs or Phys 162-163 + labs.

Years 2, 3 & 4
4 Science credits per year plus 2 other course-credits per year in Years 2 and 3; 1 other credit in Year 4. Of the total required 14 Faculty of Science credits, at least 10 must be at the 200-level or higher and at least 4 of them other than any Science labelled credits must be at the 300 or 400-level.

Programme (2)
Honours Science (with specialization in Biology)
(For Year 1, see page 211)

Year 2
3 credits from Biology 210, 211, 220, 221, 239, 240, 241, 250.
Chemistry 286-286L and either 267 or 237-237L.
2 other credits (Stat 202 is recommended).

Year 3
Chemistry 332-333 and 332L-333L
2 other credits.

Year 4
4 Science credits at least 2 of which are Biology credits from the 400-level or the list of 300-level courses above.
1 other credit.

1 Students who plan to specialize in areas of Biology with a substantial Biochemical component should plan to take Biochemistry in Years 3 and 4. They are advised to take Organic Chemistry 267 in their second year and to select, as electives, Biochemistry 332-333 in their third year and other Biochemistry courses in fourth year (Chem 332-333 will no longer be compulsory in 1981-82). Other students are advised to take Chem 237-237L in their second year. Students in this latter ‘stream’ who subsequently wish more Biochemistry should be prepared to take Organic Chem 267 as an elective before taking Chem 333.

Programme 3
Honours Science (with specialization in Chemistry)
(For Year 1, see page 211 under “Chemistry”).

Year 2 (see notes below)
3 Chemistry lecture credits, at least 2 of which must be chosen from Chemistry 212, 220, 221, 264, 254, 255.
1 lecture credit to be chosen from Physics, Biology or Earth Sciences. (Not Science-labelled courses)
Elective credits to give a total of at least 6 credits in the Year.

Year 3 (see notes below)
3 Chemistry credits at the 300-level or higher. 1 lecture credit to be chosen from Physics, Biology or Earth Sciences (Not Science-labelled courses)
2 Elective credits

Year 4 (see notes below)
2 Chemistry credits at the 300-level or higher. At least 1.0 must be at the 400-level.
2 lecture credits chosen from Physics, Biology, Chemistry or Earth Sciences (Not Science-labelled courses)
1 Elective credit

Note 1
Before graduation a student must obtain at least 20.0 lecture credits.

Note 2
Before graduation a student must obtain at least one lecture credit in each of the following areas of Chemistry: Analytical, Inorganic, Organic, Physical.
Note 3
Before graduation a student must obtain at least 0.5 laboratory credits in each of the four areas of Note 2. Wherever possible, the laboratory chosen should accompany the appropriate lecture-course.

Note 4
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 least 23.0 credits of which 10 are Earth Sciences credits, selected as indicated below. In addition at least four other Science credits and eight other course-credits must be chosen. Science-labelled courses may not be used for Science course-credits. (Chem 123-124 and 123L-124L, a Year 1 Physics course, Math 113, CS 118 or equivalent must be among these choices). A suggested year by year breakdown is as follows:

(For Year 1, see page 211)

Year 2
Earth 221, 231, 232, 235, 236, 260
1 other Science credit
2 other credits

Year 3
3 or 4 Earth credits at the 300 level (chosen from Earth 331, 332, 333, 336, 342, 345, 360, 370)
At least 1 other Science credit
At least 1 other credit (for a total of 6 credits in Year 3)
Attendance on field trips (Earth 390, Earth 490) is required.

Year 4
4 Science credits of which at least 2 are Earth Sciences credits at the 300-level shown above or from the 400-level.
1 other credit.

Programme (5)
Honours Science (with specialization in Physics)
This programme was designed to allow a student the broadest possible selection of courses consistent with specialization in Physics. A total of 22 credits are required, 14.0 of which must be Faculty of Science credits.

The following Honours Courses from Physics and Mathematics should be included.

(For Year 1, see page 211)

Year 2
Physics 253, 253L, 254, 256, 256L, 255 (or 324, 325 in third year), Math 213a-213b, 216.

Years 3 and 4
At least 2.5 credits of Honours Physics core courses at the 300 or 400 level and an additional 3.5 credits of Physics courses at the 300 or 400 level.

In addition at least 1.5 credits of Physics lab courses 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 they 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 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 courses at a College of Education in Ontario with specialization in a single subject.

Depending on the option chosen, a student may graduate with the General BSc after either three or four years; the graduation diploma will indicate whether the three- or four-year 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 BSc requires the successful completion of 15 credits at least 14 of which must be lecture credits. Normal progress is 5 lecture credits per year. At least half of the 15 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 credits or 7 Mathematics credits or 7 English credits, etc.). Also, at least 6 of the 15 credits 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 Year 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**

5 lecture credits, exclusive of laboratory credits. At least two of these must be Science courses chosen from: Biol 111-112 or two 200-level term courses; Chem 123-124 + labs; Earth 121-122; Phys 111-112 or Phys 121-122 + labs or Phys 162-163 + labs.

**Year 2**

5 credits of which 2 or 3 should normally be in Science.

**Year 3**

5 credits of which 2 or 3 should normally be in Science.

The following list, while not complete, indicates some of the courses from which a choice should be made. Since some Departments offer Honours or General equivalents of the same course area, or co-operative or regular versions of the same course area, duplication of subject matter is not allowed. It is usually obvious from the course descriptions where such duplication is possible and care should be taken to avoid it as credit for only one such overlapping course will be allowed (e.g. credit for one of 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 4 credits may be selected from the courses under the “Science” label).

**Science courses recommended**

(Other than Year 1 courses)


**Mathematics courses recommended**

Mathematics 113, 111a, 111b, 215, or 216, CS 118, 180, 210; AM 101, 111; Stat 204, 205.

**Arts courses recommended**

It is impossible to list all 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 Major Programmes

The four-year programmes require the successful completion of at least 20.0 or more credits for the BSc, the number depending on the respective programme. Of this total at least 18.0 must be lecture credits. At least half of the 20.0 credits presented must be in Science. Students are encouraged to take at least 4 courses (an average of one per year) from non-Science areas such as Arts or Mathematics. No more than 4 credits may be selected under the "Science" label. An official major field (from Biology, Chemistry, Earth Sciences and Physics) must be selected; at least 8 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 selection of both Business and Science courses are 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 credits available in each programme; Departments may have published recommendations regarding electives which should be strongly considered although they are not compulsory).

The minimum standard for graduation from the four-year majoring programmes will be a cumulative (overall) average of 50% calculated from all courses taken (in any year - whether passed or failed) plus a 60% cumulative average for the major field courses. Students who do not maintain their major field average in the four-year 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 two 200-level term courses in Biology (see Note 6 on pg. 212) and Chem 123-124 and 123L-124L (see pg. 213).

Chemistry Major

Year 1
Including Chem 123-124 and 123L-124L and Math 113 and a full-year Physics course.

Year 2†
Chem 226-227 and 226L-227L, 266-267, 266L, 218, 219
2 Elective credits†

Year 3†
Chem 316-316L, 356-357, 356L-357L, 366-366L
2 Elective credits†
Year 4††
Five elective credits to complete the requirements for the degree†.

†Electives can be freely chosen provided that before graduation at least two Chemistry credits are obtained at the 300- or 400-level, in addition to the required courses listed above. At least 19.0 lecture credits must be obtained before graduation.

††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 121-122 and Chem 123-124 and 123L, and at least 1-1/2 credits from courses discussed in Note 4 (see page 212)

Year 2
Earth 221, 231, 232, 235, 236, 260
Two elective credits

Note
Students should note that Phys 111-112 is a prerequisite for the Applied Geophysics course Earth 360 given in the third year. Math 113 and an introductory course in computer programming are prerequisites for Earth 355, 356 and 461 given in the third and fourth years.

Year 3
Two or three credits from:
Earth 331, 332, 333, 336, 342, 345, 355, 360, 370
Two or one course-credits from Science or Mathematics
Arts elective: One credit. Attendance on field trips (Earth 390, Earth 490) is required.

Year 4
Two or three credits from:
Earth 421, 427, 432, 433, 434, 435, 438, 439, 440, 456, 461, 470
Three or two credits from non-Earth Sciences courses

Physics Major (a minimum of 20.0 credits required)

Year 1
(Including Phys 121-122 or 162-163 and Math 113 (see page 211)

Year 2
Phys 222-223 and 222L-223L, 226-227 and 226L-227L
One of: Math 216, 220a,b or a course in computing
One of: Chem 218-219, 266-267, Sci 251-252, Earth 121-122 or 231-232
Elective

Year 3
Phys 324-325
One or two of: Phys 250-251, 32 and 352L, 353 and 353L, 358-359, 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 three of: Phys 250-251, 352 and 352L, 353 and 353L, 358-359, 362-363, 364-365, 368-369, 480-481, 441
Two or one non-Physics Science credits
Arts or Mathematics Elective

General Science and Business

There is a growing need for graduates who have competence in the combined disciplines of science and business administration. For those students whose leanings are towards administration in industry, marketing, analysis, etc., the following programme is recommended. The business and economic courses normally provide the prerequisite background for a Master of Business Administration course. Normally a B average is required in these courses. Admission requirements for postgraduate studies in Business Administration depend on the admitting university. In some instances, an entrance examination may be required. It is the student's responsibility to obtain information regarding admission from the university of their choice.

The programme is made up of at least 20 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 student's responsibility to keep informed of these changes.
These Changes are Effective for Students Entering Year 2 in September 1979

Year 1
5 lecture credits:
At least 2.0 lecture credits must be from Biol 111-112 + labs or any two term courses from the 200-level, Chem 123-124 + labs, Earth 121-122 and Phys 111-112 or 121-122 8+ labs.

plus
Math 113
Econ 101-102
CS 118 and CS 115

Year 2, 3 and 4
Students must take during years 2 through 4, at least 5 lecture credits from one of the departments of Science, viz. Biology, Chemistry, Earth Sciences or Physics and at least 2 of these credits must be at the 300 level or higher. In addition 3 more lecture credits in Science must be taken and can be chosen from any science offering.

plus at Year 2
ECON 191-192 (or ECON 281-282)
One of Econ 193-194 or Econ 201-202

plus at Year 3
Stats 202 or Econ 221
One of Bus 275 (WLU) or M Sci 46
Bus 352-362 (WLU)

plus at Year 4
3 credits from:
Econ 291-292; Econ 391-392; Econ 393-394; Bus 385-395 (WLU); Bus 388-398 (WLU) or M Sci 44; Bus 454-464 (WLU)
Undergraduate Course Descriptions
Course Description Information

Explanatory Notes and Terminology
Each course description begins with a line of coding as shown in the sample below. The course numbers are prefixed by a subject code. The terms offered, number of hours per week, type of instruction and "credit weight" are displayed. For some courses, information concerning terms offered and type of instruction was not available at the time of publication.

The course descriptions follow 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

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

<table>
<thead>
<tr>
<th>Terms Offered</th>
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## Subject Codes

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<td>ISS</td>
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<td>PACS</td>
<td>Peace and Conflict Studies</td>
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<td>SIPAR</td>
<td>Studies in Personality &amp; Religion</td>
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<td>Systems Design</td>
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<tr>
<td>Ital</td>
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</table>
Department of Anthropology

Associate Professor, Chairman of the Department
T. S. Abler, BA (Northwestern), MS (Wisconsin-Milwaukee), PhD (Toronto)

Associate Professors
D. E. Counts, BS (S. W. Texas State College),
MA (Kentucky), PhD (Southern Illinois)
Wm. B. Roosa, BA (Texas Christian), MA (New Mexico), PhD (Michigan)
M. Shimpo', BA (International Christian, Japan) MA,
PhD (Br. Col.) J
S. M. Weaver, BA, MA, PhD (Toronto)

Assistant Professor
M. H. Hill, BA (Washington), MA (Washington State),
PhD (Southern Illinois)

Faculty members holding cross and/or joint appointments as shown
'Sociology and Anthropology (St. Jerome's)
'Anthropology and Urban Regional Planning

Course Descriptions

Notes
While this calendar is as up-to-date as deadlines permit, students should consult the course offerings list issued at preregistration.

Anthropology 101 courses introduce physical anthropology and archaeology. Anthropology 102 courses introduce social-cultural anthropology. The letter designations (A, B) indicate the special approach of the course. A student may take introductory courses in any order. Either 101, 102, or 103 may be taken first and any combination may be taken together.

Anth 101 F,W 3C 0.5
Human and Cultural Evolution
An overview of Physical Anthropology and Archaeology. Lectures on living and fossil primates, the fossil evidence for the origins and development of man, modern races, and archaeological evidence for the origins and development of culture.

Anth 102A W 3C 0.5
Introduction to Social and Cultural Anthropology
The dynamic nature of socio-cultural systems is examined. Topics include language, technology, social organization, economics, politics, and religion. Data are drawn from a broad ethnographic base, including both "primitive" cultures and modern, developed societies.

Anth 102B F 3C 0.5
Anthropology Through Science Fiction
Basic anthropological concepts, such as biological and cultural evolution, culture, human adaptability, and culture contact will be explored through examples from science fiction and related anthropological studies.
Formerly 105F

Anth 103 F 3C 0.5
The Nature of Language
A general introduction to the scientific study of language. Lectures on the nature of human language as compared with animal communication, some of the basic methods of historical and descriptive linguistics, and the importance of language in culture and society.

Anth 202 F 3C 0.5
Principles of Social Organization
An introduction to basic concepts used by social anthropologists for the analysis of social, economics, political, and ideational systems. Recommended to Honours Anthropology students. Prereq: Anth 102 or permission of instructor

Anth 203 F 3C 0.5
Prehistoric Man in North America
This is a general introduction to North American Archaeology. The traditional cultural ecological approach is compared and contrasted with the more revolutionary ideas recently expounded by popular writers.

Anth 204 W 3C 0.5
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 205 Anthropology of Race and Racism in Canada
Not offered 1980-81.

Anth 220 W 3C 0.5
Prehistoric Archaeology: Old World I
A survey of the development of culture, from the beginnings of tool making to the transition to agriculture. Primary attention to sequences from Africa, Western Asia, and Europe. Comparative attention to the non-agricultural peoples of recent times. Not acceptable for Honours Anthropology credit

Anth 221 Prehistoric Archaeology: Old World II
Not offered 1980-81
Anth 223  New World Civilizations
Not offered 1980-81

Anth 226  People of the Pacific
Not offered 1980-81

Anth 230  F  3C  0.5
Indians of Canada
The cultures of Canadian Indians are described as they existed when initially contacted by Europeans. Consideration is given to economic adaptation, social organization, political structure, material culture, ritual, and mythology.
Prerequisite: Second year standing

Anth 233  W  3C  0.5
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 236J Social and Cultural Change in South East Asia
Not offered 1980-81

Anth 241  W  3C  0.5
The Contemporary Canadian Indian Scene
An analysis of present-day Canadian Indian politics, economics, social organization, and education. The emergence of pan-Indianism and large-scale Indian organizations will be examined as responses to the Federal Government's policy of withdrawing and decentralizing administrative services for native people.

Anth 246J  W  3C  0.5
Social and Cultural Change in Modern Japan
This course analyzes the traditional social structure as well as changes in social, economic and cultural spheres in Japan since 1868. Current topics such as land reform, the consequent changes, and changing values in Japanese society will be analyzed.
Offered at St. Jerome's College.

Anth 250 Regional Studies in Archaeology
Not offered 1980-81

Anth 258  W  3C  0.5
Anthropology and the Future of Man
Anthropological theories pertaining to culture change and cultural evolution are examined in the context of the modern world. Long and short term trends in technology are examined using data from Archaeology, Ethnography, History, Technology and Science.
Prereq: Anth 101 or 102 or permission of the instructor

Anth 260  F  3C, 1L  0.5
Human Evolution
Data, methods, and theory in the study of the origin and evolution of humans are surveyed. Topics will include osteology, growth and development, the fossil record, and genetics.
Prereq: Anth 101 or permission of the instructor.

Anth 261  W  3C  0.5
Primate Behaviour
An introduction to the behaviour of the non-human primates with emphasis on relevance to the origin of man. Topics will include sexual behaviour, mating systems, aggression, territoriality, and communication.

Anth 271 Archaeological Field Methods
Not offered 1980-81

Anth 275  F  3C  0.5
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  0.5
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 1980-81

Anth 286 Descriptive Grammar 2 - Syntax
Not offered 1980-81

Anth 290  F  3C  0.5
Language and Culture
An examination of language as it reflects the culture of the speakers. Focus will be on exploring aspects of vocabulary and special usages for their cultural relevance, with illustrations from a variety of languages.
Prereq: One half-course from each of linguistics and socio-cultural anthropology
Anth 311 W 3C 0.5
**Anthropology of Religion**
An introduction to the way in which anthropologists study the system of behaviour and belief known as religion.

Anth 320 W 3C 0.5
**Pleistocene Prehistory in the Old World**
Detailed considerations of prehistoric cultural developments from earliest toolmaking to the transition to agriculture. An examination of the human mode of adaptation and the increasing complexity of cultural systems among prehistoric hunters and gatherers.
*Prereq: Anth 275 or permission of the instructor.*

Anth 321 Recent Prehistory in the Old World
*Not offered 1980-81*

Anth 322 W 3C 0.5
**Prehistoric Man in the Great Lakes Area**
An in-depth study of the archaeological evidence of prehistoric man in the Great Lakes area from his arrival ca. 11,000 years ago to the coming of Europeans. Cultural ecology and cultural evolution will be stressed.
*Prereq: Anth 203 or consent of the instructor*

Anth 330 W 3C 0.5
**Cultural Ecology**
An examination of the relationships among environment, technology, society, and culture. The increasing levels of complexity will be considered in the context of hunting and foraging bands, horticultural tribes and chiefdoms, pastoral tribes, and agricultural peasantry.
*Prereq: Full credit in Anth or consent of the instructor*

Anth 333 Canadian Communities and Planned Change
*Not offered 1980-81*

Anth 345 F 0.5
**Special Problems in Anthropology:** Directed independent research
*Prereq: Permission of instructor*

Anth 346 W 0.5
**Special Problems in Anthropology:** Directed independent research
*Prereq: Permission of instructor*

Anth 347 Special Problems in Anthropology
*Not offered 1980-81*

Anth 349 Special Problems in Anthropology
*Not offered 1980-81*

Anth 350 W 3C 0.5
**Sex Roles in Anthropology**
A comparison will be made of the roles of men and women in human evolution and in social life. The special problems encountered by men and women field workers will also be considered.

Anth 365 W 3C 0.5
**Fossil Man**
A detailed examination of the fossil evidence for human evolution with particular emphasis on interpretation and reconstruction.
*Prereq: Anth 260 or permission of the instructor*

Anth 370 W 3C 0.5
**Ethnographic Field Methods**
The techniques and problems of ethnographic field work will be explored. Emphasis will be on field work in contemporary society. Students will be expected to complete a field project of their own.
*Prereq: Anth 202 or consent of the instructor*

Anth 372 W 3C 0.5
**Archaeological Techniques**
Various archaeological techniques will be discussed and demonstrated. Major emphasis will be on working with artifacts in the lab. The relationship of other disciplines such as Pleistocene Geology, Palynology, Paleontology, and Soils Analysis to Archaeology will also be dealt with.
*Primarily for Honours Anthropology students.*

Anth 377 Early Man in the New World
*Not offered 1980-81*

Anth 388 Applied Anthropology
*Not offered 1980-81*

Anth 390 Y 1.0
**Reading in Anthropology**
Guided reading in a selected portion of the anthropological literature.
*Prereq: Anthropology major or honours student and permission of the instructor.*

Anth 391/393 S,F,W 0.5
**Reading in Anthropology**
Guided reading in a selected portion of the anthropological literature.
*Prereq: Anthropology major or honours student and permission of the instructor.*

Anth 401 Seminar in the Literature of Social and Cultural Anthropology
*Not offered 1980-81*
Anth 420  W  3S  0.5
Social and Cultural Change
An analysis of contemporary thought on culture contact and cultural evolution. The concepts to be explored might include integration, assimilation, conflict, nativistic reactions, and general and specific evolution.
Prereq: One credit in socio-cultural anthropology

Anth 451  F  3S  0.5
The Formative Years of Cultural Theory
A survey of the history of cultural theory from 1850 to 1940.
Prereq: One credit in socio-cultural anthropology

Anth 452  Contemporary Cultural Theory
Not offered 1980-81

Anth 492  Y  1.0
Reading in Anthropology
Guided reading in a selected portion of the anthropological literature.
Prereq: Anthropology major or honours student and permission of the instructor.

Anth 495/497  S,F,W  0.5
Reading in Anthropology
Guided reading in a selected portion of the anthropological literature.
Prereq: Anthropology major or honours student and permission of the instructor.

Anth 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
Professor, Director
R. H. Sime, AADip (Hon), (London) RIBA

Associate Professor, Associate Director, Undergraduate Officer
F. Thompson, BArch, MArch (Toronto), MRAIC

Professors
L. A. Cummings¹, AB (Washington), AM (Missouri), PhD (Washington)
C. K. Knapple², BA Hons (Sheffield) PhD (Saskatchewan)
P. H. Nash³, BA, MA (UCLA) CE (Grenoble) MCP, MPA, PhD (Harvard), MCIP
F. H. Watts, AA Dip (London), MLA (Harvard), RIBA, MRAIC

Associate Professors
A. Banerji, BArch (Calcutta), MArch (North Dakota State)
M. Elmitt, National Diploma in Design (High Wycombe)
B. R. Hunt, AADIP (London), RIBA, MRAIC
D. B. McIntyre, BArch (Toronto), MRAIC
A. H. Schrecker, BA (Kalamazoo), MA (Wellesley), PhD (Bryn Mawr), BArch (Toronto)
R. M. Schuster³, BS, MS (North Dakota State), PhD (Iowa State), PEng
J. C. Somfay, BArch (N.S.W. Sydney), MArch (Toronto), MRAIC

Assistant Professors
A. Brown, BArch (Toronto)
O. Dutt, BA (Punjab), BSc (Hon) (London), MS (Wisconsin), PhD (Waterloo), PEng
E. R. Haldenby, BES, BArch (Waterloo)
R. Wiljer, BA (Waterloo), MA (Ottawa)

Lecturer
D. McKay, BArch (Toronto)

Adjunct Professor
P. J. Stokes, BArch, LLD (Toronto), FRAIC

Adjunct Associate Professor
J. Zvilina

Adjunct Assistant Professor
E. Gustavs, BArch, MArch (Toronto), MRAIC

Visiting Critics
B. Barron, BES, BArch (Waterloo)
D. J. Clark, BArch (Toronto), MRAIC
K. Stevens, BArch, (Manitoba) MArch (Harvard), MRAIC
Course Descriptions

Special Lecturers
W. G. Dailey, BArch (Liverpool)
D. K. Lansdowne

Faculty members holding cross and/or joint appointments as shown
1Architecture and English
2Architecture and Civil Engineering
3Environmental Studies and Psychology
4Environmental Studies

Course Descriptions

Courses for Bachelor of Environmental Studies (Pre-Professional Architecture)

For Recommended Programme, see page 154. For Elective Course Requirements, see page 250.

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 175 F 3C,2L 0.5
Mathematics and Building Science
Review of basic algebra, trigonometry, and vector geometry; elementary differential and integral calculus, i.e. rates of change, centroids, moments of inertia. Topics in building science, i.e. heat flow, psychometry and air movement and their control in buildings.
Prereq: None

Arch 103 W 3C 0.5
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 163 W 1C,2L 0.5
Statics
Basic concepts, forces, moments, systems of forces, resolution of forces, transformation of couples; resultant of force systems; centre of gravity of a system of forces and of composite bodies; equilibrium, free body diagrams; shears, moments, bar forces in simple trusses; friction, moment of inertia.
Prereq: Arch 102 or Math 130

Arch 212 F 2C,2L 0.5
Computer Science Simulation
Simulation programming is developed in FORTRAN so as to build up meaningful architectural simulation concepts necessary in architectural planning. Specific simulation languages such as G.P.S.S. is introduced.
Prereq: none

Arch 213 S 4C 0.5
Computer Generated Design 1
Architectural Design 1
An overview of design logic and computer system requirement currently used for architectural design.
Prereq: Arch 212 or consent of instructor

Arch 262 F 2C,2L 0.5
Strength of Materials
Concept of simple stress and strain; statically indeterminate axially loaded members; thermal stresses, torsion, shear and bending moments in simple beam; shear and moment diagrams, qualitative deflected shapes, flexural and shearing stresses, deflection calculations; combined stresses, beams of different materials, compression members, Euler's formula.
Prereq: Arch 163

Arch 263 S 2C,2L 0.5
Theory of Structures 1
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

CS 116
Introduction to Computers
See Computer Science course descriptions, page **.
### Architecture

**Arch 265 S 1C,2L 0.5**
**Structural Morphogenesis**

*Prereq:* Architecture students should have completed first year; other students require consent of instructor.

**Env S 271**
**Introduction to Quantitative Research Methods**
See Env S course descriptions, page 311.

**Env S 272**
**Computer Programming in Environmental Studies**
See Env S course descriptions, page 311.

**Arch 283 W 3C,3fstd 0.5**
**Preservation Practice-Technology and Technique**
An introduction to the field of preservation of older buildings, particularly in Canada; dealing mainly with older building technology, typical problems in the preservation field and indicated steps toward solution.

**Arch 313 F,W 4C 0.5**
**Computer Generated Design 2**
Architectural Design 2
Input from various other courses is formulated into comprehensive data structures and simulated behaviour patterns; methods of synthesis problem-solving techniques, analysis of thought processes and protocol analyses. Course is project oriented.

*Prereq:* Arch 213

**Arch 363 F 2C,2L 0.5**
**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 0.5**
**Mechanical Systems I**
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 S 111 Introduction to the Study of the Future**
See Env S course descriptions, page 310.

**Env S 195A Introduction to Environmental Studies**
See Env S course descriptions, page 310.

**Env S 195B Introduction to Environmental Problems**
See Env S course descriptions, page 310.

**Env S 200 Field Ecology**
See Env S course descriptions, page 310.

**Env S 201 Introduction to Environmental and Planning Law**
See Env S course descriptions, page 310.

**Arch 223 S 2C 0.5**
**Human Ecology**
Social Behaviour as the Human/Physical Interface
The biological and psychological basis of perception and cognition of environments; factors affecting percepts, images and meanings, small groups and the social environment; the structure, functioning and change of neighbourhoods and communities.

*Prereq:* Env St 195A

**Arch 224 F,S 1C,3std 0.5**
**An Introduction to Landscape Design**
An introduction to the design of landscape with emphasis upon the architectural attributes of plants and landforms.

*Prereq:* Arch 192 or 193 or consent of instructor

**Env S 252 Media Tools for Environmental Studies**
See Env S course descriptions, page 311.

**Env S 253 Media Tools for Environmental Studies - Advanced Level**
See Env S course descriptions, page 311.

**Env S 310 Behavioural Studies**
See Env S course descriptions, page 311.

**Env S 333 Parkland Management**
See Env S course descriptions, page 311.

**Env S 358 Environmental Pollution and its Control**
See Env S course descriptions, page 311.
Course Descriptions

Architecture

Env S 380/381 Environmental Studies Workshop
See Env S course descriptions, page 311.

Env S 400 Professional Development in Environmental Management
See Env S course descriptions, page 311.

Env S 401 Environmental Law
See Env S course descriptions, page 311.

Env S 402 Planning
See Env S course descriptions, page 312.

Env S 411 Alternative Future Environments 1
See Env S course descriptions, page 312.

Env S 412 Alternative Future Environments 2
See Env S course descriptions, page 312.

Env S 417 Land Use History and Landscape Change 1
See Env S course descriptions, page 312.

Env S 418 Land Use History and Landscape Change 2
See Env S course descriptions, page 312.

Env S 444 Land Evaluation and Resources Management
See Env S course descriptions, page 312.

Design

The courses in design studio combine design fundamentals and design concepts, along with the opportunity to involve analysis and synthesis, professional and scientific insights, application of tools and methods for designing artifacts for man, and an awareness of the inherent physical characteristics and limitations of media and materials. The objectives of the studio are: (1) to guide the student in observing aspects of the physical and social environment; to find, categorize and associate the information into fundamental structures and patterns of relationships; (2) to apply theories generated in the lecture courses to situations in the physical environment, implementing by categorizing the courses into behaviour materials, structures and mechanical systems, behaviour of man, and communications; (3) to provide the student with an opportunity to develop skill in using different “techniques” for analyzing and synthesizing problems in the physical environment; (4) to establish a relationship between faculty and students; (5) to provide a vehicle for persons from faculties of different disciplines and from outside of the university to discuss with students their problems and projects from different points of view.

Arch 192 F IT,IS,8Std 1.5
Design Fundamentals and Workshop Design Studio
Development of the means to appreciate art and science of building; introduction to a history of architecture; introduction to the study of theories of architecture; development of skills in graphic communication; introduction to a study of building structure, construction, and materials; promotion and encouragement of the theory and practice of design. Field trip to New York City (1 week).
Prereq: Architecture students only.

Arch 174/175 Experimental Courses
These courses offer a vehicle for introducing additional electives to the programme on a short term basis, and for developing future permanent courses.
Prereq: Consent of instructor

Arch 193 W IT,IS,14Std 1.5
Design Fundamentals and Studio
Reinforcement and development of the Arch 192 programme, but with emphasis upon the application of design method and practice to specific architectural problems.
Prereq: Arch 192

Arch 194 W 2C 0.5
Visual Interdisciplinary Language
Theory and practice of visual form based on formative processes and hierarchial structures. Propositions: form follows process, rotation is a universal form-generating process, symmetric form is a result of an asymmetric process and freedom is the single organizing principle.
Prereq: Consent of instructor

Arch 252 W 0.5
Creative Problem Solving
Development of creative skills through group behaviour in problem solving sessions by: 1) developing a clear understanding of each participant’s own creative thought processes; 2) increasing his/her ability to consciously and deliberately make use of his/her own creative potential; 3) engendering an awareness of the capacity to use himself/herself and the people he/she works with to produce better solutions to the problems identified by the group.
Prereq: Consent of instructor

Arch 274/275 Experimental Courses
These courses offer a vehicle for introducing additional electives to the programme on a short term basis, and for developing future permanent courses.
Prereq: Consent of instructor
Arch 284, 285  F,W  3C  0.5
Architectural Research
This offers a student an opportunity for independent research into architectural problems not offered in the regular curriculum, guided exploration of specific architectural problem areas, of appropriate complexity to the particular term.
Prereq: Approval of (in house) UGAC

Arch 292  F  3C, 11std  1.5
Design Concepts and Studio
To develop in each student the ability to design on a small, personal scale and explore design as a thinking process. Small space design exercises where the student is required to define and analyze a problem and generate an architectural solution. Solutions are refined through a series of evaluations.
Prereq: Arch 193

Arch 293  S  3C, 11std  1.5
Design Concepts and Studio
Design involving problems of human perception and dimension in complex or large spaces, and to develop in each student the ability to generate solutions to architectural problems on a scale which involves "privacy and community". Emphasis is placed on programming, analysis and solution evaluation. Problems of construction, servicing, and siting will be further explored. Field trip to Chicago (1 week).
Prereq: Arch 292

Arch 374/375
Experimental Courses
These courses offer a vehicle for introducing additional electives to the programme on a short term basis, and for developing future permanent courses.
Prereq: Consent of instructor

Arch 384, 385  F,W  R  0.5
Architectural Research
This offers a student an opportunity for independent research into architectural problems not offered in the regular curriculum. It allows guided exploration of a specific architectural problem area, of appropriate complexity to the particular term.
Prereq: Approval of (in house) UGAC

Arch 392  W  4C, 17std  2.0
Design Concepts and Studio
Design of complex environments; the effect of legal and administrative controls on the design of process and form; the influence of mechanical, structural and industrial building components on design process and architectural form. Projects will involve co-ordination of the design task with other disciplines involved in such projects.
Prereq: 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 142  F  4C, 2L  1.0
Iconography 1
Conventions
Selected schemes of order, such as fate, providence, natural law, the human will, as expressed in plays, poems, and fiction from various ages; selected conventions in literature, cinema, and the visual arts; the development of one or two archetypal symbols in literature and the visual arts; directed to lead into more detailed studies of symbolic patterns in Iconography 2.
Prereq: Consent of instructor

Arch 143  W  4C, 2L  1.0
Iconography 2
A survey of the symbolic Nature of the Environment
A study centred on ancient life to initiate the student into the stream of cultural history and the complex problems of what the artist is, the quality of human existence, culture, environment, as well as the working of the icon from raw state of perceived image to its function as an expressive symbol in poetry, music, dance, architecture and other works of art; a study of modern work in comparison to an ancient achievement.
Prereq: Arch 142
Arch 244  W  2C,2D  0.5  
**History of Gardens of Europe and Western Asia**
The study of gardens as works of art reconciling man with his world. Gardens of Europe and Western Asia are studied as responses to specific human needs, the stress and aspirations of an age, and to the climate and landscape of the land in which they were created.  
*Prereq:* Arch 142, 143 and 246 for Architecture students and completion of first year for others or consent of instructor.

Arch 245  W,S  1C,2L  0.5  
**Survey of Contemporary Architecture**
Formative years in Europe, early North American scene, study of contemporary works in Architecture, analyses of important buildings of twentieth century. Philosophies of internationally known architects and designers. Study of the development of architectural styles, trends and schools of thought in North America and other countries.  
*Prereq:* Second year standing

Arch 246  F  4C,2L  1.0  
**Foundations of Europe**
*Sense of Periods and Styles*
Recognition of patterns of life and concepts of order and conduct, models of the universe and other, moving metaphors and myths by means of study of the thoughts, acts, art, architecture, technology, literature, music and town design of the West from the break-up of the Roman Empire until the Renaissance. Field trips to museums, concerts in Toronto, Detroit or Buffalo.  
*Prereq:* Arch 143

Arch 247  S  4C,2L  1.0  
**Renaissance to Revolution**
*Sense of Periods and Styles*
Analysis of the various styles emerging out of provincial and international Gothic, especially Italian use of classical models, the spread of this "renaisssance" mode, leading to consideration of the Mannerist, the Baroque, the Rococo, the Neoclassical; investigation of the course of men's attitudes from humanism, nationalism, and Reformation through the Enlightenment until the French Revolution and Hume's dethronement of Reason. Field trips to museums, concerts in Toronto, Quebec, Detroit or Buffalo; Stratford Festival.  
*Prereq:* Arch 246

Arch 248  F  3C,fieldtrip  0.5  
**Preservation Practice-Background**
An introduction to the field of preservation of older buildings, particularly in Canada; reference will be made to the philosophies and attitudes towards the preservation of older buildings and will be combined with the study, in brief, of historical, social and architectural influences on Canadian building.

Arch 345  W  2C,1S  0.5  
**Architectural Theory 1850-1940**
An introduction to the development of architectural theory from the mid-19th century to the 2nd World War, through an examination of architectural movement and philosophies of the period and of the architecture, built and imagined, which they generated.  
*Prereq:* Consent of instructor

Arch 346  W  2C,2L  0.5  
**Romanticism and 20th Century**
*Sense of Periods and Styles*
Depiction of "modern" culture as one in which the notion of environmental order as the fulfilling of natural law is replaced by a notion of order as the creation of the autonomous human wills. Selected works in philosophy, literature, art and architecture will be studied.  
*Prereq:* Arch 247 or consent of instructor.

Arch 347  4C  0.5  
**The Roots of Civilization**
The course attempts to establish a basis for the understanding of the functions of myth, ceremony and ritual, the structures of primitive and ancient built environments, man's attitude towards nature, and his use of the resource environment, the development of classical culture, and beginnings of science.  
*Prereq:* Arch 346 or consent of instructors

Arch 348  W  2C,2S  0.5  
**Italian Renaissance Architecture**
Architecture and urban design from the early fifteenth to the early seventeenth century in central and northern Italy. Special attention is paid to the development of theory and its relation to architectural practice. In addition to the works of the major figures of the period, typical relationships between buildings and their urban and natural contexts are considered.  
*Prereq:* Arch 247 for architecture students and consent of instructor for others.
Courses for Bachelor of Architecture

(For Recommended Programme, see page 155)
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.

Arch 445 W 2C,2S 0.5
The Practice of Criticism in Creative Design
The application of critical thought will be exercised regularly through oral and written assignments on a wide range of designed human experiences; secondarily, there will be reading assignments to facilitate the practice of criticism through a broadening knowledge of critical theory and its relationship to culture.
Prereq: Consent of instructor

Arch 452 F 2C 0.5
Specifications
Architectural working drawings and specifications; bidding requirements; general conditions; general requirements trade divisions; reference and source material; assembly and reproduction; structural, mechanical and electrical consultants.
Prereq: BES standing

Arch 455 W 2C 0.5
Management and Estimating
Exposure of the student to the administrative responsibilities of the practicing architect's work in the building industry, which includes: bidding, bid opening and analysis; contract award; administration of the contract; contractors organization; sub-contractors; labour relations, estimating and cost control.
Prereq: BES standing

Arch 462 F 2C,2L 0.5
Structural Synthesis 1
Steel and Concrete Design
Design and behaviour of structural steel systems, application of current building specifications, proportioning structural elements based on pertinent design considerations, bolted and welded; criteria for choosing steel systems; introduction to plastic design.
Prereq: BES standing

Arch 463 W 2C,2L 0.5
Structural Synthesis 2
Concrete and Timber Design
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 0.5
Mechanical Systems 2
Heating, ventilating and air conditioning systems for buildings; plumbing and drainage; electrical distribution for power and light in buildings; illumination; acoustics, geometries and materials; and vertical transportation systems.
Prereq: Arch 372

Arch 474/475
Experimental Courses
These courses offer a vehicle for introducing additional electives to the programme on a short term basis, and for developing future permanent courses.
Prereq: Consent of instructor

Arch 484,485 F,W 3R 0.5
Architectural Research
This offers a student an opportunity for independent research into architectural problems not offered in the regular curriculum. It allows guided exploration of a specific architectural problem area, of appropriate complexity to the particular term.
Prereq: Approval of (in house) UGAC
Course Descriptions
Architecture

Arch 492, 493  F, W  3C, 18 std  2.0 each
**Design Studio**
The intent of these courses is to develop skills and gain experience in architectural design through the application of design and analysis techniques to complex building types. This is approached through a series of design projects aimed at the exploration of generative factors in the definition of built form. Projects are related to existing contexts and respond to current concerns of architectural theory and practice. Both individual and group work are included. Term held in Rome or Waterloo.
*Prereq: BES or its equivalent*

Arch 554  W  3C  0.5
**Development and Financing**
Introduction to the important determinants of the development, growth and re-planning of the various man environments, including development law, land use development, land use planning, appraisal, mortgage lending and accounting.
*Prereq: Arch 455*

Arch 555  S  2C  0.5
**Architectural Practice**
*The Profession*
Discussion of the legal and ethical aspects of architectural practice in Canada and in Ontario in particular, contracts, bonds and insurance, mechanics' liens, by-laws and regulations, architectural partnership. The legal background, client-architect relations, partial services, professional problems.
*Prereq: BES standing*

Arch 563  W  3C  0.5
**Suspended and Space Structures**
State-of-the-art review of cable-suspended construction. Analysis of cable networks, basic equations. Effect of live loads on cables; dynamic considerations. Double cable systems; synclastics and anticlastic surfaces. Cable-stayed systems; analysis of space structures; space frames and roof systems; one and two-way design.
*Prereq: 4B architecture standing or equivalent*

Arch 574/575
**Experimental Courses**
These courses offer a vehicle for introducing additional electives to the programme on a short term basis, and for developing future permanent courses.
*Prereq: Consent of instructor*

Arch 584, 585  W, S  3R  0.5
**Architectural Research**
This offers a student an opportunity for independent research into architectural problems not offered in the regular curriculum. It allows guided exploration of a specific architectural problem area, of appropriate complexity to the particular term.
*Prereq: Approval of (in house) UGAC*

Arch 592, 593  W, S  32C  3.0 each
**Design Studio**
The course provides an opportunity for the student to select an area of concentration for study and design in depth. A thesis topic is to be submitted and approved during term 8 (4b) and all research work completed by the end of the 8 month co-op work term 5. Terms 9 and 10 (5a and 5b) will be spent developing the thesis for presentation during term 10. The thesis is to be a vehicle for thinking and design at an innovative level. Thus considerable emphasis is placed on both theory and development of design solutions.
*Prereq: 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, with the aim of providing better orientation and more interdisciplinary communications.

Electives are divided into the following two categories:

(TE)
Theme Elective (BES Degree) courses within the Faculty of Environmental Studies which deal with ecological issues. Theme Elective (BArch Degree) any course within the School of Urban and Regional Planning.

Each student pursuing a BES degree must have accumulated one and a half-course credits in the theme area of Ecology by or before his/her 6th academic term.

Each student pursuing a BArch degree must have one half course credit in the theme area of Planning by or before his/her 10th academic term.

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

**Note**
Department approval is mandatory for both TE and FE.
Arts

Professors
W. Klaassen, BA (McMaster), BD (McMaster Divinity School), DPhil (Oxford) G
P. H. Smith, Jr., BA (Harvard), PhD (Pennsylvania) G
D. E. Smucker, BA (Bluffton), BD (Princeton Theological Seminary), MA, PhD (Chicago) G

Course Descriptions

Courses designated "Arts", those listed below, usually cover some topics and themes of general interest to several disciplines and their presentation is often made with this interdisciplinary perspective in view. Arts courses are elective courses in General and Honours programmes and do not satisfy either the Group A or Group B requirements.

Arts 105 Introduction to the Science of Man
Not offered in 1980-81

Arts 122G/123G F,W 2C,1D 0.5
Quest for Meaning in the 20th Century 1 and 2
Against the background of rapidly shifting values in western culture, this course asks the student to examine his or her perspective and then face the resources of others in answering the question of Who am I? What is my obligation to society? What is my relationship to the natural world? Is there an ultimate meaning to life? Teaching methods include personal statements, thematic and biographical books and films.

Arts 198 W 0.5
Introduction to Computer Technology
An introduction to the basic ideas of computers, with emphasis on the use of terminals, including word processing and file-maintenance ("database") systems. The course will examine the future of computers and their political, ethical, and social impact. No previous knowledge of computing is assumed.

Arts 200G F 2C,1D 0.5
Issues in Mass Communication 1
An introductory and interdisciplinary approach to those factors in mass media behaviour 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 0.5
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 202P F 0.5
Psychology of Religion in Historical Perspective
A study of the Psychology of Religion in its historical perspective from the nineteenth century to the present day. Methods, techniques and practices of research that are applicable to the examination of religious experience will also be introduced.

Arts 211/212 F/F,W 0.5/0.5
Computing Techniques in Language and Literature
An introduction to non-mathematical computer programming, with special emphasis on the manipulation of language data. The programming language used will be PL/1. 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, Solzhenitsyn, Dostoevsky, Zamiatin, Camus, and others. Taught in English.

Prereq: none
Arts 215A  F  3C  0.5
**Man in Crisis 1 (Literary Views)**
A critical study of Dostoevsky's *The Grand Inquisitor*, Nietzsche's *Thus Spake Zarathustra*, Tolstoy's *What Men Live By*, and works by Aldous Huxley, Zamiatin, Turgenev, and Andres. The two major themes are *Utopia*, the yearning for and the shape of perfectibility, and *Nihilism*, the denial and/or destruction of "Old Tablets" or "God is dead."

Arts 215B  W  3C  0.5
**Man in Crisis 2 (Literary Views)**
A critical study of Brecht's *The Caucasian Chalk Circle*, Kafka's *The Metamorphosis*, and works by Ibsen, Hesse, Dostoevsky, Tolstoy, and Solzhenitsyn. The two major themes are *Nihilism* (see above) and *Alienation*, the divided self in exile, or the inability to give and to accept love.

Arts 220R  F  3C  0.5
**Chinese Thought and Culture 1**
An examination of traditional culture, institutions and the modern development of China as the context for the examination of contemporary Chinese society.
*Prereq: none*

Arts 221R  W  3C  0.5
**Chinese Thought and Culture 2**
An investigation of the dynamics of the new China: education, medicine, the arts, the position of women, foreign policy, the Cultural Revolution and subsequent developments, rural and urban organization, the role of the army, the role of the Chinese Communist Party, and the philosophy of Mao Tse Tung.
*Prereq: Arts 220R or consent of instructor.*

Arts 230G  F  2C,1D  0.5
**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.

Arts 249J  J,Y  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.
Department of Biology

Professor, Chairman of Department
J. K. Morton, BSc, PhD (Durham), FLS

Associate Professor, Associate Chairman of the Department
C. I. Mayfield, BSc, PhD (Liverpool)

Professor, Graduate Officer
A. D. Harrison, MSc, PhD (Capetown)

Professor, Graduate Officer
C. H. Fernando, BSc (Ceylon), D Phil (Oxford)

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 (W. Ont.)

Professors
C. R. Barnes¹, BSc (Birmingham), PhD (Ottawa)
H. B. N. Hynes, PhD, DSc (London), ARCS, FRSC
W. B. Kendrick, BSc, PhD (Liverpool)
J. Kruu², MSc (Waterloo), PhD (W. Ont.)
J. J. Pasternak, MA (Toronto), PhD (Indiana)
G. Power, BSc (Durham), PhD (McGill)
J. E. Thompson, BSA (Toronto), PhD (Alberta)

Associate Professors
R. D. Beauchamp³, 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 (W. Ont.)
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)
P. E. Morrison, MSc (W. Ont.), PhD (McMaster)
G. G. Mulamootti⁴, BSc (Mysore), MSc (Bombay), PhD (Delhi)
S. M. Smith, MSc (McMaster), PhD (Manitoba)
J. B. Theberge⁵, BScA (Guelph), MSc (Toronto), PhD (B.C. Col.)
K. Zachariah, BSc (Madras), BA Hons (Oxford), MA, PhD (Princeton)

Assistant Professors
N. Bols, BSc (S Fraser), MSc (Br. Col.), PhD (Toronto)
M. Globus, MSc (McGill), PhD (Toronto)
J. R. Lepock⁶, MS (W. Virginia), PhD (Penn. State)
C. A. Peterson, MSc (Alberta), PhD (California, Davis)
J. C. Semple, BSc (Tufts), MA, PhD (Washington U, St Louis)
L. W. Stobbs, MSc (Brock), PhD (Guelph)

Adjunct Faculty
R. W. McCauley, MA (Toronto), PhD (W. Ont.)
Wilfrid Laurier University

Faculty members holding cross appointments as shown
¹Biology and Earth Sciences
²Biology and Physics
³Biology and Urban and Regional Planning
⁴Biology and Optometry

Course Descriptions

All Honours Biology students who have completed their third year are required to participate in an off-campus field course (Biol 450 or 498) 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 range from $50 to $200 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 credit towards a BSc if taken by students of the University of Waterloo.

Biol 111 F 2C 0.5
Introductory Biology 1
An introduction to basic concepts in biology, including aspects of genetics, evolution and plant biology.
Open to students other than those intending to major in Biology or to enter the School of Optometry.

Biol 111L F 3L 0.25
Introductory Biology 1 Laboratory
A laboratory course only for students taking Biology 111. Take-home problems and/or assignments will alternate with in-house labs.
Open to students other than those intending to major in Biology or to enter the School of Optometry.
Course Descriptions
Biology

Biol 112  W  2C  0.5
Introductory Biology 2
An introduction to the basic principles of zoology and ecology with reference to man as a biological organism.
Open to students other than those intending to major in Biology or to enter the School of Optometry.

Biol 112L W  3L  0.25
Introductory Biology 2 Laboratory
A laboratory course only for students taking Biology 112. Labs. on alternate weeks.
Open to students other than those intending to major in Biology or to enter the School of Optometry.

Biol 201 Y  2C,3L  1.0
Anatomy, Histology and Embryology
A survey of functional mammalian anatomy and histology, with particular emphasis on the human, and an introduction to basic embryology.
(For Pre-Optometry Students only)

Biol 210 F  2C,3L  0.5
Introductory Invertebrate Zoology
A study of the functional morphology of selected invertebrate types with special emphasis on the various grades of organization and development in the different phyla.

Biol 211 W  2C,3L  0.5
Introductory Vertebrate Zoology
An introduction to the structure, evolution and development of vertebrate organ systems.

Biol 220 F  2C,3L  0.5
Plant Biology 1 - The Living Plant
An introduction to the structure, function and physiology of plants with emphasis on flowering plants.

Biol 221 W  2C,3L  0.5
Plant Biology - The Diversity of Plants
A comparative survey of the morphology and life histories of the different kinds of plants and fungi important to man and an introduction to their evolution.

Biol 230 F  2C,3L  0.5
Introductory Cell Biology
An introduction to the concepts of cell biology with emphasis on (i) the structural organization of the cell and its constituent organelles and (ii) the function of critical molecular processes that are characteristic of living organisms.

Biol 233 W  2C,3L  0.5
Human Physiology
The physiology of the major organ systems including the nervous, muscular, circulatory, respiratory, urinary, digestive, endocrine and reproductive systems.

Biol 239 W  2C,3L  0.5
Genetics
The mendelian basis of genetic analysis.
Chromosomal mechanisms in mitosis and meiosis.
The origin, inheritance and adaptive significance of chromosomal changes. Nucleic acids as the carriers of genetic information. Natural selection and the evolution of genetic systems.

Biol 240 F  2C,3L  0.5
Fundamentals of Microbiology
Introduction to fundamental theories, principles and methods of microbiology. Structure, methods of cultivation, growth, effects of physical factors, and inhibition and killing of microorganisms will be studied.

Biol 241 W  2C,3L  0.5
Introduction to the Microbial World
Biological characterization of major bacterial groups, microorganisms as geochemical agents, utilization of microorganisms by man, and mechanisms of microbial pathogenicity.

Biol 245 F  2C,3L  0.5
General Microbiology 1
History and scope of microbiology. Study of the characteristics of bacteria and other microorganisms.
Open to students other than those intending to major in Biology or to enter the School of Optometry.

Biol 246 W  2C,3L  0.5
General Microbiology 2
Relationships of microorganisms to man and his environment.
Prereq: Biol 245
Open to students other than those intending to major in Biology or to enter the School of Optometry.

Biol 250 F  3C/FLDLAB  0.5
Ecology
An introduction to the study of the relationships of plants and animals to their environment. The nature of ecosystems, ecological energetics, biogeochemical cycling, community ecology, introduction to population biology.
Field trips as required
<table>
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<tr>
<th>Course Code</th>
<th>Year</th>
<th>Credits</th>
<th>Title</th>
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<tr>
<td>Biol 301</td>
<td>Y</td>
<td>2C,3L</td>
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<tr>
<td>Human Physiology</td>
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<tr>
<td>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. <strong>(For Optometry students only)</strong></td>
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<tr>
<td>Biol 331</td>
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<tr>
<td>Vertebrate Zoology</td>
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<tr>
<td>Major topics in vertebrate zoology as exemplified by both living and fossil members of the subphylum Craniata. <strong>Prereq: Biol 238 or 211</strong></td>
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<tr>
<td>Biol 332</td>
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<tr>
<td>Anthropod Zoology</td>
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<tr>
<td>A survey of the phylum Arthropoda, including the insects, with emphasis on their classification, interrelationships and ways of life. <strong>Prereq: Biol 237 or 247 or 210</strong></td>
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<tr>
<td>Biol 333</td>
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<tr>
<td>Invertebrate Zoology</td>
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<tr>
<td>A survey of the major invertebrate phyla other than the arthropods, with emphasis on their functional anatomy, classification and ways of life. <strong>Prereq: Biol 237 or 247 or 210</strong></td>
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<tr>
<td>Biol 334</td>
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<tr>
<td>The Flowering Plants</td>
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<tr>
<td>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. <strong>(Students entering this course are required to make a flowering plant collection. Instructions should be obtained from the Herbarium prior to the summer break.)</strong></td>
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<tr>
<td>Biol 335</td>
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<tr>
<td>Identification and Variety of Microorganisms</td>
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<tr>
<td>Principles of classification and identification of microorganisms. Identification procedures and systems. The study of selected groups of transitional microorganisms. <strong>Prereq: Biol 235 or 240-241 or permission of instructor</strong></td>
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<tr>
<td>Biol 337</td>
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<tr>
<td>Microorganisms in Foods</td>
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<tr>
<td>Food preservation, spoilage, poisoning and modern concepts in quality assurance programmes are studied. The aim is to understand factors governing microbial changes in foods. Problem solving in the food industry is emphasized. Laboratory work will reflect current practices in quality control and testing. <strong>Prereq: Biol 335 or permission of instructor</strong></td>
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<tr>
<td>Biol 338</td>
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<tr>
<td>Plant Anatomy and Morphogenesis</td>
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<tr>
<td>Plant structure in relation to function and development with particular reference to the vascular plants. Cell, tissue and organ differentiation. <strong>Prereq: Biol 234 or 220 and 230</strong></td>
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<tr>
<td>Biol 340</td>
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<tr>
<td>Molecular Biology</td>
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<tr>
<td>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. <strong>Prereq: Biol 111-112, 111L-112L or 121-122, 121L-122L or 230</strong> <strong>Coreq: Chem 332</strong></td>
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<tr>
<td>Biol 341</td>
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<tr>
<td>Cell Physiology</td>
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<td>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. <strong>Prereq: Biol 111-112, 111L-112L or 121-122, 121L-122L or 230</strong> <strong>Coreq: Chem 332</strong></td>
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<tr>
<td>Biol 343</td>
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<tr>
<td>Histology and Cytology</td>
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<tr>
<td>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. <strong>Prereq: Biol 111-112, 111L-112L or 121-122, 121L-122L or 211 or 230 or 233</strong></td>
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<tr>
<td>Biol 345</td>
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<tr>
<td>Plant Physiology</td>
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<tr>
<td>An integrated study of plant function: the dynamics of nutrient and water movement, photosynthesis, control mechanisms of growth and development. <strong>Prereq: Biol 234 or 220</strong> <strong>Coreq: Chem 332-333</strong></td>
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</table>
Biol 346 F 2C,1T 0.5
Population Ecology 1
The ecology of populations. Topics include: demographic parameters and their estimation; population growth and regulation; competitive and predator-prey interactions; population genetics and evolution; applied population biology. 
Prereq: Biol 231 or 250 and Stat 202

Biol 347 F 2S,3L 0.5
Mycology 1
Fungal taxonomy and ecology; medical mycology; plant pathology; industrial applications; food and food processing; toxins and hallucinogens; biological control; fungi as coprophiles, predators, and symbionts with plants and animals. 
Prereq: Biol 232 or 227

Biol 348 F 2C,3L 0.5
Vertebrate Physiology 1
A general study of selected physiological topics in vertebrates including nutrition, digestion, respiration and circulation.
Not open to students who have taken Biol 203, 204

Biol 349 W 2C,3L 0.5
Vertebrate Physiology 2
A general study of selected physiological topics in vertebrates including nerve and muscle physiology, endocrinology, osmoregulation and excretion.
Not open to students who have taken Biol 203, 204

Biol 350 W 2C,3L 0.5
Environmental Toxicology 1
An introduction to the basic theories, principles and techniques of environmental toxicology. A comparative study of the effects of specific groups of toxicants on ecosystems; biodegradation and cycling.

Biol 351 F 2C,3flab/T 0.5
The Analysis of Communities
Sampling procedures to estimate abundance and distribution of organisms in time and space. Methods to analyze succession. The classification and ordination of ecosystems. The response of ecosystems to exploitation. The role of biological management in conservation programmes. 
Prereq: Biol 231 or 250 and Stat 202

Biol 352 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 or 240-241

Biol 353 F 2C,3L 0.5
Entomology
Introduction to morphology, systematics and biology of insects (Brief field trips will be made to collect insects from different local habitats.)

Biol 354 W 3C/S 0.5
Advanced Genetics
A detailed examination of the recent advances in molecular genetics with emphasis on the regulation of gene action in both prokaryotes and eukaryotes. Current research literature will be reviewed. (Offered every other year. Alternates with Biol 438)

Biol 355 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 or 240-241, Chem 332-333

Biol 356 F 2C,3L 0.5
Quaternary Ecology
A consideration of the Quaternary environment. Pollen, plant macrofossil and faunal remains as indicators of past environments. Relationship of fossil assemblages to modern ecosystems. Pollen analysis and the interpretation of fossil deposits. 
Prereq: an introductory course in biology or geology, or permission of the instructor.

Biol 357 W 3C/S 0.5
Biosystematics and Evolution
A study of the processes of evolution: the differentiation of populations and the origin of new forms of life. 
Prereq: Biol 239

Biol 358 W 3C/S 0.5
Advanced Molecular Biology
An examination of the current major issues in Molecular Biology with emphasis on the technical and conceptual advances. Current research literature will be reviewed. (Offered every other year. Alternates with Biol 434)
Prereq: Biol 340
Offered in Winter Term 1981

Biol 363 Y 2C,3L 1.0
Populations of the Sea
An introduction to marine populations and ecosystems. The classification and ordination of marine systems. The response of marine ecosystems to exploitation. The role of biological management in conservation programmes. 
Prereq: Biol 235 or 240-241

Course Descriptions
Biology
Biol 440  F  2C,3L  0.5  
**Plant Growth and Development**  
A study of the plant hormones and the mechanics that control growth, dormancy and development.  
*Prereq: Biol 345*

Biol 441  W  2C,3L  0.5  
**Stress Physiology and Aging in Plants**  
A study of stress tolerance and aging in plants. Mechanisms of adjustment to temperature, moisture, salt and chemical stress will be emphasized.  
*Prereq: Biol 345*

Biol 443  F  2C,3L  0.5  
**Microorganisms of Industrial Importance**  
A study of the role of microorganisms in industrial processes of biosynthesis and degradation.  
*Prereq: Biol 347*

Biol 444  W  2C,3L  0.5  
**Microorganisms and Disease**  
A study of the microorganisms involved in pathogenesis, their mode of infection, symptoms and prevention.  
*Prereq: Biol 335, 451*

Biol 445  W  2S,3L  0.5  
**Psychology**  
A study of selected topics in the biology of algae.  
*Prereq: Biol 232 or 220*

Biol 446  W  2C,3L  0.5  
**History of Biology**  
The development of biological thought from Greek and Roman times to the present; i.e. from classification to the present experimental approach.  
*(Not to be taken in conjunction with Sci 400)*

Biol 447  F  3C  0.5  
**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 448  F  2C,3L  0.5  
**Virology**  
The nature of viruses and their interaction with their plant, microbial and animal hosts.  
*Prereq: Biol 235 or 240-241*

Biol 449  W  2C,3L  0.5  
**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; priority will be given to Honours students.*  
*Prereq: Either Biol 332 or Biol 333*

Biol 450  F  2C,3L  0.5  
**Immunology**  
Physical and biological properties of immunological agents that protect against disease, the procedures for their identification and their practical applications.  
*Prereq: Biol 235 or 240-241*

Biol 451  F  2C,3L  0.5  
**Comparative Animal Physiology 1**  
A comparative study of respiratory, circulatory and endocrinological systems of animals; emphasis will be placed on invertebrate groups.

Biol 452  F  2C,3L  0.5  
**Comparative Animal Physiology 2**  
Comparative study of the endocrine and reproductive systems of mammals. Major topics include hormone assay, chemistry, regulation of secretion, mechanism of action, neurosecretion and reproductive cycles.

Biol 453  W  2C,3L  0.5  
**Environmental Toxicology 2**  
Cellular, developmental and physiological effects of toxicants on multicellular organisms.  
*Prereq: Biol 350*  
*Offered in Fall term 1981*

Biol 498  F or W  fildlab  0.25  
**Field Course**  
Required of all Honours Biology students except those who take Biol 450. This field course may be any of several arranged by the Department, and should be taken after completion of the 3rd year.
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.

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Canadian Studies

Professor, Chairman of the Canadian Studies Programme Board
R. R. Krueger, BA (W. Ont.), PhD (Indiana)

Assistant Professor, Director of the Programme
S. E. McMullin, BA, MA (Carleton), PhD (Dalhousie)

Members of the Canadian Studies Programme Board
Professors
F. C. Gerard, MA (College St. Dominique, France), BD (McGill), STM (McGill), PhD (Hartford, Conn)
D. W. Hoffman, BSA, MSA (Toronto) PhD (Waterloo)
J. H. Hotson, BA (Colorado College), MA, PhD (Penn)

Associate Professors
T. S. Abler, BA (Northwestern), MS (Wisconsin-Milwaukee), PhD (Toronto)
J. R. Dugan, BA, MA (Toronto), PhD (Yale)
A. Hunter, BA (Br. Col.), MA, PhD (Columbia)
W. R. MacNaughton, BA (Toronto), MA, PhD (Wisconsin)

Assistant Professors
D. J. Horton, BA (Wat. Luth.), MA (Waterloo), PhD (McGill)
R. D. Legge, BA (Transylvania); STB (Howard), PhD (McMaster)
R. J. Williams, BA, MA, (McMaster), PhD (Toronto)

Participating Faculty (1979-80)

Professors
R. R. Krueger, BA, MA (W. Ont.), PhD (Indiana)
J. M. Wilson, BA, MA (Toronto)

Assistant Professors
D. J. Horton, BA (Wat. Luth.), MA (Waterloo), PhD (McGill)
S. E. McMullin, BA, MA (Carleton), PhD (Dalhousie)
P. Socken, BA (Toronto), MA (Iowa), PhD (Toronto)

Lecturer
S. D. Burt, BA, MA (Waterloo)

Guest Lecturer
Wallace Clement, Sociology, McMaster University

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

Cdn St 201  F  2C,1S  0.5
Social Regionalism
Lecturers in Geography, Political Science, Sociology and History discuss the roles which economic disparities, social elites, federal/provincial relations and political parties play in defining Canadian regionalism. Particular attention is paid to Quebec's desire for separate status.

Cdn St 202  W  2C,1S  0.5
Cultural Regionalism
Lecturers discuss the contribution made by literature, film, drama, and fine arts in defining distinctive regional identities in Canada. Particular attention is paid to the emergence of a distinctive Ontario culture.

Cdn St 301  F  3S  0.5
Regionalism: West
This course continues the exploration of Canadian regionalism by applying knowledge gained in Cdn St 201/202 to distinctive problems of the Canadian west and northwest. The focus of the seminar will vary according to the interests of the faculty and students.
Prereq: Cdn St 201 or 202

Cdn St 302  W  3S  0.5
Regionalism: East
This course continues the exploration of Canadian regionalism by applying knowledge gained in Cdn St 201/202 to distinctive problems of Atlantic Canada. The focus of the seminar will vary according to the interests of the faculty and students.
Prereq: Cdn St 201 or 202

Cdn St 400  Y  T  1.0
Research Essay
An extensive senior research essay, supervised by a committee composed of faculty members from two or more of the participating departments, which deals with a specific aspect of Canada utilizing material and methods from several different disciplines.
Prereq: Cdn St 301/302

Principal Canadian Content Courses
Offered by the Participating Departments

Anthropology

Anth 102A Introduction to Social and Cultural Anthropology
Anth 203 Prehistoric Man in North America
Anth 205 Race and Racism in Canada
Anth 230 Indians of Canada
Anth 233 Eskimo Cultures
Anth 241 The Contemporary Canadian Indian Scene
Anth 322 Prehistoric Man in the Great Lakes Area
Anth 333 Canadian Communities and Planned Change
Anth 377 Early Man in the New World
Anth 499 Honours Essay

Economics

Econ 100A/B Introduction to Modern 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 214 Themes in Canadian Literature
Engl 215 Canadian Regional Literature
Engl 313 Canadian Literature to 1920
Engl 314 Canadian Poetry Since 1920
Engl 315 Canadian Prose Since 1920
Engl 316 Canadian Drama
Engl 415 Major Canadian Writers
Engl 495 Senior Honours Essay (Canadian Literature option)

Environmental Studies

Env S 195A Introduction to Environmental Studies
Env S 195B Introduction to Environmental Studies
Env S 201 Introduction to Environmental and Planning Law
Env S 333 Parkland Management
Env S 401 Environmental Law
Env S 402 Planning Law
Env S 417 Land Use History and Landscape Change 1
Course Descriptions
Canadian Studies

Env S 418  Land Use History and Landscape Change 2

French
Fr 151  Basic French (For students who have not passed the equivalent of Year 5 French)
Fr 152  Basic French (For students who have not passed the equivalent of Year 5 French)
Fr 192  French Language
Fr 195  French Literature 1
Fr 196  French Literature 2
Fr 205  Spoken French
Fr 206  Spoken French
Fr 207  Spoken French
Fr 208  Spoken French
Fr 250  Intensive Language Training
Fr 273  Aspects of Québec
Fr 274  Survey of French-Canadian 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

Geography
Geog 300  Geomorphology and the Southern Ontario Environment
Geog 322  Geographical Study of Canada
Geog 341  Historical Geography of Canada 1
Geog 342  Historical Geography of Canada 2
Geog 352  The Rural-Urban Fringe of Canadian Cities
Geog 411  Resource Studies
Geog 422  Canada

History
Hist 126  Canada Takes Shape
Hist 127  Canada: Unity in Diversity
Hist 223  Canadian Culture and Society to 1900
Hist 224  Canadian Culture and Society in the Twentieth Century
Hist 243  Canadian History 1760-1896
Hist 244  Canadian History 1896-1979
Hist 245G  Canadian Minorities 1
Hist 246G  Canadian Minorities 2
Hist 247G  Mennonite History 1
Hist 248G  Mennonite History 2
Hist 256  Canada 1896-1939
Hist 257  Canada 1939-1976
Hist 317  Studies in Canadian Regionalism: East and West
Hist 318  Studies in Canadian Regionalism: Central Canada
Hist 319  French Canadian History to 1867
Hist 320  History of Modern Quebec
Hist 321  History of Canadian-American Relations to 1914
Hist 322  History of Canadian-American Relations Since 1914
Hist 323  Canada in World Affairs: The Twentieth Century (Part 1)
Hist 324  Canada in World Affairs: The Twentieth Century (Part 2)
Hist 325  History of Canadian Indians (Part 1)
Hist 326  History of Canadian Indians (Part 2)
Hist 386  Ontario History to Confederation
Hist 387  Ontario History Since Confederation
Hist 420  Senior Seminar: Canada in the Nineteenth Century
Hist 421  Senior Seminar: Ontario History
Hist 423  Senior Seminar: Modern Quebec
Hist 425  Senior Seminar: Twentieth Century Canada
Hist 450  Senior Seminar: Marxism and Canadian History

Man-Environment Studies
M Env 356  Canadian Non-renewable Resources (Cross-listed as Sci 350).

Political Science
P Sci 102C  Politics in Action
P Sci 102D  Political Power and the Political Process
P Sci 102H  Citizen Participation in Canada
P Sci 102M  Contemporary Issues in Canadian Public Policy
P Sci 260  Canadian Government and Politics
P Sci 260A/260B  Canadian Government and Politics 1/2
P Sci 272  Political Behaviour 2
P Sci 291  The Canadian Legal Process
P Sci 292  Aspects of Canadian Law
P Sci 293  Political Journalism
P Sci 331  Public Administration 1
P Sci 332  Public Administration 2
P Sci 341  Provincial Politics
P Sci 342  Politics in Quebec
P Sci 343  Canadian Municipal Government
P Sci 344  The Politics of Local Government
P Sci 351  Comparative Federal Systems
P Sci 352  Comparative Legislative Systems
P Sci 374  Interest Group Politics
P Sci 428  The State and Economic Life
P Sci 435  The Politics of Canadian Resource Development
P Sci 442  Politics in Ontario
P Sci 461  Problems in Canadian Politics 1
P Sci 462  Problems in Canadian Politics 2
P Sci 473  Voting Behaviour
P Sci 475  Political Socialization
P Sci 476  Research Seminar in Political Behaviour
### Sociology

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<tr>
<td>Soc 101</td>
<td>Introduction to Sociology</td>
</tr>
<tr>
<td>Soc 120R</td>
<td>Fundamentals of Sociology</td>
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<tr>
<td>Soc 201</td>
<td>Canadian Society: Structure and Development</td>
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<tr>
<td>Soc 205</td>
<td>Sociological Analysis of Social Problems</td>
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<tr>
<td>Soc 215</td>
<td>Sociology of Sex Roles</td>
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<tr>
<td>Soc 216</td>
<td>An Introduction to the Sociology of Marriage and the Family</td>
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<tr>
<td>Soc 217</td>
<td>Family Origin and Personal Identity</td>
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<tr>
<td>Soc 231</td>
<td>Industrial Sociology</td>
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<tr>
<td>Soc 245</td>
<td>Deviance: Perspectives and Processes</td>
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<tr>
<td>Soc 246</td>
<td>Law and Order: A Sociological Perspective</td>
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<td>Soc 250</td>
<td>Crime and Society</td>
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<td>Soc 251</td>
<td>Ethnic and Racial Relations</td>
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<td>Soc 260</td>
<td>French-English Relations in Canada</td>
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<td>Soc 262</td>
<td>Population in Canadian Society</td>
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<td>Soc 272</td>
<td>Medical Sociology</td>
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<td>Soc 300</td>
<td>Canadian Social Institutions</td>
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<td>Soc 301</td>
<td>Urban Sociology</td>
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<td>Soc 315</td>
<td>Social Stratification</td>
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<tr>
<td>Soc 327R</td>
<td>Canadian Ethnic and Cultural Minorities</td>
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<tr>
<td>Soc 328R</td>
<td>Canadian Ethnic and Cultural Minorities</td>
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<tr>
<td>Soc 330</td>
<td>Comparative Social Structure</td>
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<tr>
<td>Soc 365</td>
<td>Sociology of the Contemporary University</td>
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<td>Soc 398</td>
<td>Seminar in Nationalism and ideology in Canada and Quebec</td>
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### Urban and Regional Planning

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<td>Plan 225</td>
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<td>Plan 330</td>
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<tr>
<td>Plan 332</td>
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<td>Plan 358</td>
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<tr>
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<td>Plan 431</td>
<td>Citizen Involvement, Planning and Social Change</td>
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</table>

### 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: Canadian Problems

#### Psychology
- Psych 212 Educational Psychology
- Psych 454 Senior Seminar in Educational Psychology

#### Religious Studies
- R S 220 Evangelical Christianity
- R S 221 Religions of Waterloo County
- R S 264P Religion in Canada 1
- R S 265P Religion in Canada 2
- R S 268B Religious Perspectives in Contemporary Canadian Literature
Course Descriptions
Chemistry

W. L. Elsdon, MSc (W. Ont.), PhD (McGill)
R. J. Friesen, BSc, MSc (Manitoba)
R. J. LeRuy, BSc, MSc (Toronto), PhD (Wisconsin)
J. L. Koppel, BA, PhD (Toronto), FCIC
D. Mackay, BSc, PhD (Aberdeen)
A. D. Maynus, MA, PhD (Toronto)
G. L. Rempel2, BSc, PhD (Br. Col.), FCIC
G. E. Toogood, BSc, PhD (Nottingham)

Assistant Professors
G. I. Dmitrienko, BSc, PhD (Toronto)
M. F. Tchir, BSc (Alberta), PhD (W. Ont.)

Senior Demonstrators
C. Folzer (Mrs.), BSc (Purdue), MSc, PhD (Rutgers)
M. C. Michael (Miss), BSc (Waterloo)
T. Rudensky, BSc (Waterloo)
M. Vatcher, HNC (Bolton Technical College), BSc (Waterloo), CChem, MRIC

Faculty Members holding cross appointments as shown
1Chemistry and Physics
2Chemistry and Applied Mathematics
3Chemistry and Chemical Engineering

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 from Waterloo or elsewhere is acceptable. With consent of the instructor, prerequisites may be waived in exceptional cases.

Chem 001 T 0
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. No University credit.
Chem 10  F,W,S  1C  0

**General Chemistry Seminar**

Required for all Chemistry students beyond Year 1, this seminar brings together students from all years to receive information concerning the activities of the Chemistry Department and the Chemical Institute of Canada, and to hear invited speakers.

**Year 1 Chemistry Courses**

Chem 123  F  3C  0.5

**Chemical Reactions, Equilibria and Kinetics**

**Prereq:** Year 5 Chem, Math (Calculus). Science students must take Chem 123L with this course.

Chem 123L  F  3L  0.25

**Chemical Reaction Laboratory**

Selected experiments for students taking Chem 123.

Chem 124  W,S  3C  0.5

**Organic Chemistry 1**

Bonding in carbon compounds. Structures, properties and nomenclature of several important classes of organic compounds. Interconversions of functional groups. Mechanisms of organic reactions.

**Prereq:** Chem 123. Science students must take Chem 124L with this course.

Chem 124L  W,S  3L  0.25

**Chemical Reaction Laboratory Cont’d**

Selected experiments for students taking Chem 124.

When selecting Chemistry courses beyond Year 1 students must obey the following rules, unless specific permission to do otherwise has been granted by their Undergraduate Officer.

1) **All Students** must have passed the listed prerequisites. In addition students are expected to have successfully completed at least 2 years of their programmes before selecting 300-level courses, and 3 years before selecting 400-level courses. (In some cases, especially where 400-level courses are offered only in alternative years, this rule may be waived with the consent of the instructor).

2) **Honours Chemistry Students** (all Options, including Co-op) may not take General Chemistry courses for credit. Honours students from other Science Departments should follow the same regulations as Honours Chemistry students unless permission to do otherwise has been approved by their Department Undergraduate Officer.

3) **General Chemistry Students** (4-year) may not take Core Honours courses but must take the General Programme equivalent e.g. 218 not 212; 226 not 220, etc. General Science (4-year with a Major) students should follow the same regulations as General Chemistry (4-year) students unless permission to do otherwise has been approved by their Department Undergraduate Officer.

4) **General Science Students** (non-major) may not take Core Honours courses; nor may they take 400-level Chemistry courses (unless the consent of the instructor is obtained). Certain 300-level Chemistry courses may also be excluded – see the specific prerequisites for each course to be sure.

5) **Students cannot obtain “Double-Credit”** for courses which clearly overlap to a significant extent. In particular, no more than 0.5 credit may be obtained within the following groups of Chemistry lecture courses:

   (212,218); (219,313); (26,266,264); (226,220);
   (227,221); (36,267,364); (312,316); (254,356);
   (255,356); (355,357); (366,365).

The same principle applies to laboratory courses. If in doubt consult your instructor and Undergraduate Officer.

**Note**

Most 300- and 400-level honours courses are listed as 2 hour lectures; an additional 1 hour tutorial may be scheduled at the discretion of the instructor.

The Courses Listed Below are Core Courses for Honours Students only.


The Courses Listed Below are Electives Primarily "Intended for Students in Chemistry Major Programmes (Honours and General)"

*Students in other Major Programmes may elect these courses provided they have the necessary prerequisites.

Non-major Students may select 300-level courses if they meet the prerequisites for the course, or have the consent of the instructor. They may not take 400-level courses without the consent of the instructor.

The Following are Core Courses Primarily Intended for General Chemistry Students but they may be taken by General, Non-Major, students (provided they have the necessary prerequisites).

The Following Courses are Offered by Correspondence Only
344, 360, 361

The Courses Listed Below are for Engineering Students only
26, 36

Upper Year Chemistry Courses

Chem 26 F,W 3C,3L 0.5
Organic Chemistry 1
The basic chemistry of the important classes of aliphatic and aromatic compounds. A laboratory course on preparative organic chemistry and organic techniques accompanies the lectures.
(For students in year 2 Engineering)

Chem 36 F,S 3C 0.5
Organic Chemistry 2
An introduction to the important classes of heterocyclic compounds and natural products.
Prereq: Chem 26
(For students in year 2 Engineering)

Chem 212 F 3C 0.5
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.
Prereq: Chem 121

Chem 218 F 2C,1T 0.5
Development of Chemical Bonding and Structure
Prereq: Year 5 Chem

Chem 219 W 2C,1T 0.5
Chemistry of Non-Transition Metals
Group trends in main group chemistry. Emphasis will be placed on correlation of structure with physical properties in various groups of compounds.
Prereq: Chem 218

Chem 220† F,W 2C 0.5
Introductory Analytical Chemistry
The principles underlying quantitative measurements.
Prereq: Chem 121-122

Chem 220L F,W 3L 0.25
Analytical Chemistry Laboratory 1
Selected experiments for students taking Chemistry 220.

Chem 221† W,S 2C 0.5
Analytical Chemistry of Multi-Component Systems
Applications of electroanalytical methods, spectroscopic methods, and analytical separations to the quantitative description of multi-component systems.
Prereq: Chem 220
†Science students registering in Chem 221 must also register in Chem 221L

Chem 221L W,S 6L 0.50
Analytical Chemistry Laboratory 2
Selected experiments for students taking Chemistry 221.

Chem 226† F 2C 0.5
Chemical Analysis 1
A variety of classical and modern analytical methods.
Prereq: Chem 121-122
†Students in the Faculty of Science taking Chem 226 must also take Chem 226L

Chem 226L F 3L 0.25
Chemical Analysis Laboratory 1
Basic techniques of analytical methods.

Chem 227†† W 2C 0.5
Chemical Analysis 2
The evolution of some modern analytical methods.
Prereq: Chem 226 or 220
††Students in the Faculty of Science taking Chem 227 must also take Chem 227L

Chem 227L W 6L 0.5
Chemical Analysis Laboratory 2
The application of analytical methods to contemporary problems in Chemistry and other Sciences.

Chem 237 W 3C 0.5
Introductory Biochemistry
The basic chemistry of amino acids, peptides, proteins, carbohydrates and lipids including some aspects of metabolism.
Prereq: Chem 266
Chem 254  F,W  2C,1T  0.5
Physical Chemistry 1
This course emphasizes the macroscopic approach. Areas to be studied include properties of gases; the first, second and third laws of thermodynamics applied to ideal systems; chemical equilibrium. *Prereq: Chem 121-122, Math 113 or equivalent.*

Chem 255  F,W,S  2C,1T  0.5
Physical Chemistry 2
Thermodynamic concepts are applied to a variety of systems, to mixtures of nonelectrolytes and to solutions of electrolytes. The difference between thermodynamic and dynamic equilibria is introduced to deal with rates of chemical reactions and their relationship to experimental data. *Prereq: Chem 254*

Chem 264  W,S  2C,1T  0.5
Organic Chemistry
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 264L*

Chem 264L  W,S  3L  0.25
Organic Chemistry Laboratory 1
Selected experiments for students taking Chemistry 264.

Chem 266  F  3C  0.5
Organic Chemistry A
The basic chemistry of the important classes of aliphatic and aromatic compounds including aspects of stereochemistry and reaction mechanisms. *Prereq: Chem 212-122.*

Chem 266L  F  3L  0.25
Organic Chemistry Laboratory
Selected experiments for students taking Chemistry 266.

Chem 267  W  2C  0.5
Organic Chemistry B
A continuation of the concepts of Chem 266. Introduction to carbohydrates, proteins, steroids, etc. Introduction to NMR and IR spectroscopies. *Prereq: Chem 266*

Chem 311  W  2C  0.5
Radiochemistry

Note
*(For students needing a full year of Organic Chemistry as a prerequisite to medicine, the sequence 266-267 and 266L should be selected.)*

Chem 312  F,S  2C  0.5
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 magnetochemistry of complexes; reaction mechanisms. *Prereq: Chem 212*

Chem 313  W  2C  0.5
The Chemistry of the Main Group Elements
A systematic approach to the syntheses, properties, reactions and structures of main group element compounds. Trends in chemical behaviour, bonding and stereochemistry. Electron deficient compounds, the rare gases, chemistry of phosphorus, nitrogen and sulfur will be dealt with in detail. *Prereq: Chem 212*

Chem 314L  F,W,S  3L  0.25
Inorganic Chemistry Laboratory 1
An introduction to practical inorganic chemistry.

Chem 315L  F,W  6L  0.5
Inorganic Chemistry Laboratory 1
Advanced experiments in inorganic chemistry. *Prereq: Chem 314L*

Chem 316  F  2C  0.5
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  0.25
Inorganic Chemistry Laboratory
Selected experiments for students taking Chemistry 316.
Chem 320  W  2C  0.5
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 permission of instructor.

Chem 320L  W  3L  0.25
Chemical Instrumentation Laboratory
Selected experiments for students taking Chem 320.

Chem 332  F,W  2C  0.5
Biochemistry 1
An introduction to the chemistry of amino acids,
peptides, proteins and nucleic acids. Structure and
synthesis of proteins.
Prereq: Chem 264 or 267

Chem 332L  F,W  3L  0.25
Biochemistry 1 Laboratory
Qualitative and quantitative measurements of
biochemically important materials for students
taking Chemistry 332.

Chem 333  F,W  2C  0.5
Biochemistry 2
Introduction to the chemistry and metabolism of
carbohydrates and lipids.
Prereq: Chem 332

Chem 333L  F,W  3L  0.25
Biochemistry 2 Laboratory
A continuation of Chemistry 332L for students taking
Chemistry 333.

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. (equiv. to 311-312)
(Ry correspondence only.)

Chem 350  W  2C  0.5
Spectroscopy and Molecular Structure
Introduction to concepts and applications of
microwave, Raman, IR, electronic and resonance
spectroscopy with respect to molecular parameters.
Prereq: Chem 355

Chem 351  W (even years)  2C  0.5
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 356. In years when Chem 351 is not
offered, students wishing this material should take
Phys 359.

Chem 353  F,S  3C  0.5
Introduction to Polymer Science
Basic definitions and polymer nomenclature,
molecular weight averages and distributions,
polymer stereochemistry, step-growth and chain-
growth polymerization reactions, applications of
copolymers.
Prereq: Chem 254 or equivalent

Chem 354  (no longer given)
Applied Kinetics
Students wishing this type of course should
consider taking Chemical Engineering 331 -
Chemical Reaction Engineering.

Chem 355  F,W,S  2C  0.5
Physical Chemistry 3
Introduction to the microscopic description of
physical processes, laws governing electrons and
atoms and the properties of atomic and molecular
states, application to electromagnetic radiation
interacting with atoms and molecules producing
transitions between states.
Prereq: Chem 255 and Math 215 or equivalent.

Chem 355L  F,W,S  3L  0.25
Physical Chemistry Laboratory 1
Selected experiments for students taking Chemistry
355.

Chem 356  F  2C  0.5
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

Chem 356L  F  3L  0.25
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)
Chem 357  W  2C  0.5  
**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*

Chem 357L  W  3L  0.25  
**General Physical Chemistry Laboratory 2**  
Selected experiments for students taking Chemistry 357.

Chem 358  F,W  2C  0.5  
**Physical Chemistry 4**  
The statistical nature of large assemblies of atoms and molecules, kinetic theory of gases, transport processes, the collision theory and transition state theory of chemical kinetics.  
*Prereq: Chem 355*

Chem 358L  F,W  6L  0.5  
**Physical Chemistry Laboratory 2**  
Selected experiments for students taking Chemistry 358.  
*Prereq: Chem 355L*

Chem 359  W (even years only)  2C  0.5  
**Application of Chemical Thermodynamics**  
Partial molar quantities; Gibbs chemical potential and non-ideal systems; chemical equilibrium; theory of electrolytes.  
*Prereq: Chem 254 and 255. In years when Chem 359 is not offered, students should consider Ch E 330 or Ch E 510.*

Chem 360  F,W,S  T  0.5  
**Organic Chemistry 3**  
Stereocchemistry of organic compounds; conformational isomers, geometrical (cis-trans-) isomers, optical isomers and diastereomers. Introductory carbohydrate chemistry.  
*Prereq: Chem 264-364*  
(By correspondence only.)

Chem 361  W,S  T  0.5  
**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*  
(By correspondence only)

Chem 362  W (even years)  2C  0.5  
**Mechanistic Organic Chemistry**  
Simple molecular orbital theories and their use in organic chemistry. Effects of substituents and reaction conditions on the mechanism of organic reactions.  
*Prereq: Chem 364; Coreq: Chem 365*

Chem 363  W  2C  0.5  
**Applied Organic Chemistry**  
The organic chemistry involved in selected industrial processes will be discussed. Petroleum chemistry, synthesis of dyestuffs, pharmaceuticals, pesticides, organic polymers, etc.  
*Prereq: Chem 364 or 267*

Chem 364  F,W  2C,1T  0.5  
**Organic Chemistry 2**  
The treatment of organic chemistry in Chemistry 264 is continued and extended to aromatic compounds.  
*Prereq: Chem 264*

Chem 364L  F,W  6L  0.5  
**Organic Chemistry Laboratory 2**  
Selected experiments for students taking Chemistry 364.

Chem 365  F,W,S  2C  0.5  
**Organic Chemistry 3**  
Stereocchemistry and conformational analysis of organic molecules. Acidity and basicity. Formation and reactions of enolate anions with emphasis on their synthetic utility.  
*Prereq: Chem 364 or 267*

Chem 366  F  2C  0.5  
**Structural and Synthetic Organic Chemistry**  
Stereocchemistry of organic molecules; synthesis of selected organic compounds examined in detail with emphasis on cyclo-addition reactions and condensation reactions.  
*Prereq: Chem 267 or 364*

Chem 366L  F  3L  0.25  
**Organic Chemistry Laboratory**  
Selected experiments for students taking Chemistry 366.

Chem 367  W  2C  0.5  
**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 0.5

History of Chemistry
The development of chemistry will be traced from alchemy to the 20th century. The contributions of famous scientists to the concepts and models of modern chemistry will be emphasized.

Chem 409 W (odd years only) 2C 0.5

Solid State Chemistry
Packing in solids; metals, alloys and molecular crystals; ionic and covalent solids; chemical factors affecting crystal structures; properties of metals, semiconductors and molecular crystals.
Prereq: Chem 212 and 312 or 313

Chem 411 F 2C 0.5

Organometallic Chemistry
Prereq: Chem 312

Chem 416 W (odd years only) 2C 0.5

Applied Inorganic Chemistry
The chemistry of inorganic compounds and processes of industrial importance will be discussed. Inorganic polymers; catalysis by inorganic systems including nitrogen fixation, hydrogenation, hydroformylation. Synthesis and purification of metals.
Prereq: Chem 312

Chem 417 W (even years only) 2C 0.5

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.
Chem 312 or 313

Chem 419 W 2C 0.5

Biological Aspects of Inorganic Chemistry
Metalloproteins and other metal-containing biological molecules in hydrolytic enzymes; redox reactions; nitrogen fixation and oxygen transport; the role of alkali and alkaline earth metal cations.
Prereq: Chem 312 or 316

Chem 420 F 2C 0.5

Analytical Chemistry
Selected topics in modern analysis of inorganic materials such as rocks, ores, ceramics, metals and alloys; Atomic flame spectroscopic methods, analytical X-ray techniques, methods for ultra-pure materials, trace and micro determinations.
Prereq: Chem 221 or permission of instructor

Chem 421 W 2C 0.5

Spectrometric and Chromatographic Analysis
Techniques and fundamental principles of chromatography and mass spectrometry as applied to the identification of chemical compounds.
Prereq: Chem 221 and 264, or permission of instructor.

Chem 422 F 2C 0.5

Thermal and Electrical Analytical Methods
Techniques and fundamental principles of thermal and electroanalytical methods in current use.
Prereq: Chem 221 and Phys 243 or permission of instructor.

Chem 422L F 3L 0.25

Biochemistry 3 Laboratory
Selected experiments for Honours Biology and Chemistry students taking Chemistry 432.

Chem 432 F 2C 0.5

Biochemistry 3
Kinetics, stereospecificity, structure and function of enzymes, bio-energetics, oxidative phosphorylation.
Prereq: Chem 333

Chem 433W 2C 0.5

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.
Chem 312 or 313

Chem 423 W 2C 0.5

Biochemistry 4
Chemistry and biosynthesis of porphyrins. Metabolism of amino acids, purines and pyrimidines. Roles of vitamins in biochemical transformations. Respiration, muscular contraction.
Prereq. Chem 432

Chem 433L W 3L 0.25

Biochemistry 4 Laboratory
Selected experiments for Honours Biology and Chemistry students taking Chemistry 433.

Chem 434 W 2C 0.5

Applied Biochemistry
Chemistry and function of antibiotics; blood coagulation and related topics. Immuno-chemistry. Nutritional aspects of food.
Prereq. Chem 333

Chem 442 F (odd years only) 2C 0.5

Fundamentals of Quantum Mechanics
The postulates of quantum mechanics; review of quantum mechanics of hydrogen-like systems; angular momentum and simple coupling schemes; atomic spectroscopy; a discussion of multi-electron atoms as time permits.
Prereq. Chem 355
Chem 452  F  2C  0.5  
**Colloids, Liquid Crystals and Bilayer Chemistry**

The colloidal size range, the importance of the interface, classical studies on Brownian motion, light scattering, the micelle formation of detergents in water and solubilisation. Phase diagrams of soaps and lipids and their study by X-ray diffraction and NMR. The biological membrane as an entity of colloidal size. The related spectroscopy, microscopy, etc. of lyotropic liquid crystals and bilayers.
*Prereq: Chem 254 and 255*

Chem 453  W  2C  0.5  
**Polymer Properties and Polymerization**

Copolymerization, emulsion polymerization, ionic and coordinate polymerization, basics of polymerization process selection.
*Prereq: Chem 353 or equivalent*

Chem 454  F  2C  0.5  
**Surface Chemistry**

An introduction to the physical chemistry of surfaces. Qualitative and quantitative descriptions of surfaces and interfaces and the development of relevant techniques and theories. Application to surface tension, spreading, wetting, adsorption, and other interfacial phenomena.
*Prereq: Chem 254 and 255*

Chem 455  F  3C  0.5  
**Electrochemistry**

Electrolytic conductance and transport, thermodynamics of electrolytic cells. Reversible and irreversible electrode processes, metallic corrosion; study of selected industrial electromechanical processes.
*Prereq: Chem 254 or 356*

Chem 456  W  2C  0.5  
**Catalysis**

An introduction to heterogeneous catalysis. Examination of the physical manifestations of catalysis and the development of experimental techniques and theoretical methods for the measurement and elucidation of catalytic phenomena.
*Prereq: Chem 255*

Chem 457  W  1C,3L  0.5  
**Experimental Aspects of Polymer Science**

Selected experiments to illustrate polymerization, polymer properties and fabrication processes.
*Prereq: Chem 353 or equivalent*

Chem 458  W (odd years only)  2C  0.5  
**Quantum Chemistry**

The application of quantum mechanics to chemistry with emphasis on the investigation, correlation, and elucidation of chemical bonds and reactions.
*Prereq: Chem 355*

Chem 464  F  2C  0.5  
**Spectroscopy in Organic Chemistry**

Elucidation and identification of organic structures by contemporary spectroscopic techniques.
*Prereq: Chem 364*

Chem 465  W  2C  0.5  
**Special Topics in Organic Chemistry**

Topics will be selected from photochemistry, organometallics, synthesis, heterocyclics, natural products, molecular rearrangements. (May be taken in third and fourth year as 465A and 465B provided topics are different).
*Prereq: or coreq: Chem 365*

Chem 492  Y  9L  1.5  
**Advanced Laboratory**

9 hours laboratory. See Chem 492 co-ordinator for details. Normally, a cumulative Chemistry average of 70% or more is required to elect Chem 492. Year 4 Honours students not electing Chem 492 must take two additional 400-level Chemistry term courses plus one other term course approved by the Department Undergraduate Officer.
Department of Chemical Engineering

Professor, Chairman of Department
E. Rhodes, BSc Tech, MSc Tech, PhD (Manchester), Eng

Professor, Associate Chairman (Graduate Studies)
T. Z. Fahidy, BSc, MSc (Queen's), PhD (Illinois), PEng

Associate Professor, Associate Chairman (Undergraduate Studies)
G. S. Mueller, BASc (Waterloo), MSc, PhD (Manchester), PEng

Professor, Director of General Studies Programme
T. L. Ratke, BASc, MASc, PhD (Toronto)

Professors
J. J. Byerley, BASc, MASc (Toronto), PhD (Br. Col.)
K. S. Chang, BS (Hanyang Inst. Tech., Seoul), MSc, PhD (Northwestern)
A. A. Dullien, Dipl Ing (Budapest Technical University) MASc, PhD (Br. Col.), PEng
R. Y-M Huang, BSc (National Taiwan University), MASc, PhD (Toronto)
R. R. Hudgins, UE, BASc, MASc (Toronto) MA, PhD (Princeton)
M. Moo Young, BSc (London), MASc (Toronto), PhD (London), PEng
K. F. O'Driscoli, BChE (Pratt Inst.), MA, PhD Princeton
D. C. T. Pei, BEng (McGill), MSc (Queen's), PhD McGill
P. M. Raillay, UE, BASc (Toronto), DIC, PhD (London), PEng
A. Rudin, BSc (Alberta), PhD (Northwestern)
D. S. Scott, BSc, MSc (Alberta), PhD (Illinois), PEng
P. L. Silverston, BS, MS (MIT), Dr Ing (Munich), PEng
D. R. Spink, BS (Mich), MS (Rochester), PhD (Iowa State), PEng
G. A. Turner, BSc (London), PhD (Manchester)
B. M. E. van der Hoff, Ing (Amsterdam), Ir (Delft)

Professor Emeritus
A. H. Heatley, BSc, MA, PhD (Toronto)

Associate Professors
L. E. Bodnar, BA, MA (Sask.), PhD (McMaster)
C. M. Burns, BASc, MASc (Toronto), PhD (Polytechnic Inst., Brooklyn)
K. Enns, BASc, LLB, MASc, PhD (Toronto)
J. D. Ford, BEng (McGill), MASc, PhD (Toronto), PEng
C. E. Gall, BASc (Toronto), MSc (Queen's), PhD (Minn.), PEng
I. F. Macdonald, BEng (NSTC), PhD (Wisconsin)

G. L. Rempel, BSc, PhD (Br. Col.)
C. W. Robinson, BASc (Br. Col.), PhD (UC Berkeley)
J. R. Wynnyckyj, BEng (McGill), MASc, PhD (Toronto)

Assistant Professors
J. M. Scharer, BSc, PhD (Pennsylvania)

Faculty members having cross-appointments as shown
1Chemical Engineering and Philosophy
2Chemical Engineering and Chemistry
3Chemical Engineering, Management Science, and Statistics
4Chemistry and Chemical Engineering

Course Descriptions

Course Descriptions
Chemical Engineering

Ch E 100  F  3C,1T,6L for first 6 weeks  0.75
Introductory Engineering Concepts 1
An introduction to the basic methods and principles used by engineers in the analysis and design of physical processes: units, dimensions, and measurements; mass balances; behaviour of fluids. Laboratory on visual communication is included.

Ch E 101  W,S  3C,1T,3L  0.75
Introductory Engineering Concepts 2
An extension of the topics covered in Ch E 100: energy balances; Laboratory experiments illustrate the physical principles discussed.

Ch E 102  F  3C,1T  0.5
Chemistry for Engineers
Chemical principles with applications in engineering. Stoichiometric calculations, properties of gases, properties of liquids and solutions; gas phase chemical equilibrium, ionic equilibrium in aqueous solution, oxidation-reduction reactions, chemical kinetics.

Ch E 211  S,F  3C,2L  0.5
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.

Ch E 220  W,F  3C,1T  0.5
Applied Mathematics 1
Statistical frequency distributions, tests of significance, correlations, curve fitting, sampling theory, applications: errors, design of experiments.
Ch E 230  W,F  3C,1T  0.5  
Physical Chemistry 1
Introduction to physical chemistry. Ideal and real gases, the kinetic theory of gases, first law of thermodynamics, thermochemistry, heats of reaction, second law, chemical equilibria in simple systems, phase equilibria in simple systems, third law.

Ch E 231  S,F  3C,1T  0.5  
Physical Chemistry 2
Prereq: Ch E 220

Ch E 232  W,F  3C  0.5  
Inorganic Chemistry 1
Wave mechanics, atomic structure and the periodic table, chemical bonding, structural chemistry of elements and compounds, introductory transition metal chemistry, some thermodynamic aspects of inorganic chemistry.

Ch E 233  S,F  3L  0.5  
Physical Chemistry Laboratory
Experiments on viscosity of gases and liquids, chemical kinetics, adsorption, homogeneous and heterogeneous catalysis, thermochemistry, phase equilibria, diffusion, determination of molecular weight of polymers, training in technical report writing.

Ch E 315  W,F  6L  0.5  
Chemical Engineering Laboratory
Experimental application of physical and chemical principles using pilot scale equipment, experiments illustrating major unit operations (distillation, adsorption, extraction, drying, humidification).  
Prereq: Ch E 312

Ch E 320  W,S  3C  0.5  
Applied Mathematics 2
Gamma-Beta-, and error-functions; sine-, cosine-, exponential- and elliptic-integrals, linear differential equations; Wronskian, Green function; initial and boundary value problems; Bessel functions; Fourier series, integrals and transforms; orthogonal functions; Laplace transforms; applications.  
Prereq: Ch E 220

Ch E 330  W,S  3C  0.5  
Chemical Engineering Thermodynamics
Thermodynamics of flow processes, vapour power plants, internal combustion engines, liquefaction of gases, refrigeration and evaporation, chemical equilibria in chemical reactions, thermal pollution, the energy crisis, efficient energy utilization and thermodynamics.  
Prereq: Ch E 231

Ch E 331  W,F  3C  0.5  
Chemical Reaction Engineering
Homogeneous reactors; batch, CSTR, tubular flow systems, ideal models, residence time distributions in ideal reactors, temperature effects, steady states, semi-batch systems, nonideal behaviour.  
Heterogeneous catalysis: mass transfer effects; catalytic rate equations, fixed and fluidized bed reactors.  
Prereq: Ch E 231

Ch E 332  W,S  3C  0.5  
Inorganic Chemistry
Introductory electrochemistry; electrolysis, electrolytic conductance and transport, reversible electrode processes, irreversible electrode processes and electrode kinetics, electrochemical measurements and their analytical applications, chemistry of corrosion.  
Prereq: Ch E 232

Ch E 334  W,S  3L  0.5  
Instrumental Methods of Chemical Analysis
An introduction to modern analysis including optical, electrochemical, radiochemical, chromatographic and spectroscopic methods.
<table>
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<tr>
<th>Course Code</th>
<th>Type</th>
<th>Credits</th>
<th>Description</th>
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| Ch E 420   | S,F  | 3C 0.5  | Process Dynamics and Control 1  
Block and signal flow diagrams, proportional-integral-derivative controllers, frequency response techniques, analytical and graphical stability criteria. Introduction to modern control theory.  
Prereq: Math 216, Ch E 312, Ch E 320. |
| Ch E 422   | S,F  | 3C 0.5  | Engineering Economics  
Mathematics of annuities, mortgages, bonds and small loans; cost accounting, including direct costing, depreciation, taxes and financial statements, estimation of sales, capital and operating costs of a new process or product, study of criteria for the appraisal of capital expenditures, critical path method, linear programming. |
| Ch E 482   | S,F  | 3C 0.5  | Technical Seminar and Process Design  
Subject material from recent literature or industrial experience will be presented and criticized. Lectures on the sizing and costing of equipment, problems on the design of process components. |
| Ch E 501   | W    | 3C 0.5  | 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. |
| Ch E 502   | W    | 3C 0.5  | Fundamentals of Petroleum Production  
Background for understanding the physical principles involved and the terminology used in petroleum production. Fundamentals of surface chemistry (capillarity), characterization of and fluid flow through porous media. Principles of production performance, water flooding and enhanced recovery techniques. |
| Ch E 510   | S,F  | 3C 0.5  | Prediction of Physico-chemical Properties  
Methods of estimating physico-chemical properties of gases and liquids in cases where experimental values are absent. Prediction is usually based on correlations of a form suggested in part by theory, with empirical constants based on experimental data. |
| Ch E 515   | W    | 3C 0.5  | Two-Phase Flow Operations  
Introductory theory to one-dimensional two-phase flow: conventions, definitions, homogeneous theory, separated flow (Lockhart-Martinelli), particulate characterization and behaviour; applications: two-phase flow in pipes, boiling and evaporation filtration. |
| Ch E 517   | W    | 3C 0.5  | Performance of Separation Processes  
Introduction, patterns of change and computational approaches, group methods, limited flows and stage requirements, capacity and efficiency of contacting devices, energy requirements, selection, optimal design and operation, mass transfer with chemical reaction. |
| Ch E 520   | W,F  | 3C 0.5  | Chemical Engineering Analysis  
Application of advanced mathematical techniques to the analysis of chemical engineering processes.  
Prereq: Permission of instructor |
| Ch E 521   | W    | 3C 0.5  | Process Dynamics and Control 2  
Analog computation, time domain analysis, control of complex chemical systems.  
Prereq: Ch E 420 |
| Ch E 523   | W    | 4L 0.5  | Process Control Laboratory  
Experiments on process dynamics, control and analog simulation of chemical processes. Time constant, step and frequency response, controller settings, cascade control of thermal, liquid level, and reaction systems.  
Prereq: Ch E 420 |
| Ch E 540   | S,F  | 3C 0.5  | Introduction to Polymer Science  
Basic concepts of polymer chemistry, classification of polymers, introductory physical chemistry of polymers, organic chemistry of polymerization reactions of polymers, naturally occurring polymers. |
| Ch E 541   | W    | 3C 0.5  | Physical Chemistry of Polymers  
Polymer solutions, molecular characterization of polymers, molecular weight distributions, morphology and crystallinity in polymers, reaction kinetics and mechanism of addition and condensation polymerization.  
Prereq: Ch E 540 |
| Ch E 543   | W    | 3L 0.5  | Polymer Laboratory  
Experimental studies of polymerization and physical properties of polymers: condensation and addition polymerization, copolymerization, molecular weight, extrusion rheology, etc.  
Coreq: Ch E 541 |
Course Descriptions
Chemical Engineering

Ch E 550  S,F  3C  0.5
Introduction to Extractive Metallurgy
Physical and chemical nature of ores and intermediates, introductory pyrometallurgy, hydrometallurgy and electrometallurgy, survey of extraction processes, application of the principles of thermodynamics and kinetics to metallurgical processes.

Ch E 551  W  3C  0.5
Metallurgical Chemistry
Ionic equilibria, thermodynamics and kinetics of reactions in solution, bonding, stability and stereochemistry of coordination compounds and mechanisms of their reaction, introductory hydrometallurgy, corrosion and homogeneous catalysis.

Ch E 553  W  3C  0.5
Principles of High Temperature Extractive Metallurgy
In-depth discussion of several processes of importance in Canada: blast-furnace smelting (iron, lead, zinc), steel making and other specialized refining processes, pyrometallurgical treatment of sulfide ore, and fused salt electrolysis. The emphasis is on the interplay of the underlying thermodynamic, kinetic, transport, and process-engineering considerations.

Ch E 560  S,F  3C  0.5
Introduction to Biochemical Engineering
Aspects of the life sciences of interest to the biochemical industries and to environmental pollution. Classification and growth characteristics of microorganisms. Physico-chemical properties of biological compounds. Metabolism and biochemical kinetics. Course includes some lab work.

Ch E 561  W  3C  0.5
Fermentation Operations
Application of process engineering principles to the design and operation of fermentation reactors which are widely used in the pharmaceutical, food, brewing, and waste treatment industries. Aspects of mass transfer, heat transfer, mixing, and rheology with biochemical and biological constraints. Course includes some lab work.
*Prereq: Ch E 560 or permission of instructor.*

Ch E 563  W  3C  0.5
Food Processing
Applications of unsteady and steady state heat and/or mass transfer operations to processing natural and texturized foods. Design and analysis of sterilization, low temperature preservation, concentration, separation and purification processes. Effects of formulation, additives and processing on organoleptic and nutritional quality.
*Prereq: Ch E 560 or permission of instructor.*

Ch E 570  W,F  3C  0.5
Air Pollution
Treatment of gaseous waste products from representative Canadian industries; characterization and toxicity of filtration, scrubbing, cycloning, electrostatic precipitation, and other chemical treatment, legal, socio-political, economic and engineering aspects.

Ch E 571  W  3C  0.5
Water Pollution
Treatment of waste water from metals processing industries; waste characterization; toxicity; recycling; treatment by electro-oxidation/reduction, ion exchange, solvent extraction, absorption, electrodialysis, reverse osmosis, etc; economics, regulations, moral, legal, social and political implications.

Ch E 580  S,F  6L  0.5
Research-Design Project 1
Individually supervised research and/or design project on any Chem Eng subject chosen by the student-professor group. Written report required.

Ch E 581  W  12L  1.0
Research-Design Project 2
Continuation of Ch E 580
Equivalent to two one-term courses. A written report, meeting minimum technical report standards, and a public oral presentation will be required.

Ch E 583  W  2T,4L  0.5
Process System Design
The undergraduate curriculum is brought together to accomplish, by team effort, the basic objective of the process engineer: the design of an integrated process. A written report, meeting minimum technical report standards, and a public oral presentation will be required.

Ch E 585  W  6L  0.5
Technical Elective Project
An individually supervised research or design project, based on one of the technical elective courses taken in the 4A term. A written report, meeting minimum technical report standards, and a public oral presentation will be required.

Ch E 007  W,S,F  1C  0
General Awareness Seminar
Informal discussions on the Chem Eng Programme.
# Department of Civil Engineering

**Professor, Chairman of the Department**  
W. C. Lennox, BASc, MSc (Waterloo), PhD (Lehigh), PEng

**Professor, Dean of Engineering**  
W. A. McLaughlin, PEng (Sask.), MS, PhD (Purdue) PEng

**Professor, Associate Dean of Engineering**  
H. H. E. Leipholz, Dip/Eng, Dr. Ing, Docent Habil (Stuttgart), PEng. Recipient of the Distinguished Teacher Award

**Professor, Associate Chairman, Graduate Studies**  
S. T. Ariaratnam, BSc (Eng.) (Ceylon), MSc (London), PhD (Cambridge)

**Professor, Associate Chairman, Undergraduate Studies**  
D. E. Grierson, BASc, MASc, PhD (Waterloo), PEng

**Professors**

- E. F. P. Burnett, BSc (Capetown), DIC, MS, PhD (London), PEng (on leave of absence)
- M. Z. Cohn, CSc (Bucharest), PEng
- G. J. Farquhar, BASc (Waterloo), PhD (Wisconsin), PEng
- G. M. L. Gladwell, BSc, PhD, DSC (London)
- R. Green, BSc (Eng.) (London), MSc (Queen’s), MSc (Waterloo), PhD (Texas), PEng
- R. C. G. Haas, BSc, MSc (Alberta), PhD (Waterloo), PEng
- V. K. Handa, BSc (Calcutta), BSc (Eng.) (London), MSc (Queen’s), MSc, PhD (Waterloo), PEng
- B. G. Hutchinson, BE (Sydney), MSc (Queen’s), PhD (Waterloo), PEng
- 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 (Banasar Hindu Univ.), PhD (Cambridge)
- J. Roorda, BASc (Waterloo), PhD (London), PEng
- J. Schroeder, BEng, MEng (McMaster), PhD (Waterloo), PEng
- A. N. Sherbourne, BSc (London), MS (Lehigh), MA, PhD (Cambridge), PEng
- J. Shortreed, BEngSc (W. Ont.), MSc (Queen’s), PhD (Northwestern), PEng
- S. I. Solomon, CivHyd Eng (Bucharest), PhD (City Univ., London), PEng
- T. H. Topper, BASc (Toronto), PhD (Cambridge), PEng
- T. E. Unny, BE (Madras), MTech (Kharagpur), Dr Ing (Dresden), PEng

**Associate Professors**

- R. W. Cockfield, BSc, MSc (Queen’s), PhD (Waterloo), PEng
- N. Kouwen, BASc, PhD (Waterloo), PEng
- B. LeLievre, BEng (West Australia), MSc, PhD (Waterloo), PEng
- E. L. Matyas, BASc (Toronto), DIC, PhD (London), PEng
- E. A. McBean, BASc (Br. Col.), SM, PhD (MIT), PEng
- R. M. Schuster, BS, MS (North Dakota State), PhD (Iowa State), PEng
- K. N. Smith, BASc (Toronto), MSc (Illinois), PhD (Waterloo), PEng
- J. C. Thompson, BASc (Toronto), MS, PhD (Illinois), PEng
- S. Yagar, BASc, MASc (Toronto), PhD (California), PEng

**Assistant Professors**

- F. F. Saccomanno, BSc, MCP (Manitoba), PhD (Toronto)
- J. F. Sykes, BASc, MASc, PhD (Waterloo), PEng

**Adjunct Professors**

- P. M. Allen
- T. A. Brookes, BASc (Toronto), LLB (Osgoode Hall), PEng
- H. J. Edens, MSc (Deift), MA Economics (York), PEng
- D. A. Godden, BASc (Toronto), LLB (Osgoode Hall) LLM (York)
- D. T. McClurkin, Chartered Accountant
- N. W. McLeod, BSc (Alberta), MSc (Sask.), ScD (Michigan), PEng
- W. R. Petri, DiplEng (Berlin), PEng
- D. W. Schnurr, BASc (Toronto), LLB (Osgoode Hall), PEng
- O. Stradal, CE, DSc (Prague)

**Faculty members holding cross-appointments as shown**

- *Architecture and Civil Engineering*
Course Descriptions

Civil Engineering

Civ E 110 W 3C 0.5
Urban Transport Problems and Prospects
Overview of urban development and role played by transport. Dimensions of current issues such as congestion, travel equity, pollution and energy consumption. Transport demands and relation to land use. Transport planning options; transport technology, general development options. Not intended for civil engineering students at any level.
Not recommended for first year students.

Civ E 116 W,S 2C,4L/T 0.75
Engineering Concepts 2
A continuation of Gen E 115 with applications of graphics, measurement and other analytic principles to introductory problems in the various disciplines of Civil Engineering; an introduction to engineering design methods as applied to Civil Engineering and including specification development, information-gathering, concept formulation, feasibility analysis and report writing.
Year 1 Engineering

Civ E 200 S,F 2C,3T 0.5
Civil Engineering Project 1
Functional designs of standard civil engineering structures. The creation and evaluation of alternative geometric configurations in accordance with user requirements. Informational content of previous courses is augmented with lectures on typical civil engineering problems and solutions.

Civ E 203 F,W 3C,2T 0.5
Statics

Civ E 204 F,W 3C,2T 0.5
Dynamics
An introduction to the Kinematics and Kinetics of particles and rigid bodies. Kinematics of particles; Kinetics of particles; Newton's Second Law; energy and momentum; impulsive motions; systems of particles. Kinematics of rigid bodies; plane motion of rigid bodies; equations of motion; energy and momentum; impulsive motions.

Civ E 205 F,S 3C,2T 0.5
Mechanics of Deformable Solids 1
Introduction of the concepts of stress and strain. Stress-strain relations for linearly elastic materials; Analysis of the response of prismatic members to axial, shearing, flexural and torsional loads; strain energy, failure hypotheses; instability in columns.

Civ E 221 F,W 3C,2T 0.5
Calculus

Civ E 222 F,S 3C,2T 0.5
Differential Equations

Civ E 224 F,W 3C,2T 0.5
Probability and Statistics

Civ E 265 F,W 3C,3L/T 0.5
Structure and Properties of Materials

Civ E 280 F,S 3C,2L/T 0.5
Fluid Mechanics
An introductory course in fluid mechanics. Fluid properties, fluid statics; Bernoulli equation; the momentum equation and applications; laminar and turbulent flow; closed conduit flow; pipe network analysis; unsteady flow in pipes.

Civ E 291 1 wk fld lab 0.5
Survey Camp
A one-week course in surveying. Introduction to surveying, length measurements, levelling, transit surveys. Approximate cost to each student $60.

Civ E 292 F,W 3C,2T 0.5
Engineering Economics
An introductory course on the principles of engineering economy. Basic concepts; capital; interest formulas and derivations; annual worth comparisons; present worth; return on investment; benefit-cost ratio; depreciation effect on taxes.
Course Descriptions
Civil Engineering

Civ E 294  F.S  3C,2T  0.5
Thermal Sciences
An introductory course in thermal science. Provides an understanding of thermodynamic principles as well as engineering aspects of heat transfer including applications to practical engineering problems.

Civ E 298  F.W  1S  0.0
Civ E 299  S,F  1S  0.0
Seminar
The engineer in society. Principles, methods and practice of Civil Engineering. Informal lectures.

Civ E 300  F.W  2C,3T  0.5
Civil Engineering Project 2
Projects ranging from feasibility studies to detailed designs by student teams. Each team member is responsible for a definable portion of a project. The work of the individual is integrated with other team members to produce a complete solution described in a report containing all appropriate calculations and schematics. Particular emphasis is placed on the utilization and integration of knowledge acquired in the more specialized courses, augmented with lectures on project administration.

Civ E 303  W.S  3C,2T  0.5
Structural Analysis 1

Civ E 304  F.W  3C,2T  0.5
Structural Analysis 2

Civ E 306  F.W  3C,2T  0.5
Mécaniques de Deformable Solids 2
An advanced course in mechanics of solids. Torsion of non-circular sections, hollow section; Warping of cross-sections; Membrane Stresses in shells; bending of flat plates; beams on elastic foundations; buckling of columns, arches, beams and plates.

Civ E 313  W,S  3C,2T  0.5
Structural Concrete Design 1

Civ E 342  W,S  3C,2T  0.5
Transport Engineering 1
Urban road traffic stream properties: Behaviour of signaled intersections. Road classification: Network flows: Spatial interaction models; Trip generation: Modal choices analysis.

Civ E 343  W,S  3C,2T  0.5
Transport Engineering 2
Modes of Transport in Canada. Trends in use. Role of Civil Engineering profession. Highway transport; Railway transport; Air transport; Water pipeline characteristics; Arctic transport; Multi-modal planning studies.

Civ E 344  F,W  3C,2T  0.5
Urban and Regional Engineering
Natural system behaviour; Man’s impacts on ecosystems; Current environmental issues in Canada; Canadian urban system; Trends in resource consumption and waste production; Population forecasting; Economic forecasting; Urban spatial structure; Regional water management; Sources of water supply; Spatial aspects of network design; impacts of urbanization on hydrological regimes; Interactions with natural systems.

Civ E 353  W,S  3C,3L,1T  0.5
Soil Mechanics
An introduction to geologic processes; subsurface exploration; classification systems; weight-volume relationships; soil mechanics principles including state of stress, ground water flow, consolidation and shear strength.

Civ E 354  F,W  3C,2T  0.5
Foundation Engineering
A course in foundation engineering; earth pressure theories; retaining walls; anchors; shallow and deep foundations; braced trenches and excavations; slope stability.
Civ E 375  F,W  3C,2L/T  0.5
Sanitary Engineering
Introduction to Sanitary engineering. Water quality; Waste disposal; Water and wastewater treatment; physical treatment processes; chemical treatment processes; biological treatment processes; sludge handling; advanced treatment processes.

Civ E 381  W,S  3C,2T  0.5
Hydraulics
Introduction to hydraulics. Dimensional analysis, hydraulic modelling; Turbo machinery, pumps and turbine characteristics; Open channel flow; Reservoir operation; Hydraulic structures; Unsteady flow; Gradually varied flow.

Civ E 383  F,W  3C,2T  0.5
Water Distribution and Collection Systems
Water requirements; water and waste volumes; water storage. Water supply and distribution systems, computer models; Urban hydrology, storm sewers, flood routing; Wastewater collection, sanitary sewers, Hydraulics of treatment works.

Civ E 398  W,S  1S  0.0
Civ E 399  F,W  1S  0.0
Seminar
The engineer in society. Principles, methods and practice of Civil Engineering. Informal lectures.

Civ E 400  W  1C,3T  0.5
Civil Engineering Project 3
The purpose is to provide the students with an opportunity to demonstrate their capacity to engage in the practice of civil engineering as a profession. The students are encouraged to independently identify and resolve a problem within the scope of their chosen area of specialization, utilizing knowledge gained from their academic and employment experiences.

Civ E 403  F,S  3C,2T  0.5
Structural Analysis 3
Approximate methods of analysis for a variety of structural forms. Application of approximate techniques to beams, building frames, shear wall structures, plates, buckling and vibration problems. Approximate structural design.

Civ E 404  W  3C,2T  0.5
Structural Analysis 4
Matrix and computer methods of structural analysis. Application of the force and displacement methods of analysis to space frameworks, nonlinear structures and continuum discretized into finite elements.

Civ E 405  W  3C,2T  0.5
Structural Dynamics and Stability
Dynamics of discretized structures. Free and forced vibrations of single and multidegree of freedom systems. Impact. Flexural vibrations of beams and plates. Static and dynamic instability of beams, shafts and frames.

Civ E 413  F,S  3C,2T  0.5
Structural Steel Design

Civ E 414  F,S  3C,2T  0.5
Structural Concrete Design 2
Sectional design principles; Element and member design; Prestressed concrete elements; Slab systems; Building systems; Elements of bridge design.

Civ E 415  W  3C,2T  0.5
Structural Systems

Civ E 430  W  3C,3L  0.5
Experimental Mechanics
Principles and techniques of experimental determination of responses of engineering structures to mechanical, thermal and wind loads, in real and simulated conditions. Foundations of modelling, observations and measurements. Selected experimental techniques: strain gauges, photo-elasticity, holography, dynamic techniques, thermoelectricity, moire.

Civ E 440  F,S  3C,2T  0.5
Urban Traffic Management

Civ E 442  W  3C,2T  0.5
Pavement Structural Design
Pavement Design, Soil identification, subgrade design, base courses, flexible pavement design, design and testing of asphaltic concrete mixes, surface treatments.
Civ E 444  W  3C,2T  0.5
Urban Transport Planning
Application of concepts of CE 342, 343, 344 to
typical urban transportation planning situations.
Urban transit, a regional shopping activity centre, a
major housing development considered using case
studies. Methods of earlier courses linked to typical
real life problems.

Civ E 453  F,S  3C,2T  0.5
Engineering Geology
A course in engineering geology; engineering
properties and characteristics of typical landforms,
sounds, rocks, and ground water regimes; introduction
to earthquake resistant design and air-photo
interpretation.

Civ E 454  W  5T  0.5
Geotechnical Engineering
This course simulates geotechnical consulting
practice. Students are exposed to real situations
which require problem identification, evaluation of
grotonal data, analysis, design and report
preparation.

Civ E 472  F,S  3C,2T  0.5
Wastewater Treatment
Introduction to wastewater treatment. Wastewater
quantity; Wastewater characteristics; Primary
treatment; Secondary treatment; Sludge treatment
and disposal; Industrial wastewater management.
Design project.

Civ E 473  W  3C,2T  0.5
Pollution in the Aquatic Environment
Mathematical modelling of transport phenomena in
rivers, estuaries and lakes. Data collection and
analysis. Thermal pollution. Non-point source
contributions to pollution. Management problems.
Ecological modelling.

Civ E 480  W  3C,2T  0.5
Basic Principles of Water Resources
A course on water resource management problems
in Canada. Descriptions of basic areas of water
resource management. Modelling of water resource
systems. Application of systems analysis and
operational research techniques in water resource
management. Benefit-cost analysis. Social, political,
legal and ecological considerations.

Civ E 486  F,S  3C,2T  0.5
Hydrology
An introduction to hydrology, the hydrologic cycle;
Runoff phenomena; River basin characteristics;
Statistical and probability analysis of hydrologic
data; Time series analysis; Non-stationary aspects of
hydrology; Forecasting.

Civ E 491  W  3C,2T  0.5
Engineering Law
General Introduction to Law and Common-Law Legal
Systems; Formation of Contracts, Effects of
Mistakes on Contracts, Interpretation of Contracts,
Breach of Contracts, Legal Remedies; Scope and
Content of Technical Specifications; Sale of Goods;
Introduction of the Law of Agency; the Tort of
Negligence, Professional Negligence; Some Aspects
of Restrictive Trade Practices; Introduction to Patent
Law.

Civ E 493  W  4C  0.5
Engineering in the Canadian North
Introduction to the technical, ecological and
sociological problems associated with construction
in the Canadian North. Major topic areas are
transportation, water supply, foundations and
structures. Specific topics include engineering and
feasibility studies for railways, pipelines, natural
resource explorations, vehicle development and
marine anchorages.

Civ E 496  F,S  3C,2T  0.5
Project Management
Introduction to project management. The project
management function. Function of the project
manager. Construction projects. Network systems.
Critical path. Network crashing. Project resource
allocation.

Civ E 497  W  3C,2T  0.5
Engineering Analysis and Modelling
Analysis, optimization and modelling techniques
with emphasis on applications to engineering
problems: linear programming and optimization;
state space representation of dynamic systems;
Laplace transform methods; computational methods
for engineering analysis; least squares estimation;
optimal mathematical models for physical systems.

Civ 498/499  S,F,W  1S/S  0.0/0.0
Seminar
The engineer in society. Principles, methods and
practice of Civil Engineering. Informal lectures.
Department of Classical Studies

Associate Professor and Chairman of the Department
P. Forsyth, AB (Mount Holyoke), MA, PhD (Toronto)
Recipient of the Distinguished Teacher Award

Professors
P. Keresztes, MA (Toronto), PhD (Graz)
D. C. Mackenzie, BA, MA, PhD (Princeton)

Assistant Professors
S. B. P. Haag, BA, MA (Queen's), MA (Waterloo)
MPhil (Toronto)
R. L. Porter, BA (McMaster), MA, PhD (Princeton)

Adjunct Faculty at Wilfrid Laurier University
H. A. MacLean, BA (McMaster), MA, PhD (Wisconsin)
D. W. Roller, BA, MA (Oklahoma), PhD (Harvard)
G. P. Schaus, BA, MA (Dalhousie), PhD (Pennsylvania)
J. Zeyl, BA, MA (Toronto), PhD (McMaster)

Course Descriptions

Classical Civilization (Courses in Translation)

C Civ 101 F 3C 0.5
Colossos - The Major Figures of Ancient Greece
An introductory study of the achievement of ancient Greece through some of its most prominent figures. Each year 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 S,W 3C 0.5
Colossos - The Major Figures of Ancient Rome
An introductory study of the achievement of ancient Rome through some of its most prominent figures. Each year two of the following will be featured: 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 3C 0.5
Ancient Greek Society
A survey of the civilization of Classical Greece, featuring such topics as the individual (male and female), political institutions, art, religion, philosophy, literature, social life and leisure activities.

C Civ 202 W,S 3C 0.5
Ancient Roman Society
A survey of the civilization of the Roman Republic and Empire, featuring such topics as the individual (male and female), political institutions, art, religion, philosophy, literature, social life and leisure activities.

C Civ 251 F 3C 0.5
Greek History
A survey of ancient Greece, emphasizing its political, military, social and economic aspects. This course is acceptable for credit by the History Dept.

C Civ 252 W 3C 0.5
Roman History
A military, political, social, economic survey of Rome from earliest times to the Empire’s fall. This course is acceptable for credit by the History Dept.

Note
With regard to the preceding two courses, Classical Civilization 251 - Classical Civilization 252, the Classics Division will accept History 237/238 as an alternative for a Classical Civilization credit. But a student may not take both History 237/238 and C Civ 251-C Civ 252.

C Civ 255 W 3C 0.5
Mediaeval Civilization
A study of mediaeval literature, art, architecture, music and other expressive forms. The period from late antiquity to the high middle ages will be studied.

C Civ 256 Mediaeval Civilization
Not offered 1980-81.

C Civ 265 F 3C 0.5
Classical Verse in Translation 1
Greek and Roman Epic and Early Tragedy: a study of the evolution of ancient epic from Homer to Vergil. The beginnings of the art of tragic drama will be studied through the plays of Aeschylus.

C Civ 266 W 3C 0.5
Classical Verse in Translation 2
Tragedy and Comedy: a study of Classical Greek tragic drama, featuring the plays of Sophocles and Euripides. The art of Greek comedy will be examined through the plays of Aristophanes. Roman dramatic art will be studied through the plays of Seneca and Plautus. (Same as Drama 251)

Note
Drama majors in this course will normally be required to do additional work on Aeschylus.
Course Descriptions
Classical Studies

C Civ 271 F 3C 0.5
Myths of the Gods, the World and Man
A survey of Greek and Roman myths concerning such topics as the birth of gods; the creation of the world; various divine dynasties; Zeus' struggles for supremacy; the twelve Olympians; Prometheus and the Fall; the Flood; and the Ages of men.

C Civ 272 W 3C 0.5
Ancient Legends, Heroes and Mystery Religions
Legends of the great Houses of the ancient world such as Mycenae, Troy, Thebes; of heroes, such as Achilles, Odysseus; of the Argonauts; of the sons of gods. Mystery religions, such as that of Mithras, will be discussed together with their relationship to Christianity.

C Civ 283 F 3C 0.5
History of Ancient Philosophy 1
From the beginnings to Plato. (Same as Phil 280)

C Civ 284 W 3C 0.5
History of Ancient Philosophy 2
From Aristotle to the close of classical antiquity. (Same as Phil 281)

C Civ 351 F 3C 0.5
Greek Art and Architecture
A survey of the art and architecture of the ancient Greek world from the Minoan to the Hellenistic periods. (Same as Fine Arts 310)

C Civ 352 W 3C 0.5
Roman Art and Architecture
A survey of the art and architecture of the Roman world from Etruscan to imperial times.

C Civ 366 Ancient Lyric and Satire in Translation
Not offered 1980-81.

C Civ 371 Christianity and the Roman Empire 1
Not offered 1980-81.

C Civ 372 Christianity and the Roman Empire 2
Not offered 1980-81.

C Civ 381 From Diocletian to Constantine
Not offered 1980-81.

C Civ 382 Constantine the Great
Not offered 1980-81.

C Civ 384 Science and Technology of Ancient Greece and Rome
Not offered 1980-81.

C Civ 401 W 2S 0.5
Atlantis: The Making of Myth
A study, through the Atlantis legend, of how ancient myths arose and developed. Topics include: the Platonic account of Atlantis; theories of lost continents; concepts of utopia in the ancient world; Minoan Crete as a possible prototype for Atlantis; the destruction of Minoan civilization through the eruption of Thera.
Prereq: C Civ 251 or C Civ 351 or C Civ 271 or 272; or consent of instructor.

C Civ 480 Greek Civilization and History
Not offered 1980-81.

C Civ 490 Y 2S 1.0
Roman Civilization and History
Senior Seminar. An intensive study of various problems and aspects of Roman civilization and history. (Same as History 400).

C Civ 492-498
Senior Seminars
By arrangement with the Department, an individual student or a small group of students will follow a course of study under the supervision of a faculty member.

Greek

Grk 100 Y 3C 1.0
Introductory Ancient Greek
A course designed for students beginning the study of ancient Greek or who have not yet reached the level expected in Greek 251. The aim is to attain as rapidly as possible the ability to read simple prose. The emphasis is on forms and structure; reading of connected passages will begin early in the first term.

Grk 251 Greek Composition and Grammar
Not offered 1980-81.

Grk 252 Introduction to Homer
Not offered 1980-81.

Grk 261 F 3C 0.5
Introduction to Attic Prose
Selections from the works of Plato.

Grk 271 W 3C 0.5
Hellenistic and Later Greek Literature
Selections from Christian and pagan writers.

Grk 351 F 2C 0.5
Advanced Composition and Grammar
Intensive study of Greek language and style through composition and translation.
Prereq: Grk 251; or consent of instructor.
Grk 361 W 3C 0.5
The Drama of Euripides
An examination of the dramatic art of Euripides through translation of at least one play and reading of others in translation.
Prereq: one full 200 level Greek course; or consent of instructor.
Offered 1980-81 at Wilfrid Laurier University.

Grk 362 The Drama of Sophocles
Not offered 1980-81

Grk 371 F 3C 0.5
Introduction to the Greek Historians
Selections from Xenophon and others.
Prereq: one full 200 level Greek course; or consent of instructor.
Offered 1980-81 at Wilfrid Laurier University.

Grk 372 W 3C 0.5
Herodotus
Selections from the Persian Wars.
Prereq: Grk 371; or consent of instructor.
Offered 1980-81 at Wilfrid Laurier University.

Grk 452 2S 0.5
Homer
An intensive study of the Iliad.
Prereq: one full 300 level Greek course, or consent of instructor.
Offered 1980-81 at Wilfrid Laurier University.

Grk 461 The Drama of Aeschylus
Not offered 1980-81.

Grk 462 The Comedy of Aristophanes
Not offered 1980-81

Grk 471 Thucydides
Not offered 1980-81

Grk 481 The Philosophy of Plato
Not offered 1980-81.

Grk 482 The Philosophy of Aristotle
Not offered 1980-81

Grk 490-499 0.5
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.

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 151 F 3C 0.5
A Survey of Latin Literature 1
A general survey of Latin prose and poetry from its origins to the beginning of the Roman Empire. The literary achievement of Rome will be examined mainly through selections in Latin with occasional readings in translation.
Prereq: Grade 13 Latin, Lat 100; or consent of instructor.

Lat 152 W 3C 0.5
A Survey of Latin Literature 2
A general survey of Latin prose and poetry from the beginning to the fall of the Roman empire; a continuation of Lat 151.
Prereq: Lat 151; or consent of instructor.

Lat 251 F 3C 0.5
Latin Composition and Grammar
Composition, translation, basic grammar with intensive analysis of selected works.

Lat 261 Latin Prose 1
Not offered 1980-81.

Lat 262 F 3C 0.5
Latin Prose 2
Selections from Livy and Suetonius
Offered 1980-81 at Wilfrid Laurier University.

Lat 272 W 3C 0.5
An Introduction to Vergil
Selections from the works of Vergil.

Lat 281 Latin Poetry 1
Not offered 1980-81.

Lat 282 Latin Poetry 2
Not offered 1980-81.

Lat 352 The History of the Latin Language
Not offered 1980-81

Lat 361 Cicero
Not offered 1980-81.
Course Descriptions

Dance

Lat 362  W  3C  0.5
Lucretius
Selections from the *De Rerum Natura*. 
Offered 1980-81 at Wilfrid Laurier University.

Lat 363  Roman Comedy
Not offered 1980-81.

Lat 371  F  3C  0.5
An Introduction to the Roman Historians
Selections from Sallust and Livy; a study of the development of Roman historiography.
Offered 1980-81 at Wilfrid Laurier University.

Lat 372  W  3C  0.5
Tacitus
Selections from the works of Tacitus.
Offered 1980-81 at Wilfrid Laurier University.

Lat 381  F  3C  0.5
Mediaeval Latin 1
Selections from the works of the fourth to the twelfth centuries A.D.

Lat 382  W  3C  0.5
Mediaeval Latin 2
Selections from the works of the twelfth century to the Renaissance.

Lat 461  Vergil 1
Not offered 1980-81.

Lat 462  Vergil 2
Not offered 1980-81.

Lat 471  Roman Elegy
Not offered 1980-81.

Lat 481  Roman Satire 1
Not offered 1980-81.

Lat 482  Roman Satire 2
Not offered 1980-81.

Lat 491-494  0.5
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.

Dance Group

Assistant Professor, Chairman of Dance Group
R. Priddle, BPHE (Toronto), MSc (Springfield), MA (Waterloo)

Dean, Faculty of Human Kinetics and Leisure Studies
G. S. Kenyon, BPE (Br. Col.), MS (Indiana), PhD (NYU)

Assistant Professor and Undergraduate Officer
J. Officer, ARAD (Adv. and ATC) (London)
Recipient of the Distinguished Teacher Award.

Assistant Professor
R. Ryman, BA (York), MA (York)

Lecturers
D. Taplin, BA (Bennington), MFA (York)

Instructors
V. Galea, BSc (Waterloo)
D. King Leslie

Course Descriptions

Dance 110  F  2C,2T  0.5
Introduction to the Dance
Introduces the student to a broad perspective of Dance, (functional and expressive) in Western society and other societies. Emphasis on Work of Art in Western society.

Dance 111  W  2C,2std  0.5
The Elements of Dance
Discussion and experience in the material, content and form of a work of art. Studio. Problem solving in space, dynamics and rhythm.
Prereq: Dance 110 or consent of instructor

Dance 220  W  3C  0.5
Socio-cultural Study of Western Dance
Development and significance of dance as a social phenomenon in Western Society.
Prereq: Soc 101
Offered alternate years

Dance 221  W  3C  0.5
Socio-cultural Study of Non-Western Dance
Development and significance of dance as a social phenomenon in non-Western Society.
Prereq: Soc 101 or Anth 102A
Offered alternate years
Course Descriptions
Dance

Dance 225 W 2C,2std 0.5
Dance Ethnology
Study of works of art in non-Western cultures, i.e. India, Japan, China, Africa.
Prereq: Anth 102A or consent of instructor.
Offered alternate years.

Dance 230 F 2C,2std 0.5
Roots of Western Theatrical Dance
History and cultural significance of dance up to and including Fokine and Duncan.
Prereq: for Dance students: Hist 105 or consent of instructor.

Dance 231 W 3C 0.5
History of Ballet in the Twentieth Century
A study of the factors affecting the Ballet in the 20th century from the advent of the Russians in Paris in 1909 to the influence of contemporary dance in recent years.
Prereq: Dance 230

Dance 233 W 3C 0.5
A History of Modern Dance
This course examines the major choreographic innovators who have philosophically and stylistically shaped the Modern dance idiom.
Prereq: Dance 230

Dance 241 F 3C 0.5
Benesh Notation 1
A theoretical and practical introduction to Benesh Notation.
Prereq: 2 courses in Dance Technique

Dance 242 Labanotation 1
Not offered Fall 1980

Dance 336 F 3C 0.5
Philosophy and Criticism Part 1
This course will examine the literature of Dance Criticism historically and stylistically and cultivate some practical skills in writing dance criticism through various class exercises and performance reviewing.
Prereq: Dance 231 or 233

Dance 337 W 3C 0.5
Philosophy and Criticism Part 2
This course examines the writings of various philosophers on the subject of dance; various aesthetic theories and their application to dance; and aesthetic issues that arise in dance specifically.
Prereq: Phil 331 or Phil 33J or consent of instructor.
Offered alternate years

Dance 341 W 3C 0.5
Benesh Notation 2
This course examines the basic theoretical concepts of the Benesh system for the graphic notation of human movement. Emphasis is given both to the reading and writing of notated dance scores, especially ballet scores.
Prereq: Dance 241

Dance 342 Labanotation 2
Not offered Winter 1981.

Dance 346 Applied Movement Analysis (Part 1)
Not offered Winter 1981.

Dance 347 W 3C 0.5
Applied Movement Analysis (Part 2)
A theoretical and practical study of dance movements utilizing qualitative biomechanical analysis.
Prereq: Dance 346 and Kin 321.

Dance 351 Ballet Choreography
Not offered Winter 1981

Dance 353 W 2C,2std 0.5
Modern Dance Composition
Analysis and study of the themes and styles of contemporary Modern dance. Through film and studio experience, consideration is given to experimental choreographic techniques and the trends for future dance.
Prereq: Dance 111, Dance 233 and Dance 394.
Offered alternate years.

Dance 364 F 2C,2T 0.5
Developmental Aspects of Movement
A study integrating the cognitive and perceptual developments in children and adolescents as they relate to motor development. Primary emphasis is placed on investigating movement experiences suitable for children.

Dance 410/411
Research Project
An independent research project on an approved topic, supervised by a faculty member. Required of all students enrolled in Honours Dance.
Dance 410 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 411 includes the completion of the project begun in Dance 410.
Prereq: Dance 410
Course Descriptions
Dance

Dance 412 W 3C 0.5
Seminar in Dance
An examination of current and major issues in dance.
Prereq: Honours Dance students only.

Dance 474 F,W 0.5
Directed Study on Special Topics
For the student who wishes to pursue a particular topic in depth through guided independent research and/or reading. A faculty member must approve a student's project prior to registration. This course may be repeated in subsequent terms.
Prereq: Consent of faculty.

Dance 480 F,W wkshp 0.5
Workshop Series
The following courses are designed to give the student an opportunity to take theoretical knowledges to the applied setting. Offerings each year are determined by student interests. Topics available include:

Dance 480 Court Dance
Dance 481 Ballet Choreography
Dance 482 Dance Notation Reconstruction
Dance 483 Modern Dance Composition
Dance 484 Dance with Children
Dance 485 Dance with Adolescents and Adults
Dance 488 Dance Production

The workshop series is open only to 3rd and 4th year Honours Dance students. Two workshops may be taken in the 480 series toward the Honours degrees.
Prereq: Permission of instructor.

Technique Courses 0.25
Each of the following technique courses consists of two classes per week for one term. Students should consult with a faculty advisor concerning the applicability of these courses for entry into future courses and possible careers such as teaching.

Dance 191 Basic Ballet 1, F
Dance 192 Basic Ballet 2, W
Dance 193 Basic Modern Dance 1, F
Dance 194 Basic Modern Dance 2, W
Dance 197 Folk Dance, F
Dance 198 Basic Jazz 1, F
Dance 291 Basic Ballet 3, F
Dance 292 Basic Ballet 4, W
Dance 293 Basic Modern Dance 3, F
Dance 294 Basic Modern Dance 4, W
Dance 298 Basic Jazz 2, W
Dance 391 Pre-elementary Ballet 1, F
Dance 392 Pre-elementary Ballet 2, W
Dance 391A Elementary Ballet 1, F
Dance 392A Elementary Ballet 2, W
Dance 393 Elementary Modern Dance 1, F
Dance 394 Elementary Modern Dance 2, W
Dance 398 Elementary Jazz 1, W
Dance 491 Intermediate Ballet 1, F
Dance 492 Intermediate Ballet 2, W
Dance 491A Advanced Ballet 1, F
Dance 492A Advanced Ballet 2, W
Dance 493 Intermediate Modern Dance 1, F
Dance 494 Intermediate Modern Dance 2, W
Drama and Theatre Arts Group

Associate Professor, Chairman
W. R. Chadwick, BA, MA (Toronto), PhD (London)

Assistant Professor
M. van Dijk, BA, MA (Wellington), PhD (Toronto)

Lecturers
T. Bentley-Fisher, Drama Centre, London
J. M. Kelman, BA (Waterloo)

Part-Time Lecturer
P. Bentley-Fisher, Drama Centre, London

Course Descriptions

Note
Laboratory sessions and rehearsal periods may be added to any course at the discretion of the instructor.

Drama 101A F 3C 0.5
Introduction to the Theatre 1
Introductory study of the theatre as a major art form. Selected plays as produced in the historical contexts (from the Greeks to Shakespeare). Contributions of the actor, designer and technician to theatrical production.

Drama 101B W 3C 0.5
Introduction to the Theatre 2
An extension of the studies described in 101A. Historical period covered from Shakespeare to the present.
Prereq: Drama 101A.

Drama 102 W 4L 0.5
Introduction to Acting
An introduction to acting. The class will be structured as a rehearsal, where the students will explore improvisation and text work, concentrating on the practical problems of an actor’s experiences in creating a role.
Limited Enrolment
Prereq: Drama 101A and B and permission of the department.

Drama 222 W 4L 0.5
Intermediate Acting 1
An extension of Drama 102. This course stresses development of the actor through scene study.
Prereq: Permission of the instructor.

Drama 226 F 5L 0.5
Seminar in Voice & Movement 1
Prereq: Drama 101A and B and Drama 102.

Drama 227 W 5L 0.5
Seminar in Voice & Movement 2
Prereq: Drama 101A and B and Drama 102.

Drama 231 F 3LD 0.5
Design for the Theatre 1 (Fine 228B)
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 101A and B.

Drama 232 W 3LD 0.5
Design for the Theatre 2
An extension of the studies described in Drama 231, concentrating on the practicalities of set design.
Prereq: Drama 101A and B and Drama 243 or consent of the instructor.

Drama 243 F 1C,2L 0.5
Introduction to Technical Production 1
Theory and practice of building, painting, rigging and shifting scenery; construction of properties; familiarity with lighting instruments, sound equipment and their control systems. Students must spend a certain number of hours working on department productions.
Prereq: Drama 101A and B.

Drama 244 W 1C2L 0.5
Introduction to Technical Production 2
An extension of the studies described in Drama 243.
Prereq: Drama 101A and B.

Drama 251 F 3C 0.5
Survey of Dramatic Literature and
Dramatic Theory 1
(cross-listed with C Civ 266)
The Greek and Roman periods.

Note
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.
Course Descriptions
Drama and Theatre Arts

Drama 252 3C 0.5
Survey of Dramatic Literature and Theory 2 (Engl 232)
The Middle Ages, the Elizabethans and Jacobeans (excluding Shakespeare) and the Spanish Golden Age.

Drama 253 3C 0.5
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. (Cross-listed with Engl 233)

Drama 254 3C 0.5
Survey of Dramatic Literature and Theory 4
The eighteenth, nineteenth and early twentieth centuries, romanticism and naturalism.

Drama 255 3C 0.5
Survey of Dramatic Literature and Theory 5
The twentieth century from Brecht to the present.

Drama 258 F 3C 0.5
Masterpieces of Western Drama.
A Study of Performance 1.
A study of representative Western dramatic literature from the Greeks to the present with films being used as examples of performance. Lab fee required.

Drama 259 W 3C 0.5
Masterpieces of Western Drama.
A Study of Performance 2.
An extension of the studies described in Drama 258.

Drama 261 Introduction to Directing 1
Not offered 1980/81.

Drama 262 Introduction to Directing 2
Not offered 1980/81.

Drama 301 F 3C 0.5
Script Interpretation 1
Advanced study and analysis of plays in the process of production covering selected periods and types of playwriting.
Prereq: Drama 101A and B and two dramatic literature classes.

Drama 302 W 3C 0.5
Script Interpretation 2
An extension of the studies described above in 301.
Prereq: Drama 101A and B and at least two dramatic literature classes.

Drama 306 (ABC) F std 0.5
Special Studies in Theatre Production 1
Production participation and the study of selected problems of theatrical production.
Prereq: Drama 101A and B and permission of the play director.

Drama 307 (ABC) W std 0.5
Special Studies in Theatre Production 2
See Drama 306.
Prereq: Drama 101A and B and permission of the play director.

Drama 321 F 4L 0.5
Advanced Acting 1
Advanced work in acting. Course involves individual and ensemble work in selections from specific plays with attention given to various periods and styles in acting.
Prereq: Drama 221 and Drama 222.

Drama 322 W 4L 0.5
Advanced Acting 2
An extension of the studies described in Drama 321.
Prereq: Drama 321 or permission.

Drama 326A F 5L 0.5
Seminar in Voice
A continuation of Drama 226/227
Prereq: Drama 226/227.

Drama 326B F 5L 0.5
Seminar in Movement
A continuation of Drama 226/227
Prereq: Drama 226/227.

Drama 327A W 5L 0.5
Seminar in Voice
A continuation of Drama 226/227
Prereq: Drama 226/227.

Drama 327B W 5L 0.5
Seminar in Movement
A continuation of Drama 226/227
Prereq: Drama 226/227.

Drama 343 F 2L,2C 0.5
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 0.5
Theatre Technology 2
See Drama 343
Prereq: Drama 243 and Drama 244.

Drama 348 Arts Administration 1
Not offered 1980/81.
Drama 349 Arts Administration 2
*Not offered 1980/81.*

Drama 351 0.5
**Canadian Drama**
A study of plays by such dramatists as Merrill Denison, Robertson Davies, Gratien Gelinas (in translation), James Reaney, John Coulter, George Ryga and Michael Tremblay (in translation). Background for 20th-century drama will be provided in lectures.
*(Cross-listed with English 316).*

Drama 361 Advanced Directing 1
*Not offered 1980/81.*

Drama 362 Advanced Directing 2
*Not offered 1980/81.*

Drama 371 F 3C 0.5
**Theatre History 1**
A survey of theatre history from Classical Greece to 1600. Students are advised to take this course in their third year.
*Prereq: Drama 101A and B.*

Drama 372 W 3C 0.5
**Theatre History 2**
An extension of studies described in Drama 371.
*Prereq: Drama 101A and B.*

Drama 406 (ABC) F std 0.5
**Theatre Workshop 1**
Participation in stage production for advanced students.
*Prereq: Permission of the play director and Drama 101A and B.*

Drama 407 (ABC) W std 0.5
**Theatre Workshop 2**
Participation in stage production for advanced students.
*Prereq: Permission of play director and Drama 101A and B.*

Drama 409 F 3C 0.5
**Theatre Criticism**
Study and practice of the criticism of theatre production and performance.
*This course will not normally be taken until the student's final year.*

Drama 490 (A-E) F wkshp 0.5
**Selected Seminars in Drama and Theatre Arts**
Seminars in special areas of drama and theatre.
*Prereq: Permission of the department.*

Drama 491 (A-E) W wkshp 0.5
**Selected Seminars in Drama and Theatre Arts**
Seminars in special areas of drama and theatre.
*Prereq: Permission of the department.*

Drama 499 Y T 1.0
**Senior Seminar**
Open only to drama honours students in their fourth year. It is designed to give the student an opportunity to complete a comprehensive presentation in his/her major area of concentration.
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), DU (Sherbrooke)

Professor, Dean of Science
R. N. Farvolden, MSc (Alberta), PhD (Illinois)

Professors
J. A. Cherry, BE (Sask.), MS (Cal., Berkeley),
PhD (Illinois), PEng
P. Fritz, Dipl Geol, Dr rer Nat (Technische
Hochschule Stuttgart)
P. F. Karrow, BSc (Queen's), PhD (Illinois)
R. W. Macqueen, BA, MA (Toronto), PhD (Princeton)

Associate Professors
E. C. Appleyard, BSc (W. Ont.), MSc (Queen's),
PhD (Cambridge)
E. O. Frind, BASc, MASC, PhD (Toronto), PEng
J. E. Gale, BA, BSc (Memorial), MSc (W. Ont.),
MEngSc, PhD (Cal., Berkeley), PEng
D. E. Lawson, BSc, MSc (New Br), PhD (Reading)
A. V. Morgan*, BSc (Leicester), MSc (Calgary),
PhD (Birmingham)
E. J. Reardon, BSc (St. Francis Xavier), PhD (Penn.
State)
R. G. Roberts, BA (Cambridge), MSc, PhD (McGill)

Assistant Professors
J. F. Barker, BSc (McMaster), PhD (Waterloo)
P. Fransham, BSc (Sir G Wms), MSc, PhD (McGill)
R. W. Gillham, BSA (Toronto), MSc (Guelph),
PhD (Illinois)
J. P. Greenhouse, BSc, MSc (Br. Col.), PhD (California)
J. A. Legault, BSc, MSc (Ottawa), PhD (Oklahoma)
D. J. Russel, BSc (Durham), PhD (Reading)

Research Professor
I. L. Gibson, BSc, PhD (Imp. College, London)

Adjunct Professors
P. H. von Bitter, MSc (Acadia), PhD (Kansas)
R. M. Brown, BSc (Bishops), PhD (McGill)
D. Lee, BSc, MSc (N. Dak.), PhD (Virg. Polytech. Inst.)
F. A. Prantl, BSc, MSc, PhD (Innsbruck)
V. K. Prest, BSc, MSc (Manitoba), PhD (Toronto)
R. L. Thomas, BSc, PhD (Wales)

Senior Demonstrators
J. L. Lang, BSc, MBA (Queen's)
P. McCauley, BSc, MSc (Laurentian)

Faculty members holding cross-appointments as
shown
1Earth Sciences and Biology
2Earth Sciences and Man-Environment Studies

Course Descriptions

Details of the undergraduate programmes offered by
the Faculty of Science are to be found in Chapter 14.

Earth 121-122 or the consent of the instructor is a
prerequisite for all later courses in Earth Sciences.
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 the third year and attend a week-long field
excursion at the start of fourth year. (Expenses in
excess of $100 are to be anticipated). Earth Sciences
students are encouraged to seek geological
employment in the summers.

Earth 121 F 2C,3L 0.5
Introductory Geology 1
An introduction to rocks and minerals and the
processes of their formation. The structure of the
earth, plate tectonics and its relationship to
deformation, metamorphism and formation of
magmas. Earth resources.

Earth 122 W 2C,3L 0.5
Introductory Geology 2
An introduction to processes that shape the earth's
landscapes. Consideration of the time concept in
geology. Introduction to fossils, their occurrence and
uses in earth sciences. The geological history of
North America.
Prereq: Earth 121

Earth 221 W,S 2C,3L 0.5
Geochemistry 1
Origin and abundances of elements. Chemical
characteristics of sedimentary, igneous, and
metamorphic rocks. Review and application of
thermodynamic principles in geochemical systems.
Introduction to aqueous geochemistry.
Prereq: Earth 121-122 and Earth 231

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.
Prereq: Earth 121-122.
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
An introduction to the nature, origin and interpretation of stratified earth materials. Emphasis on principles and approaches. Stratigraphy in earth history and economic deposits.
Prereq: Earth 121-122

Earth 236  F  2C,3L  0.5
Principles of Paleontology
The principles of paleontology with particular stress on the species concept and evolution; examples will be drawn primarily from the fossil record of plants and vertebrates. Laboratory work will include projects and reference to field trip collections.
Prereq: Earth 121-122

Earth 260  W,S  2C,3L  0.5
Introductory Structural Geology
Prereq: Earth 121-122

Earth 331  F  2C,3L  0.5
Igneous Petrology
The principles and theories of igneous rock genesis. Silicate phase equilibria in magmatic systems. Magmatic differentiation; distribution and occurrence of magma types.
Prereq: Earth 231, 232

Earth 332  W  2C,3L  0.5
Metamorphic Petrology
Prereq: Earth 231, 232

Earth 333  W  2C,3L  0.5
Introductory Sedimentology
The origin, transport and deposition of sediments. Size analysis and sedimentary structures. Recent sedimentary environments as a key to the interpretation of ancient sediments. Sedimentary petrology.
Prereq: Earth 232

Earth 336  F  2C,3L  0.5
Paleontology
Advanced paleontology emphasizing morphology, classification, evolution, paleoecology and stratigraphic value of fossil invertebrates. Field trip and laboratory study of fossil collections.
Prereq: Earth 236

Earth 338  W  2C,3L  0.5
Rock Mechanics
Review of stress and strain. Mohr's circle, strength theories, laboratory tests, classification of rocks. Rock mechanics considerations in the construction of shafts, drifts, tunnels, foundations and rock slopes. Laboratory exercises will deal with uniaxial, triaxial, flexure, hardness and tensile testing of rock. Problem sets will be assigned.
Prereq: A course in Statics and Mechanics of deformable materials, or consent of instructor

Earth 342  F  2C,3L  0.5
Geomorphology

Earth 345  W  2C,2L  0.5
Historical Geology
A systematic review of the geological history of North America from the Precambrian to the Recent exemplified by regional geology. Laboratory work will include study of rock and fossil regional suites and geological maps.
Prereq: Earth 235

Earth 355  F  3C  0.5
Statistical Methods in Geology
Introduction to the principles of probability and statistics and their application in the earth sciences. Evaluation of quantitative data; statistical models.
Prereq: Math 113 and an introductory course in computer programming.

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 (identical to Phys 368)
Prereq: Math 113, Phys 121-122 or equivalent
Earth 369 W  3C  0.5  
**Geophysics 2** (Identical to Phys 369)  
The geology of the ocean basins. Topics in physical oceanography. Physical properties of ocean water, heat budget of the world oceans. Oceanic circulation, Coriolis effects. Some idealized current regimes.  
*Prereq: Math 113 and Phys 121-122 or equivalent*

Earth 370 W  3C,2L  0.5  
**Economic Geology**  
The occurrence and geological setting of metallic, non-metallic minerals and construction materials. Energy resources. Special emphasis on Canada's resource industries. The laboratory will involve sampling methods, ore calculation and property evaluation.  
*Prereq: Earth 231, 232*

Earth 390 W  flldlab  
**Field Camp**  
Ten day field camp at Whitetish Falls, held at beginning of spring term.

Earth 421 W  2C,3L  0.5  
**Geochemistry 2**  
An introduction to geochemical processes in the low temperature environment with special emphasis on aqueous geochemistry. This is considered with an introduction to radiometric dating. The laboratory is analytically orientated and familiarizes students with techniques used in geochemical investigations.  
*Prereq: First year chem., Earth 221*

Earth 427 W  2C,3S  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 world geology.

Earth 432 W  2C,3L  0.5  
**Precambrian Geology**  
The geology, tectonics, stratigraphy and history of the Canadian Precambrian Shield. The early evolution of the earth's crust. The Precambrian time scale and problems of geochronology. Life, climate and physical conditions in Precambrian time.

Earth 433 W  2C,3L  0.5  
**Applied Sedimentology**  
The source, migration and sedimentary environment of hydrocarbons, exploration, types of traps, extraction. Carbonate sediments and their diagenesis. The environmental impact and control of recent sedimentation.  
*Prereq: Earth 333*  

Earth 434 F  2C,3S  0.5  
**Biostratigraphy**  
Methods of using paleontological data to solve stratigraphic problems. Faunal provinces in space and time. Effects of continental drift and climatic change on biogeography through the Phanerozoic.  
*Prereq: Earth 236*

Earth 435 W  3C,2L  0.5  
**Advanced Structural Geology**  
The geometry, kinematics and dynamics of structural geology. The relationship of structures from the microscopic to the megascopic scale; statistical studies of structural elements.  
*Prereq: Earth 260*

Earth 436 Y  5L  1.0  
**Honours Thesis**  
A course for honours Earth Sciences students only. Each student will work under the direction of a member of the Department on a short research project. The results of this will be presented in thesis form and will be critically examined by members of this and, where pertinent, other departments.

Earth 438 F  2C,3wkshp  0.5  
**Engineering Geology**  
Review of basic concepts in soil and rock mechanics. Field and laboratory methods used to define and characterize the properties of geological materials and the use in selected engineering geologic design and construction problems. Laboratory assignments will focus on the determination of physical properties and site assessment problems.

Earth 439 F  3C,1T  0.5  
**Hydrogeology**  
The location, exploitation, and conservation of Groundwater. Groundwater-surface water interactions, effect of man's activities on ground water quality, hydrogeologic aspects of subsurface waste disposal.

Earth 440 F  2C,3L  0.5  
**Quaternary Geology**  
Stratigraphy and history of the Quaternary Period with emphasis on glaciation. Laboratory studies on glacial deposits. Field trips. A previous course in geomorphology is recommended.
**Course Descriptions**

**Economics**

**Earth 456 F 3C 0.5**

**Numerical Methods in Geoscience**


*Prereq: Math 113 and an introductory course in computer programming.*

**Earth 461 W 3C,1T 0.5**

**Applied Geophysics 2**

A detailed examination of selected topics in exploration geophysics, with an emphasis on data processing and computer modelling of geophysical responses.

*Prereq: Earth 360 and an introductory course in computer programming.*

**Earth 470 F 3C,2L 0.5**

**Metallic Mineral Deposits**

The petrology and genesis of 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 fieldlab 0.5**

**Field Study**

Depending on the demand and the availability of an instructor, a six-week field course may be offered in an area of unusual geological interest during the spring or summer. This course will consist of two weeks of classroom lectures and one month in the field location. Expenses are to be paid by the student.

*Prereq: consent of the instructor.*

**Earth 490 F fieldlab**

**Field trip**

Week-long field trip to Appalachian localities, held at beginning of fall term.
Adjunct Faculty
W. Campbell, BA, MBA (York), RIA
I. Duncan, BA (Brock), LLB (McMaster)
W. D. Jenkins, BA, LLB (W. Ont.)
R. F. Kilimnik, BA (Waterloo), MBA (McMaster) CFA
K. A. Tambling, BSc (McGill), MBA (W. Ont.)

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 100a/100b F,W 3C 0.5/0.5
Introduction to Modern Economics
A study of the principles of modern economics that contribute to an understanding of the operation of the Canadian economy. Micro- and macro-concepts are integrated in a Post-Keynesian framework.

Econ 101 F,W,S 3C 0.5
Introduction to Microeconomics
An introduction to the central economic problems of society, the functioning of a mixed capitalistic enterprise system, the economic role of government, the composition of and pricing of national output, pricing of productive factors, and income distribution.
Also offered at St. Jerome’s College.

Econ 102 F,W,S 3C 0.5
Introduction to Macroeconomics
Determination of national income; the banking system; government fiscal and monetary policy; international trade and finance; and current economic problems.
Also offered at St. Jerome’s College

Econ 103 Introduction to Economic Concepts and Current Problems
Not offered 1980-81.

Econ 191 F,W,S 2C,1L 0.5
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,S 2C,1L 0.5
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

Econ 193/194 F,W 3C 0.5/0.5
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 331

Econ 201 F,W 3C 0.5
Microeconomic Theory
Theory of consumer demand; production theory; market structure; resource pricing and allocation under perfect and imperfect competition.
Prereq: Econ 101 or Econ 100a

Econ 202 F,W,S 3C 0.5
Macroeconomic Theory
Theory of the determination of the level of national income, employment and the price level.
Prereq: Econ 102 or Econ 100b

Econ 211 F,W,S 3C 0.5
Mathematics for Economists
Application of elementary mathematics to problems in economic theory. Topics include the graphing of functions, elementary exponential and logarithmic functions and differentiation – all developed within the context of economic theory.
Prereq: Econ 101/102 or Econ 100a/100b

Econ 221 F,W 3C 0.5
Statistics for Economists
An introduction to the underlying logic of statistical procedures most commonly employed by economists. No mathematical training beyond high school algebra is presumed. Emphasis is given to solving problems as a way of learning statistical theory.
Prereq: Econ 101/102 or Econ 100a/100b
<table>
<thead>
<tr>
<th>Department of Economics: Course Offerings</th>
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<tbody>
<tr>
<td><strong>1st Year</strong></td>
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<tr>
<td>100 Intro, Modern Economics</td>
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<td>101 Intro, Micro-Economics</td>
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<td>102 Intro, Macro-Economics</td>
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<td>211 Mathematics for Economists</td>
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<td>231 Intro., International Economics</td>
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<td>263 Canadian Economic History</td>
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<tr>
<td>291 - 389 Special Topics</td>
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<td>191 Intro, Financial Accounting 1</td>
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<td>192 Intro, Financial Accounting 2</td>
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<td>193 Economics and the Administrator 1</td>
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<td>194 Economics and the Administrator 2</td>
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Econ 231  F,W  3C  0.5
Introduction to International Economics
Theory of comparative advantage and the gains from trade; tariff theory; concepts and measurement of balance of payments; exchange rate systems; reform of international monetary system.
Prereq: Econ 101/102 or Econ 100a/100b

Econ 241  W  3C  0.5
Cost-benefit Analysis and Project Evaluation
Methods for evaluating private and public projects; decision rules, efficiency conditions and methods of conducting cost-benefit analysis. Application of the technique.
Prereq: Econ 201

Econ 263  W  3C  0.5
Economic History of Canada
A study of the economic development of Canada; export staple theory, industrial structure and national policies analysed in a Classical-Marxian framework.
Prereq: Econ 101/102 or Econ 100a/100b

Econ 281  F  3C  0.5
Accounting for the User of Financial Statements
An overview of the role of accounting in serving Society’s economic problems. The production dimension of accounting will be emphasized, involving the preparation of financial statements and reports, using generally accepted accounting principles.

Econ 282  W  3C  0.5
Uses of Accounting Information
The consumption dimension of accounting will be emphasized, involving both internal and external decision makers. Students will be exposed to managerial decisions involving accounting data as well as financial statement analysis.
Prereq: Econ 281

Econ 291  F,W,S  3C  0.5
Intermediate Financial Accounting 1
Includes a review of the foundations of accounting theory and the accounting process. This is followed by 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

Course Descriptions
Economics

Econ 292  F,W,S  3C  0.5
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 earning per share). The treatment of accounting changes and the statement of changes in financial position will also be covered.
Prereq: Econ 291

Econ 293  F,W  3C  0.5
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  F,W  3C  0.5
Business Law
Introductory course in law, including the following subjects: law of contracts; discharge, breach, misrepresentation; business organizations; creation of a business, taxation, agency termination; duties of directors, rights of shareholders, safeguard to shareholders and creditors; commercial torts, estates, wills.

Econ 301  F,W  3C  0.5
Intermediate Microeconomics
Distribution theory; production, consumption and general equilibrium analysis; welfare economics.
Prereq: Econ 201

Econ 302  F,W  3C  0.5
Monetary Theory and Banking
Monetary theory and banking in an open economy; national policies for achieving full employment, price stability, and equilibrium in the balance of payments.
Prereq: Econ 201, 202, 231

Econ 303  F  3C  0.5
Economic Thought
A critical survey of the development of economic thought from the pre-Socratics to the Post-Keynesians. Emphasis on Classical Economics.
Prereq: Econ 201, 202, 231
Econ 311 F S 3C 0.5
Introduction to Mathematical Economics
Mathematical treatment of some micro- and macro-
partial and general equilibrium models; programming and game theoretic techniques;
stability analysis; simple growth models.
Prereq: Econ 201, 202, 211 (or Math 130)

Econ 321 W 3C 0.5
Introduction to Econometrics
Introductory level course in econometrics; includes
economic model building and testing, regression and
and price indices.
Prereq: Econ 221

Econ 331 F 3C 0.5
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 3C 0.5
International Monetary Theory
The monetary aspects 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 F 3C 0.5
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 W 3C 0.5
Economic Development
The nature of the problem of economic development;
thories of economic development; major policy
issues in economic development.
Prereq: Econ 201, 202, 231

Econ 341 F 3C 0.5
Public Finance
The economic rationale of governmental fiscal
activity; cost-benefit analysis; the structure and
economic effects of public expenditure and
revenues; the analysis of income, consumption and
wealth taxes; introduction to fiscal federalism.
Prereq: Econ 201

Econ 343 W 3C 0.5
Urban Economics
Application of economic analysis to location
decisions of firms and households; discussion of
policy problems, for example, urban renewal and
housing.
Prereq: Econ 101 or Econ 100a (Econ 201 is
recommended)

Econ 344 W 3C 0.5
Consumer Theory
The development of economic principles for
consumer analysis. The course appraises market
responsiveness as well as conditions causing
problems for public and private consumption. It also
evaluates alternative economic policies for
correcting such conditions.
Prereq: Econ 201

Econ 345 F 3C 0.5
Industrial Organization
An analysis of the characteristics of industrial
structure, behaviour and performance with special
reference to Canada. Competition and
“rationalization” policy in Canada and other selected
countries.
Prereq: Econ 201

Econ 347 Economics of Transportation and
Communication
Not offered 1980/81

Econ 351 F 3C 0.5
Labour Economics
Wage theory, training and mobility theory;
economics of information in Canadian labour
markets; other investments in human capital;
manpower policies.
Prereq: Econ 201

Econ 353 W 3C 0.5
Population Economics
Population objectives; demographic techniques;
economic interrelationships with fertility, mortality
and migration; determinants and consequences of
current world population changes.
Prereq: Econ 201

Econ 355 W 3C 0.5
Economics of Energy and Natural Resources
An analysis of the economics of conservation,
especially the adequacy of the market mechanism
as an allocator of resource use over time. The
political economy of the world’s supply of and
demand for energy resources and major issues in
Canadian energy policy will be considered.
Prereq: Econ 201 (Econ 241 is recommended)
Econ 357  W  3C  0.5
Environmental Economics
Application of economic theory to problems of the environment, in particular, air, water, and land pollution. Emphasis is on the theory of the management of common property resources.  
Prereq: Econ 201

Econ 361  North American Economic History
Not offered in 1980/81

Econ 363/364  F,W  3C  0.5/0.5
Contemporary Canadian Problems 1, 2
A "topic oriented" seminar course. The class agrees to study a Canadian problem selected from a list that includes poverty, unemployment, industrial policy, and so forth. The format assists the student in gaining analytical skill through work on the selected topics.  
Prereq: Econ 201, 202

Econ 365  W  3C  0.5
Economic Development of Modern Europe, 1780-1973
Prereq: Econ 101 and 102 or 100a/100b

Econ 381-389  3S  0.5 each
Special Topics
One or more special half courses will be offered at different times as announced by the Department.  
Prereq: Consent of Instructor

Econ 391/392  F,W,S  3C  0.5/0.5
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 prereq. for Econ 392

Econ 393/394  F,W,S  3C  0.5/0.5
Managerial Finance 1, 2
An introductory conceptual framework for decision making in financial management. Emphasis is placed upon the investment problem in long term assets, capital structure and dividend policy. Techniques studied will be applied to actual case situations.  
Prereq: Econ 101, 102, 191, 221
Econ 393 is a prereq. for Econ 394

Econ 401  F  3C  0.5
Advanced Microeconomic Theory
Production and consumption theory; advanced theory of oligopology; price competition; non-price competition; growth decisions of the firm; financial decisions of the firm; decision-making under risk and uncertainty.  
Prereq: Econ 301

Econ 402  W  3C  0.5
Advanced Macroeconomic Theory
Classical and Keynesian models and recent contributions; theory of economic policy; inflation and unemployment; modern theories of economic growth.  
Prereq: Econ 301, 302

Econ 403  W  3C  0.5
Economic Analysis, Forecasting, and Public Policy
The course focuses on the problems of forecasting economic activity (as measured by the principal macroeconomic variables), and of designing and implementing policies to control those variables; topics covered include a critical review of current forecasting models, problems associated with lags in the impact of policies, and so forth.  
Prereq: Econ 301, 302, 321

Econ 411 Mathematical Economics
Not offered 1980/81

Econ 413  W  3C  0.5
Economic Growth Theory
Classical, neoclassical, and Cambridge theories of growth, study of production, technical progress, and consumption; aggregate and two-sector models of growth; growth theory in an open economy.  
Prereq: Econ 301, 302, 311

Econ 421/422  F,W  3C  0.5/0.5
Econometrics 2
Review of linear algebra, and development of basic statistical inference; formulation, identification, estimation, and tests of single equation and simultaneous equation regression models of micro- and macroeconomics; empirical models.  
Prereq: Econ 201, 202, 211, 221, 321

Econ 431 Advanced International Economics
Not offered 1980/81
Course Descriptions
Economics

Econ 432  W  3C  0.5
International Economic Policy
Analysis of selected policy problems of open economies, such as optimum tariff and balance of payments stabilization, international capital flows, monetary and fiscal policy mix, multinational firms, multinational monetary reform and the new international economic order.
Prereq: Econ 301, 302, 331 and 332

Econ 441  F  3C  0.5
Economics of the Public Sector 1
An overview of fiscal functions and institutions; the theory of social goods; expenditure and revenue structures; fiscal incidence.
Prereq: Econ 231, 301, 302, 341

Econ 442  W  3C  0.5
Economics of the Public Sector 2
Fiscal stabilization, fiscal federalism, public pricing, international public finance, social security and other contemporary policy issues.
Prereq: Econ 441

Econ 451  3C  0.5
Advanced Topics in Resource Economics
Advanced analysis of selected topics in the area of energy, land, and labour resources.
Prereq: Econ 201, 202, 231, 355

Econ 481-489  3S  0.5 each
Special Studies
Research and reading courses under the direction of individual instructors.
Admission by consent of instructor.

Econ 491  F,S  3C  0.5
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  F,W,S  3C  0.5
Seminar in Financial Accounting Theory and Research
Analysis of the theoretical foundations of the financial accounting discipline including a survey of academic accounting literature with emphasis upon selected alternative models of accounting theory and the various methodologies and findings of selected accounting researchers. Canadian implications for accounting education will be examined.
Prereq: Econ 291, 292

Econ 493  3C  0.5
Taxation I
A course in the interpretation of the Canadian Income Tax Act, the common law pertaining to taxation, and the pronouncements of Revenue Canada - Taxation on tax topics. The emphasis will be the taxation of individuals.
Prereq: Econ 292

Econ 494  3C  0.5
Taxation II
Analysis and interpretation of the Income Tax Act, common law, and departmental practice dealing with estates, trusts, partnerships, and corporations. Topics will include incidence of tax, rollovers, deferrals, distributions, determination of taxable income, and tax payable.
Prereq: Econ 493

Econ 495  3C  0.5
Accounting Information Systems
The course investigates the concepts and principles of management information systems. Concentration is on the role of accounting information in the planning/decision making process and the design and implementation of accounting information systems.
Prereq: Econ 391/392

Econ 496  3C  0.5
Investment Analysis
The objective of this course is to introduce the student to concepts of investment selection, purchase and management. The student should obtain a knowledge of security markets and the risk/return characteristics of forms of investment.
Prereq: Econ 393

Econ 497  3C  0.5
Accounting Planning and Control Systems
This advanced course deals with tools of management accounting useful in planning and control of financial resources. Topics include measurement of performance, control centres, transfer pricing, planning and budgeting, and control of costs.
Prereq: Econ 392
Department of Electrical Engineering

Professor, Chairman
I. F. Blake, BSc, MSc (Queen's), MA, PhD (Princeton), PEng

Professor, Associate Chairman for Graduate Affairs
J. W. Mark, BASc (Toronto), MEng, PhD (McMaster), PEng

Professor, Associate Chairman for Undergraduate Affairs
R. S. Ramshaw, BSc, PhD (Nottingham), PEng

Professor, Dean of Graduate Studies
L. A. K. Watt, BSc (Manitoba), MS (Chicago), PhD (Minnesota)

Professor, Director Computer Communications Network Group
E. G. Manning*, MSc (Waterloo) PhD (Illinois)

Professors
R. G. Anthes, BASc, MASc (Toronto), PEng
P. R. Bryant, MSc (London), MA, PhD (Cambridge)
S. G. Chamberlain, MSc, PhD (Southampton)
J. D. Cross, BSc (Cardiff), MS PhD (Carleton), PEng
E. L. Heasell, BSc, PhD(Imperial College, London)
R. H. MacPhie, BASc (Toronto), MS, PhD (Illinois)
S. N. Kalra, BSc (Punjab), MA, PhD (Illinois), PEng
J. Vlach, Dipl Ing CSc (Technical University of Prague)
L. Y. Wei, BS (National Northwestern College, China), MSc, PhD (Illinois)

Associate Professors
J. D. Aplevich, BE (Sask.), PhD (Imperial College, London), CEng
Y. L. Chow, BEng (McGill), MASc, PhD (Toronto), PEng
G. J. Dufault, RA (Ottawa), BSc (Carleton), PEng
M. I. Elmasry, BSc (Cairo), MASc, PhD (Ottawa), PEng
J. A. Field, BE (Sask.), MASc, PhD (Toronto), PEng
J. V. Hanson, BASc (Toronto), MSc, PhD (Imperial College, London)
T. Kameda, BSc, MS(Tokyo), PhD (Princeton)

J. S. Keeler, BASc, MASc (Toronto), PEng
W. D. Little, BASc, MASc, PhD (Br. Col.), PEng
J. C. Majithia, BSc (Honors) (London), MEng, PhD (McMaster), PEng
W. N. Meikle, BASc, MASc (Toronto), PEng
V. H. Quintana, BEng (Chile), MSc (Wisconsin), PhD (Toronto), PEng
R. G. van Heeswijk, Ir (Delft, Holland), PEng

Assistant Professors
S. K. Chaudhuri, PhD (Manitoba)
W. J. Wilson, BE, MSc (Sask), PhD (Cambridge), PEng

Adjunct Professors
J. Carr, PhD (Waterloo)

Laboratory Director
R. L. Wright, PEng

Faculty member holding cross-appointment as shown

Department of Computer Science

Course Descriptions

Electrical Engineering

El E 14  W,F  3C,3L,1T  0.5
Electrical Engineering 1
Kirchoff’s Laws, mesh current equations, superposition theorem, measuring instruments, phasors, power distribution and three-phase circuits, power factor and its correction, magnetic circuits, transformers, introduction to dc and ac motors. *Alternate weeks.
Prereq: Gen E 122, Math 110a & b, Math 114, or equivalent.

El E 32  W,S  3C,3L,1T  0.5
Electrical Engineering 2
Introduction to electronic devices and their characteristics; integrated circuits; operational amplifiers; digital circuits and systems; electric power control using semiconductor devices and circuits; electronic instruments and instrumentation systems. *Alternate weeks.

El E 116  W,S  2C,3L,1T  0.75
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 Electrical Engineering; and introduction to engineering design methods as applied to Electrical engineering and including specification development, information-gathering, concept formulation, feasibility analysis and report writing. Year 1 Engineering
El E 201  W,F  1C  0.0  
Seminar  
General Seminar

El E 202  F,S  1C  0.0  
Seminar  
General Seminar

El E 205 (Math 221)  W,F  2C,2T  0.5  
Advanced Calculus for Electrical Engineers 1  
Differential calculus of several variables. Differential equations. Multiple integrals. Applications to Electrical Engineering will be stressed.

El E 206 (Math 212)  S,F  2C,2T  0.5  
Advanced Calculus for Electrical Engineers 2  
Fourier series, partial differential equations, separation of variables, wave equation, heat equation and Laplace’s equation. Fourier integral, properties of complex analytic functions, complex integration.

El E 222  W,F  2C,1T,2L  0.5  
Introduction to Digital Computers  
Prereq: GE 121 or equivalent.

El E 233  W,F  3C,1T  0.5  
Physical Electronics  
Particle and wave theory of light, photoelectric effect, Compton effect. Structure of hydrogen atom; many-electron atoms. Solid state physics; semiconductors, n and p-type materials, Fermi levels, mass action law, charge neutrality, diffusion. Introduction to p-n junctions.

El E 241  W,F  3C,2T  0.5  
Electrical Networks 1  
Introduction to network variables and laws, resistors, sources and simple circuits; resistance networks; capacitors and inductors; first order circuits, sinusoidal steady state analysis.

El E 261  S,F  3C,1T  0.5  
Energy Processing and Conversion  

El E 271  S,F  3C,1T  0.5  
Electric and Magnetic Fields  
Vector analysis, Coulomb’s law and electric field intensity; electric flux density; Gauss’ law and divergence; energy and potential; conductors, dielectrics, capacitance; experimental mapping methods; Poisson’s and Laplace’s equations; the steady magnetic field; magnetic forces, materials and inductance; time varying fields and Maxwell’s equations.

El E 293  W,F  1C,4L  0.5  
Measurement and Instrumentation 1  
The principle objectives of this course are to introduce students to the methods and techniques for measuring electrical variables and parameters and to give them laboratory experience with electrical instruments, devices and circuits. Instruments studied include oscilloscopes, multimeters, power supplies, dc and ac bridges, signal generators and electronic volt meters. The devices and circuits include: linear and non-linear resistors, capacitors and inductors; RC, RL and RLC networks. 'Open Lab.

El E 294  S,F  1C,3L,1T  0.5  
Measurement Instrumentation 2  
Experiments related to material covered in courses El E 261 and El E 271 will be performed. This course also includes further topics on instrumentation and measurement techniques. 'Open Lab.

El E 301  W,S  1C  0.0  
Seminar  
General Seminar  

El E 302  W,F  1C  0.0  
Seminar  
General Seminar

El E 316  W,S  2C,2T  0.5  
Probability and Statistics  
Conditional probability and independence; Bayes’ Theorem; random variables; functions of random variables; distribution functions; applications to reliability and failure rates; marginal and conditional distributions; correlation and applications to regression and statistical testing.

El E 317  W,F  3C,1L  0.5  
Signal Analysis Methods  
Representation of periodic and non periodic signals in both continuous time and discrete time forms; the concept of sampling; the development and application of Fourier series, Fourier transforms, and the convolution integral to continuous time signals and systems; linear modulation, and modulation techniques such as DSB, AM, SSB, etc.; the z-transform and its application to discrete time sequences and systems.
EI E 323  W,S  2C,1T,2L'  0.5  
Principles of Digital Circuits and Systems  
Review of switching algebra. Analysis and synthesis  
of combinational circuits. Karnaugh maps. The TTL  
family of IC's. Design with MSI and SSI chips  
(selectors, counters, registers). Design of  
clocked sequential circuits. Hardwired and  
microprogrammed controllers. Applications of  
semiconductor memories. 'Open.

EI E 342  W,S  2C,2T  0.5  
Electric Networks 2  
Review of sinusoidal steady-state, node, and mesh  
analysis; the Laplace transformation and  
applications; transient response of second and  
higher order circuits; two-part network parameters.  
Prereq: EI E 241 or Equivalent

EI E 351  W,S  2C,1T,3L'  0.5  
Electronic Devices  
Review of semiconductor properties, Boltzmann  
relations. Derivation of d.c. and a.c. characteristics  
of n-p junctions and bipolar transistors. Small and  
large signal models. Introduction to field effect  
transistors. 'Alternate weeks.  
Prereq: EI E 233 or equivalent

EI E 352  W,F  2C,1T,3L'  0.5  
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.  
'Alternate weeks.

EI E 362  W,S  2C,1T,3L'  0.5  
Energy Conversion  
Electric motors and generators. 'Alternate weeks.  
Prereq: EI E 261

EI E 372  W,F  2C,1T,3L'  0.5  
Transmission Lines and Electromagnetic Fields  
Transmission lines; distributed parameters;  
telegrapher's equations; sinusoidal waves;  
terminated lines, matching with the Smith Chart;  
Electromagnetic Fields; Maxwell's equations; plane  
waves; reflection and refraction; Poynting vector;  
waveguides. 'Alternate weeks.

EI E 380  W,F  2C,2T,3L'  0.5  
Introduction to Systems and Control  
An introduction to control. Advantages of closed-  
loop feedback systems. The role of the system  
mathematical model. Block diagrams and signal flow  
graphs. The basic control system design problem,  
stability in control systems. Frequency response  
analysis techniques. 'Alternate weeks.

EI E 401  S,F  1C  0.0  
Seminar  
General Seminar

EI E 402  W  1C  0.0  
Seminar  
General Seminar

EI E 407  W  2C,2T  0.5  
Numerical Methods  
Fundamentals of numerical methods, solution of  
non-linear equations, polynomials and zeros of  
polynomials, matrix methods and systems of linear  
algebraic equations, interpolation, estimation of  
parameters by least squares, numerical integration,  
solution of ordinary differential equations.

EI E 418  S,F  2C,1T,1L  
Communication Systems  
Review of signal analysis and linear modulation;  
angle modulation and FM spectra; noise in circuits  
and communication channels; noise figure and noise  
temperature; performance of linear and exponential  
modulation systems in the presence of noise; analog  
pulse modulation, PAM, PPM, PDM; noise in pulse  
modulation systems.

EI E 419  W  3C,1T  
Digital Communication  
Review of sampling and quantization; data  
transmission and digital data systems; pulse code  
modulation, and delta modulation; noise and errors  
in pulse communications; matched filters, probability  
of error and correlation detection; intersymbol  
interference, distortion and equalization; signal  
design and transmission line coding; introduction to  
channel capacity and error control coding.

EI E 425  S,F  2C,1T,1L'  0.5  
System Simulation  
A study of computer simulation techniques;  
principles of analog computation; models, scaling  
procedures; digital simulation languages, computer  
simulation and investigation of continuous systems;  
differential equations, transfer functions, boundary  
value problems; application of hybrid computers.  
'Open.

EI E 426  W  3C,3L  0.5  
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 E 324 or equivalent
EI E 427  S,F  2C,2L  0.5  
**Digital Hardware Engineering**  
**Prereq:** EI E 222, EI E 323 or equivalent

EI E 434  W  2C,2T  0.5  
**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.

EI E 435  S,F  2C,2T  0.5  
**Semiconductor Devices 1**  
This course deals with the theory and characteristics of modern semiconductor devices, SCRs, power rectifiers, MOSFETs, JFETs, radiation detectors, solar cells, LEDs, CCDs, IMPATT and Gunn effect devices, step recovery diodes, P-I-N diodes, Schottky diodes, memory devices.

EI E 436  W  3C,1T  0.5  
**Semiconductor Devices 2**  
Techniques for the design and realization of discrete and integrated circuit elements, bipolar, JFET and MOSFET models. Integrated circuit biasing. Design and implementation of logic circuit elements. Semiconductor memories; RAMs, ROMs, shift registers.

EI E 443  W  2C,1T,1L  0.5  
**Electric Networks 3**  
Two-port descriptions of ideal active devices; simulation of nonideal linear active devices; formulation and solution of network equations; network functions and their sensitivity in the frequency domain; introduction to passive and active filters, approximation theory and simple synthesis; time domain solutions; computer-aided analysis and design of networks, simulation of nonideal nonlinear devices.  
**Prereq:** EI E 342 or equivalent.

EI E 446  S,F  2C,2T  0.5  
**Linear Systems**  
Three types of linear multivariable systems are studied:  
1) real time-continuous systems;  
2) real time-discrete systems; and  
3) modulo-two time-discrete systems.  
The unifying approach of state equations is developed and the importance of linear algebra is emphasized. Topics include: time domain analysis, transform analysis (Laplace- and Z-transforms), stability considerations, system equivalence, system decomposition, system realization. The necessary matrix and linear-algebra theory is developed as required.

EI E 453  W  2C,1T,3L  0.5  
**Linear Electronic Circuits**  
**Project.**

EI E 454  S,F  2C,1T,1L  0.5  
**Nonlinear Electronic Circuits**  
Switching characteristics of semiconductor devices, non-sinusoidal wave generation and shaping, voltage and current sweeps, binary circuits and gates, digital integrated circuits, DCTL, DTL, ECL, TTL and i*P.

EI E 459  W  2C,1T,3L  0.5  
**Sound, Noise and Electroacoustics**  
An interdisciplinary study of acoustical physics, human response to sound and audio engineering. Main topics include: the physics of sound, electroacoustical systems, human audiology, acoustical measurements, audio electronics and applications.  
**Every third week**

EI E 463  S,F  2C,1T,1L  0.5  
**Power Electronics**  
Characteristics and ratings of power semiconductor devices with emphasis on the thyristor. General methods of achieving design objectives. Performance and analysis of power conversion circuits for both static and rotating loads.  
**Alternate weeks.**

EI E 464  W  3C,3L  0.5  
**High Voltage and Insulation Engineering**  
Nature and origin of high voltage surges encountered on power systems. Travelling waves on transmission systems; insulation engineering; electrostatic fields in high voltage apparatus, insulation failure; corona; insulation testing; circuit breakers and surge protection devices; insulation coordination.  
**Alternate weeks.**

EI E 465  W  2C,2T  0.5  
**Power Systems**  
Introduction to system concepts; aspects of power system planning and operation. Energy sources; environmental and resource implications. Per-unit and co-ordinate systems. Representation of equipment such as generators, transformers and transmission lines in system analysis. Analysis of imbalanced systems and faults. Voltage and reactive power control. Load/frequency control. Power transfer and system stability. Introduction to load flow methods. High voltage dc transmission.
Course Descriptions

English

EI E 473  W  2C,1T,3L'  0.5
Microwave Engineering
Rectangular and circular waveguides; simple waveguide discontinuity; periodic transmission systems; microwave scattering theory; ferrite components; klystrons; travelling-wave amplifiers; backward-wave oscillator, manetron; solid-state microwave devices.
*Every third week.

EI E 474  S,F  2C,1T,1L'  0.5
Antenna and Propagation Engineering
An introduction to the theory of radiation and of antenna and propagation engineering; linear antennas, linear arrays, aperture antennas, frequency independent antennas, measurement theory; ground wave propagation, ionspheric propagation, plasmas.
*Every third week
Prereq: EI E 372 or equivalent

EI E 481  S,F  2C,1T,1L'  0.5
Control Systems 1
*Alternate weeks

EI E 482  W  2C,1L',1T  0.5
Control Systems 2
*Open lab.
Prereq: EI E 446, EI E 481

EI E 499A  S,F  9L  0.5
Project
An engineering assignment requiring the student to demonstrate initiative and assume responsibility. The student will select a project at the end of the 3B term from an approved list prepared by the Department. A short progress report at the end of the 4A term and a full report at the end of the 4B term are required.

EI E 499B  W  9L  0.5
Project
Either a continuation of EI E 449A or a separate one-term project.

L' indicates lab every 2nd, 3rd week or open lab.

Department of English

Associate Professor, Chairman of Department
W. R. Macnaughton, BA (Toronto), MA, PhD (Wisconsin)

Professor, Associate Chairman and Undergraduate Officer
W. R. Martin, BA, MA, D Litt et Phil (South Africa)

Associate Professor and Graduate Officer
G. E. Slethaug, BA (Pacific Lutheran), MA, PhD (Nebraska)

Professor and Associate Dean, Special Programmes
K. L. Ledbetter, AB (Central College, Mo.), MA, PhD (Illinois)

Professors
L. A. Curnnings', AB (Washington), AM (Missouri), PhD (Washington)
J. Gold, BA (Birmingham), PhD (Wisconsin)
J. C. Gray, BA (Washington State), MA (Connecticut), PhD (Syracuse)
G. R. Hibbard, BA, MA (London)
W. U. Ober, BA (Washington and Lee), PhD (Indiana)
W. K. Thomas, MA, PhD (Toronto)
H. Tuyn, MA (Utrecht and Oxon), Docteur de l'Université de Paris R

Associate Professors
P. D. Beam, BA (Waterloo), MA (McMaster), PhD (Toronto)
R. R. Dubinski, BA, MA (W. Ont.), PhD (Toronto)
A. I. Dust, MA, PhD (Illinois)
H. B. Ellis, BA (Rollins), MA, PhD (Illinois)
R. N. Gosselink, BA (Kansas), MA, PhD (Colorado)
P. M. Hinchcliffe, BA (Br. Col.), MA, PhD (Toronto) J
N. C. Hultin, BA (Concordia), MA (Chicago), PhD (Johns Hopkins)
D. R. Letson, BA (Waterloo), MA (McMaster), PhD (Toronto)
R. Lister, BA, MA, PhD (Toronto)
H. M. Logan, AB (Franklin and Marshall), PhD (Pennsylvania)
E. P. McCormack, MA (Glasgow), PhD (Manitoba)
J. S. North, BA, MA (Br. Col.), PhD (Alberta)
E. F. Shields, BA (Chester Hill), MA (Villanova), PhD (Illinois)
J. S. Stone, BA, MA (Br. Col.)

Assistant Professors
S. Fogel, BA (Carleton), MA (Br. Col.), PhD (Purdue)
M. A. Gerhardstein, MA (Montana), PhD (Iowa)
C. E. McGee, BA, MA, PhD (Toronto)
S. E. McMullin, BA, MA (Carleton), PhD (Dalhousie)
Lecturers
L. Dorney, BA, MA (Louisville) (part-time)
J. Miller, BA, BLS (McGill), MA, MPhil (Waterloo) (part-time)

"Jointly appointed from Architecture"

For courses in Drama, see Drama and Theatre Arts Group in this Chapter.

Although the Department of English provides advisors to help students to choose their 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.

Note 1
W. K. Thomas's Correct Form of Essay Writing is the official style sheet for all undergraduate English courses.

Note 2
The "normal" number of lectures per week in each course is three; however, 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.

Course Descriptions

Consult the time-table for an up-to-date list of courses offered in 1980-81.

Group One

1) Courses in this group count towards a degree as electives in any programme in the University. None of them, however, may be counted as an English Major credit; in other words, none of them fulfills a core requirement for a General or an Honours programme in English.

A) Courses in Group 1(A) are primarily concerned with assisting students to improve their writing.

B) Courses in Group 1(B) are primarily designed to make students aware of the different functions of language in various contexts to assist them to improve their writing.

Engl 109 F.W.S 0.5
Introduction to Essay Writing 1
The course teaches the construction of the expository essay with attention to the structure of good paragraphs, to techniques of putting the essay together, and to the nature of the language. Ten to twelve short writing assignments are required.

Engl 110 W 0.5
Introduction to Essay Writing 2
The course teaches the construction of the persuasive essay, with attention to the elements of logical thinking, to the techniques of successful persuasion, and to the demands of the library research paper. Six to eight writing assignments are required.

Prereq: Engl 109

Engl 129R F.W,S 1C,2L,2T 0.5
Introduction to Written English
Instruction provided in basic grammar, sentence and paragraph structure, elements of composition and essay writing including focus on theme, development of central idea, exposition and argumentation. Minimum of four hours of instruction each week with additional tutorial hours as required.

Prereq: Open only to students whose maternal language is not English and who lack language mastery sufficient for admission to other introductory English language courses.

Engl 209 F 0.5
Advanced Essay Writing
Provides further opportunities for serious students of writing to study and to practise descriptive, expository, argumentative, and persuasive writing. In addition to lectures, there are workshop sessions in which student writing is discussed.

Prereq: Second-year standing or above
Engl 210  F,W  0.5
Report Writing
The many functions of the report - an orderly and objective communication of factual information which serves some specific purpose - are taught. Students will receive practice in research, in organization, and in writing many kinds of reports. Prereq: Second-year standing or above

Engl 309  Seminar in Essay Writing
Not offered in 1980-81.

Engl 335  0.5
Creative Writing
Aimed at encouraging students to develop their creative and critical potentials, the course consists of supervised practice, tutorials, and seminar discussions.

Engl 150  F  0.5
English as an Instrument of Thought and Communication 1
The course is designed to improve the reading and writing of students from all disciplines. In order to develop clarity of thought and critical awareness, students will identify and study in several media the various ends that are served by language: objective reporting; persuasion; argument; and emotional, social, and artistic expression. About eight written exercises are assigned. Also offered at Renison College

Engl 151  W  0.5
English as an Instrument of Thought and Communication 2
A continuation of Engl 150. From a basis of simple semantics and elementary logic, students will proceed to examine more complex language in fiction and other forms of literature. About six written exercises are assigned. Prereq: Engl 150 Also offered at Renison College

Engl 140R  F,W  0.5
The Use of English 1
The use and abuse of spoken and written English. The study and evaluation of language as it is used for various purposes (e.g. colloquial, scientific, legal, political, commercial, journalistic, literary) in order to increase critical awareness and help students to write clearly and effectively themselves.

Engl 141R  W  0.5
The Use of English 2
A continuation of Engl 140R. The study of factual, emotive, scientific and imaginative writing; relevance, context; meaning, tone, feeling and intention. Prereq: Engl 140R

Engl 240R  F  3C  0.5
Form and Function 1
The uses of literacy and the functions of language as acquired in Engl 140R/141R. These will be applied to the more advanced form of the literary and critical assignment essay, involving comparison, evaluation and exposition.

Engl 241R  Form and Function 2
Not offered in 1980-81

Note
A Courses are administered by Renison College

Group Two
Courses in this group carry degree credit and may be counted as fulfilling the minimum requirements for a General or Honours programme in English.

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. 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  Themes of Literature
An exploration of the great variety of literature through thematic perspectives.

Engl 108A  0.5
The Hero
A study of human excellence in thought and action embodied in representative men and women, as seen through works of literature. Also offered at St. Jerome's College.
Engl 108B  0.5  
_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 ideas of various periods.

Engl 108C  0.5  
_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 1980-81._

Engl 108E  0.5  
_Women in Literature_
A study of the nature and role of women in British, Canadian, and American literature. Works by both men and women will be studied in which women are seen in such forms as earth mothers, people, sex objects, and bitches. _Also offered at St. Jerome's College_

Engl 108F  0.5  
_The Rebel_
A study of various works of literature in which the protagonist is a rebel against existing norms. The course will examine a number of rebel types and concepts, moral implications and final outcomes either in successful realization or in tragic defeat. _Also offered at St. Jerome's College_.

Engl 108H  0.5  
_Isolation and Alienation_
The study of a variety of works centering on the theme of man in crisis, the stress being on the individual at variance with his inner self, his fellow man, or his world. The course will discuss the process in which wisdom and maturity are gained as the ultimate products of suffering. _Also offered at St. Jerome's College_.

Engl 190  0.5  
_Shakespeare_
Designed for students in all faculties, the course examines some of Shakespeare's comedies, history plays, and tragedies. Shakespeare's variety and flexibility in developing characters and dramatic structures are stressed, as are significant themes. _No previous work in Shakespeare is required_.

Engl 201  0.5  
_The Short Story_
This course deals with the history and techniques of the short story with emphasis upon works by such British, American and Canadian writers as Henry James, James Joyce, D. H. Lawrence, Ernest Hemingway, and Alice Munro.

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  0.5  
_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  0.5  
_Introduction to Folklore 2_
Similar to 203 but dealing with folk-drama, ballads, songs, medicines, riddles, chants, proverbs, and charms.

Engl 205F  _F,W,S_  3C  0.5  
_The Canadian Short Story_
The Canadian short story, from its beginnings - in the bush, in the north, on the land, in the small towns - through the struggles of an urbanizing society to the present. Students will be expected to work in some depth with individual authors.

_Note_
_R Courses are administered by Renison College._

Engl 208  
_Literary Genres and Themes_

Engl 208A  0.5  
_Forms of Fantasy_
This course will deal with the history and forms of fantasy written for adults. In considering the genre, related forms like the romance, the fairy tale, the fable, and the gothic horror story will be discussed. Authors such as Morris, C. S. Lewis, Tolkien, Williams, and White will be studied.
**Course Descriptions**

**English**

**Engl 208B 0.5**

**Science Fiction**

Various examples drawn, for instance, from Utopian and anti-Utopian science fiction, social science fiction, "gadget" science fiction, parapsychology, and alternate worlds and beings, will be considered. Some attention will be given to the historical development of the genre.

*Also offered at St. Jerome's College*

**Engl 208C 0.5**

**Studies in Children's Literature**

This course will deal with classic works of children's literature, including fantasy written primarily for children. Selections from such authors as Kipling, Woolf, C. S. Lewis, George MacDonald, Kenneth Grahame, and Thurber will be studied.

**Engl 208D 0.5**

**Modern Satire**

The mode of satire in the fiction, drama, poetry and discourse of the 20th century. Particular attention to the literary works of Waugh, Huxley, Orwell, Parker, Heller, Hiebert, and a dramatist of the absurd, but also attention to satiric cartoons and nightclub satire.

**Engl 208E 0.5**

**Women Writers of the 20th Century**

A study of such major 20th-century women writers as Woolf, Hellman, Murdoch, McCarthy, Lessing, Laurence, Plath and Atwood. Emphasis will be on the concerns of these writers with the roles of women, the writer's search for new meanings, and their innovations in literary forms.

*Also offered at St. Jerome's College*

**Engl 208H 0.5**

**Arthurian Legend**

The story of Arthur and his knights of the Round Table will be discussed as it is treated at various times in various works and genres. Such matters will be considered as the character of Arthur, the concept of Camelot, and the Fellowship of the Round Table.

**Engl 208K 0.5**

**Detective Fiction**

The history and characteristics of the "detective novel," the "novel of crime," and the "thriller." Attention will also be given to the novel of intrigue and espionage. Such authors as Poe, Collins, Doyle, Chesterton, Hammett, Buchan, Greene, Deighton, and Le Carre will be discussed. The course includes the examination of critical approaches to the form of detective fiction.

**Engl 211/212**

**The Novel**

The novel, by its nature, constitutes an attempt to formulate and to interpret the bewildering human experience. This course undertakes an exploration of the forms that attempt can take. British, Canadian, and American novels will be studied. The two halves of the course may be taken independently.

*Also offered at St. Jerome's College*

**Engl 211 F 0.5**

**The Novel 1**

A study of the novel in English from its beginnings to the late 19th century.

*Also offered at St. Jerome's College*

**Engl 212 W 0.5**

**The Novel 2**

A study of the novel in English from the late 19th century to the present.

*Also offered at St. Jerome's College*

**Engl 214 0.5**

**Themes in Canadian Literature**

The course will survey a theme which is significant to the understanding of the Canadian literary mind. Topics will vary from section to section.

*Also offered at St. Jerome's College*

**Engl 215 0.5**

**Canadian Regional Literature**

The course will provide a survey of literature written about a distinctive region of Canada.

**Engl 230 0.5**

**Narrative Poetry**

A study of the major narrative forms in English poetry including the ballad, epic, mock epic, and dramatic monologue.

**Engl 231 0.5**

**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.

**Engl 232 0.5**

**The Development of Drama to 1660**

A study of the origins and development of English drama, with special concentration on 16th-century non-Shakespearean drama.

(Cross-listed with Drama 252)
Course Descriptions

English

Engl 233 0.5
Drama from 1660
A study of the principal playwrights, plays, and movements in dramatic history from the re-opening of the theatres in 1660 to the present day.
(Cross-listed with Drama 253).

Engl 236 Literature of Ideas 1
Not offered in 1980-81

Engl 237 Literature of Ideas 2
Not offered in 1980-81

Engl 251 Y 1.0
The Practice and Theory of Criticism
The study and practice of skills needed for a close, analytical reading of literary texts and for the writing of critical analyses on them; studies of theories concerning literature and literary criticism.
Also offered at St. Jerome's College.

Engl 305 Y 1.0
Old English
An introduction to the literature and language of pre-Conquest England. The principal literary methods, themes, and types of English literature up to the 12th century constitute the material of study in this course.
Also offered at St. Jerome's College.

Engl 310 Y 1.0
Middle English
A study of Middle English literature with special emphasis on the work of Geoffrey Chaucer.
Also offered at St. Jerome's College.

Engl 312 0.5
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.
Also offered at St. Jerome's College.

Engl 313 0.5
Canadian Literature to 1920
A study of Canadian prose and verse to 1920, with particular attention to the poetry of the School of the Sixties and to the historical and idyllic novels of the 19th and early 20th centuries.
Also offered at St. Jerome's College.

Engl 314 0.5
Canadian Poetry Since 1920
Also offered at St. Jerome's College.

Engl 315 0.5
Canadian Prose Since 1920
The Canadian novel since the appearance of Morley Callaghan, with brief consideration of the essay and short story during the period.
Also offered at St. Jerome's College.

Engl 316 0.5
Canadian Drama
A study of plays by such dramatists as Merrill Denison, Robertson Davies, Gratien Gélinas (in translation), James 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)

Engl 330 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 before the reign of Elizabeth I. Reserved for special attention is Spenser's epic poem glorifying Elizabeth 1 and England - The Faerie Queene.
Also offered at St. Jerome's College.

Engl 330A F 0.5
Elizabethan Literature 1 (excluding Drama)
A study of the principal writers of prose and of lyric and narrative poetry in England during and immediately before the reign of Elizabeth I.
Also offered at St. Jerome's College.

Engl 330B W 0.5
Elizabethan Literature 2 (excluding Drama)
The continuation of English 330A. Reserved for special attention is Spenser's epic poem glorifying England and Elizabeth I - The Faerie Queene.
Prereq: 330A or consent of instructor.
Also offered at St. Jerome's College.

Engl 339 Contemporary British Literature
Npt offered in 1980-81

Engl 343 F 0.5
American Literature
The meaning of America - the myth, the dream, and the reality - as experienced through its major literary works. Sin, guilt, madness, mysticism, and grace: the search for fulfillment and peace by such writers as Poe, Thoreau, Whitman, Twain, and Crane.
Also offered at St. Jerome's College.
Engl 344 W 0.5  
**Modern American Literature**  
Approaches to reality amid the confusion and uncertainty of 20th-century America. Emphasis on such major writers as Faulkner, Miller, and Cummings.  
*Prereq: Engl 343  
Also offered at St. Jerome's College*  

Engl 345/346/347  
**Studies in American Literature**  
(Usually only one or two courses from this series are offered each year.)  

Engl 345B W 0.5  
**American Fiction**  
The Southern Myth: its origins in early literature, its flowering and ruin, as seen by white and black writers, including Twain, Faulkner, Welty, Styron, Grau, O'Connor, Wright, and Ellison.  
*Prereq: Engl 343 or consent of instructor.*  

Engl 346C W 0.5  
**American Fiction**  
Special emphasis will be given to the works of two or three major American novelists such as Herman Melville and William Faulkner.  
*Prereq: Engl 343 or consent of instructor;*  

Engl 347A W 0.5  
**Contemporary American Literature**  
A study of American Literature from World War 2 to the present.  
*Prereq: Engl 343 or consent of instructor  
Also offered at St. Jerome's College*  

Engl 350 Y 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.  
*Also offered at St. Jerome's College.*  

Engl 355 **Forms of Classical and Neo-Classical Satire**  
Not offered in 1980-81.  

Engl 356 **Pastoral and Mythological Aspects of Classical and Neo-Classical Poetry**  
Not offered in 1980-81.  

Engl 362 F 0.5  
**Shakespeare 1**  
A study of the plays written prior to 1599-1600, excluding *Julius Caesar.*  
*Also offered at St. Jerome's College*  

Engl 363 W 0.5  
**Shakespeare 2**  
A study of the plays written after 1599-1600, including *Julius Caesar.*  
*Also offered at St. Jerome's College*  

Engl 365/366 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*  

Engl 373 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.  

Engl 375 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.  

Engl 376R **Our Changing Language: Syntax and Semantics 1**  
*Not offered in 1980-81*  

Engl 377R **Our Changing Language: Syntax and Semantics 2**  
*Not offered in 1980-81*  

Engl 386R F 3C 0.5  
**Twentieth-Century Literature 1**  
A survey of writing in an age of anxiety from the psychoanalytic novel to the theatre of the absurd. The concept of the anti-hero in the various approaches. Satirical, emotional and intellectual writing as studied in novels and plays by Graham Greene, Aldous Huxley, D. H. Lawrence, Evelyn Waugh and Harold Pinter.  

Engl 387R W 3C 0.5  
**Twentieth Century Literature 2**  
A continuation of topics covered in Engl 386R.  

*Note:  
R courses are administered by Renison College.*
Course Descriptions
English

**Engl 400** 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.*

**Engl 410** Y 1.0
**The Augustan Age**
A study of English literature from 1660 to 1798: the comedy of the Restoration; 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.*

**Engl 410A** F 0.5
**Satire and Sense: The Restoration and Early Eighteenth Century**
The Restoration comedy of manners, heroic and high tragedy, poetry of the court wits and other amused commentators on society, and the major writings of Dryden, Swift, Addison, Defoe, and the early Pope.
*Also offered at St. Jerome’s College.*

**Engl 410B** W 0.5
**Sense and Sensibility: The Middle and Later Eighteenth Century**
The probing of mores and manners by Pope and Johnson, the emergence of the novel with Fielding and Sterne, and the transformation (in “the age of sensibility”) of literary attitudes and practice from classicism to romanticism.
*Also offered at St. Jerome’s College.*

**Engl 415** 0.5
**Major Canadian Writers**
An intensive study of the work of two or three major Canadian authors. Writers who may be studied include Morley Callaghan, F. P. Grove, Robertson Davies, A. M. Klein, Thomas Haliburton, Irving Layton, Margaret Atwood, and Margaret Laurence.
*Prereq: Consent of instructor*

**Engl 430** Y 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.*

**Engl 451** Y 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.*

**Engl 460** Y 1.0
**British Literature from Shaw to Eliot**
A study of the major writers in British Literature from 1885 to World War 2, with special emphasis on such writers as Shaw, Yeats, Eliot, Conrad, Joyce, and Lawrence.
*Also offered at St. Jerome’s College.*

**Engl 460A** F 0.5
**British Literature, 1885-1914**
A study of works by such writers as Shaw, Conrad, and Yeats.
*Also offered at St. Jerome’s College.*

**Engl 460B** W 0.5
**British Literature, 1914-1945**
A study of works by such writers as James Joyce, D. H. Lawrence, and T. S. Eliot.
*Also offered at St. Jerome’s College.*

**Engl 495** 1.0
**Supervision of Senior Honours Essay**
Course Descriptions

Environmental Studies

Env S 111  F  3C  0.5
Introduction to the Study of the Future
Non-technical survey of current approaches to thinking about and refining your views of the "Future". The role of images and scenarios, contributions of the arts and concepts of space and time. Impacts of regional science, ekistics, bioethics, synergetics, and prognostics. Paths to "inventing" the future and the comprehensive design of "optimum" environments.
No prereq.

Env S 195A  F,W  3C  0.5
Introduction to Environmental Studies
Theories, methods and conceptual approaches that have become associated with the study of environment are introduced. This course attempts to develop an understanding of the relationship between people and their environment and an appreciation of how we do and how we could manage that relationship.
Prereq: Environmental Studies Students only.

Env S 200  F,W  2C,2L  0.75
Field Ecology
Introduces the main concepts and principles of ecology: the cycling of elements, energetics and structural organization of major ecological systems; population dynamics; impact of natural resource management practices and urban and industrial development on the environment; incorporating environmental quality considerations into development activities. There are weekly field trips to study natural and disturbed ecosystems, urban and applied ecology.
Prereq: 2nd, 3rd and 4th year students only

Env S 201  F,W  0.5
Introduction to Environmental and Planning Law
Introduction to legal concepts generally and to environmental and planning law concepts in particular. Designed both for students who do not plan to take further in-depth legal courses and as a prerequisite for senior legal courses - Env S 401 and Env S 402. Topics to be covered include Sources of Law, Nature of Legal Remedies, Common Law, Judicial Review, Administrative Agencies and the law relating to them, Planning Act, Environmental Protection and Assessment Acts, and Federal Fisheries Act.

Faculty of Environmental Studies

There are a number of courses offered in the Faculty of Environmental Studies of an integrative nature which extend across the academic interests of the four units, School of Architecture, Department of Geography, Department of 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. Students interested in this area are urged to consult the course offerings of the four individual units mentioned above. These four departments/schools offer a variety of related courses allowing in-depth studies of topics covered in the Environmental Studies courses.

The following persons have wide ranging interests and hence have been appointed to the Faculty of Environmental Studies rather than to a specific Department and/or School:

Professor
C. K. Knapper¹, BA Hons (Sheffield), PhD (Sask.)
P. H. Nash, BA, MA (UCLA), CE (Grenoble), MCP, MPA, PhD (Harvard), MCIP

Associate Professor
D. Estrin², BA, LLB (Alberta) (part-time)
R. T. Newkirk³, BA, MSc, PhD (W. Ont.)
D. H. Wood⁴, BComm, LLB (Toronto) (part-time)

Adjunct Professor
M. M. R. Freeman, BSc (Reading), PhD (McGill)

Adjunct Lecturers
K. Elliott, Diploma Creative Arts
D. G. E. Wicken, Diploma AA

Faculty members cross and/or joint appointments as shown
¹Environmental Studies and Psychology
²Environmental Studies and Planning
³Environmental Studies and Man-Environment Studies
Course Descriptions
Environmental Studies

Env S 252  F  3C  0.5
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 S students only or consent of instructors

Env S 253  W  3C  0.5
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: 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 students. The student will be required to purchase materials.
Prereq: Env S 252 or consent of instructors

Env S 271  F,W  3C.1L  0.75
Introduction to Quantitative Research Methods
An introduction to scientific method; descriptive and inferential statistics; sampling design. The course emphasizes the methodological and interpretative problems involved in using selected quantitative methods to investigate selected environmental topics.
Prereq: only for students in Environmental Studies.

Env S 272  W  3C  0.5
Computer Programming in Environmental Studies
The course emphasizes programming skills and applications in the context of environmental problems.
Prereq: Env S 271

Env S 310  F,W  2C  0.5
Behavioural Studies
(Formerly Geog 413)
Studies of environmental perception and of the behaviour of individuals and groups in interaction with their environment. Emphasis will be divided between an explanation of the methods of social science suitable for the study of environmental behaviour and the substantive findings from such applications.
Prereq: Second, third or fourth year students only
Note: Contains material previously offered in M Env 330

Env S 333  W  0.5
Parkland Management
Systems planning, master planning and site planning for Ontario's non-urban parks. Design and management for linear open space, such as rivers, trails, and coasts. Environmental assessment as it relates to amenity resources. Evaluating the effectiveness of the public participation process.
Prereq: Consent of instructor

Env S 358  F,W  3C  0.5
Environmental Pollution and its Control
After some introductory material, course instructor and guest lecturers 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 S 380/381  F,W  C  0.5
Environmental Studies Workshop
An interdisciplinary workshop focusing upon environmental issues in a project or research format.
Prereq: 3rd and 4th year students in Environmental Studies; enrolment is by research team only with representatives from at least 3 units of the faculty (max. 7 people) and subject to selection of an advisor and a satisfactory project or research proposal.

Env S 400  0.5
Professional Development in Environmental Management
Those interested in qualifying for professional status and those from other related disciplines such as civil engineering, planning, architecture, and geography may find a discussion of professional environmental management strategies useful. Issues of technical principles, data assessment, ethics, interdisciplinary work and costs will be discussed.
Prereq: 4th year students or consent of instructor

Env S 401  F  3C.1.5S  0.75
Environmental Law
An advanced, in-depth version of Env S 201, providing an opportunity for detailed analysis of institutional factors regulating the natural environment and resources development in Ontario and Canada. How satisfactory present statutes, court systems and boards are for improving environmental quality as well as alternatives to these legal-institutional approaches will be discussed.
Prereq: Env S 201
Env S 402 W 3C,1.5S 0.75
Planning Law
An analysis of the legal basis for planning in Ontario and the practice of planning law as it affects planners, municipalities, local councils, property owners and residents. The roles of planning boards, municipal councils, the Ontario Municipal Board, the Ministry of Housing, provincial Cabinet and the Niagara Escarpment Commission in the planning process will be discussed.
Prereq: Env S 201

Env S 411 F 3S 0.5
Alternative Future Environments 1
Analysis of "ideal" environments of the past, including "utopian" communities. Scrutiny of current "concepts" of future environments, including distillation of works of Bell, Clarke, Commoner, de Chardin, de Jouvenal, Dror, Doxiadis, Ehrlich, Forrester, Fuller, Kahn, Mead, Meadows, McHale, Michael, Polak, Theobald, Thompson, Toynbee, and Ward.
Prereq: 3rd or 4th year standing or consent of instructor

Env S 412 W 3S 0.5
Alternative Future Environments 2
Examination of "issues" in futuristics and their "methodological" problems, with particular attention to resources utilization. Socio-Cultural Change Theory and Policy Science. Science Fiction, Extrapolation, and Technology Forecasting. Societal Indicators, Quality of Life, and Technology Assessment. Probable and Possible Urban Futures.
Prereq: Env S 411 or consent of instructor.

Env S 417 Land Use History and Landscape Change 1
Not offered 1980-81.

Env S 418 Land Use History and Landscape Change 2
Not offered 1980-81.

Env S 444 1.0
Land Evaluation and Resources Management
The course will focus on the management of land and resources. It will emphasize the techniques of inventory, critical evaluation, and policy formulation related to sensible use of these commodities. Attitudinal, legal, and political influences will be investigated, particularly as they affect the design and implementation of planning decisions.

Department of Fine Arts

Associate Professor, Chairman
N. L. Patterson, BA (Washington)

Professors
V. Burnett, BS (Columbia), MA (California)
A. M. Urquhart, BFA (Buffalo)

Associate Professor
D. I. MacKay, BFA (Mt. Allison), MFA (Cornell)

Assistant Professors
A. Green, BFA (Art Instit. of Chicago)
B. Irland, BFA (Illinois), MFA (Massachusetts)
E. Kliman, MA, PhD (Toronto)
A. Roberts, BA (Guelph)
J. Uhde, MA (Purkyne's University Brno, Czechoslovakia), PhD (Waterloo)

Course Descriptions

Fine 110 F 3C 0.5
Introduction to World Art 1
A comparative survey of Prehistoric and Ancient Art, and of Oriental, African, New World and Oceanian Art, emphasizing visual form as an expression of its historical and cultural context.

Fine 111 W 3C 0.5
Introduction to World Art 2
A comparative survey of Western Art from the Classical to the Modern period, emphasizing visual form as an expression of its historical and cultural context.

Fine 120 F 1G,1std 0.5
Fundamentals of Visual Art 1
An introduction to the fundamental principles and concepts of visual art, through a series of experimental studio problems in two and three dimensional materials and media. Lab fee.

Fine 121 W 3std 0.5
Fundamentals of Visual Art 2
A continuation of Fine 120 with emphasis on colour
Prereq:Fine 120

Fine 210 F 3C 0.5
Modern Art 1
An examination of the history of Modern Art from the late 18th century up to the time of impressionism.
Fine 211  W  3C  0.5
Modern Art 2
A continuation of Fine 210, commencing with impressionism and proceeding through the major trends of the early 20th century up to the contemporary period.

Fine 212  F  3C  0.5
Italian Renaissance Art 1
A survey of painting, sculpture, and architecture, especially in Florence and Siena, starting with Giotto and his contemporaries and covering innovations in perspective, anatomy, and iconography through the end of the 15th century.

Fine 213  W  3C  0.5
Italian Renaissance Art 2
A continuation of Fine 212 starting with the masters of the High Renaissance, Leonardo, Raphael and Michelangelo, and proceeding through Mannerism, Baroque and Rococo in Florence, Venice and Rome.

Fine 216  F  3C  0.5
Northern Renaissance and Baroque Art 1400-1700
The survey concentrates on artistic developments in Northern Europe, with reference, where appropriate, to the art of Italy. 
Prereq: Fine 111 or consent of instructor.

Fine 217  F  3C  0.5
Medieval Art and Architecture 400 A.D. – 1400 A.D.
A survey that begins with the paintings of the catacombs and ends with late Gothic book illumination. 
Prereq: Fine 111 or consent of instructor.

Fine 218  0.5
Western Religious Art
Admission by consent of instructor

Fine 220  F  6std  0.5
Fundamentals of Painting 1
An exploration of the problems and possibilities of painting as a vehicle for serious creative expression. The fundamentals of composition and painting techniques will be presented through a series of studio projects. Lab fee. 
Prereq: Fine 120/121 or consent of instructor.

Fine 220A  F  6std  0.5
Watercolour Painting
An exploration of the technique of watercolour painting as a means of creating both non-objective and representational forms on a two-dimensional surface. Lab fee. 
Prereq: Fine 120/121.

Fine 221  W  6std  0.5
Fundamentals of Painting 2
A continuation of the studio projects begun in Fine Arts 220 with a greater emphasis on the development of individual expression. Lab fee. 
Prereq: Fine 220 or consent of instructor.

Fine 222  F  3 std  0.5
Fundamentals of Sculpture 1
An introduction to clay sculpture. Three-dimensional form will be explored with the emphasis on the handling of clay as an expressive medium enhanced by surface treatment. Primitive reduction and Raku firing methods will be used to understand basic clay and glaze reactions to heat. Lab fee. 
Prereq: Fine 120/121.

Fine 223  W  3 std  0.5
Fundamentals of Sculpture 2
An introduction to multi-media sculpture. Additive and subtractive use of wood, metal and plaster casting, together with a mastery of three-dimensional forms in a variety of media. Lab fee. 
Prereq: Fine 222.

Fine 223A  W  6 std  0.5
Clay Studies from the Human Form
Three dimensional studies from the model. Hollow fired, terra-cotta portraiture and cement fondu casting of the human figure. Lab fee. 
Prereq: consent of instructor.

Fine 224  F,W  4std  0.5
Introduction to Drawing
Half the time will be devoted to drawing from the model and the remainder to a series of drawing concepts. At least one field trip will be included: Art Gallery of Ontario or the Albright Knox in Buffalo. Lab fee. 
Prereq: Fine 120/121.

Fine 225  W  6 std  0.5
Analytical Figure Drawing
Analytical figure drawing from the model will be combined with a study of human anatomy for artists. Lab fee. 
Prereq: Fine 120/121.

Fine 226
Printmaking
Introduction to materials and methods of printmaking. Current offerings are given below.

Fine 226A  F  4std  0.5
Printmaking (Intaglio)
An introduction to basic intaglio techniques including etching and engraving through workshops, class demonstrations and field trips. Lab fee. 
Prereq: Fine 120/121 or consent of instructor.
Fine 226B  W  4std  0.5  
**Printmaking (Relief)**  
An introduction to relief printing including collograph, wood block, lino cut and type using press and non-press materials to make print images in a series of workshops, demonstrations and field trips. *Lab fee.*  
*Prereq:* Fine 226A or permission of instructor.

Fine 226C  W  6std  0.5  
**Printmaking (Screen)**  
An introduction to screen printing, with emphasis on exploration of ink properties and stencil techniques. *Lab fee.*  
*Prereq:* Fine 120/121 or consent of instructor.

Fine 227  0.5  
**Scientific Drawing**  
*Admission by consent of Instructor.*

Fine 228  
**Applied Arts**  
The history, design and practice of various applied arts will be explored in slide lectures and studio projects. Specific arts will vary from year to year; current offerings are given below.

Fine 228A  W  3std  0.5  
**Expressive Textile Forms**  
The history of textile arts and problems of design for textile media will be explored combining lectures and studio projects in both two and three dimensional expressive forms. Traditional textile materials and methods will be applied to the creation of contemporary expressive and autonomous forms. Students will supply their own materials.

Fine 244  F  D,C  0.5  
**History of Film 1**  
General history of world cinema in its silent era (1895-1929), covering the work of outstanding directors, important movements and the contribution to the film medium as an independent art form. *(Regular screening of a variety of films.) Film fee.*

Fine 245  W  D,C  0.5  
**History of Film 2 - Sound Film**  
A continuation of Fine 244. The expression of film history into the sound era (since 1929) including the most recent period: *(Regular screening of a variety of films.) Film fee.*
Fine 317  W  3C  0.5
**Canadian Art**
An examination of Canadian Art extending through the important styles of settlers, especially from Britain and France, in the seventeenth, eighteenth and nineteenth centuries, to the development of the nationalist styles of early twentieth century, culminating in contemporary Canadian art.

Fine 318  0.5
**Canadian Ethnic and Traditional Arts**
*Admission by consent of Instructor.*

Fine 319  W  3C  0.5
**Contemporary Art**
A seminar exploring the contemporary avant garde art movements through critical analysis, historical correlation, discussions with artists and trips to Toronto and New York. Topics covered will include environmental sculpture, conceptual trends, earthworks, performance, technology, postal art, and the business aspects of art.

No prerequisite.

Fine 319A  W  3C  0.5
**Special Topics in 20th Century Art: 1900-1940**
An in-depth study of the major innovations in early 20th century painting, sculpture and architecture. Honours Art History majors interested in the modern period are encouraged to use this course as preparation for their 4th year honours presentation.

*Prereq: Fine 211 or consent of Instructor.*

Fine 319B  W  3C  0.5
**Special Topics in 20th Century Art: 1940-1970**
A survey of the major movements during the thirty year period following the beginning of World War II, including Op Art, Action Painting, the Beat Consciousness, Happenings, Pop Art, Assemblage, Post-Painterly Abstraction and Field Painting, and Kinetic and Light Sculpture.

Fine 320  F  6std  0.5
**Advanced Painting 1**
Drawing upon the experience gained in Fine 220/221 this course will emphasize the student's individual development as a beginning painter, through independent problems, along with class discussions and individual critiques.

*Lab fee.*

*Prereq: Fine 220/221 or consent of instructor.*

Fine 321  W  6std  0.5
**Advanced Painting**
A continuation of Fine Arts 320 with a further emphasis on independent problems.

*Lab fee.*

*Prereq: Fine 320 or consent of instructor.*

Fine 322  F  0.5
**Advanced Sculpture 1**
An exploration of sculpture problems in a variety of media as vehicles for serious creative expression. Wood, metal, glass and soapstone will be used for visual portrayal of spatial ideas.

*Lab fee.*

*Prereq: Fine 222/223.*

Fine 323  W  0.5
**Advanced Sculpture 2**
Organization and integration of sculptural concepts in clay to develop a series of representational or abstract sculptures. Clay and glaze technology for oxidation stoneware firing will be stressed.

*Prereq: Fine 322.*

Fine 323A  W  S,std  0.5
**Assemblage**
A two and three dimensional study of the various aspects of assemblage, including visual poetry, processes, events, conceptualization, and structuralism.

Fine 324  F  6std  0.5
**Advanced Drawing**
A course in which drawing is investigated as a means of expression and communication. The human figure, objects, and the landscape will be studied as sources of artistic imagery. The student will be encouraged to experiment with imagery, to develop personal vision, and to devise individual formal means of expression.

*Lab fee.*

*Prereq: Fine Arts 224 or consent of instructor.*

Fine 325  W  6std  0.5
**Advanced Drawing 2**
Continuation of Fine 324.

Fine 326A  F  std  0.5
**Advanced Printmaking (Intaglio)**
A continuation of printmaking concepts developed in relief/intaglio printing with emphasis on projects/portfolios and individual experimentation.

*Lab fee.*

*Prereq: Fine 226A and one of Fine 226B or Fine 226C or consent of Instructor.*

Fine 326C  F  std  0.5
**Advanced Printmaking (Screen)**
Advanced studio in screen printing, with emphasis on photographic stencil techniques.

*Lab fee.*

*Prereq: Fine 226C and one of Fine 226A or Fine 226B or consent of Instructor.*

Fine 327A  W  std  0.5
**Advanced Printmaking (Intaglio)**
A senior printmaking studio in relief/intaglio printing with emphasis on projects and individual experimentation.

*Lab fee.*

*Prereq: Fine 326A or consent of Instructor.*
Fine 327C W std 0.5
Advanced Printmaking (Screen)
A continuation of Fine 326C with emphasis on independent problems in large format printing.
Lab fee.
Prereq: Fine 326C or consent of Instructor.

Fine 328 W 3std 0.5
Calligraphy
A study of the art of written forms, combining studio projects with slide lectures on the history of writing, illuminating, and lettering. Students will strive for mastery in various calligraphic forms including Roman, Uncial, Gothic, Italic, and Fraktur.

Fine 329 F 3std,C 0.5
Illustration
Studio work in techniques and theory of book illustration, together with slide lectures on the history of printed forms.
Prereq: Consent of Instructor.

Fine 344A F 3D,C 0.5
Topics in European Film History 1
Admission by consent of instructor.

Fine 345A W 3D,C 0.5
Topics in European Film History 2
Admission by consent of instructor.

Fine 346R/347R 0.5/0.5
Special Topics in Film
Special topics will be announced from year to year.

Fine 348R The Films of Chaplin
Not offered 1980-81

Fine 349R The Films of Fellini
Not offered 1980-81

Fine 370 F D,std 0.5
Film Theory 1 (Anatomy of Film)
Discussion of the aesthetic aspects of cinematographic work (principles known as “film language”). Film Fee.
Prereq: Consent of Instructor.

Fine 371 W D,2std 0.5
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. Film Fee
Prereq: Fine 370.

Fine 390 F R 0.5
Selected Subjects in Fine Arts
Research and reading courses under the direction of individual instructors.
Admission by consent of Instructor.

Fine 390A F 3S 0.5
Methods in the History of Art
For students planning a Senior Honours Presentation in Art History as it is currently understood. Students will examine methods of formal and stylistic analysis, iconographical interpretation and the application of social and political history to understanding of works of art. Required of all art history majors who take Fine 490/491.
Prereq: Consent of Instructor.

Fine 391 W R 0.5
Selected Subjects in Fine Arts
Research and reading courses under the direction of individual instructors.
Admission by consent of Instructor.

Fine 420 F 4std 0.5
Senior Graphics Techniques 1
Admission by consent of Instructor.

Fine 421 W 4std 0.5
Senior Graphics Techniques 2
Admission by consent of Instructor.

Fine 470 F 0.5
Senior Seminar in Film Concepts 1
Admission by consent of Instructor.

Fine 471 W 0.5
Senior Seminar in Film Concepts 2
Admission by consent of Instructor.

Fine 472 F 0.5
Senior Seminar I
Admission by consent of Instructor.
Fine 473  W  0.5
Senior Seminar II
Admission by consent of Instructor.

Fine 490  S,std,R  0.5
Senior Honours Presentation 1
Each student will work under the direction of a Fine Arts faculty member on an advanced creative project. The result of this endeavour will be presented in the form of an exhibition or its equivalent (i.e.: film, illustrated book, portfolio, or essay), which will be examined by faculty members of Fine Arts and also where pertinent, by members of other departments.
Required of all students in Honours Fine Arts. Admission by permission only.

Fine 491  S,std,R  0.5
Senior Honours Presentation 2
A continuation of Fine 490. Admission by permission only.

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**Department of French**

**Associate Professor and Chairman of the Department**
J. R. Dugan, BA, MA (Toronto), PhD (Yale)

**Professors**
A. Ages, BA (Carleton), MA, PhD (Ohio State)
J. R. Finn, CR, BA (W. Ont.), MA (Toronto), PhD (Illinois)
R. L. Myers, BA (W. Ont.), MA, PhD (Johns Hopkins)

**Associate Professors**
J. J. Binamé, Len Phil Rom, Agrégé (Brussels)
P. H. Dubé, BA, MA (Toronto), PhD (Ohio State)
W. D. Wilson, MA, PhD (Trinity College, Dublin)

**Assistant Professors**
H. S. Fournier, BA (Toronto), MA, PhD (W. Ont.)
R. J. Fournier, BA, MA, PhD (W. Ont.)
D. W. Russell, BA, MA, PhD (Toronto)
P. Socken, BA (Toronto), MA (Iowa), PhD (Toronto)

**Sessional Appointments**
C. A. Abbott, BA, MA, PhD (Ohio State)
M. Hennig, BA (W. Ont.), 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, Baccalauréat ès Arts, Licence ès Lettres (Laval), MA (Toronto)

**Waterloo at Laval**
There is an arrangement between the Department and the Université Laval, at Québec, whereby Waterloo students may study for a year or a term at Laval. Further particulars may be obtained from the Department.

**First-Year French Courses**
Students should read the following carefully in order to enrol initially in the appropriate course. When in doubt, consult the Department.

**Level 1: Courses for Students Who have not Completed High School Year 5 French**

Fr 151  F,S  3C,1L  0.5
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 Grade 13 French. Involves reading, writing and speaking French. Successful completion of Fr 151 qualifies a student to take Fr 152.
Course Descriptions

French

Note
Students will be placed into sections appropriate to their ability and background in French.
Also offered at St. Jerome's College.

Fr 152 W 3C,1L 0.5
Basic French
A continuation of the work done in Fr 151.
Successful completion of Fr 152 qualifies a student to take Fr 192.
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 Grade 13 French, or who Have Otherwise Acquired an Equivalent Command of French.

Note 1
Students wishing to enroll 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.)

Note 2
Successful completion of Fr 192 or Fr 192B or Fr 196 automatically entitles the student to register in the General or Honours Degree programme in French.

Fr 192 Y 4C,1L 1.0
French Language
A very intensive French language course, taught in French. Emphasis will be placed on strengthening oral expression, comprehension of spoken French, reading and writing skills.
Prereq: Grade 13 French, Fr 152 or consent of Department.
Also offered at St. Jerome's College

Fr 192A F 4C,1L 0.5
French Language
Fall term of Fr 192; see note below.

Fr 192B W 4C,1L 0.5
French Language
Winter term of Fr 192; see note below

Note
These term courses are available only to students in the co-operative System or with the permission of the Department.

Fr 195 F 3C 0.5
French Literature I
A study of various critical approaches and their application to French literature.
Prereq: Grade 13 French or equivalent, Fr 152 or consent of Department.

Note
Students taking this course who wish to major or honour in French are strongly urged to enroll in Fr 192 as well.

Fr 196 W 3C 0.5
French Literature II
A study of various critical approaches and their application to French literature. A continuation of French 195.
Prereq: Fr 195 or consent of Department.

Note
Students taking this course who wish to major or honour in French are strongly urged to enroll in Fr 192 as well.

**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.

French for Reading Knowledge

Fr 198 F 3C,1L 0.5
Reading French (Formerly Fr 101)
An elementary course, taught in English, designed to give the student a rapid and adequate reading knowledge of French. Basic elements of French sentence structure are explained, and reading passages from diverse academic disciplines are studied. This course will not give the student training in oral French.
Prereq: Consent of Department.

Note
This course is intended for students who have never had French before. Students must have an adequate knowledge of the English language to enroll in this course.
Fr 199 W 3C,1L 0.5
Reading French (Formerly Fr 102)
A continuation and completion of the work begun in French 198 (formerly Fr 101).
Prereq: Fr 198, Fr 101 or consent of Department.

Note 1
This course is intended for students who have never had French before. Students must have an adequate knowledge of the English language to enroll in this course.

Note 2
There is no follow-up to Fr 199. Students wishing a basic French course leading to further courses should see Fr 151.

Note 3
Successful completion of Fr 199 will satisfy the "reading knowledge of French" requirement of the University of Waterloo Graduate programmes.

Second-Year French Courses

Language

Fr 205 F,W 3C,1L 0.5
Spoken French
Intensive oral and aural training in the classroom. There will be particular emphasis on comprehension and conversation, with the class being divided into small groups for practice in speaking. These groups will be streamed according to the fluency of the students.
Prereq: normally one of: Fr 152, 191, 192, 192B, or consent of Department.

Fr 206 W,S 3C,1L 0.5
Spoken French
Continuation and completion of work begun in Fr 205.
Prereq: Fr 205 or consent of Department.

Fr 207 F,S 3C,1L 0.5
Spoken French
Advanced level for continued intensive oral and aural training in the classroom. There will be particular emphasis on comprehension and conversation, with the class being divided into small groups for practice in speaking.
Prereq: Fr 206 or consent of Department.

Fr 208 W 3C,1L 0.5
Spoken French
Continuation and completion of work begun in Fr 207.
Prereq: Fr 207 or consent of Department.

Note 1
Each classroom section of this course will be limited to a maximum enrollment of 12 students.

Note 2
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.

Fr 210 F 2C 0.5
Report Writing in French
This course is designed to give students practice in the research, the organization and the writing of a variety of reports in the French language.
Prereq: Fr 191 or Fr 192 or consent of Department.

Fr 250 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: Fr 191, Fr 192 or consent of Department.

Fr 251 F 3C,1L 0.5
French Language
Fall term of Fr 250; see note below

Fr 252 W 3C,1L 0.5
French Language
Winter term of Fr 250; see note below.

Note
These term courses are available only to students in the co-operative System or with the permission of the Department.

Fr 255 F 2C,1L 0.5
Business French
A French language course designed to enable the student to carry on standard business practices in spoken and written French.
Prereq: Fr 191 or Fr 192.

Note
A student registered in the General French or Honours French degree programmes may include this course as a non-French elective. This course may not be counted as one of the French courses required to complete the major.
Course Descriptions

French

Literature

Fr 231  F  3C  0.5
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: Fr 191, 192 or consent of Department.

Fr 232  W  3C  0.5
Topics and Problems in Seventeenth Century French
Literature
A more detailed study of writers/works of the
classical period. This course is taught entirely in
French.
Prereq: Fr 191, 192 or consent of Department.

Fr 253  F  3C  0.5
Survey of Nineteenth Century French Literature
This course will trace the development of French
literature from the French Revolution to the end of
the nineteenth century. This course is taught entirely
in French.
Prereq: Fr 191, 192 or consent of Department.

Fr 254  W  3C  0.5
Topics and Problems in Nineteenth Century French
Literature
This course will study in depth one genre of the
nineteenth century. This course will be taught
entirely in French.
Prereq: Fr 191, 192 or consent of Department.

Fr 273  F  3C  0.5
Aspects of Québec
A presentation of traditional and contemporary
Québec in the fields of the Arts, literature, music,
politics and society. Taught in French.
Prereq: Fr 191, 192 or consent of Department.

Fr 274  W  3C  0.5
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: Fr 191, 192 or consent of Department.

Fr 291  F  3C  0.5
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. It is open to
Arts students in second year and higher, and to
others in any year. Open to students majoring or
honouring in French only with the permission of the
Department.

Fr 292  W  3C  0.5
French and French-Canadian Civilization
This course completes the study of the cultural
development of France and French Canada to 1900.
After that the course emphasizes a study of life in
these two areas today. Considerable attention will
be paid to art, politics, industry, etc.
Prereq: Fr 291 is recommended

Advanced Level French Courses

Language

Fr 300  Y  3C,1L  1.0
French Language
Advanced grammar and composition, including
translation; oral practice and corrective phonetics.
Prereq: Fr 250, Fr 252 or consent of Department.

Fr 301  F  3C,1L  0.5
French Language
Fall term of Fr 300; see note below.

Fr 302  W  3C,1L  0.5
French Language
Winter term of Fr 300; see note below

Note
These term courses are available only to students in
the co-operative System or with the permission of
the Department.

Fr 310  F  2C  0.5
French for Accountants
This course will provide students with the
vocabulary, style and syntax to carry on basic
accounting in French.
Prereq: Fr 191 or Fr 192 or consent of Department.

Fr 311  W  2C  0.5
Legal French
This course will provide students with the
vocabulary, style and syntax required to understand
as well as to write legal documents in French.
Prereq: Fr 191 or Fr 192 or consent of Department.
Course Descriptions
French

Fr 401 F 0.5
Advanced Language Study
Consult the Department for further details of this course.
Prereq: Fr 300, Fr 302 or consent of Department.

Fr 402 W 0.5
Advanced Language Study
Consult the Department for further details of this course.
Prereq: Fr 401 or consent of Department.

Fr 501 F 0.5
Problems of the French Language
Advanced training in stylistics and in problems of translation. Admission to the course by permission of the Department only.

Fr 502 W 0.5
Problems of the French Language
Advanced training in stylistics and in problems of translation. Admission to the course by permission of the Department only.

Literature Courses

Period Numbering System
Fr 409-419 Medieval Language or Literature
Fr 420-429 Renaissance Literature
Fr 230-239, 330-339, 430-439 17th Century French Literature
Fr 340-349, 440-449 18th Century French Literature
Fr 253-259, 350-359, 450-459 19th Century French Literature
Fr 360-369, 460-469 20th Century French Literature
Fr 270-279, 370-379, 470-479 French-Canadian Literature

Note 1
Please refer to the degree requirements outlined in the Faculty of Arts Programme Section, Chapter 7.

Note 2
Students registered in the General French degree programme must complete one term course in at least three of the areas listed above, as well as Fr 300 or its equivalent.

Note 3
Students registered in the Honours French degree programme must complete one term course in at least six of the areas listed above, as well as Fr 401/Fr 402 or their equivalent.

Note 4
Students registered in a Joint Honours programme combining French with another subject must complete one half-credit in at least five of the above areas, as well as Fr 401/Fr 402 or their equivalent.

Fr 342 F 3C 0.5
Survey of Eighteenth Century French Literature
This course will trace the development of French literature from 1700-1800. The course is taught entirely in French.

Fr 343 W 3C 0.5
Topics and Problems in Eighteenth Century French Literature
A more detailed study of one or more aspects of the Enlightenment. The course is taught entirely in French.

Fr 363 F 3C 0.5
Survey of Twentieth Century French Literature
This course will trace the development of French literature from 1900 to the present. The course is taught entirely in French.

Fr 364 W 3C 0.5
Topics and Problems in Twentieth Century French Literature
A more detailed study of one or more aspects of the modern period. The course is taught entirely in French.

Fr 409 F 3C 0.5
Medieval French Language
Introduction to the early development of French. Offered at St. Jerome's College.

Fr 410 W 3C 0.5
Medieval French Literature
An introduction to French literature of the Middle Ages through the study of representative texts, including excerpts from the epic, courtly and satirical works. Taught in French.

Fr 421 F 3C 0.5
French Prose of the Renaissance
Readings in sixteenth century literature; Rabelais, Montaigne, etc. Taught in French.
Course Descriptions
French

Fr 422 W 3C 0.5
French Poetry of the Renaissance
Readings in sixteenth century poetry: Marot, the Pléiade, the baroque poets, etc.
Taught in French.

Fr 451 F 3C 0.5
Movements and Themes in Nineteenth Century Poetry
A survey of lyric poetry in the nineteenth century.
Taught in French.

Fr 471 W 3C 0.5
French-Canadian Poetry
A study of its evolution from Octave Crémazie to Anne Hébert.
Taught in French.

Fr 472 F 3C 0.5
Contemporary Quebec Theatre
A study of the themes, structures and evolution of contemporary Quebec theatre, based on the principal plays of authors such as: Gratien Gélinas; Marcel Dubé; Yves Thériault; François Loranger; Anne Hébert; Jacques Ferron; Jacques Langirand; Michel Tremblay.
Taught in French.

Fr 481 F 3C 0.5
French Theatre
Each year this course will focus on a different aspect of French theatre either through a chronological or thematic approach. French dramatic theory will also be analyzed.
Taught in French.

Fr 482 F 3C 0.5
Study of Individual Authors
Each year a different author is the subject of specialized study to permit an in-depth exploration of his literary qualities.
Taught in French.

Fr 483 W 3C 0.5
Literary Criticism
A study of the major trends in French literary criticism. Nineteenth century critics such as Taine and Sainte-Beuve will be analyzed. Twentieth century theories such as the nouvelle critique will also be explored.
Taught in French.

Fr 484 W 3C 0.5
Non-Fiction Prose
The study of genres such as autobiography, journal intime, memoirs and essays.
Taught in French.

Fr 490-498 0.5
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.
General Engineering

Instructor
J. Lowe, BSc (Carleton) Recipient of Distinguished Teacher Award

Course Descriptions

Gen E 100 F,W 1S 0.0
Co-ordination Orientation
Given by the Department of Co-ordination for students in Year 1 Engineering. Its purpose is to introduce the students to the various features of the co-operative programme and engineering as a profession.

Gen E 061 F,W 3C 0.5
History and Philosophy of Science
The major conceptual transformations in evolution of science and technology: Greek, modern classical, contemporary periods. Scientific technology as a determining characteristic of global civilization and some critical questions it poses.
Not open to Year 1 students.

Gen E 062 F 3C 0.5
Introduction to Human Communications Systems
The processes involved in man-man, man-machine and mass communications will be discussed. Models of communication systems. The contributions and points of view of the various disciplines which make up the spectrum of communication studies today.
Not open to Year 1 students.

Gen E 114 W,S 1C,3L 0.25
Application 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.

Gen E 115 F 2C,4L 0.75
Engineering Concepts 1
An introduction to some of the basic methods and principles used by engineers including fundamentals of graphics, projections, spatial co-ordinate plotting, free-hand sketching, vector graphics.

Gen 121 W,S 3C,2T 0.5
Digital Computation
Introduction to electronic digital computers, hardware and software organization; basic features of FORTRAN IV; examples of efficient numerical algorithms for basic scientific computations.

Gen E 122 W,S 3C,2L,1T 0.5
Electricity and Magnetism
Introduction to fundamentals of electromagnetics, circuits, wave motion and propagation.
Department of Geography

Professor, Chairman of the Department
L. H. Russwurm, BA, MA (W. Ont.), PhD (Illinois) (on Sabbatical Leave 1980-81)

Associate Professor, Associate Chairman
C. Bryant, BA, PhD (London)

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) (on Sabbatical Leave, Fall Term, 1980)

Professor, Associate Dean
(Environmental Studies Undergraduate Affairs)
J. S. Gardner, BSc (Alberta), MSc, PhD (McGill)

Associate Professor, Associate Dean
(Environmental Studies Special Programmes)
D. F. Walker, BSc (London), MA, PhD (Toronto)

Professor, Graduate Officer
J. H. Bater, BA, MA (Br. Col.), PhD (London)

Assistant Professor, Undergraduate Officer
T. E. Bunting, BA (York), MA (W. Ont.), PhD (Toronto)

Professors
A. Diem, BA (Wayne State), MA (Clark), PhD (Michigan)
D. K. Erb, BSc (W. Ont.), MA (Toronto), PhD (McGill)
R. M. Irving, BA, MA (Toronto), PhD (Minnesota) (on Sabbatical Leave 1980-81)
C. K. Knapper, BA Hons, (Sheffield), PhD (Sask.)
R. R. Krueger, BA, MA, (W. Ont.), PhD (Indiana)
W. B. Mitchell, BA, MA (Br. Col.), PhD (Liverpool)
P. H. Nash, BA, MA (California), CE (Grenoble), MCP, MPA, PhD (Harvard) AIP
R. E. Preston, BA (Central Washington), MA (Washington), PhD (Clark)

Associate Professors
R. A. Bullock, BA, MA (Belfast), PhD (London)
L. T. Guelke, BSc (Cape Town), MA (York), PhD (Toronto)
B. Hyma, BS, MS (Madras), MA (Sheffield), PhD (Pittsburgh)
A. R. Keski, MA, PhD (UMCS-Lublin, Poland)
G. R. McBoyle, BSc, PhD (Aberdeen)
A. G. McElroy, BSc, PhD (Glasgow) (On Sabbatical Leave 1980-81)
G. B. Priddle, BA (W. Ont.), MA, PhD (Clark)
G. Wall, BA (Leeds), MA (Toronto), PhD ( Hull) (on Sabbatical Leave 1980-81)

Assistant Professors
R. Johnston, BA, MA (Windsor), PhD (Minnesota)
E. F. LeDrew, BA (Toronto), MA, PhD (Colorado)
E. R. Officer, BA (Br. Col.), MA (Wisconsin)

Lecturer
D. Dudycha, BA (Wat. Luth.), MA (Waterloo)

Adjunct Lecturers
G. Brannon, CC
D. I. McKenzie, BES, MA (Waterloo)

Faculty members holding cross and/or joint appointments as shown
1Geography and Earth Sciences
2Environmental Studies
3Geography and Planning
4Geography and Renison College
5Environmental Studies and Psychology
6Recreation and Geography
7Man-Environment Studies and Geography

Course Descriptions

Geog 101 F,W 2C,2L 0.75
Introduction to Human Geography
An introduction to human geography through a survey of some of the concepts, methods, techniques and applications of geographic analysis to man's cultural environment. Directed towards the man-land theme and the location analysis theme.

Geog 102 F,W,S 2C,2L 0.75
Introduction to Physical Geography
Emphasis on the natural environment as an integrated system of which it is a part. Selected aspects of weather-climate, water, soils, biota, landforms along with flows of energy, water and matter and their resultant effects on the subsystems of the natural environment are studied.
Geog 110  F  2T  0.5
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.
times and meetings will be arranged individually.
Prereq: Year 1 Geography Majors only.

Env S 111 Introduction to the Study of the Future
See Env S course description, page 310.

Geog 125R  F  3C  0.5
Introduction to the Developing World
Problems of population growth, resource
development, cultural diversity, and industrial and
urban growth. Contemporary problems of economic,
cultural and demographic differences will be
examined in selected regions of Asia and Africa.

Geog 126R Development in the Third World
Not offered 1980-81.

Geog 127  F  2C,2L  0.75
Regional Problems of Europe
An introduction to the Geography of Europe which
examines agricultural, industrial and urban
problems. Lectures, discussions and visual
presentations based on field experience of
instructors.

Env S 195A Introduction to Environmental Studies
See Env S course descriptions, page 310.

Env S 195B Introduction to Environmental Problems
See Env S course descriptions, page 310.

Env S 200 Field Ecology
See Env S course descriptions, page 310.

Env S 201 Introduction to Environmental and
Planning Law
See Env S course descriptions, page 310.

Geog 201  F,W  2C,2L  0.75
Some Basic Topics of Physical Geography
Further studies of energy and matter flows in the
atmosphere and on the land. Specific topics include
radiation, energy and circulation regimes of the
earth-atmosphere system and the dynamics and
morphology of earth structures, stream systems and
glacial landform systems.
Prereq: Geog 102.

Geog 202  F,W  3C  0.5
Some Basic Topics of Economic and Urban
Geography
An analysis of the locational structure of economic
activities in the overall context of regional
development and with the use of case studies. Basic
concepts and tools are explained; these are used to
analyse the location structure of primary, secondary
and tertiary activities.
Prereq: A first-year human geography course.

Geog 203  W  2C,2L  0.75
Some Basic Topics of Cultural and Regional
Geography
The approach of the regional geographer is
illustrated by reference to one or more world
regions. Political, social and historical processes are
studied as they affect man’s perceptions of his
environment and the identification of culture regions.
Prereq: A first-year human geography course.

Geog 204  W  3C  0.5
Soviet Union
Introduction to the geography of the Soviet Union,
with a focus on selected problems in urbanization,
industrialization, resource use and regional
economic development in a planned economy.

Geog 205  F,S  2C,2L  0.75
Africa
The geography of modern Africa south of the Sahara
in the context of changing attitudes to the continent
on the part of the “developed” countries. Attention
will focus on problems of the physical, social and
economic environments.

Geog 220  Y  2C,2L  1.5
World Regional Geography
Physical, economic and cultural inter-relationships of
selected areas of the world’s climatic regions.
Utilization of natural resources, effects of increasing
population density, occupancy and utilization of
urban and rural lands, and effects of man’s tools,
techniques and institutions on the earth’s surface.

Geog 225R  W  3C  0.5
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 Food and Agriculture, and Integrated
Rural Development in the Third World
Not offered 1980-81.
Geog 232 F 3C 0.5
*Geography of Population*

Geog 251 F,S 2C,1L 0.5
*Cities in Canada*
An introduction to some basic concepts in urban studies emphasizing a systematic approach to processes and problems of urban development in Canada.

Env S 252 Media Tools for Environmental Studies
See Env S course descriptions, page 311.

Env S 253 Media Tools for Environmental Studies - Advanced Level
See Env S course descriptions, page 311.

Geog 260 F,W 2C,2L 0.75
*Introduction to Cartography and Map Analysis*
Basic concepts involved in the analysis and use of existing types of cartographic products. Background theory of the production and reproduction of topographic and thematic maps, including historical development, collection of data and symbolization.

Env S 271 Introduction to Quantitative Research Methods
See Env S course descriptions, page 311.

Env S 272 Computer Programming in Environmental Studies
See Env S course descriptions, page 311.

Geog 275 F,W 2C,2L 0.75
*Introductory Air Photo Analysis and Remote Sensing*
Basic techniques of handling air photos, viewing them stereoscopically (in 3D), identifying and describing features, making measurements and 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 $10-$15.

Geog 300 S 2C,4L1/dlab 0.75
*Geomorphology and the Southern Ontario Environment*
Emphasizes field work and field trips in exploring the evolution of S. Ontario landforms. The identification of landforms, landform assemblages and their relationship. The meaning and utility of this information in terms of the contemporary and future environment will be stressed. 
*Lab fee $10-$15.
Prereq: Geog 201, or Earth 121-122 or consent of instructor.

Geog 301 F 3C 0.5
*Climatology*
*Prereq: Geog 201.

Geog 302 F 2C,2L 0.75
*Geomorphical Process*
The impact of processes in landform development and modification. Techniques of measurement particularly as they show the impact of changes under different climatic conditions and processes connected with glaciation and deglaciation, andolian, karst, coastal and fluvial landforms. 
*Prereq: Geog 201 or Earth 121-122 or consent of instructor.

Geog 303 W 2C,2L 0.75
*Physical Basis and the Geography of Water*
Specific topics include: the earth's water balance and cycle, oceans, lakes and swamps, snow cover, ground ice, glacier ice and streams. Attention is directed to the impact of water on the earth's surface, the role of water in the earth's system, and water as a resource and hazard. Some field work. 
*Prereq: Geog 201 or consent of instructor.

Geog 307 F,W 2C,1D 0.5
*Social Survey Techniques*
Social research and the planning process; interview and self administered surveys; questionnaire design; profile data; sampling; data processing; non-survey data collection techniques; practical applications. 
*Cross-listed as Plan 307.
Prereq: Second or third year Geography students and Env S 271; other Env S students with consent of instructor.

Env S 310 Behavioural Studies
See Env S course descriptions, page 311.

Geog 311 F 3C 0.5
*Regional Industrial Development*
Manufacturing and transportation in the context of economic development at regional and urban scales. Aims at deepening conceptual insights and fostering appreciation of their relevance to understanding particular areas. Empirical focus on Canada and the U.K. 
*Prereq: Geog 202 or consent of instructor.*
Course Descriptions
Geography

Geog 315 F 3C 0.5
Agricultural Geography
The geographical dimensions of agricultural systems. Issues include the diffusion of innovations, regional evolution of agricultural structure and vertical integration. Comparative study of programmes of government intervention in agriculture in Canada and Europe. Some field trips. Prereq: Geog 202 or consent of instructor.

Geog 316 W 3S 0.5
Multivariate Statistics
The theory and application of multivariate statistics, with particular emphasis upon the use of the computer. Cross-listed as Plan 316. Prereq: Env S 271 or consent of instructor.

Geog 317 W 3C 0.5
Nonparametric Statistics
The theory and application of nonparametric statistics, with particular emphasis upon social science problems. Same as Plan 317. Prereq: Env S 271 or consent of instructor

Geog 318 F 3C 0.5
Spatial Analysis
Advanced quantitative analysis applied to spatial patterns and interactions. Focuses on a selection of techniques from gravity models, linear programming, nearest neighbour analysis, Markov chain analysis, graph theory, simulations, and trend surface analysis. Same as Plan 318. Prereq: Env S 271 or consent of instructor

Geog 319 F 2C,1L 0.5
Economic and Social Techniques for Regional Planning
Study and critical appraisal of a selection of descriptive and evaluative regional analysis techniques in common use. Reliability and applicability will be reviewed. Emphasis given to economic considerations of regional development. Discussion of input-output analysis; cost-benefit analysis, planning, programming and budgeting systems; and social area analysis. Prereq: Econ 101, 102 or consent of instructor.

Geog 321 The United States
Not offered 1980-81

Geog 322 W 3C 0.5
Geographical Study of Canada
Geographical basis of Canada and Canadian issues. Selected problems relating to nationalism, regionalism, environmental quality, urbanization, regional disparities and resource development.

Geog 323 W 2S 0.5
Comparative Regional Problems
A geographical analysis of selected regions and current problems. The theme chosen in any given year will vary. In 1980-81, Tourism - economic environmental and social impacts.

Geog 325R Special Topics in Development of the Third World
Not offered 1980-81

Geog 326R W 3C 0.5
Special Topics in Development of the Third World
Research methods and approaches to geographic aspects of selected social and economic development problems. Regions of concentration mainly tropical Africa, South and South-East Asia, Caribbean and tropical Latin America. Topics include agriculture, health, population, rural, urban and resource development and regional planning. Prereq: First or second year courses related to Third World studies or consent of instructor.

Geog 330 W,S 3C 0.5
Cultural Geography
The place of culture, material and non-material, in man's relationship with his environment. Attention will be given to both the historical and contemporary periods. Prereq: A second year human geography course.

Geog 331 Special Topics in Cultural Geography
Not offered 1980-81

Geog 332 Special Topics in the Geography of Population
Not offered 1980-81.

Env S 333 Parkland Management
See Env S course descriptions, page 311

Geog 341 F,S 2C,1S 0.5
Historical Geography of Canada 1
The changing geographies of settlement and resource use from the Discoveries to the early nineteenth century. Prereq: A second year human geography course or consent of instructor.

Geog 342 W 2C,1S 0.5
Historical Geography of Canada 2
The changing geographies of settlement and resource use in the nineteenth and early twentieth centuries. Prereq: A second year human geography course or consent of instructor.
Geog 345 F,S 3C 0.5
Political Geography
Differences from place to place in political phenomena. Subjects include interrelationships of states and nations, centripetal and centrifugal "forces" within states, electoral geography, boundary and frontier problems, location of capital cities, internal organization of states, external relations, and geopolitics.
Prereq: A 2nd year human geography course or consent of instructor.

Geog 349 W 3C 0.5
The City as a System 1
An examination of theories, models, and research procedures appropriate to the study of internal urban structure. Focuses on city-wide processes, urban land use, spatial economic processes, transportation and interaction, systems, individual spatial behaviour, decision-making, urban growth, and the processes of development and redevelopment.
Prereq: Geog 202 or 251 or consent of instructor.

Geog 350 F,S 3C 0.5
Regional Urban Systems 1
An examination of theories, models, and research procedures dealing with the growth and support of urban centres and city systems, with relationships between aspects of urbanization and regional development, with the outward growth of cities, and with analytical techniques useful in studying such topics.
Prereq: Geog 202 or Geog 251 or consent of instructor.

Geog 352 W 3C 0.5
The Rural-Urban Fringe of Canadian Cities
Study of the processes underlying the natural, economic and cultural environments of the rural-urban fringe. Emphasis will be placed on the use, ownership, development and management of land and the interrelationships between the resource base and urban demands on it.
Prereq: Geog 202.

Geog 356 F,W 3C 0.5
Resources Management
Reviews selected theories, methods, and terminology related to economic, behavioural, institutional and decision-making aspects of resources and environmental problems. Lab fee $10-$15.
Prereq: Env S 271 or consent of instructor.

Geog 357 F,W 3C 0.5
Conservation and Resource Management
History of the conservation movement; ecological principles of conservation and resource management. Analysis, use and planning of recreational resources. Same as Plan 357. Lab fee $10-$15.
Prereq: Env S 200.

Env S 358 Environmental Pollution and its Control
See Env S course descriptions, page 311.

Geog 358 W 3C,1L 0.75
Water Planning and Management: Strategies and Experiences
Benchmark theory and principles of comprehensive water planning and integrated river basin management. Selected international to local scale case studies. Lab fee $10-$15.
Prereq: Geog 356 or consent of instructor.

Geog 360 W 1C,2L 0.5
Preparation of Maps and Illustrations
Basic equipment, materials and techniques involved in the practical construction of maps and other forms of cartographic illustrations, including conventional drafting and plotting procedures, symbolization of data, and map editing consideration for reproduction.
Prereq: Geog 260.

Geog 375 F 2C,2L 0.75
Air Photo Interpretation
The principles of air photo interpretation utilizing specific criteria visible in the conventional air photo. Examples from local and foreign environments. Lab fee $10-$15.
Prereq: Geog 275 and Geog 201 or Earth Sci 121-122 or Sci 100.

Geog 376 W 2C,3L 0.75
Environmental Remote Sensing
Theoretical and practical aspects of remote sensing (RS). Interaction between electromagnetic radiation, environmental media and sensors. Analysis of non-photographic systems like RADAR and LANDSAT. Methods of RS data processing and analysis and the application of RD techniques to studies of physical and human environments. Lab fee $10-$15.
Prereq: Geog 275.

Env S 380/381 Environmental Studies Workshop
See Env S course descriptions, page 311.
Geog 381  F,W  2S  0.5
The Nature of Geography
Prereq: Any three Geog credits or consent of instructor.

Geog 390  F,W,S  2S  0.5
Senior Honours Research Essay Proposal
Participants are responsible for developing a research proposal under the supervision of an appropriate faculty member. Normally taken in the third year.
Prereq: Honours Geography students only; cannot be counted for credit towards a general degree.

Geog 391  F  fidlab  0.5
Field Research
One week field camp session during which a specific area will be analysed from a geographic point of view. Students will be expected to undertake individual or group analysis of specific problems and must present the results in a written report.
Prereq: Third Year Honours Geography students only; cannot be counted for credit towards a general degree.
Estimated cost to student: Between $80-$100.

Env S 400  Professional Development in Environmental Management
See Env S course descriptions, page 311.

Env S 401  Environmental Law
See Env S course descriptions, page 312.

Env S 402  Planning Law
See Env S course descriptions, page 312.

Geog 400  W  2C,2L  0.75
Climatic and Periglacial Morphology
Characteristics of the main principles of climatic and climatogenetic geomorphology. Examination of processes and forms related to the periglacial environment.
Prereq: One of Geog 300, Geog 302 or Earth Sci 342 or consent of instructor.

Geog 401  Glacial Geomorphology and some Contemporary Applications
Not offered 1980-81.

Geog 403  W  1C,3L  0.75
Advanced Cartography 1
Advanced study of numerical map analysis and computer mapping techniques.
Prereq: Geog 260, and Env S 271.

Geog 404  S  3C  0.5
Advanced Cartography 2
Advanced study of the basic techniques of map production, the theory of cartographic communication and map design. Technical aspects include 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.
Lab fee $10-$15.
Prereq: Geog 360.

Geog 406  Tropical Geomorphology
Not offered 1980-81.

Geog 407  Field and Lab Techniques in Geomorphology
Not offered 1980-81.

Geog 408  Special Topics in Climatology and Natural Hazards
Not offered 1980-81

Geog 409  S  2C,1L  0.5
Energy Balance Climatology
A field and lecture course including the radiation and energy balances of various surfaces, the principles of turbulent energy exchange, and the biotic response to the energy environment. These concepts will be illustrated through the collection and examination of field data.
Prereq: Geog 101,201 and 301.

Geog 410  Recreation Geography
Not offered 1980-81.

Env S 411  Alternative Future Environments 1
See Env S course descriptions, page 312.

Geog 411  F  3C  0.5
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 S 412  Alternative Future Environments 2
See Env S course descriptions, page 312.

Geog 412  W  3C  0.5
Geography of Manufacturing Firms and Industries
A companion course to Geog 311. Emphasis on decision-making, multinational corporations, technological change, and analyses of the locational patterns of specific industries.
Prereq: Geog 311.
Geog 414  W  2S  0.5
**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 project will utilize individual and group approaches.
*Prereq: Geog 356 and consent of instructor.*

Env S 417  **Land Use History and Landscape Change 1**
*See Env S course descriptions, page 312.*

Env S 418  **Land Use History and Landscape Change 2**
*See Env S course descriptions, page 312.*

Geog 421  Y  2C,2L  1.5
**Europe and the Mediterranean**
Detailed study of physical, cultural, economic and political geography, including the development of cities, problems of agriculture, changing industrial patterns, distribution of trade, regional disparities, and planning on the city, regional and national levels.

Geog 422  F  2S  0.5
**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  **Central and Eastern Europe**
*Not offered 1980-81.*

Geog 424  **Soviet Union**
*Not offered 1980-81.*

Geog 425  S  3C  0.5
**Africa**
Examination of selected aspects of the geography of a major region in Africa with particular reference to problems of development. The region will normally be East Africa; a degree of flexibility will facilitate the selection of topics related to the interests of participants.
*Prereq: Geog 205.*

Geog 430  S  fldlab  .5/1.0/1.5
**Field Research in Regional Geography**
430A  (.5 course credit)
or:
430B  (1.0 course credit)
or:
430C  (1.5 course credits)
A detailed analysis of a selected region with major emphasis upon a field examination of the region (several weeks duration) in spring.
*Prereq: Fourth year honours geography students or consent of instructor.*

Env S 444  **Land Evaluation and Resources Management**
*See Env S course descriptions, page 312.*

Geog 448  F  2S  0.5
**Urban Historical Geography**
An examination of the process of city growth during the nineteenth and early twentieth centuries. The course will focus on internal urban structure and will cover both the European and North American city. Emphasis on student projects.
*Prereq: Geog 349 or consent of instructor. Hist 204C recommended.*

Geog 449  **The City as a System 2**
*Not offered 1980-81*

Geog 450  W  3C  0.5
**Regional Urban Systems 2**
A continuation of Geog 350 with an emphasis on student projects.
*Prereq: Geog 350.*

Geog 451  F  1C,3L  0.75
**Soils Geography**
*Prereq: Env S 200 and Geog 315.*

Geog 452  **Problems of Rural Land Use**
*Not offered 1980-81.*

Geog 461  **Land Dereliction & Rehabilitation 1**
*Not offered 1980-81.*

Geog 462  **Land Dereliction & Rehabilitation 2**
*Not offered 1980-81.*
### Geog 470 W 2C,2L 0.75
**Applied Air Photo Interpretation**
Advanced air photo interpretation and its application in geomorphology, geology, resources inventory, engineering soils, hydrology, and pre-planning studies (terrain analysis). Projects in specific fields of interest form a significant part of the course. *Lab fee $10-$15.*  
**Prereq:** Geog 375 and Geog 300 or Geog 302 or consent of instructor.

### Geog 471 F 2C,2L 0.75
**Advanced Remote Sensing**
The principles of earth resource analysis using remotely sensed imagery and digital data will be studied with emphasis upon satellite platform sources. The coordination of supplemental imagery and ground truth missions with satellite data will be considered in a multi-strategy perspective. *Lab fee $10-$15.*  
**Prereq:** Geog 376.

### Geog 475 F,W,S 2S 0.5
**Special Reading and Seminar on Selected Topics**
A brief outline is to be filed with the Chairman or UG officer.  
**Prereq:** 3 full credits in Geog and consent of instructor.

### Geog 476 Y 2S 1.0
**Special Readings and Seminar on Selected Topics**
A brief outline is to be filed with the Chairman or UG officer.  
**Prereq:** 3 full credits in Geog and consent of instructor.

### Geog 481 W 2S 0.5
**Frontiers in Geography**
Current philosophical and methodological trends in geographical thought. New and resurgent developments in various sub-fields and issues in related disciplines including professional planning, architecture, future studies, environmental psychology and public administration.  
**Prereq:** Geog 381 or consent of instructor.

### Geog 482 W 2S 0.5
**Geography and Education**
**Prereq:** Honours Geography, Man-Environment Studies, Architecture, or Urban and Regional Planning. Preference given to those in third year who are interested in being teaching assistants in their fourth year.

### Geog 490A F,W,S 3S 0.5
**Senior Honours Research Essay**
Preparatory work and first draft of essay.  
**Prereq:** Geog 390; only fourth year Honours students.

### Geog 490B F,W,S 6S 1.0
**Senior Honours Research Essay**
Completed Essay.  
**Prereq:** Geog 390 and Geog 490A; only fourth year Honours students.
Course Descriptions

German

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  0.5
First Year German
For students with little or no knowledge of German. The basic elements of German grammar with an emphasis on oral practice and pronunciation. Language laboratory. Introduction to aspects of German culture and reading of appropriate graded texts. One section, Ger 101A, offers more intensive oral practice with an additional language lab hour per week.

Note
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  0.5
First Year German
As Ger 101.
Prereq: Ger 101

Ger 105  F  3C  0.5
German for Reading Knowledge
The elements of German grammar with practice in pronunciation. Selected readings from the humanities and social sciences. This course 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.

Ger 106  W  3C  0.5
German for Reading Knowledge
As Ger 105
Prereq: Ger 105.

Ger 111  F,W,S  3C  0.5
First Year Scientific German
For students with little or no knowledge of German. The basic elements of German grammar and pronunciation with an emphasis on reading and translation of elementary scientific literature from various fields.
Note
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  0.5
First Year Scientific German
As Ger 111.
Prereq: Ger 111.

Ger 121  F  3C  0.5
Studies in German Literature with Language Practice
An introduction to German literature designed to accomplish the transition from language studies to reading and discussing literary texts. Grammar review, conversation practice, and the reading of selected works.
Prereq: At least 2 years of High School German, or equivalent.

Ger 122  W  3C  0.5
Studies in German Literature with Language Practice
As Ger 121.
Prereq: Ger 121.

Ger 151  F  3C  0.5
German Conversation and Grammar Review
Conversation on topics of everyday life as well as on political, social, and cultural aspects of the German-speaking countries: West and East Germany, Austria, and Switzerland. Comprehensive grammar review, vocabulary building, written practice. Language lab is recommended.
Prereq: At least 2 years of High School German, or equivalent.

Ger 152  W  3C  0.5
German Conversation and Grammar Review
As Ger 151.
Prereq: Ger 151.

Ger 201  F  3C  0.5
Second Year German
This course is a continuation of first year Ger 101/102. It offers extensive practice in both the spoken and written language. It provides vocabulary building, grammar review, and exercises in pronunciation and comprehension. Language Lab.
Prereq: Ger 102 or equivalent.

Ger 202  W  3C  0.5
Second Year German
As Ger 201.
Prereq: Ger 201.

Ger 211  F  3C  0.5
Intermediate Scientific German
Grammar review and more advanced study of German structure and idiom. Reading and translating of scientific writings for vocabulary building and mastery of difficulties peculiar to technical style. Reading material is selected according to the field of the individual student.
Prereq: Ger 106, 112 or equivalent.

Ger 212  W  3C  0.5
Intermediate Scientific German
As Ger 211.
Prereq: Ger 211.

Ger 231  F  3C  0.5
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  0.5
German Through Contemporary Literature
As Ger 231.
Prereq: Ger 231.

Ger 251  F  3C  0.5
German Conversation and Composition
This course offers extensive practice in both the spoken and written language. It provides vocabulary building, grammar review, and exercises in pronunciation and comprehension. Option Language Lab.
Prereq: Ger 122, 152 or equivalent.

Ger 252  W  3C  0.5
German Conversation and Composition
As Ger 251.
Prereq: Ger 251.

Ger 261  F  3C  0.5
The Age of Goethe (Classicism)
Reading, interpretation, and critical analysis of representative works (Goethe, Schiller, Hölderlin, etc.)
Prereq: Ger 122, 152 or equivalent.

Ger 262  W  3C  0.5
The Age of Goethe (Romanticism)
Reading, interpretation, and critical analysis of representative works (Novalis, Tieck, Brentano, etc.)
Prereq: Ger 122, 152 or equivalent.
Ger 271  F  3C  0.5  
**German Thought and Culture**  
A survey of cultural currents to the time of Enlightenment. Lectures will focus on major developments in literature, philosophy, religion, art, architecture, and music as seen against the historical background of the German speaking peoples.  
*Taught in English.*

Ger 272  W  3C  0.5  
**German Thought and Culture**  
A survey of cultural events from Goethe to the present. Lectures will focus on major developments in literature, philosophy, religion, art, architecture, and music as seen against the historical background of the German speaking peoples.  
*Taught in English.*

Ger 275  F  3C  0.5  
**German Culture in the 20th Century**  
German cultural trends are discussed in the light of social and political events up to 1945. Emphasis is placed on literary and artistic movements, especially Expressionism. Readings include selections from Mann, Hesse, Kafka and Brecht. Documentary films and slides are introduced.  
*Taught in English.*

Ger 276  W  3C  0.5  
**German Culture in the 20th Century**  
As Ger 275.

Ger 281  F  3C  0.5  
**Post-War Literature**  
Reading and interpretation of major works since 1945 in prose, drama and poetry. Main authors: Brecht, Borchert, Böll, Frisch, Dürenmatt, Grass, Eich.  
*Prereq: Ger 122, 152 or equivalent. Students with Ger 231 are ineligible.*

Ger 282  W  3C  0.5  
**Post-War Literature**  
As Ger 281.  
*Prereq: Ger 122, 152 or equivalent.*

Ger 291  F  3C  0.5  
**Survey of German Literature**  
Introduction to the major periods of German literature. Readings and interpretation of representative texts.  
*Prereq: Ger 122, 152, 202 or equivalent.*

Ger 292  W  3C  0.5  
**Survey of German Literature**  
As Ger 291.  
*Prereq: Ger 122, 152 or equivalent.*

Ger 311  F  3C  0.5  
**Theory of Translation**  
Theory, methodology, and techniques of translation. Patterns and problems in the translation of scholarly texts from the arts and sciences, with special emphasis on idiom and structure as compared with the target language.  
*Prereq: Ger 212 or equivalent.*

Ger 312  W  3C  0.5  
**Theory of Translation**  
As Ger 311.  
*Prereq: Ger 311.*

Ger 343  F  3C  0.5  
**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  0.5  
**Intermediate Conversation and Composition**  
As Ger 343.  
*Prereq: Ger 343.*

Ger 351  F  3C  0.5  
**Intermediate Conversation and Composition**  
Conversation on modern topics. Exercises in advanced grammar, stylistics, and composition.  
*Prereq: Ger 202, 252 or equivalent.*

Ger 352  W  3C  0.5  
**Intermediate Conversation and Composition**  
As Ger 351.  
*Prereq: Ger 351 or equivalent.*

Ger 355  F  3C  0.5  
**The Stage as Forum: German Drama in Translation**  
Major German Dramas will be studied from various points of view, including historical importance, themes, and technique. The course includes theory and selected dramas of such playwrights as Lessing, Goethe, Schiller, Büchner, Brecht, and Dürenmatt. 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.*
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Credits</th>
<th>Title</th>
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| Ger 361     | F    | 3C      | 0.5   | Young Germany and Biedermeier  
Reading, interpretation, and critical analysis of prescribed prose, drama and poetry. (Grillparzer, Mörke, Stifter, Gotthelf, etc.)  
Prereq: Ger 122, 152 or equivalent. |
| Ger 362     | W    | 3C      | 0.5   | Poetic Realism  
Reading, interpretation, and critical analysis of prescribed prose, drama and poetry (Storm, Keller, Ludwig, Hebbel, Raabe, Fontane, etc.)  
Prereq: Ger 122, 152 or equivalent. |
| Ger 371     | F    | 3C      | 0.5   | Modern German Literature  
Reading, interpretation, and critical analysis of prescribed texts relating to the "Moderne" and various literary movements around the turn of the century.  
Prereq: Ger 122, 152 or equivalent. |
| Ger 372     | W    | 3C      | 0.5   | Modern German Literature  
Reading, interpretation, and critical analysis of prescribed texts from the early 20th century to the end of World War II (Kafka, Brecht, etc.).  
Prereq: Ger 122, 152 or equivalent. |
| Ger 391     | F    | 3C      | 0.5   | Masterpieces of German Literature in Translation  
A study of significant prose and drama from 1770 to the present representing themes such as Man and Revolution, Duty vs. Inclination, Flesh vs. Spirit, Modern Germany East and West. Works studied include Danton's Death ( Büchner), Maria Stuart (Schiller), Demian (Hesse), Galileo (Brecht), and Cat and Mouse (Grass).  
Prereq: Ger 122, 152 or equivalent. |
| Ger 392     | W    | 3C      | 0.5   | Masterpieces of German Literature in Translation  
As Ger 391. |
| Ger 395Z    | F    | 2.5     |       | Waterloo in Germany Programme  
See page 106 for description. |
| Ger 396Z    | W    | 2.5     |       | Waterloo in Germany Programme  
As 395Z. |
| Ger 441     | F    | 3C      | 0.5   | Humanism, Reformation and Baroque  
Reading, interpretation, and critical analysis of prescribed texts (Erasmus, Luther, Sachs, Opitz, Gryphius, Grimmelshausen, etc.)  
Prereq: Second year standing in German. |
| Ger 442     | W    | 3C      | 0.5   | Enlightenment and Storm and Stress  
Reading, interpretation, and critical analysis of prescribed texts (Lessing, Wieland, Klopstock, Lenz, Klinger, etc.)  
Prereq: Second year standing in German. |
| Ger 451     | F    | 3C      | 0.5   | Advanced Conversation, Grammar and Composition  
This course is conducted in German and provides intensive practice in spoken and written German on the advanced level.  
Prereq: Ger 352 or equivalent. |
| Ger 452     | W    | 3C      | 0.5   | Advanced Conversation, Grammar and Composition  
As Ger 451.  
Prereq: Ger 451 or equivalent. |
| Ger 461     | F    | 3C      | 0.5   | Introduction to the History of the German Language with Readings in Middle High German  
Prereq: Ger 122, 152 or equivalent.  
Offered in alternate years. |
| Ger 462     | W    | 3C      | 0.5   | Middle High German Literature  
Reading and interpretation of samples from the major works of the MHG period, with emphasis on writers of the first "Blütezeit" in German literature (1170 to 1250): Early Minnesang, Walther von der Vogelweide, Nibelungenlied, Hartmann von Aue, Wolfram von Eschenbach, etc.  
Prereq: Ger 122, 152 or equivalent.  
Offered in alternate years. |
| Ger 471     | F    | 3C      | 0.5   | German Poetry  
A study of the main thoughts, themes, forms, and schools in German poetry from the beginning to Goethe.  
Prereq: Ger 122, 152 or equivalent. |
| Ger 472     | W    | 3C      | 0.5   | German Poetry  
A study of the main thoughts, themes, forms, and schools in German poetry from German Romanticism to the present.  
Prereq: Ger 471 or equivalent. |
| Ger 495-498 | F,W,S,M | R each 0.5 |  
Reading Courses in Approved Topics  
Prereq: Fourth year students only. |
Dutch

Dutch 101 F 3C 0.5
First Year Dutch
The basic elements of Dutch grammar with emphasis on oral practice and pronunciation. Optional reading of appropriate texts from Dutch literature and cultural history. Open to all students.

Dutch 102 W 3C 0.5
First Year Dutch
As Dutch 101. Prereq: Dutch 101 or equivalent.

Russian

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: 1.5 (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 three half credits prior to graduation. Prereq: Russ 102 or equivalent.

Russ 10 Y 3C 1.0
Reading and Translation
This course is designed to assist graduate students in acquiring a reading knowledge of Russian. Usage and structure of Russian scientific writings. Translation in fields of specialization. Open to graduate students of all departments.

Russ 101 F 3C,1L 0.5
First Year Russian
(Shuts Oriented) For students with little or no knowledge of Russian. The elements of Russian grammar and composition; with emphasis on oral practice and pronunciation. Language Laboratory and Visual Aids. Selected readings of major Russian authors. Open to all university students, except those who have credit for Russ 111/112.

Russ 102 W 3C,1L 0.5
First Year Russian
As Russ 101. Prereq: Russ 101 or equivalent.
Course Descriptions
Russian

Russ 271 F 3C 0.5
Russian Thought and Culture
A survey of cultural history from 862 to 1905. Lectures will focus on major developments in literature, 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. Open to all students.

Russ 272 W 3C 0.5
Russian Thought and Culture
A survey of cultural history from 1905 to the present. Lectures will focus on major developments in literature, philosophy, art, and music as seen against the background of Russia's historical past. Discussion will be devoted primarily to works of Russian literature. This course is taught in English. Open to all students.

Note
Arts students can take Russ 271 and 272 in their second or subsequent years; students for other faculties, in any year (See Chapter 7 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 Aii 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. Conducted in English. Extra work in Russian required of Russian majors only. Open to all students.

Russ 282 W 3C 0.5
Russian Short Story
As Russ 281. Conducted in English. Extra work in Russian required of Russian majors only. Open to all students.

Russ 311 F 3C 0.5
Theory of Translation
Theory, methodology, and techniques of translation. Patterns and problems in the translation of scholarly texts from the arts and sciences, with special emphasis on idiom and structure as compared with the target language. Prereq: Russ 202 or equivalent.

Russ 312 W 3C 0.5
Theory of Translation
As Russ 311. Prereq: Russ 311.

Russ 341 F 3C 0.5
Russian Drama
A study of the origins and development of Russian drama up to 1905. Reading and critical analysis of major works in various genres with emphasis on authors of the nineteenth century. Conducted in English. Extra work in Russian required of Russian majors only. Open to all students.

Russ 342 W 3C 0.5
Russian Drama
As Russ 341. Conducted in English. Extra work in Russian required of Russian majors only. Open to all students.

Russ 351 F 3C 0.5
Intermediate Conversation and Composition
Written reports on prescribed themes and topics. Oral drill and translation. Prereq: Russ 252 or equivalent.

Russ 352 W 3C 0.5
Intermediate Conversation and Composition
As Russ 351. Prereq: Russ 351 or equivalent.

Russ 356 W 3C 0.5
The Stage as Forum: Russian Drama in Translation
Major Russian dramas will be studied from various points of view, including historical importance, themes, and technique. The course includes theory and selected dramas of such playwrights as Gogol, Chekhov, Tolstoy, Gorky, Mayakovsky, and Pogodin. The course is conducted entirely in English. Fall term: See Ger 355. Open to students from all departments. Not normally open to first year students.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Title</th>
<th>Description</th>
<th>Prerequisites/Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russ 381</td>
<td>3 C</td>
<td><strong>The Peoples of the Soviet Union</strong></td>
<td>Especially emphasized will be the study of non-Slav peoples of the Caucasus and Central Asia, European Russian and Siberia. Czarist and Soviet policy towards national minorities, assimilation and integration problems in the light of linguistic division; development of literary languages. Some achievements of Soviet anthropology.</td>
<td>Open to all students.</td>
</tr>
<tr>
<td>Russ 382</td>
<td>3 C</td>
<td><strong>The Peoples of the Soviet Union</strong></td>
<td>As 381.</td>
<td>Open to all students.</td>
</tr>
<tr>
<td>Russ 391</td>
<td>F 3 C</td>
<td><strong>Great Russian Novels</strong></td>
<td>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.</td>
<td>Open to all students.</td>
</tr>
<tr>
<td>Russ 392</td>
<td>W 3 C</td>
<td><strong>Great Russian Novels</strong></td>
<td>As 381.</td>
<td></td>
</tr>
<tr>
<td>Russ 441</td>
<td>3 C</td>
<td><strong>East Slavic Epic Tradition</strong></td>
<td>A study of the origins and development of the Epic tradition in East Slavic Literature. Conducted in English. Open to all students.</td>
<td></td>
</tr>
<tr>
<td>Russ 442</td>
<td>3 C</td>
<td><strong>Russian Epic Tradition</strong></td>
<td>As 441. Conducted in English. Open to all students.</td>
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</tr>
<tr>
<td>Russ 451</td>
<td>F 3 C</td>
<td><strong>Advanced Conversation, Grammar and Composition</strong></td>
<td>This course is conducted in Russian and provides intensive practice in spoken and written Russian on the advanced level. Prereq: Russ 352 or equivalent.</td>
<td></td>
</tr>
<tr>
<td>Russ 452</td>
<td>W 3 C</td>
<td><strong>Advanced Conversation, Grammar and Composition</strong></td>
<td>As 451. Prereq: Russ 451 or equivalent.</td>
<td></td>
</tr>
<tr>
<td>Russ 461</td>
<td>F 3 C</td>
<td><strong>Twentieth Century Russian Literature</strong></td>
<td>Reading, interpretation, and critical analysis of selected fiction and drama (Andreev, Bunin, Gorky, Kataev, Sholokhov, A. N. Tolstoy). Conducted in English. Extra work in Russian required of Russian majors only.</td>
<td>Open to all students.</td>
</tr>
<tr>
<td>Russ 462</td>
<td>W 3 C</td>
<td><strong>Twentieth Century Russian Literature</strong></td>
<td>As 481.</td>
<td></td>
</tr>
<tr>
<td>Russ 481</td>
<td>F 3 C</td>
<td><strong>Russian Poetry</strong></td>
<td>A study of themes and forms of representative authors of Classicism, Romanticism (Lomonosov, Derzhavin, Pushkin, Lermontov, Nekrasov, Fet, Tiuchev, etc.). Prereq: Russ 102 or equivalent.</td>
<td></td>
</tr>
<tr>
<td>Russ 482</td>
<td>W 3 C</td>
<td><strong>Russian Poetry</strong></td>
<td>As 481.</td>
<td></td>
</tr>
<tr>
<td>Russ 485</td>
<td>F 3 C</td>
<td><strong>History of Russian Literature</strong></td>
<td>This course deals with the emergence of the Russian national literature, emphasizing the cultural and intellectual setting from the beginning to 1917. Literary movements and major representative works not studied in other courses will be discussed. Conducted in English. Extra work in Russian required of Russian majors only.</td>
<td>Open to all students.</td>
</tr>
<tr>
<td>Russ 486</td>
<td>W 3 C</td>
<td><strong>History of Russian Literature</strong></td>
<td>As 485.</td>
<td></td>
</tr>
<tr>
<td>Russ 496-498</td>
<td>F,W,S</td>
<td><strong>Reading Courses in Approved Topics</strong></td>
<td>Open to fourth year students only.</td>
<td></td>
</tr>
</tbody>
</table>
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.
Taught in alternate years.

Polish 202  W  3C  0.5
Intermediate Polish
As Polish 201.
Prereq: Polish 201 or equivalent.
Taught in alternate years.

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: Ukrainian 101 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: Ukrainian 102 or equivalent.
Taught in alternate years.

Course Descriptions
Polish
Ukrainian

Ukrainian 202  W  3C,1L  0.5
Intermediate Ukrainian
As Ukrainian 201.
Prereq: Ukrainian 201 or equivalent.
Taught in alternate years.

Ukrainian 301  F  3C  0.5
Introduction to Ukrainian Literature
Reading and critical interpretation of texts chosen from the works of Skovoroda, Kotliarevsky, Shevchenko, Franko, L. Ukrainka and others. This course is taught in English.
Open to all students.

Ukrainian 302  W  3C  0.5
A Critical Survey of Literary Movements in 20th Century Ukrainian Literature
With special attention to the rise of the new angry generation of poets of the Sixties (V. Symonenko, L. Kostenko, V. Korotych, and others).
This course is taught in English.
Open to all students.

Ukrainian 401  F  3C  0.5
Ukrainian Romanticism
Taras Shevchenko and his Time. Kharkov and Kiev as literary centres. Reading and critical analysis of prescribed texts (Shevchenko, Kulish, Kostomarov, etc.).
Prereq: Ukrainian 202 or equivalent.

Ukrainian 402  W  3C  0.5
Ukrainian Romanticism
The literary revival in Western Ukraine. A critical study of the literary movement with special emphasis on the major authors (Shashkevych, Vahylevych, Holovats'kyj and others).
Prereq: Ukrainian 202 or equivalent.
Department of Health Studies

Associate Professor, Chairman of Department of Health Studies
J. A. Best, BA (Queen's), PhD (Waterloo)

Professor, Dean of the Faculty of Human Kinetics and Leisure Studies
G. S. Kenyon, BPE (Br. Col.), MS (Indiana), PhD (NYU)

Assistant Professor, Undergraduate Officer
S. McColl, BSc (McGill), PhD (Purdue)

Associate Professor, Graduate Officer
R. P. Schlegel, BA (W. Ont.), MSc (Illinois) PhD (Ohio State)

Assistant Professors
H. W. Gruchow, BSc, MSc, PhD (Wisconsin)
B. Flay, D. Phil (Waikato)
M. T. Sharratt, BA, MA (W. Ont.), PhD (Wisconsin)
K. M. Prkachin, PhD (Br. Col.)
D. J. Wraits, MSc (Waterloo), MD (Queen's)

Research Associate
C. H. Pierce, BA (Grinnell), MA (DePauw), PhD (Kansas)

Faculty Members Holding Cross Appointment as shown:
*Department of Kinesiology

Course Descriptions

Health

Heith 140 W 3C,1T 0.5
Introduction to Health Sciences 1
An exploration of the biological basis of health and disease, strategies for prevention and treatment of disease, and the moral, social, and psychological impact of innovations in health care on Canadian society. Topics include the human nervous system (neurological disorders, mental illness, brain dysfunctions, drug abuse), lifestyles and health (heart disease, obesity, exercise, smoking), and health care systems (environmental health, medical abuses, aging, and dying).

Heith 220 F 3C,1T 0.5
Health and the Family
The course familiarizes students with the issues involved in understanding how people live and develop within the context of families, and the family interaction with the larger social community. Special emphasis will be placed on health related concerns and the ways in which the family and health care institutions of the society contribute to the physical and emotional health of its members.
Prereq: Heith 140 and 141

Heith 241 W 3C 0.5
Disease Process
An introduction to the study of factors governing the occurrence of diseases in human populations, using selected diseases to illustrate disease mechanisms and identification of risk factors.
Prereq: Biol 230, 233, Kin 317 or equivalent.

Heith 245 F 3C 0.5
Community Health
This course examines health care delivery systems by considering organizational principles, manpower issues, health resources and economics, service utilization and alternatives to the institutional model. There is a focus on societal and political issues which affect the health of the society through the delivery system.
Prereq: Health Studies students only, or permission of instructor.

Heith 302 F 2C 0.5
Introduction to Biometrics 1 (MTHEL 302a)
Biometry is a biological discipline requiring both a knowledge of mathematics and some basic understanding of specific biological phenomena. The course material has been selected from genetics and gerontology to provide examples of where both mathematics and biology have contributed to the advancement of knowledge in interdisciplinary areas.
Prereq: Kin 116 or first year Chemistry or consent of instructor.
Health 303  W  2C  0.5
**Introduction to Biomathematics 2 (MTHEL 302b)**
A continuation of Biomathematics 1. Topics considered are first order reaction kinetics in biological systems including a discussion of radioisotope and C14 dating, higher order kinetics including statistical considerations in enzyme kinetics, models for and the measurement of evolution from a knowledge of genetics and protein structure and assessing the relative importance of environmental factors as evolutionary determinants.
*Prereq: Health 302.*

Health 340  F  3C  0.5
**Environmental Health**
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.
*Prereq: Kin 317 or equivalent.*

Health 344  W  3C  0.5
**Programme Evaluation**
A comprehensive and systematic introduction to the key concepts, methodologies, and issues related to programme evaluation in general and their application to health programmes in particular. Administrative and policy implications as well as the technical/methodological evaluation issues that face individuals involved in administering, planning, implementing, and evaluating health programmes will be discussed.
*Prereq/Coreq: Kin 222 and Kin 300 or equivalent basic knowledge in statistics and research design/methodology.*

Health 346  W,S  3C  0.5
**Nutrition** (Kin 346)
An elementary course in nutrition with special emphasis on diet for sport and certain physiological conditions.
*Prereq: Kin 317 or equivalent.*

Health 348  W,S  3C  0.5
**Social Psychology of Health Behaviour**
The study and application of basic social psychological processes in relation to selected health-related behaviours (e.g. family planning, overeating, smoking, non-medical drug use, cardiovascular risk factors, patient compliance, medical care utilization).
*Prereq: Psych 101 or consent of instructor.*

Health 349  F,S  3C  0.5
**Principles of Behaviour Modification**
A course providing a general overview of behaviour modification principles and procedures. Basic principles of reinforcement, punishment, modelling and desensitization are examined as they relate to health behaviour.
*Prereq: Psych 101 or consent of instructor.*

Health 410  W  3C  0.5
**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: Kin 200 and Biol 233.*

Health 431  F,W,S  0.5
**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.*

Health 432  F,W,S  0.5
**Research Project**
An independent research project on an approved topic, supervised by a faculty member. Includes data collection, data analysis and presentation of results in thesis form.
*Prereq: Completion of Health 431.*

Health 442  F  3C  0.5
**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: Health 241 or consent of instructor.*

Health 443  W,S  3C  0.5
**Behavioural Strategies for the Prevention of Chronic Diseases**
A critical analysis of various behavioural strategies for the prevention of coronary heart disease, hypertension, chronic obstructive pulmonary disease, and lung cancer. The role of behaviour in the pathogenesis of disease and the feasibility of behavioural change for prevention of disease will be discussed.
Health 445  W  3C  0.5

Seminar in Health Behaviour
A study of current issues pertaining to health and health behaviour. Topics include pertinent research in the field of health which have significant values to the individual, family and community, as well as a study of the problem areas in health behaviour.
Prereq: Health Studies students only, or permission of instructor.

Health 472  F,W,S  0.5

Independent Study
For the student who desires to pursue a particular topic in depth through guided independent research and/or reading. A faculty member must approve a student's project prior to registration. May be repeated in subsequent terms.
Prereq: Consult with Department.

Department of History

Professor, Chairman of the Department
H. MacKinnon, BA (Montreal), PhL, STL (Gregorian), MA (Toronto), DPhil (Oxford)

Assistant Professor, Associate Chairman
D. E. Wright, BA (Cambridge), MA, PhD (McMaster)

Professors
R. W. Beachey, BA (Queen's), PhD (Edinburgh)
FRHistS
P. G. Cornell, ED, MA, PhD (Toronto)
M. J. Craton, BA (London), MA, PhD (McMaster)
FRHistS
F. H. Epp, BA (Bethel College), MA, PhD (Minnesota), LLB (Brandon) G
F. C. Gérard, MA (College St. Dominique, France), BD (McGill), STM (McGill), PhD (Hartford, Conn. U.S.A.) P
P. Kerésztesi, MA (Toronto), PhD (Graz)
J. H. New, BA, MA (Melbourne), PhD (Toronto), FRHistS
G. M. Ostrander, BA (Columbia), MA, PhD (California-Berkeley)

Adjunct Professors (WLU and Guelph)
R. P. Fuke, BA (Toronto), MA (Maryland), PhD (Chicago), (WLU)
W. Stanford Reid, PhD (Penn.), FRHistS

Associate Professors
D. N. Baker, BA (Br. Col.), AM, PhD (Stanford)
M. T. Cherniavsky, MA (Oxford)
D. A. Davies, BA, PhD (Washington) Recipient of the Distinguished Teacher Award
K. R. Davis, BA (Toronto), MA (Wheaton), PhD (Michigan)
K. D. Eagles, BA (Cambridge), MA, PhD (Washington)
R. J. English, BA (Waterloo), AM, PhD (Harvard)
P. J. Harrigan, BA (Detroit), AM, PhD (Michigan)
L. A. Johnson, BA (Waterloo), MA, MPhil (Toronto)
R. C. MacGillivray, BA (Queen's), AM, PhD (Harvard)
K. M. McLaughlin, BA (Waterloo), MA (Dalhousie), PhD (Toronto) P
E. P. Patterson, BA (Baylor), MA (Kansas), PhD (Washington)
P. S. Smith, MA (Toronto), PhD (New Mexico) J
J. O. Stubbs, BA (Toronto), MSc (Econ) (London), DPhil (Oxford)
J. A. Wahl, CR, BA (W. Ont.), MA, PhD (St. Louis) J
J. W. Walker, BA (Toronto), MA (Waterloo), PhD (Dalhousie)
R. E. Wynne, DJur (Vienna), BEd, MA (Alberta), PhD (Washington)
Assistant Professors
D. J. Horton, BA (Wat. Luth.), MA (Waterloo), PhD (McGill)
S. K. Johannesen, BA (Evangel College), MA, PhD (Missouri)
W. O. Packull, BA (Guelph), MA (Waterloo), PhD (Queen's)
R. Sawatsky, BChEd (CMBC), BA (Bethel College)
MA (Minnesota), MA (Princeton), PhD (Princeton)

Course Descriptions

Hist 100 F 0.5
**Landmarks in World History**
A thematic introduction to the development of the world's major civilizations. This year's theme is "Community and Social Order", examining the dynamic relationship between individuals and their social structures, and their state.
Instructors: Harrigan, MacKinnon, Walker.

Hist 101R F 3C 0.5
**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.
Offered at Renison College.

Hist 102A W 0.5
**The American Revolution in World Perspective**
A discussion of the ideas of the Revolution, their sources in Western and in British History, their function in determining the political and cultural history of North America, and their relevance to the modern world.
Instructor: Johannesen.

Hist 102B W 0.5
**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 102C W 0.5
**The Origins of Wars in the Twentieth Century**
An analysis of the diplomatic, political, economic, ideological, social and cultural explanations of the causes of the major wars of this century.
Instructor: Stubbs.

Hist 102D W 0.5
**The Beginning of the Twentieth Century**
A look at how profound changes at the turn of the century (1880-1920) drastically affected the political, social, economic and cultural foundations of Western civilization.
Instructor: Davies.

Hist 102R W 3C 0.5
**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.
Offered at Renison College.

Hist 105 W 0.5
**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: MacKinnon.

Hist 106A F 0.5
**Canadian History**
This course will examine six main themes: pioneer life, modern economic development, urban growth, native Canadians, the social and economic role of women and the theory and practice of the "Canadian Mosaic".
Instructor: Johnson.

Hist 106B F 0.5
**The American Identity 1607-1980**
A considering of the shaping of American characteristics under the headings of: The Frontier; Religious Denominationism; Libertarian Revolution; Black Slavery; New Immigrations; Mass Production; the Great Depression; War, and Global Americanism.
Instructor: Ostrander.

Hist 106K W 0.5
**The Problem of Quebec**
The course will discuss the problem of Quebec in contemporary Canada by analyzing the historical background of key issues like separatism, the survival of the French language, French-Canadian nationalism and the Quiet Revolution.
Instructor: Horton.
Hist 118  F  0.5
An Introduction to Western Intellectual History; Plato to More
The course is a foray into seminal visions of the human predicament from early times to the 16th century. Readings range from Plato to Sir Thomas More, and Job to Danté.
Instructor: New.

Hist 119  W  0.5
An Introduction to Western Intellectual History: Since the Renaissance
An exploration of some of the questions and answers posed by thinkers on the human predicament from Renaissance and Reformation times to the modern period. Readings range from Luther to J. P. Sartre, Shakespeare to Marx and Freud.
Instructor: New.

Hist 125A  F  0.5
The Ancient World
This course will survey various aspects of ancient western civilization. The foundations of political life, social organization, and intellectual development will be considered, including the development of the Greek city-state and the Roman Empire.
Instructor: Lavigne.
Offered at St. Jerome's College.

Hist 125B  W  0.5
The Medieval World
A survey of selected topics designed to illustrate the development of medieval Europe. The end of the Roman political system and the formation of new political groupings in the West, the origins of feudalism, the crusades, and the Renaissance of the 12th century will be among the subjects considered.
Instructor: Lavigne.
Offered at St. Jerome's College.

Hist 125C  F  0.5
Early Modern Europe
This course will survey the chief features of early modern European society. Topics will include the Renaissance and Reformation, the expansion of Europe, Old Regime society, the scientific revolution and the Enlightenment.
Instructor: Smith.
Offered at St. Jerome's College.

Hist 125D  W  0.5
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.
Instructor: Smith.
Offered at St. Jerome's College.

Hist 126  F  0.5
Canada Takes Shape
The historical development of the societies, economy and public affairs of Canada from New France to the end of the Nineteenth Century. This is a foundation course for students concerned about Canadian questions.
Instructor: McLaughlin
Offered at St. Jerome's College.

Hist 127  W  0.5
Canada: Unity in Diversity
An historical approach to the societies, economy, regions and public affairs of Canada in its world setting in the Twentieth Century. This is a foundation course for students concerned about Canadian questions.
Instructor: McLaughlin.
Offered at St. Jerome's College.

Hist 130  F,S  0.5
The Modern World in Historical Perspective
This course will introduce students, through the interrelationships and interaction of selected themes, to the contemporary history of Europe, North America, and the Far East. Its format includes two interpretive lectures per week plus major films on twentieth century crises and optional discussion groups.
Instructors: Wynne, Davies.

Hist 204C  F  0.5
Canadian Urban History
An historical examination of the urbanization process, the social, political and economic factors that shaped the Canadian city, and the relationship between selected metropolitan and hinterland areas.
Instructor: Johnson.

Hist 204E  War and Society in the Twentieth Century
Not offered 1980-81.
Hist 204H  F  0.5  
The Individual and the Family in History
A survey of the changes in the quality and structure of life with special emphasis on love, marriage and the family in the West since the sixteenth century.  
Instructor: Johannesen.  
Offered at St. Jerome's College 1980-81.

Hist 204P  F  0.5  
Modern Western Popular Culture
This course examines historically the formation of a distinct modern western popular culture, looking primarily at Britain, France, Canada and the United States from around 1850 to the present, and emphasizing such aspects as: industrialism and leisure, the family and sexual attitudes, religion and popular belief, education and literacy, drinking habits, organized sport and mass entertainment.  
Instructors: Harrigan, Wright.

Hist 204Q  W  0.5  
The Russian Revolution
The course will examine the revolutionary period of Russian history in terms of its broad implications for such issues as the transformation of man, society and culture.  
Instructor: Davies.

Hist 204S  F  0.5  
Oil and Politics in Latin America
An historical analysis of the development of Latin American oil policies and their relevance to North America. Multinational oil companies and the creation of indigenous petroleum industries will be studied.  
Instructor: Smith.  
Offered at St. Jerome's College.

Hist 204U  W  0.5  
Revolutions in Latin America
A evaluation of the causes and effects of revolutions in Latin America through an analysis of such countries as Cuba, Mexico, Chile, etc.  
Instructor: Smith.  
Offered at St. Jerome's College.

Hist 204V  W  0.5  
The History of Selected Racial and Regional Minorities in Canada
An introduction to the history of selected racial and regional minorities in Canada. The course examines the emergence of minority communities, and their position in modern Canadian society.  
Instructor: Walker.  
Offered at St. Jerome's College 1980-81.

Hist 211  F  0.5  
British History to 1603
A survey of the main stages in the transition of Britain from a remote province of the Roman Empire to a prominent state of post-Reformation Europe. Within the chronological framework, cultural and social as well as political and institutional development will be examined.  
Instructor: Cherniavsky.

Hist 212  W  0.5  
British History since 1603
A survey of the shaping of British society and the British experience from the time of Shakespeare to the present: constitutional conflict and compromise, rise and fall of empire, industrial and urban revolution, world wars and welfare state.  
Instructor: Wright.

Hist 215  F  0.5  
Critical Issues in Contemporary European History
A survey of major developments in East and West Europe since 1945, with emphasis on the effects of the Second World War, the emergence of blocs, economic growth and institutions, political life in the major states, and international policies and problems.  
Instructor: Baker.

Hist 216  F  0.5  
Irish History in the Age of Unification and Revolt
Political, social and religious history of Ireland from the supremacy of the Gaelic social order to the Act of Union, 1485 to 1800.  
Instructor: MacGillivray.  
Offered by correspondence only in 1980-81.

Hist 217  W  0.5  
Irish History in the 19th and 20th Centuries
Political, social and religious history of Ireland emphasizing social changes, the struggle for Home Rule and the Républic, 1800 to present.  
Instructor: MacGillivray.  
Also offered by correspondence in 1980-81.

Hist 223  F,W,S  0.5  
Canadian Culture and Society to 1900
An inquiry into the nature of the Canadian experience by examining concepts and themes that were significant before the 20th Century.  
Instructor: Cornell.  
Offered by correspondence only in 1980-81.
Hist 224  F,W,S  0.5  
**Canadian Culture and Society in the Twentieth Century**
An approach to modern Canadian development as the people have wrestled with such phenomena as: war, depression, internal and external tensions, urban growth, the "post industrial" society.  
Instructor: Cornell.  
Offered by correspondence only in 1980-81.

Hist 230  F  0.5  
**Institutions of Jurisprudence and Concepts of Justice from Roman Times to Present Day Canada**
An introduction to the historical development of the principal streams of "the law" in the Western world and in Canada.  
Instructors: Cornell, New.

Hist 235G (R.S. 227G)  F  2C,1D  0.5  
**History of Christianity 1**
The development of Western and Eastern Christianity to the end of the medieval period.  
Instructor: Klaassen.  
Offered at Conrad Grebel College.

Hist 236G (R.S. 228G)  W  2C,1D  0.5  
**History of Christianity 2**
Roman Catholicism, Eastern Orthodoxy and Protestantism from the Reformation to the present.  
Instructor: Klaassen.  
Offered at Conrad Grebel College.

Hist 237  F  0.5  
**Ancient Civilization: Greece**
A survey of the social, political, and economic history of Greece with an introduction to the civilization of the Near East. Emphasis will be placed on Greece in the 5th and 4th centuries before Christ.  
Instructor: Patterson.  
This course is acceptable for credit by the Classical Studies department.

Hist 238  W  0.5  
**Ancient Civilization: Rome**
An introduction to the social, political, and economic history of Rome and the Roman empire. The give-and-take relationship of Rome and Greek and other peoples within the empire will be examined.  
Instructor: Patterson.  
This course is acceptable for credit by the Classical Studies department.

Hist 239  F  0.5  
**History of Medieval Europe to 814**
The political, cultural, economic and ecclesiastical development of Europe from Constantine to Charlemagne.  
Instructor: MacKinnon.

Hist 240  W  0.5  
**History of Medieval Europe from 814**
The political, cultural, economic and ecclesiastical development of Europe from Charlemagne to Philip III.  
Instructor: MacKinnon.

Hist 241  F  0.5  
**The Emergence of Modern Europe: Renaissance**
This course will focus on the Italian microcosm (1300-1527) and emphasize those intellectual, social, political and economic changes, most significant for the emergence of modern Europe such as the rise of capitalism, socialism and humanism.  
Instructor: Davis.  
Offered off-campus only in 1980-81.

Hist 242  W  0.5  
**Europe in Transition 1500-1650**
This course will focus on the transfer of the Italian Renaissance to northern Europe and on the development of the new state system, political morality and diplomacy in the context of Europe in Reformation.  
Instructor: Davis.  
Offered off-campus only in 1980-81.

Hist 243  F  0.5  
**Canadian History: 1760-1900**
The evolution of a distinctive Canadian society in the face of dominant British and American influences. Topics will include Loyalists and Rebellion, Confederation, western settlement and Riel.  
Instructor: McLaughlin.

Hist 244  W  0.5  
**Canadian History: 1900-1979**
"Canada's century" - 1900 to the present, emphasizing the development of a distinctive society through a consideration of such topics as: immigration, industrialization, feminism, labour unrest and the growth of western Canada.  
Instructor: McLaughlin.

Hist 245G  F  2C,1D  0.5  
**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.  
Offered at Conrad Grebel College.
History

Hist 246G  W  2C,1D  0.5
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.
Offered at Conrad Grebel College.

Hist 247G  F,J  2C,1D  0.5
Mennonite History 1 (1826-1920)
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.
Offered at Conrad Grebel College.

Hist 248G  W,A  2C,1D  0.5
Mennonite History 2 (1920-1975)
The world-wide Mennonite struggle for survival and
meaningful identity in such settings as Communist
Russia and Nazi Germany. Other topics: migrations
to Latin America, assimilation in North America, new
communities in Africa and Asia.
Instructor: Epp.
Offered at Conrad Grebel College.

Hist 251A, B, C, D
Special Topics
Courses to be mounted for one year only.

Hist 251C  F  0.5
History of Japan
This term course will attempt to show Japan's
transition from Medieval Feudalism to a modern
industrial World Power. The major part of the
lectures will deal with the 19th and 20th centuries.
The economic and social consequences of the
political change will be emphasized.
Instructor: Wynne.

Hist 253  F  0.5
Change and Continuity in 20th Century America,
1898-1945
The topics which illustrate the title theme are drawn
in connected fashion from domestic and foreign
politics: the Populists, American imperialism, 1898,
Progressivism, the lost generation, the New Deal,
F.D.R. and World Order, 1945. Novels and films are
used.
Instructor: Eagles.
Offered at St. Jerome's College

Hist 254  W  0.5
Change and Continuity in 20th Century America,
1945-1978
An examination of the title theme with particular
emphasis on the United States' emergence as a
world power after 1945: the Cold War, J.F.K. and the
New Frontier, the October missile crisis, 1962,
Vietnam, L.B.J. and the Great Society, the 1970's
retrospect.
Instructor: Eagles.
Offered at St. Jerome's College

Hist 256  F  0.5
Canada: 1896-1939
Many Canadians thought their country had failed in
1939. The twentieth century was to be Canada's
century. Sometimes it seemed it was; most often
Canadians thought it was not.
Instructor: Horton.

Hist 257  W  0.5
Canada: 1939-1978
Canadians in 1939 had lived through our worst
depression. What they wanted - material prosperity
- was what they obtained. Yet by 1976 this was
obviously not enough. This course considers why.
Instructor: Horton.

Hist 263  F  0.5
Europe in the Nineteenth Century
A study of Europe from the French Revolution to
approximately 1900 with particular emphasis on the
social forces that affect European society and the
historical role of institutions in European society.
Instructor: Harrigan.

Hist 264  W  0.5
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. It will cover the period
from the 1880's to 1945.
Instructor: Wynne.
Also offered off-campus in 1980-81.

Hist 271  British Empire and Commonwealth: The
British Influence
Not offered 1980-81.

Hist 272  British Empire and Commonwealth: The
Colonial Identity
Not offered 1980-81.
Hist 279  F  0.5

Pre-Colonial and Colonial Africa
An African History survey course from pre-historic times to the end of the 19th Century, with special attention to African peoples, their cultures, the impact of European imperialist rule and African response.
Instructor: Beachey.

Hist 280  W  0.5

Colonial and Independent Africa
The nature of Colonial rule, the impact of World Wars I and II on Africa, emergence of African nationalism and retreat of Colonialism, attainment of Independence and basic problems faced by newly-independent African countries.
Instructor: Beachey.

Hist 284  F  0.5

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.

Hist 285  W  0.5

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 286  F  0.5

History of the United States to 1865
A survey of American society, politics and thought, and of relations with the outside world from first settlement to 1865.
Instructor: Johannesen.

Hist 287  W  0.5

History of the United States since 1865
A survey of American society, politics and thought, and of the relations of the United States with the outside world from 1865 to the present.
Instructor: Ostrander.

Hist 288R  F  0.5

History of Modern Revolutions 1
The Western revolutionary tradition from the early modern period to the 20th century, including revolutions that accompanied the break-up of feudalism, the English, French, and Revolutions of 1848, and 19th century revolutionary ideologies. Offered at Renison College.

Hist 289R  W  0.5

History of Modern Revolutions 2
The course deals with revolutions in the 20th century, including Russia 1917, Germany 1918, China 1949, and the emergence of right-wing revolutionary ideologies and movements in Europe. Offered at Renison College.

Hist 300  F  0.5

Law and Conflict on the Canadian Frontier, to 1870
A survey of the history of Western Canada. Various topics will be examined including native-white contact, the fur trade, exploration, missions and early European settlement.
Instructor: Patterson.
Offered at St. Jerome's College 1980-81.

Hist 301  W  0.5

Law and Conflict on the Canadian Frontier, 1870-1914
An introduction to the early history of the Western provinces – their political, social and economic affairs will be surveyed.
Instructor: Patterson.
Offered at St. Jerome’s College 1980-81.

Hist 302  Medieval Church History from 312 to 1096
Not offered 1980-81.

Hist 303  Medieval Church History from 1096 to 1449
Not offered 1980-81.

Hist 305  F  0.5

English History 1485-1603: Tudor
A study of achievements and crises in politics and society, and of changes and continuities in religion and philosophy in the Tudor period.
Instructor: New.

Hist 306  English History 1603-1660: Stuart
Not offered 1980-81.

Hist 307  Britain, 1760-1867
Not offered 1980-81.
Hist 308  W  0.5
Britain since 1867
A general survey of the British experience and of
Britain's part in world history from the 1860s to the
1980s.
Instructor: Wright.

Hist 309  F  0.5
English History to 1215
A study of government, Church and society from the
coming of the Anglo-Saxons to the Great Charter.
Instructor: Cherniavsky.

Hist 310  W  0.5
English History 1215-1485
A study of government, Church and society in the
later middle ages.
Instructor: Cherniavsky.

Hist 311  F  0.5
Western European Cultural History, 1815-1890
Evolution of the idea of consciousness as seen in
the major works and manifestoes of artists, writers,
musicians, architects and thinkers of the period,
with particular emphasis on the roles assigned to
"artists" (broadly defined) in the shaping of
consciousness and society.
Instructor: Baker.
Offered by correspondence only in 1980-81.

Hist 312  W  0.5
Western European Cultural History, 1890-1939
Evolution of the idea of consciousness as seen in
the major works and manifestoes of artists, writers,
musicians, architects and thinkers of the period,
with particular emphasis on the roles assigned to
"artists" (broadly defined) in the shaping of
consciousness and society.
Instructor: Baker.
Also offered by correspondence 1980-81.

Hist 313  International History since 1871 (Part 1)
Not offered 1980-81.

Hist 314  International History since 1871 (Part 2)
Not offered 1980-81.

Hist 315  Britain since 1851 (Part 1)
Not offered 1980-81.

Hist 316  Britain since 1851 (Part 2)
Not offered 1980-81.

Hist 317  Studies in Canadian Regionalism: East and
West
Not offered 1980-81.

Hist 318  Studies in Canadian Regionalism: Central
Canada
Not offered 1980-81.

Hist 319  F  0.5
French-Canadian History
An examination of Pre-Industrial French Canada with
emphasis on the cultural, political and economic
themes which form the background to Modern
Quebec history.
Instructor: Horton.
Also offered by correspondence in 1980-81

Hist 320  W  0.5
The History of Modern Quebec
The course will treat the history of Quebec from
1867 to the present. Nationalism, separatism,
language and cultural problems, economic and
social issues, are all examined in their historical
context.
Instructor: Horton.
Also offered by correspondence in 1980-81

Hist 321  F  0.5
History of Canadian-American Relations to 1914
An examination of the history of relations between
the two countries from the eighteenth century to
1914. Topics of a political, economic, social and
cultural nature will be studied.
Instructor: Ostrander.

Hist 322  W  0.5
History of Canadian-American Relations since 1914
An examination of the history of relations between
the two countries since 1914. Topics of a political,
economic, social and cultural nature will be studied.
Instructor: Ostrander.

Hist 323  Canada in World Affairs: The Twentieth
Century (Part 1)
Not offered 1980-81.

Hist 324  Canada in World Affairs: The Twentieth
Century (Part 2)
Not offered 1980-81.

Hist 325  History of Canadian Indians (Part 1)
Not offered 1980-81.

Hist 326  History of Canadian Indians (Part 2)
Not offered 1980-81.

Hist 327  Law in the Ancient World (Part 1)
Not offered 1980-81

Hist 328  Law in the Ancient World (Part 2)
Not offered 1980-81.
Hist 329 The Origins of the Common Law  
Not offered 1980-81.

Hist 330 The Developing Common Law  
Not offered 1980-81.

Hist 331 F 0.5  
East Africa prior to the 20th Century  
Instructor: Beachey.  
Offered by correspondence only in 1980-81.

Hist 332 F 0.5  
Eastern Africa in the Twentieth Century  
Instructor: Beachey.  
Offered by correspondence only in 1980-81.

Hist 341 Roman History to 27 B.C.  
Not offered 1980-81.

Hist 342 Roman History 27 B.C. to 337 A.D.  
Not offered 1980-81.

Hist 343G F 0.5  
Mystical and Utopian Movements from the 12th to the 17th Century 1  
A study of the recurring dream of the coming golden age in the High Middle Ages beginning with Joachim of Fiore, including the Spiritual Franciscans and the Taborites, and ending with the Revolutionary of the Upper Rhine.  
Alternates with Hist 347G.  
Instructor: Klaassen.  
Offered at Conrad Grebel College.

Hist 344G W 0.5  
Mystical and Utopian Movements from the 12th to the 17th Century 2  
A study of the Utopian theme from the German Peasant Revolt of the Fifth Monarchy Men, including More's Utopia and several other lesser known statements.  
Alternates with Hist 348G.  
Instructor: Klaassen.  
Offered at Conrad Grebel College.

Hist 347G (R.S. 321G) Radical Reformation 1  
Not offered 1980-81.

Hist 348G (R.S. 322G) Radical Reformation 2  
Not offered 1980-81.

Hist 351A, B, C, D  
Special Subjects  
Seminars and lectures in special fields. (See current departmental brochure for future information.)

Hist 355 F 0.5  
Russian History 1613-1825  
The course will focus on selected themes in the development of the Russian state and society from the beginning of Romanov rule to the middle of the nineteenth century.  
Instructor: Davies.

Hist 356 W 0.5  
Russian History since 1825  
The course will focus on selected themes in Russia's development in the nineteenth and twentieth centuries, including the Soviet Period.  
Instructor: Davies.

Hist 357 German History 1815-1918  
Not offered 1980-81.

Hist 358 German History 1918-1939  
Not offered 1980-81.

Hist 364R F 3C 0.5  
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.  
Offered at Renison College.

Hist 365R W 3C 0.5  
The Enlightenment 2, Europe in the 18th Century  
The term will focus on the Enlightenment itself, its religious and political implications, and the practice of Enlightened Despotism in France, Prussia, Austria, and Russia.  
Offered at Renison College.

Hist 374G F 0.5  
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.  
Offered at Conrad Grebel College.
Hist 386   F  0.5
Ontario History to Confederation
The course will examine the growth of Ontario from a pioneer settlement, with particular emphasis on economic, social, political, and cultural aspects of change. An emphasis will be placed on the sources and methods of local historical research.
Instructor: MacGillivray.
Offered off campus only 1980-81.

Hist 387   W  0.5
Ontario History since Confederation
The course will examine the emergence of Ontario as an industrial giant and the development of its hegemony in Canada. An emphasis will be placed on the sources and methods of local historical research.
Instructor: Cornell.
Offered off campus only in 1980-81.

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  0.5
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  0.5
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.

Seminars Y  1.0
These seminars are designed for fourth year students who have a preparation in the subject through appropriate previous courses. In all cases the instructor's permission is required to register.
The following Seminars are not offered in 1980-81:

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 412  19th and 20th Century British History: Wright
Hist 414  Modern European Social and Cultural History: Baker, Harrigan
Hist 418  Russian History since 1861: Davies
Hist 420  Canada in the 19th Century: Cornell, McLaughlin
Hist 421  Ontario History: Cornell
Hist 423  Modern Quebec: Horton
Hist 425  20th Century Canadian History; Johnson
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 450  Marxism and Canadian History: Johnson
Hist 453  20th Century International History: Stubbs

Other Senior Courses
Hist 465  The History and Theory of Historical Writing
Not offered 1980-81.

Hist 491 Y  1.0
Directed Studies in Special Topics
(Note not counted as a Senior Seminar.)
Senior Students only.
Also offered at St. Jerome's College.
Italian

Italian Faculty

Assistant Professor
V. F. Golini, BA (McMaster), MA (Colorado) PhD (Berkeley)

Lecturer
A. Gualtieri, BA (Toronto), MA (Colorado)

The following courses are administered by St. Jerome's College.

Ital 100J Y 3C,1L 1.0
Introduction to Italian
An intensive study of the fundamentals of grammar and conversation. The language laboratory will be used. In the first year of Italian, emphasis will be placed on the fundamentals of grammar and speech.

Ital 101J F 3C,1L 0.5
Introduction to Italian
Fall term of Ital 100J.

Ital 102J W 3C,1L 0.5
Introduction to Italian
Winter term of Ital 100J.

Ital 190J Y 3C,1L 1.0
Intermediate Italian
Advanced study of grammar, conversation and an intensive study of one or two novels. Some finer points of grammar will be studied but will actually be a secondary aspect. A survey of 19th century literature will be offered.
Prereq: Ital 100J or consent of instructor.

Ital 191J F 3C,1L 0.5
Intermediate Italian
Fall term of Ital 190J.

Ital 192J W 3C,1L 0.5
Intermediate Italian
Winter term of Ital 190J.

Ital 251J F 3C 0.5
Conversation and Composition
This course offers extensive practice in idiomatic spoken and written language. Conversation will be based on social, political, and cultural aspects of Italian life.
Prereq: Ital 190J (191J/192J), or permission of instructor.

Ital 252J W 3C 0.5
Conversation and Composition
Continuation of Italian 251J.
Prereq: See Ital 251J.

Ital 291J F 3C 0.5
Italian Culture
This course, given in English, aims at giving the student a well-balanced view of Italy and her culture, through the study of her Geography, History, Religion, Literature, Arts, Music and her contribution to the world and to North America in particular.
Prereq: Second year standing.

Ital 292J W 3C 0.5
Italian Culture
A continuation of Ital 291J.
Prereq: Second year standing.

Ital 310J Y 3C 1.0
From Dante to Machiavelli
An intensive survey of major works from Dante to Machiavelli. Some attention will be given to examining the influence of Medieval and Renaissance Italian writers on European literature.
Prereq: Ital 190J, or 191J/192J, or consent of instructor.

Ital 320J Italian Literature from 1600-1800
Not offered 1980/81.

Ital 331J F 3C 0.5
Masterpieces of Italian Literature in Translation
Major authors will be studied to provide an understanding of the historical significance of Italian literature, especially the Medieval and Renaissance periods. Taught in English.
No prereq.

Ital 332J W 3C 0.5
Masterpieces of Italian Literature in Translation
Continuation of Ital 331J.
Taught in English.
No prereq.

Ital 391J F 2S 0.5
The Modern Italian Novel
A brief study of the development of the Italian novel since Manzoni with concentration on the novels just before and after World War II.
Prereq: Ital 190J, 191J/192J, or consent of instructor.
Modern Italian Poetry
A survey of the major Italian poets from the Futurists through to Montale and their influence on European poetry.
Prereq: Ita 190J, 191J/192J, or consent of instructor.

Special Topics/Directed Readings
This course gives the student an opportunity to study authors and works of special interest which are not covered in other courses.
No prereq.

Special Topics/Directed Readings
Winter term of Ita 396J.
No prereq.

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. Kenyon, BPE (Br. Col.), MS (Indiana), PhD (NYU)

Assistant Professor, Associate Dean of Undergraduate Affairs of the Faculty of Human Kinetics and Leisure Studies
W. N. Widmeyer, BA (W. Ont.), BPE (McMaster), MA (California), PhD (Illinois)

Associate Professor, Associate Dean of Graduate Affairs of the Faculty of Human Kinetics and Leisure Studies
B. D. McPherson, BA, MA, (W. Ont.), PhD (Wisconsin)

Associate Professor, Associate Chairman Undergraduate Affairs
P. J. Bishop, BSc, BPE (Waterloo), MS (Western Illinois), PhD (Minnesota)

Associate Professor, Associate Chairman Graduate Affairs
R. G. Marteniuk, BPE, MA (Alberta), EdD (Berkeley)

Associate Professor, Head of School of Anatomy
D. A. Ranney, BA (Toronto), MD (Toronto), FRCS (England)

Professors
D. A. Winter, BSc, MSc (Queen's), PhD (Dalhousie)

Associate Professors
H. J. Green, BA, BPHS (Queen's), MA (Alberta), PhD (Wisconsin)
K. C. Hayes, Dip, PE (St. Luke's College), MSc, PhD (Massachusetts)
M. E. Houston, BSc (Toronto), PhD (Waterloo)
R. W. Norman, BS, BPE (McMaster), MSc (Alberta)
PhD (Penn State)
Assistant Professors
F. Allard*, BA, BPE, PhD (Waterloo)
L. Brawley., BPE (Calgary), MSc (Oregon), PhD (Penn State)
R. Hughson, BSc (W. Ont.), MSc (Br. Col.), PhD (McMaster)
E. Roy, BSc (Waterloo), MPE (Br. Cot.), PhD (Waterloo)
M. T. Sharratt, BA, MA (W. Ont.), PhD (Wisconsin)
N. Theberge', BA (Massachusetts), MA (Boston),
PhD (Massachusetts)
J. A. Thomson, BA, MSc (McMaster), PhD (Waterloo)
R. Wells, BSc (Manchester), MEng (McMaster),
PhD (Manchester)
I. D. Williams, MS, PhD (Illinois)

Adjunct Associate Professors
E. English, MBA (UCLA), MD (Toronto), FRCS
(Canada)
J. A. Israel, MD (Toronto), FRCS (Canada)
D. R. McTavish, MD (W. Ont.) FRCS
G. H. Mann, MB, BS (London), DRCOG (London)

Adjunct Assistant Professor
D. Rainham, MS, BB, BCh (Wales)

Faculty members holding cross appointments as shown
1Sociology
2Psychology
3Systems Design

Course Descriptions
Kinesiology

Kin 102  F  3C,1T  0.5
Biophysical Basis of Kinesiology
Human physical movement is discussed from
mechanical, anatomical and physiological
viewpoints. The course provides a general
orientation to the study of Kinesiology.

Kin 103  F  3C,1T  0.5
Psycho-Social Basis of Kinesiology
An introduction to the study of human physical
activity from psychological, sociological,
anthropological and historical perspectives.

Kin 116  W  3C  0.5
General and Organic Chemistry
An introduction to the chemical concepts of
importance in kinesiology and health studies.

Kin 171  History of Sport and Physical Activity
Not offered 1980-81.

Kin 200  F  3C,2L  0.5
Human Anatomy of the Limbs and Trunk
Functionally-oriented study of the limbs and trunk by
regions using predissected cadavers. A brief
introduction to Neuroanatomy is included.
Prereq: Kinesiology, Health Studies and Dance
students or permission of instructor. Lab 5 is for
Dance students only. No Year 1 students admitted.

Kin 201  W  3C,2L  0.5
Human Anatomy of the Brain, Head and Neck
The anatomical structure and function of the brain,
cranial nerves and sense organs of the head are
emphasized. Included is an introduction to the
histology of the nervous system. An opportunity for
some dissection of the head and neck is provided.

Kin 222  F  3C,2L  0.5
Statistical Techniques Applied to Kinesiology
An introduction to descriptive and inferential
statistics and the interpretation of data. A major
consideration of the course is the use of statistics in
the solution of problems in Kinesiology.
Prereq: Kin students only.

Kin 252  W,S  3C  0.5
An Introduction to the Sociology of Sport
An introduction to the characteristics, processes
and problems of sport as a social system. In
addition, the social psychological aspects of sport
involvement are considered.
Prereq: Kin 103 and Soc 101.

Kin 255  W  3C,2L  0.5
Introduction to Psychomotor Behaviour
An information processing approach is used to
introduce the principles of learning and performing
fine and gross motor skills. In addition, social
psychological variables are studied as they relate to
the facilitation or decrement in learning and
performance.
Prereq: Kin 103 and Psych 101

Kin 280  Administration
Not offered 1980-81.

Kin 300  F  3C,2L  0.5
Physiology of Physical Activity
A study of the effects of physical activity on the
muscular, circulatory and respiratory systems and
the mechanisms through which the body adapts to
activity and environment.
Prereq: Biol 230, 233.
Kin 317  F  3C  0.5  
**Human Biochemistry**  
An elementary course in human biochemistry including the metabolism and function of proteins, carbohydrates, lipids, and hormones. Emphasis is placed on the application of biochemical principles to human movement.  
*Prereq: Kin 116 or equivalent.*

Kin 321  W,S  3C,2L  0.5  
**Introduction to the Biomechanics of Human Movement**  
Anatomical, neural and mechanical considerations in the qualitative and quantitative analysis of human movement are examined. Concepts related to the biostatics and biodynamics of linked segment models of human motion are introduced.  
*Prereq: Phys 103, Kin 200 and 222.*

Kin 330  W,S  3C  0.5  
**Research Design**  
An introduction to the basic principles of scientific inquiry in Kinesiology. A systematic treatment of the logic and practice of methods and techniques employed in research related to physical activity with an examination of design, sampling, data gathering and analysis.  
*Prereq: Kinesiology students only.*

Kin 335  W,S  3C,2L  0.5  
**Evaluation of Human Motor Performance**  
The nature and methodology of assessment is reviewed from theoretical and empirical perspectives. Taxonomies of motor performance are examined and principles developed for the measurement of specific construction in field and laboratory situations.  
*Prereq: Kin 222.*

Kin 340  F  3C,2L  0.5  
**An Introduction to Sports Medicine**  
An introductory course to the area of sports medicine, including the prevention, care and rehabilitation of common sports injuries. Considerable attention is directed towards the mechanisms of traumatic injuries as well as the management in the acute, intermediate and advanced stages of injury care.  
*Prereq: Kin 200, 3rd and 4th year students only.*

Kin 341  W  3C,2L  0.5  
**Selected Topics in Sports Medicine**  
A course for those students wishing additional study in the area of sport medicine. Topics to be presented include trauma to the head and vertebral column, internal injuries, heat problems and the medical and non-medical use of drugs in sport.  
*Prereq: Kin 340.*

Kin 346  W,S  3C  0.5  
**Nutrition (Health Studies 346)**  
An elementary course in nutrition with special emphasis on diet for sport and certain physiological conditions.  
*Prereq: Kin 317 or equivalent.*

Kin 352  F  3C  0.5  
**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 analysed. Special emphasis is given to the problem of leisure time in the later years of life.  
*Prereq: Soc 101 and one other Soc course. Offered even year only.*

Kin 354  W,S  2C,1T  0.5  
**Social Psychology and Physical Activity**  
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 structures, and cohesion.  
*Prereq: Psych 101.*

Kin 356  F  2C,1T  0.5  
**Information Processing in Human Perceptual Motor Performance**  
An information processing model of perceptual-motor behaviour is presented. Human performance theory is used to study processes mediating input and output information. Specifically, the subprocesses of storage of information in memory, perception, retrieval of information from memory and execution of movement are examined.  
*Prereq: Kin 222, 255.*

Kin 357  W  2C,1T  0.5  
**Motor Learning**  
A course focused on the bases and applications of theories of motor learning. Included are selected psychological and neurophysiological processes as they relate to these theories.  
*Prereq: Kin 222, 255.*

Kin 401  W,S  3C,2L  0.5  
**Physiological Adaptations to Physical Activity**  
An analysis of the physiological adaptations that occur in response to protracted physical activity and the influence of such adaptations on the response to work in a variety of environmental conditions. Special emphasis is given to the changes occurring in skeletal and cardiac muscles and the neuroendocrine mechanisms involved.  
*Prereq: Kin 300 and 317.*
Kin 402  F,S  3C  0.5
Hydrospace, Altitude and Aerospace Physiology
An examination of man's cardiorespiratory responses at rest and during work to selected stresses of hyperbaric and hypobaric environments.
Prereq: Kin 300.

Kin 405  W  3C,2L  0.5
Exercise Management
An examination of the rationale and procedures used in the development of exercise programmes for normally healthy individuals.
Prereq: Kin 300 and 321.

Kin 407  W  3C  0.5
The Physiology of Coronary Heart Disease
An examination of the pathology, risk factors and rehabilitation programmes related to coronary heart disease. Major emphasis is placed on the cardiorespiratory implications of exercise in the rehabilitation process.
Prereq: Kin 300 or equiv.

Kin 410  W  3C  0.5
Growth, Development and Aging (Health Studies 410)
The physiology of growth, development and aging is examined with special reference to the influence of physical activity, diet and other environmental factors on the normal processes.
Prereq: Kin 200 and Biol 230.

Kin 416  W  3C  0.5
Neuromuscular Integration
An examination of the neural processes involved in the maintenance of posture and the control of movement.
Prereq: Kin 201 and Psych 261 or permission of instructor.

Kin 420  F  3C  0.5
Kinesiological Considerations in Equipment Evaluation
The principles of evaluation and design of equipment for human use are studied from a kinesiological perspective.
Prereq: Kin 321 and 340.

Kin 425  F  3C,2L  0.5
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  0.5
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 357 or permission of instructor.

Kin 431  F,W,S  0.5
Research Proposal
An independent paper in the form of a research proposal on an approved topic, supervised by a faculty member (see Kin 432 for range of topics). The proposal shall consist of three chapters which include: (1) an introduction or statement of the problem, (2) a review of the literature, (3) methods and procedures.
Prereq: 4th year Honours Kinesiology.

Kin 432  F,W,S  0.5
Research Project
An independent research project on an approved topic, supervised by a faculty member. (The first three chapters are completed as Kin 431.) The project may include survey, experimental or theoretical research, programme evaluation, mathematical modelling, fitness appraisal, etc.
Prereq: Kin 431.
It is strongly recommended that students planning graduate studies take Kin 431 and Kin 432.

Kin 433  F,W,S  0.5
Senior Essay
An extensive critical review of the literature on an approved topic. The topics will be broader in scope than those associated with specific research proposals.
Prereq: 4th year Honours Kinesiology.

Kin 442  W  2C,2L  0.5
Adapted Physical Activity
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.
Prereq: Kin 300.

Kin 452  F,S  3C  0.5
Sport in Society
An introduction to the sociology of sport. Utilizing the major frames of reference of the social sciences, the function of sport in contemporary society is examined.
Prereq: Kin 252.
Cross-listed as Recreation 303 and Sociology 348
Kin 453  F,S  3C  0.5
The Psychology of Sport and Physical Activity
The course focuses on the effect 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 354.

Kin 456  F  3C  0.5
Cognitive Dysfunction and Motor Skill (Psych 307)
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, which is not offered in 1980/81

Kin 470  F,W,S  3C  0.5
Seminar in Kinesiology
An examination of current major issues and trends in Kinesiology. Students select areas of major interest from a series of faculty introduced topics.
Prereq: Fourth year Kinesiology students.

Kin 472  F,W,S  0.5
Directed Study in Special Topics
For the student who desires to pursue a particular topic in depth through guided independent research and/or reading. A faculty member must approve a student's project prior to registration. May be repeated in subsequent terms.
Prereq: Consent of department.

Kin 480  F,W,S  0.5
Coaching Foundations
A study of basic principles and philosophies of coaching today. Emphasis is placed upon the application of kinesiological principles of performance as well as social, organizational and resource problems pertinent to each of several sport sections.

The specific sections offered are:
Kin 481T - Volleyball, Kin 482T - Basketball,
Kin 483T - Gymnastics, Kin 484T - 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.

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 those courses for entry into careers such as teaching.

In an attempt to satisfy those students who are keenly interested in teaching, the Sport Proficiency Certification Programme is being introduced in the Fall of 1980. The contents of the programme would be tied to the requirements of the Colleges of Education and result in a more marketable graduate in this field. A small fee may be charged to cover the costs of printed materials, additional instruction, etc.
Further information regarding this programme can be found in the Kinesiology Undergraduate Student Handbook.

The following activity courses are offered if there are sufficient requests.
Kin 180  Elem. Basketball, W,S
Kin 183  Gymnastics - Floor Exercises, F,W
Kin 187  Beginner Swimming, F
Kin 188  Elem. Aquatics, F,W
Kin 281  Elem. Volleyball, F
Kin 282  Elem. Lacrosse, W
Kin 283  Gymnastics - Apparatus, W (Men)
Kin 284  Gymnastics - Apparatus, W (Women)
Kin 285  Elem. Football, F,S
Kin 286  Elem. Badminton, W
Kin 287  Elem. Soccer, F (even years)
Kin 288  Elem. Wrestling, W
Kin 289  Elem. Rugger, F (even years)
Kin 381  Elem. Tennis, F,S
Kin 382  Elem. Squash, F
Kin 383  Elem. Golf, F,S
Kin 384  Elem. Raquetball, W
Kin 385  Elem. Field Hockey, F,S
Kin 386  Elem. Ice Hockey, W
Kin 387  Elem. Curling, W
Kin 388  Int. Aquatics, W
Kin 389  Elem. Track and Field, F,S
Kin 389A  Outdoor Skills Camp, F
Kin 481  Adv. Volleyball, W
Kin 482  Adv. Basketball, F
Kin 483  Adv. Gymnastics, W
Kin 484  Adv. Raquetts, W
Kin 485  Adv. Football, W,S
Kin 486  Adv. Ice Hockey, W
Kin 487  Adv. Field Hockey, F,S
Kin 488  Adv. Aquatics, W
Kin 489  Adv. Track and Field, F,S
Kin 489A  Ski School, W
Course Descriptions
Man-Environment Studies

Department of Man-Environment Studies

Associate Professor, Chairman
R. F. Keith, BSA (Guelph), MA, PhD (Michigan State)

Associate Professor, Undergraduate Officer
E. J. Farkas, BSE (Princeton), ScD (MIT) PEng

Professors
G. R. Francis, BA (Toronto), BA (McGill), MA (Br. Col), PhD (Michigan)
C. K. Knapper, BA Honours (Sheffield), PhD (Sask.)
P. H. Nash, BA, MA (UCLA), CE (Grenoble), MCP, MPA, PhD (Harvard), MCIP

Associate Professors
D. Estrin, BA, LLB (Alberta)
S. K. Gupta, BSc, MSc (Punjab), MA, PhD (Toronto)
G. B. Priddle, BA (W. Ont.), MA, PhD (Clark)

Adjunct Associate Professor
A. T. O'Brien, BS (Marymount), PhD (Fordham)

Assistant Professors
M. C. Th. Kesik-Delfgaauw, BEcon (Amsterdam), MA (Waterloo)
S. C. Lerner, BA (Ohio State), MA (Columbia)
G. O. Michalenko, BA, PhD (Sask.)
A. V. Morgan, BA (Leicester), MA (Calgary), PhD (Waterloo)
J. E. Robinson, BSc (Waterloo), MES (York)
T. McL. Semple, BA (W. Ont.), MA, PhD (Waterloo)

Adjunct Lecturer
C. S. Farkas, BSc (Delaware), MEd (Tufts Univ.)

Faculty members holding cross and/or joint appointment(s) as shown
1Geography, Planning and School of Landscape Architecture, Univ. of Guelph
2Man-Environment Studies and Earth Sciences
3Environmental Studies and Psychology
4Environmental Studies
5Man-Environment Studies and Environmental Studies

Course Descriptions

Env 111 Introduction to the Study of the Future
See Env S course descriptions, page 310.

M Env 130 F 3C 0.5
Environmental Issues 1
Survey and analysis of selected environmental issues drawing upon concepts and theories from the natural and social sciences and the humanities.
Prereq: Honours Man-Environment Studies.

M Env 131 W 3C 0.5
Environmental Issues 2
Continuation of M Env 130.
Prereq: Honours Man-Environment Studies.

M Env 150 F 3C 0.5
Environmental Methods and Techniques 1
Series of concurrent six week workshops to introduce methods and techniques appropriate for investigating different environmental problems. Students to select any two from a series of workshops such as field studies, laboratory analyses, questionnaire design, survey research, small group dynamics and participant observation of social interactions.

M Env 151 W 3C 0.5
Environmental Methods and Techniques 2
Continuation of M Env 150.

M Env 190 F 4S,1wkshp 0.5
Seminar-Workshop
Faculty supervised individual or small group investigation of selected environmental issues to help develop skills for defining and resolving problem situations.
Prereq: Honours Man-Environment Studies.

M Env 191 W 4S,1wkshp 0.5
Seminar-Workshop
Continuation of M Env 190.
Prereq: Honours Man-Environment Studies.

Env S 195A Introduction to Environmental Studies
See Env S course descriptions, page 310.

Env S 195B Introduction to Environmental Problems
See Env S course descriptions, page 310.

Env S 200 Field Ecology
See Env S course descriptions, page 310.

Env S 201 Introduction to Environmental and Planning Law
See Env S course descriptions, page 310.
Course Descriptions
Man-Environment Studies

M Env 241 W 3C 0.5
Social Change
An analysis of major theories of social change, the sources and patterns of change processes with emphasis on the environmental context. Provide an opportunity to explore aspects of change which are of special interest to the student.

M Env 247 F 3C 0.5
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.

M Env 250 F,W 3C 0.5
Environmental Methods & Techniques
Series of concurrent six week workshops to continue the methods and techniques offerings of M Env 150/151. Students to select any two from a series of workshops such as field studies, laboratory analyses, questionnaire design, survey research, small group dynamics and participant observation of social interactions.

Env S 252 Media Tools for Environmental Studies
See Env S course descriptions, page 311.

Env S 253 Media Tools for Environmental Studies - Advanced Level
See Env S course descriptions, page 311.

M Env 260 W 3C 0.5
Visual Perception and Communication
An exploration of the nature of perception and its relationship to communication with special reference to visual phenomena.
Prereq: Consent of instructor.

Env S 271 Introduction to Quantitative Research Methods
See Env S course descriptions, page 311.

Env S 272 Computer Programming in Environmental Studies
See Env S course descriptions, page 311.

M Env 275 F,W 2R 0.5
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
The course begins with an examination of the design and conduct of research including elements of philosophy of science, goal-setting, research techniques, design and analysis. With this background students will prepare a project proposal to be conducted throughout the balance of the year in consultation with selected faculty advisors.
Prereq: Second year Honours Man-Environment Studies.

M Env 295 Y 2C,1S 1.0
Development of Environmental Thought
Through the use of Ascent of Man film series and a number of texts, this course will provide an historical perspective on the development of environmental thought, with special emphasis on the role of science and technology.
Prereq: Honours Man-Environment or consent of instructor.

M Env 310 F 4C 0.5
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.

Env S 310 Behavioural Studies
See Env S course descriptions, page 311.

M Env 320 F,W 3C 0.5
Environmental Economics
Principal economic concepts and their environmental implications. Examination of the economic approach to environmental quality. Introduction to social benefit-cost analysis as applied to environmental problems.

M Env 330 Psycho-Social Aspects of Environmental Design
Not offered 1980-81.

M Env 331 W 2C 0.5
Environmental Issues in a Global Perspective
Env S 333 Parkland Management
See Env S course descriptions, page 311.

M Env 335 W 2C 0.5
Anthropology of Education
A seminar on selected theories of socialization, acculturation and enculturation. These theories will be related to what in the west is usually categorized as "education". There will also be some emphasis on understanding how field work should be done in educational settings. Students should be prepared to do some field work themselves.
Prereq: Anth 102A or consent of instructor.

M Env 340 F,W 3C 0.5
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 analysing problems in detail. Dependent on student demand and faculty availability.
Prereq: Honours Man-Environment Studies.

M Env 350 W 2C 0.5
Community Action on Environmental Problems
The citizen's role in the solution of environmental problems. The work of various community groups is examined and evaluated. Students take part in one group project to experience the process at first hand.

M Env 351 W 3S 0.5
Organizations and Environmental Management
Analyses of inter-jurisdictional and inter-organizational arrangements governing major environmental-resource complexes in Canada. Policy and other issues relating to the development of coherent, effective planning and management systems for such complexes. The course will focus on one particular environmental-resource complex each year to serve as an on-going case study. Examples may include the Great Lakes system, agricultural lands in Canada, development north of 60°, off-shore resources to the 200-mile limit.

M Env 356 W 3C 0.5
Canadian Non-Renewable Resources
An introduction to mineral resources and the state of reserves of selected minerals. Geological factors affecting the occurrence of economic minerals and rocks, concentrating upon energy minerals. Political and social implications are discussed.
Cross-listed as Sci 350.

Env S 358 Environmental Pollution and its Control
See Env S course descriptions, page 311.

M Env 360 F 3C 0.5
Man and Nature
An exploration of Man's position in Nature as viewed in science and arts and in different cultures. Course materials will be drawn from many sources including philosophy, psychology, religions, biology and literature.
Prereq: Third and fourth year students and consent of instructor.

M Env 361 F,S 3C 0.5
Contemporary Media of Communication and Human Environments
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 presented, with special reference to social and political changes.
Prereq: M Env 260 or consent of instructor.

M Env 375 F,W 2R 0.5
Special Readings or Seminars on Selected Topics
Prereq: Consent of instructor.

Env S 380/381 Environmental Studies Workshop
See Env S course descriptions, page 311.

M Env 385 F 3C,1S 0.5
Technology/Lifestyles for a Conserver Society
Based upon a Conserver Society approach, the course will focus upon energy as a central and symbolic issue. Energy alternatives will be discussed with emphasis on the technologies of alternate energy systems and on the social, political and economic implications.
Prereq: Second year or above.
M Env 390 Y 4.8S, wkshp 1.0/2.0
Seminar-Workshop
390A (1 course credit)
390B (2 course credits)
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. Prereq: Honours Man-Environment Studies.

Env S 400 Professional Development in Environmental Management
See Env S course descriptions, page 311.

Env S 401 Environmental Law
See Env S course descriptions, page 311.

Env S 402 Planning Law
See Env S course descriptions, page 312.

M Env 410 Y 3S 1.0
Honours Seminar: Environmental Management
Major problems and issues in the management of environmental impacts stemming from development projects. Synthesis of ecological, economic and institutional aspects. Integrating environmental management with social and economic development policies and programmes. Prereq: Hon. Man-Environment Studies or instructor consent,

Env S 411 Alternative Future Environments 1
See Env S course descriptions, page 312.

Env S 412 Alternative Future Environments 2
See Env S course descriptions, page 312.

Env S 417 Land Use History and Landscape Change 1
See Env S course descriptions, page 312.

Env S 418 Land Use History and Landscape Change 2
See Env S course descriptions, page 312.

Env S 444 Land Evaluation and Resources Management
See Env S course descriptions, page 312.

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. 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/or wilderness environments. Integration of psycho-social information with economics and environmental information in the design process. Prereq: Honours Man-Environment Studies or consent of instructor.

M Env 470 Y 3C 1.0
Environmental Teaching and Learning
Examination of physical and social environments which induce particular kinds of learning. Practical training and experience in project development and co-ordination, leadership and group facilitation processes. Prereq: Third and fourth year Honours Man-Environment Studies or consent of instructor.

M Env 475 F,W 2R 0.5
Special Readings or Seminar on Selected Topics
See M Env 375 for selected topics which were offered in 1979-80 and will likely be offered in 1980-81. 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, faculty availability, and priorities of issues before Canadian society.
Course Descriptions
Management Sciences

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

Department of Management Sciences

Professor, Chairman of the Department
D. W. Conrath, BA (Stanford), MS (Carnegie Tech) MA, PhD (UC, Berkeley) PEng

Professor, Associate Chairman
E. A. Silver, BEng (McGill), ScD (MIT), PEng

Professors
D. J. Clough, BASc, MBA (Toronto), PEng
P. M. Reilly', BASc (Toronto), DIC PhD (London), FSS, PEng
S. D. Saleh, BA (Cairo), MA, PhD (Case Western Reserve)

Associate Professors
I. Bernhardt, BA (NYU) PhD (UC, Berkeley)
M. J. Magazine, BS (CCNY), MS (NYU), MEng, PhD (Florida), PEng
J. B. Moore, BASc (Toronto), MMath, PhD (Waterloo), PEng
R. G. Vickson, DSc (Br. Col.), PhD (MIT)

Assistant Professors
†M. E. El-Gazzar, BSc, MSc (Cairo), PhD (Waterloo), PEng
J. D. Fuller, BSc (Queen’s), MSc, PhD (Br. Col.)
R. J. McClean, BSc, MSc, PhD (Waterloo)

Faculty Member holding cross appointment as shown:
†Department of Chemical Engineering

† Visiting
Course Descriptions

M Sci 21  F,W  3C  0.5
Probability and Statistics 1

M Sci 23  F,W,S  2C,1T  0.5
Managerial and Engineering Economics 1
This course is designed to satisfy Engineering Economics requirements of the Canadian Accreditation Board. Price and output decisions. Choosing among alternative inputs and production processes. Evaluating alternative investments, equipment service life, and new products.

M Sci 31  W  2C,1T  0.5
Probability and Statistics 2
Linear statistical models. General regression theory and applications. Design of orthogonal experiments and industrial applications. Correlation coefficient analysis. Elementary time series analysis. 
Prereq: M Sci 21 or equivalent

M Sci 43  W  2C,1T  0.5
Managerial and Engineering Economics 2
Prereq: M Sci 23 or equivalent

M Sci 44  F,S  3C  0.5
Organizational Behaviour 1
Introduction to the concepts of learning, person perception, attitudes and motivation in an organization. Consideration of communication, roles, norms and decision making within a group. Discussion of power, control, leadership and management in light of the above concepts.

M Sci 46  F,W,S  3C  0.5
Operations Research 1

M Sci 47  F,S  3C  0.5
Operations Research 2
Classification of stochastic processes. Recurrent events including birth and death processes, and branching processes. Waiting line models and applications. Markov processes and decision problems. Applications include inventory control, reliability, equipment replacement, maintenance, design of service facilities, etc.
Prereq: M Sci 21 or equivalent, and M Sci 46

M Sci 48  W  3C  0.5
Introduction to Production Management
Introduction to a number of problem areas in the management of production/industrial engineering. Topics chosen from production planning and inventory control, planning/control of large projects, quality control, reliability/maintenance, facilities layout, job design, production standards and work measurement.

M Sci 53  F,W  3C  0.5
Organizational Behaviour 2
Macro theories of organization and organizational processes are discussed. First half of course examines the development of organizational theories. The second half discusses organizational processes such as conflict, communication control. Throughout, an effort is made to relate course material to organizational structures.
Prereq: M Sci 44
Faculty of Mathematics

Dean of the Faculty of Mathematics
W. F. Forbes, BSc, PhD, DSc (London) DIC, ARCS

Associate Deans, Undergraduate Studies
K. D. Fryer, BA, (W. Ont.), PhD (Toronto)
P. J. Ponzo, MA (Toronto), PhD (Illinois)

Associate Dean, Graduate Studies
J. Paldus, RNDr (Charles University, Prague), CSc (Czechoslovak Academy of Sciences, Prague)

Director of Undergraduate Affairs
P. C. Brillinger, BA (McMaster), MA (Waterloo)

Director, Mathematics Computing Facility
W. M. Gentleman, BSc (McGill), PhD (Princeton)

Director of Computer Communications Network Group
E. G. Manning, MSc (Waterloo) PhD (Illinois)

Director, Statistical Consulting Service
G. W. Bennett, BSc, BA, PhD (Adelaide)

Director, Mathematics/Commerce Group
C. F. A. Beaumont, BA, (McMaster), MA (Toronto)

Associate Director, Mathematics/Commerce Group
R. G. Dunkley, BA (W. Ont.)

Associate Director, Operations Research Group
R. N. Burns, BSc (Toronto), PhD (Waterloo)

Assistant Professor
M. W. Carter, PhD (Waterloo)

Lecturers
Z. Dvoracek, MS, RNDr (Charles University, Prague), PhD (Czechoslovak Academy of Sciences, Prague)
R. G. Scoins, MMath (Waterloo)

Adjunct Lecturer
R. G. N. Lawrence, QC

Course Descriptions
Mathematics

Department of Applied Mathematics

Associate Professor and Chairman of the Department
C. F. A. Beaumont, BA (McMaster), MA (Toronto)

Professor and Associate Chairman of the Department
I. J. McGee, BASc (Toronto), MSc (Waterloo), PhD (Yale)

Professors
J. Cizek, RNDr (Charles University, Prague), CSc (Czechoslovak Academy of Sciences, Prague)
H. F. Davis, PhD (MIT)
S. G. Davison, PhD (Manchester)
B. Forte, PhD (Pisa), Habil DSc (Rome)
J. A. George, MSc (Alberta), PhD (Stanford)
G. M. L. Gladwell, BSc, PhD, DSc (London)
F. O. Goodman, BSc (London), PhD (London), DSc (London), FlnstP, FAIP
W. H. Hui, BSc (Peking), PhD (Southampton)
F. R. McCourt, BSc, MSc, PhD (Br. Col.)
M. A. McKiernan, MA (Loyola), PhD (IIT)
J. Paldus, RNDr (Charles University, Prague), CSc (Czechoslovak Academy of Sciences, Prague)
M. M. Pintar, BSc, MSc, PhD (Ljubljana)
P. J. Ponzo, MA (Toronto), PhD (Illinois)
D. G. Wertheim, BA (McMaster), PhD (Toronto)

Associate Professors
C. B. Collins, BSc (London), PhD (Cambridge)
J. Froese, BA (Manitoba), MA (Queen’s), PhD (Br. Col.)
G. W. Horndeski, BSc (Washington University), PhD (Waterloo)
G. J. Lastman, MA (Br. Col.), PhD (Texas)
R. G. McLennan, MSc (Queen’s), PhD (Cantab)
J. Li, Morris, BSc (Leicester), PhD (St. Andrews)
C. Rogers, BAHons (Oxford), MSc, PhD (Nottingham)
J. Wainwright, BSc (Natal), PhD (South Africa)
Recipient of Distinguished Teacher Award
R. A. Wentzell, BSc (Acadia), PhD (W. Ont.)

Assistant Professors
S. P. Lipshitz, BSc Hons (Natal), MSc (South Africa), PhD (Witwatersrand)
M. E. Snyder, BSc (W. Ont.), MSc (Waterloo)

Lecturer
B. J. Marshman, PhD (Waterloo)

Postdoctoral Fellows
R. J. McKellar, PhD (Arizona)

Adjunct Professors
Y. C. Cheng, PhD (Br. Col.)
M. A. Donelan, PhD (Br. Col.)
Course Descriptions
Mathematics

D. J. Henderson, BS (Br. Col.), PhD (Utah), FinstP
M. S. Klamkin, BChE (Cooper Union), MS (Brooklyn)
D. Lovelock, PhD, DSc (Natal)
H. Rund, PhD (Cape Town), Habilitation (Freiburg)
R. E. Woolsey, PhD (Texas)

Faculty Members holding cross-appointments as shown:
1Applied Mathematics and Chemistry
2Applied Mathematics/Statistics/Computer Science/Pure Mathematics
3Computer Science and Applied Mathematics
4Civil Engineering and Applied Mathematics
5Pure Mathematics and Applied Mathematics
6Physics and Applied Mathematics

Department of Computer Science

Professor and Chairman of the Department
J. A. Brzozowski, MASc (Toronto), PhD (Princeton)

Professor and Associate Chairman for Undergraduate Studies
J. W. Graham, MA (Toronto)
Recipient of Distinguished Teacher Award

Associate Professor and Associate Chairman for Graduate Studies
J. Li. Morris1, BSc (Leicester), PhD (St. Andrews)

Professors
D. D. Cowan, BASc (Toronto), PhD (Waterloo)
K. Culik, MSc, RNDr (Prague), PhD (Czechoslovak Acad Sci)
B. Forte1, PhD (Pisa), Habl DSc (Rome)
W. M. Gentleman2, BSc (McGill), PhD (Princeton)
J. A. George1, MSc (Alberta), PhD (Stanford)
J. D. Lawson, BASc (Toronto), PhD (Waterloo), FIMA
E. G. Manning, MSc (Waterloo), PhD (Illinois)
T. Pietrzykowski, MA (Warsaw), PhD (Polish Acad Sci)

Associate Professors
E. A. Ashcroft, BA (Cantab), PhD (Imperial College)
R. H. Bartels, MS (Michigan), PhD (Stanford)
A. R. Conn3, BSc (London), PhD (Waterloo)
K. O. Geddes, BA (Sask.), MSc, PhD (Toronto)
J. F. Gentleman3, MS (Chicago), PhD (Waterloo)
J. Majithia3, BSc (London), MEng, PhD (McMaster)
M. A. Malcolm, BSc, MEng (Denver)

Assistant Professors
J. C. Beatty, AB (Math) (Princeton), PhD (UC Berkeley)
K. S. Booth, BS (Calif Inst Tech), PhD (UC Berkeley)
T. A. Cargill, BSc (Reading), PhD (Waterloo)
V. A. Dyck, MMath (Waterloo)
G. H. Gonnet, PhD (Waterloo)
T. S. E. Maibaum, BSc (Toronto), PhD (London)
D. Rotem, BSc (Hebrew Univ Jerusalem), PhD (Witwatersrand)
J. A. Smith, PhD (Waterloo), PEng
D. J. Taylor, BSc (Sask), MMath, PhD (Waterloo)
F. W. Tompa, ScM (Brown), PhD (Toronto)
J. H. Vellinga, BA (W. Ont.), MA (Waterloo) (part-time)
J. W. Welch, BSc (McGill), PhD (Waterloo) (part-time)
J. W. Wong, PhD (UC Los Angeles)

Lecturers
R. J. Beach, BMath, MMath (Waterloo)
R. L. Newkirk, BSc, MMath (W. Ont.) (part-time)

Adjunct Professors
P. H. Dirksen MA (Waterloo)
S. C. Johnson, BA (Haverford College, Pa.), PhD (Columbia)

Adjunct Assistant Professor
G. R. Sager, PhD (Washington)

Faculty Members holding cross-appointments as shown:
1Computer Science and Applied Mathematics
2Applied Mathematics/Statistics/Computer Science/Pure Mathematics
3Computer Science and Applied Mathematics
4Statistics and Computer Science
5Electrical Engineering and Computer Science
6Computer Science and Combinatorics and Optimization

Faculty Member holding joint appointment as shown:
1Computer Science and Combinatorics and Optimization

Department of Combinatorics and Optimization

Professor and Chairman of the Department
J. A. Bondy, DPhil (Oxon)

Professor and Associate Chairman of the Department
R. C. Read, MA (Cantab), PhD (London)

Associate Professor and Associate Chairman of the Department
C. E. Haif, BS (Stanford), PhD (Waterloo)

Distinguished Professor
W. T. Tutte, PhD (Cantab), FRSC
Professors
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J. Edmonds, BA (Geo Washington), MS (Maryland)
K. D. Fryer, BA (W. Ont.), PhD (Toronto)
P. L. Hammer, PhD Math (Bucharest)
Professorial Leave
R. G. Mullin, BA (W. Ont.), PhD (Waterloo)
E. R. Swart, BScEng (Witwatersrand), MSc (UNISA),
DSc (Pretoria)
D. H. Younger, PhD (Columbia)
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PhD (Waterloo)
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D. M. Jackson, PhD (Cantab)
U. S. R. Murty, MA (Osmania), PhD (Indian Stat. Inst.)
L. B. Richmond, MSc (Manitoba), PhD (Alberta)
P. Schellenberg, PhD (Waterloo)
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S. A. Vanstone, PhD (Waterloo)
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R. G. Dunkley, BA (W. Ont.)
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E. L. Johnson, BS (Georgia Tech), PhD (UC Berkeley)
C. J. A. Nash-Williams, PhD (Cantab), FRSE
K. Ritter, Dhab (Karlsruhe)
Adjunct Lecturer
J. W. Dodd, BASc (Toronto), MSc (Waterloo)
Faculty Member holding joint appointment as shown:
1Computer Science and Combinatorics and
Optimization
Faculty Members holding cross-appointments as
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2Pure Mathematics and Combinatorics and
Optimization
3St. Jerome’s and Combinatorics and Optimization
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W. J. Gilbert, MA (Cantab), DPhil (Oxon)
Associate Professor and Associate Chairman for
Graduate Affairs
J. W. Lawrence, MSc (McGill), PhD (Carleton)
Distinguished Professor
J. Aczel, PhD (Budapest), Habilitation (Hungarian Acad
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D. Z. Djokovic, PhD (Belgrad)
B. Forte, PhD (Pisa), Habilitation (Rome)
H. Haruki, PhD (Osaka)
P. Hoffman, BA (Toronto), PhD (Manchester)
Pi. Kannappan, BScHons (Annamalai),
PhD (Washington)
M. A. McKiernan, MA (Loyola), PhD (ITT)
R. A. Staal, PhD (Toronto)
J. W. Tucker, BSc (London), PhD (London)
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L. J. Cummings, PhD (Br. Col.)
P. R. Higgs, BScHons (Witwatersrand), MA (Cantab),
PhD (McMaster)
A. Kerr-Lawson, BA (Toronto), MA (Chicago),
PhD (McMaster)
E. Moskal, BA (Toronto), PhD (Illinois)
D. Mowat, PhD (Waterloo)
C. I. Ng, BSc (Chinese Univ), PhD (Waterloo)
F. C. Y. Tang, BSc (Hong Kong), MS (South Carolina),
PhD (Illinois)
P. de Witte, MSc Theor. Phys (Ghent), MScMath,
PhD (Brussels)
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K. R. Davidson, BMath (Waterloo), PhD (Berkeley)
L. J. Dickey, MA (Arizona), PhD (Wisconsin)
K. A. Rowe, BSc (Toronto), MS (Wisconsin),
PhD (Illinois)
C. L. Stewart, BSc (Br. Col.), MSc (McGill),
PhD (Cantab)
F. Zorzitto, BSc (Windsor), PhD (Queen’s)
Adjunct Professor
H. H. Crapo, AB (Michigan), PhD (MIT)
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\*Pure Mathematics and Applied Mathematics
\*Pure Mathematics and Philosophy
\*Pure Mathematics and Combinatorics and Optimization
\*St. Jerome's and Pure Mathematics

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J. F. Lawless, BSc, MSc, PhD (Waterloo)

Associate Professor and Associate Chairman of the Department
M. E. Thompson, BSc (Toronto), MSc, PhD (Illinois)

Associate Professor and Associate Chairman, Actuarial Science
F. G. Reynolds, BSc, MSc (Manitoba), FSA, FCIA

Professors
H. M. Atrubin, BA (Manitoba), FSA, FCIA (part-time)
G. A. Barnard, MA (Cambridge), DSc (London), FIMA, HonARCS
W. F. Forbes, BSc, PhD, DSc (London), DIC, ARCS
B. Fort\*e\*, PhD (Pisa), HabilitDSc (Rome)
W. M. Gentleman\*\*, BSc (McGill), PhD (Princeton)
V. P. Godambe, MSc (Bombay), PhD (London)
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J. G. Kalbfleisch, BSc (Toronto), MA, PhD (Waterloo)
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Associate Professors
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G. W. Bennett, BSc, BA, PhD (Adelaide)
M. A. Bennett, BA (Nottingham), FSA, FCIA
K. S. Brown, BMath, PhD (Waterloo)
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W. S. Rickert, BSc, PhD (Waterloo)
J. C. Robinson, BASc, MASc, PhD (Waterloo)
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J. C. Young, BASc (Toronto), MSc (Waterloo), PhD (Edinburgh)

Assistant Professors
B. Abraham, BSc (Kerala), MSc (Guelph), PhD (Wisconsin)
A. Brender, BSc (McGill), MA, PhD (UC Berkeley), ASA
R. L. Brown, BMath (Waterloo), FSA, FCIA
M. J. Goddard, BSc (Toronto), MSc, PhD (LSHTM)
I. P. Goulden, BMath, MMath, PhD (Waterloo) (part-time)
R. J. MacKay, BSc (Waterloo), MSc, PhD (Toronto)
D. E. Matthews, BA, MA (W. Ont.), PhD (London), DIC
C. Minder, Dipl Math (Basel), MMath, PhD (Waterloo)

Lecturers
J. A. Jackson, BS, BCHir, MB, MA (Cambridge) (part-time)
C. Springer, BSc, MSc (McGill)

Adjunct Professors
I. P. Fellegi, BSc (Budapest), MSc, PhD (Carleton)
A. Finch, BSc, ARCS, PhD, DSc (London), DIC

Faculty Members holding cross-appointments as shown:

\*Applied Mathematics/Statistics/Computer Science/Pure Mathematics
\*Computer Science and Statistics
\*Chemical Engineering and Statistics
\*Statistics and Psychology
\*Psychology and Statistics
\*Statistics and Computer Science

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Faculty of Mathematics

Course Offerings - Notes

1. Courses with the following abbreviations are offered by the Faculty of Mathematics: Math (non-departmental faculty courses), AM (Applied Mathematics), C&O (Combinatorics & Optimization), CS (Computer Science), PMath (Pure Mathematics), Stat (Statistics, including Actuarial Science), MTHEL (Mathematics Elective). The course descriptions which follow appear in ascending order by course number within these groups. Unless otherwise indicated, these courses are open to students in any UW faculty provided that stated prerequisites have been met.

2. Courses offered by the Faculty of Mathematics which have been designed with the academic needs and backgrounds of students in other faculties in mind are identified by a note following the course description. These courses appear in the sequence described above. They are Math 103, 104, 105, 106, 107, 110a/b, 111a/b, 113, 114, 115a/b, 210, 211, 212, 213a/b, 215, 216, 226; AM 101, 111, 405; CS 112, 115, 116, 118, 316; Stat 202, 204, 205, 210, 300, 500.

3. Certain core Mathematics courses are offered at three different levels. The advanced level courses are intended for exceptionally gifted students in an Honours programme. A student pursuing an Honours degree may substitute the corresponding Advanced level course(s) for any required Honours level course(s).

   Similarly, a student pursuing a Pass or General degree may substitute the corresponding Honours level course(s) for any required General level course(s), unless the student has been required by the Standings & Promotions Committee to switch from an Honours programme to General or Pass. In this case, the student must enrol in General level courses. The following table sets out corresponding advanced/honours/general courses.
Mathematics Course Descriptions

Math 103 F 3C,1T 0.5
Introductory Algebra (For students in Arts/Social Sciences)
Topics chosen from set theory, permutations and combinations, binomial theorem, probability theory, systems of linear equations, vectors and matrices, mathematical introduction.
N.B.: Not open to students in the Faculty of Mathematics. Math 103 does not cover all the material normally included in Grade 13 Algebra; however, superior performance (approximately 80%) would probably provide an adequate background for most courses that demand Grade 13 Algebra as a prerequisite (e.g. Math 124a). Grade 12 Mathematics is recommended.

Math 104 W 3C,1T 0.5
Introductory Calculus (For students in Arts/Social Sciences)
N.B.: Not open to students in the Faculty of Mathematics. Math 104 does not cover all the material normally included in Grade 13 Calculus; however, superior performance (approximately 80%) would probably provide an adequate background for most courses that demand Grade 13 Calculus as a prerequisite (e.g. Math 120a). Grade 12 Mathematics is recommended.

Math 105 F 3C 0.5
Mathematics (For Environmental Studies Students)
Quantitative analysis in environmental research. Elementary concepts in Algebra: notation, terminology, operations. Probability Theory. Permutations and Combinations, approaches to probability, dependent and independent events, conditional probability, distribution functions, including the Binomial, Poisson and Normal distributions, with applications to problems in Environmental Studies.
Prereq: None
N.B.: Not open to students in the Faculty of Mathematics

See notes preceding 'Math' course descriptions.
Math 106  F  3C  0.5  
**Mathematics (For Kinesiology Students)**
Algebraic functions and their graphs; exponential and logarithmic functions; elementary differential and integral calculus; applications and problems associated with kinesiology.
_N.B.: Not open to students in the Faculty of Mathematics. This course is open to Kinesiology students who have not taken Grade 13 Calculus._

Math 107  F  3C  0.5  
**Mathematics (For Kinesiology Students)**
Content similar to that of Math 106 except that it will be assumed that students have completed Grade 13 Calculus. Accordingly, there will be broader consideration of applications.
_N.B.: Not open to students in the Faculty of Mathematics._

Math 110a  F  3C,2T  0.625  
**Calculus 1a (For Engineering Students)**
Functions and their inverses, limits, continuity and derivatives. The trigonometric functions, their inverses and derivatives. Applications to rate, max./min., curve sketching problems. Sequences, the definite integral, the fundamental theorem of calculus. Applications to area and volume problems.
_Prereq: Grade 13 Calculus
_N.B.: Not open to students in the Faculty of Mathematics._

Math 110b  W,S  3C,2T  0.5  
**Calculus 1b (For Engineering Students)**
_Prereq: Math 110a
_N.B.: Not open to students in the Faculty of Mathematics._

Math 111a  F  3C  0.5  
**Algebra and Solid Geometry (For Science Students)**
The real and complex number systems, mathematical induction, the Binomial Theorem, monotone sequences and the Cauchy criteria, polynomial functions, theory of equations.
_Prereq: Grade 13 Algebra recommended but not required.
_N.B.: Not open to students in the Faculty of Mathematics._

Math 111b  W,S  3C  0.5  
**Algebra and Solid Geometry (For Science Students)**
Determinants, vector and matrix notation, elementary solid geometry, linear transformations, eigenvalues and eigenvectors.
_Prereq: Grade 13 Algebra recommended but not required.
_N.B.: Not open to students in the Faculty of Mathematics._

Math 113  Y  3C,2T  1.0  
**Calculus (For Arts and Science Students)**
_Prereq: Grade 13 Calculus
_N.B.: Not open to students in the Faculty of Mathematics._

Math 114  F  3C,2T  0.625  
**Algebra and Vector Geometry (For Engineering Students)**
_Prereq: Grade 13 Algebra
_N.B.: Not open to students in the Faculty of Mathematics._

Math 115a  F  3C,2T  0.5  
**Calculus (For Co-op Physics & Chemistry)**
Real numbers, functions, trig functions. Limits. The derivative, differentiation, higher order derivatives, implicit functions, differentials, applications of the derivative. The definite integral. Antidifferentiation. Logarithms and exponential functions. Inverse functions.
_Prereq: Grade 13 Calculus
_N.B.: Not open to students in the Faculty of Mathematics._

Math 115b  W,S  3C,2T  0.5  
**Calculus (For Co-op Physics & Chemistry)**
_Prereq: Math 115a
_N.B.: Not open to students in the Faculty of Mathematics._

See notes preceding 'Math' course descriptions.
Math 120a  F,W,S  3C,1T  0.5
Calculus
Functions and limits, differentiation of trigonometric, logarithmic and exponential functions, the chain rule, Rolle's theorem, the mean value theorem, extreme value theorem, applications of the derivative, the differential, the definite integral, fundamental theorem of calculus.
Prereq: Grade 13 Calculus
N.B.: Math 120a is not open to Honours Mathematics students.

Math 120b  F,W,S  3C,1T  0.5
Calculus
Techniques of integration, applications of the integral, indeterminate forms, Taylor's theorem, convergence of sequences and series, power series.
Prereq: Math 120a
N.B.: Math 120b is not open to Honours Mathematics students.

Math 124a  F,W  3C,1T  0.5
Deductive Geometry
Euclidean geometry with emphasis on deductive reasoning and problem solving, number systems.
Prereq: Grade 13 Algebra
N.B.: Math 124a is not open to Honours Mathematics students. This course may also be offered in the spring term.

Math 124b  F,W,S  3C,1T  0.5
Linear Algebra 1
Systems of equations, vector spaces, matrices, determinants, geometric applications.
Prereq: Grade 13 Algebra (Math 124a is recommended, but not required)
N.B.: Math 124b is not open to Honours Mathematics students.

Math 130a  F  3C,1T  0.5
Calculus
Functions and limits, differentiation of trigonometric, logarithmic and exponential functions, the chain rule, Rolle's theorem, the mean value theorem, extreme value theorem, applications of the derivative, the differential, the definite integral, fundamental theorem of calculus.
Prereq: Grade 13 Calculus
N.B.: Credit will only be granted for one of Math 120a, 130a, 140a. This course may also be offered in the spring term.
Also offered at St. Jerome's College.

Math 130b  W,S  3C,1T  0.5
Calculus
Techniques of integration, applications of the integral, indeterminate forms, Taylor's theorem, convergence of sequences and series, power series.
Prereq: Math 130a or 80% in Math 120a
N.B.: Credit will only be granted for one of Math 120b, 130b, 140b.
Also offered at St. Jerome's College.

Math 134a  F  3C,1T  0.5
Algebra
Basic set theory, cardinality, elementary number theory, number systems, polynomials.
Prereq: Grade 13 Algebra
N.B.: Credit will only be granted for one of Math 124a, 134a, 144a. This course may also be offered in the spring term.
Also offered at St. Jerome's College.

Math 134b  W,S  3C,1T  0.5
Linear Algebra 1
Systems of equations, vector spaces, matrices, determinants, geometric applications.
Prereq: Grade 13 Algebra (Math 134a or 80% in Math 124a, is recommended, but not required)
N.B.: Credit will only be granted for one of Math 124b, 134b, 144b.
Also offered at St. Jerome's College.

Math 140a  F  3C  0.5
Calculus
Math 140a is an advanced-level, enriched version of Math 130a.
Prereq: Grade 13 Calculus and a Grade 13 Math Average of at least 85% (or permission of instructor)
N.B.: Credit will only be granted for one of Math 120a, 130a, 140a. This course may also be offered in the spring term.

Math 140b  W,S  3C  0.5
Calculus
Math 140b is an advanced-level, enriched version of Math 130b.
Prereq: Math 140a (or permission of instructor)
N.B.: Credit will only be granted for one of Math 120b, 130b, 140b.

Math 144a  F  3C  0.5
Algebra
Math 144A is an advanced-level, enriched version of Math 134a.
Prereq: Grade 13 Algebra and a Grade 13 Math Average of at least 85% (or permission of instructor)
N.B.: Credit will only be granted for one of Math 124a, 134a, 144a. This course may also be offered in the spring term.

See notes preceding 'Math' course descriptions
<table>
<thead>
<tr>
<th>Course</th>
<th>Type</th>
<th>Credits</th>
<th>Grade Levels</th>
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<tr>
<td>Math 144b</td>
<td>Linear Algebra 1</td>
<td>3C, 0.5</td>
<td>W, S</td>
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<tr>
<td>Math 144b</td>
<td></td>
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<tr>
<td>Prerequisite: Math 134a</td>
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<tr>
<td>N.B.: Credit will only be granted for one of Math 124b, 134b, 144b.</td>
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<tr>
<td>Math 210</td>
<td>Calculus 2</td>
<td>3C, 0.5</td>
<td>F, W</td>
</tr>
<tr>
<td>Math 211</td>
<td>Calculus 2</td>
<td>2C, 2T, 0.5</td>
<td>F, W</td>
</tr>
<tr>
<td>Math 212</td>
<td>Advanced Calculus</td>
<td>2C, 2T, 0.5</td>
<td>F, S</td>
</tr>
<tr>
<td>Math 213a</td>
<td>Calculus 2</td>
<td>3C, 0.5</td>
<td>F</td>
</tr>
<tr>
<td>Math 213b</td>
<td>Calculus 2</td>
<td>3C, 0.5</td>
<td>F, W, S</td>
</tr>
<tr>
<td>Math 215</td>
<td>Differential Equations</td>
<td>3C, 0.5</td>
<td>F, W</td>
</tr>
<tr>
<td>Math 216</td>
<td>Differential Equations</td>
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<td>F, S</td>
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<td>Math 220a</td>
<td>Advanced Calculus</td>
<td>3C, 1T, 0.5</td>
<td>F, W, S</td>
</tr>
<tr>
<td>Math 220b</td>
<td>Advanced Calculus</td>
<td>3C, 1T, 0.5</td>
<td>F, W, S</td>
</tr>
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<td>Math 221a</td>
<td>Linear Algebra</td>
<td>3C, 0.5</td>
<td>F</td>
</tr>
<tr>
<td>Math 221b</td>
<td>Linear Algebra</td>
<td>3C, 0.5</td>
<td>F</td>
</tr>
</tbody>
</table>

See notes preceding 'Math' course descriptions.
Math 224a  F,W,S  3C  0.5
Linear Algebra 2
Linear transformations, eigenvalues, characteristic polynomials, inner products.
Prereq: Math 124b
N.B.: Math 224a is not open to Honours Mathematics students.

Math 224b  F,W,S  3C  0.5
Abstract Algebra 1
Elementary group and field theory and other topics in algebra.
Prereq: Math 224a
N.B.: Math 224b is not open to Honours Mathematics students.

Math 226  Y  2C  1.0
Elementary Differential Equations (For Science Students)
N.B.: Math 226 is not open to Honours or General Mathematics students.

Math 230a  F,W  3C,1T  0.5
Advanced Calculus
Differential calculus of functions of several variables: limits and continuity, partial derivatives, differentiability, chain rule, Taylor's formula, extreme values, mappings and Jacobians. Integral calculus of functions of several variables: multiple integrals, iterated integrals, change of variables, applications to area and volume calculations.
Prereq: Math 130b or 80% in Math 120a/b
N.B.: Credit will only be granted for one of Math 220a, 230a, 240a.
Also offered at St. Jerome's College.

Math 230b  F,W,S  3C,1T  0.5
Advanced Calculus
Prereq: Math 230a
N.B.: Credit will only be granted for one of Math 220b, 230b, 240b.
Also offered at St. Jerome's College.

Math 231a
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.
Prereq: Math 134a/b or 80% in Math 124a/b
N.B.: Credit will only be granted for one of Math 221a, 231a, 241a.

Math 231b  F  3C  0.5
Linear Algebra
A continuation of Math 231a.
Prereq: Math 231a
N.B.: Credit will only be granted for one of Math 221b, 231b, 241b.

Math 234a  F,W  3C  0.5
Linear Algebra 2
Linear transformations, eigenvalues, characteristic polynomials, inner products.
Prereq: Math 134b or 80% in Math 124b
N.B.: Credit will only be granted for one of Math 224a, 234a, 244a.
Also offered at St. Jerome's College.

Math 234b  F,W,S  3C  0.5
Abstract Algebra 1
Groups, fields and other topics in abstract algebra.
Prereq: Math 234a
N.B.: Credit will only be granted for one of Math 224b, 234b, 244b.
Also offered at St. Jerome's College.

Math 240a  F,W  3C  0.5
Advanced Calculus
Math 240a is an advanced-level, enriched version of Math 230a.
Prereq: Math 140b (or permission of instructor)
N.B.: Credit will only be granted for one of Math 220a, 230a, 240a.

Math 240b  F,W,S  3C  0.5
Advanced Calculus
Math 240b is an advanced level, enriched version of Math 230b.
Prereq: Math 240a (or permission of instructor)
N.B.: Credit will only be granted for one of Math 220b, 230b, 240b.

Math 241b  F  3C  0.5
Linear Algebra
Math 241b is an advanced-level, enriched version of Math 231b.
Prereq: Math 241a (or permission of instructor)
N.B.: Credit will only be granted for one of Math 221b, 231b, 241b.

See notes preceding 'Math' course descriptions.
Math 244a  F,W  3C  0.5  
**Linear Algebra 2**
Math 244a is an advanced-level, enriched version of Math 234a.

*Prereq: Math 144b (or permission of instructor)*

*N.B.: Credit will only be granted for one of Math 224a, 234a, 244a.*

Math 244b  F,W,S  3C  0.5  
**Abstract Algebra 1**
Math 244b is an advanced-level, enriched version of Math 234b.

*Prereq: Math 244a (or permission of instructor)*

*N.B.: Credit will only be granted for one of Math 224b, 234b, 244b.*

Math 321a  F,W,S  2C,1T  0.5  
**Modern Algebra**
Groups, monoids and Boolean algebras with selected applications.

*Prereq: Math 124ab (Math 221a desirable)*

*N.B.: Math 321a is not open to Honours Mathematics students.*

Math 321b  F,W  2C,1T  0.5  
**Modern Algebra**
Rings and fields with selected applications.

*Prereq: Math 321a*

*N.B.: Math 321b is not open to Honours Mathematics students.*

Math 322a  F,W,S  3C  0.5  
**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.

*Prereq: Math 220a (Math 220b desirable)*

*N.B.: Math 322a is not open to Honours Mathematics students.*

Math 322b  F,W  3C  0.5  
**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.

*Prereq: Math 220b*

*N.B.: Math 322b is not open to Honours Mathematics students.*

Math 324a  0.5  
**Linear Algebra 3**
Further topics in linear algebra and its application.

*Prereq: Math 224b*

*N.B.: Math 324a is not open to Honours Mathematics students.*

Math 324b  0.5  
**Abstract Algebra 2**
Topics in abstract algebra: groups, rings, fields and applications.

*Prereq: Math 224b*

*N.B.: Math 324b is not open to Honours Mathematics students.*

Math 331a  F,W,S  2C,1T  0.5  
**Modern Algebra**
Groups, monoids and Boolean algebras with selected applications.

*Prereq: Math 134ab or 80% in Math 124ab (Math 231a desirable)*

*N.B.: Credit will only be granted for one of Math 321a, 331a.*

Math 331b  F,W  2C,1T  0.5  
**Modern Algebra**
Rings and fields with selected applications.

*Prereq: Math 331a*

*N.B. Credit will only be granted for one of Math 321b, 331b.*

Math 332a  F,W,S  3C  0.5  
**Real Variables**
Real numbers, Sequences and series, Power series, Continuous functions, Convergence of functions, Fourier series, Normed linear spaces.

*Prereq: Math 230a (Math 230b desirable)*

*N.B.: Credit will only be granted for one of Math 322a, 332a.*

See notes preceding ‘Math’ course descriptions.
Math 332b  F,W  3C  0.5
An Introduction to Complex Variable Theory
Complex numbers; continuity, differentiability, analyticity of functions; the Cauchy-Riemann equations; solution of Laplace's equation; conformal mapping by elementary functions, and applications; the Cauchy and allied theorems; Taylor and Laurent expansions, uniform convergence and power series; the residue calculus, and applications.
Prereq: Math 230b
N.B.: Credit will only be granted for one of Math 322b, 332b.

Math 334a  0.5
Linear Algebra 3
Further topics in linear algebra and its application.
Prereq: Math 234b
N.B.: Credit will only be granted for one of Math 324a, 334a.

Math 334b  0.5
Abstract Algebra 2
Topics in abstract algebra: groups, rings, fields and applications.
Prereq: Math 234b
N.B.: Credit will only be granted for one of Math 324b, 334b.

Math 380a  F  2C,1T  0.5
Introduction to Information Theory with Applications

Math 380b  W  2C,1T  0.5
Information Theory with Applications
Measures of expected conditional information. Maximizing expected conditional information. Applications to communication theory and programming. Basics in questionnaire theory.

See notes preceding 'Math' course descriptions.
AM 260  F,W  2C  0.5  
Mathematical Modelling  
Mathematical models for problems in the physical and biological sciences. Typical problems chosen from ecology, special relativity, spread of epidemics, rumours and tumors. Solutions to problems will be obtained primarily by differential equations.  
Prereq: Math 130a/b  
N.B. Credit will be given for only one of AM 230, 260.

AM 270  F,W  2C  0.5  
Mathematical Modelling  
Further mathematical models from various disciplines. An introduction to Newtonian mechanics will also be included in the course.  
Prereq: AM 260 or consent of instructor  
N.B.: Credit will be given for only one of AM 240, 270.

AM 340  W  2C  0.5  
Applications of Mathematics  
Difference equations, Laplace transforms applied to discrete and continuous mathematical models taken from ecology, biology, economics and other fields.  
Prereq: Math 220a/b or consent of instructor.

AM 362  F  2C,1T  0.5  
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. Co-ordinate transformations and tensors in n-dimensions; n-dimensional Riemannian spaces; covariant differentiation; geodesics; the curvature, Ricci and Einstein tensors. Applications of tensors in Relativity and Continuum Mechanics.  
Prereq: Math 230a/b or consent of instructor.  
N.B.: Cross listed with PMath 365

AM 365  W  2C,1T  0.5  
Introduction to Continuum Mechanics  
Prereq: Math 230a/b, or consent of instructor.

AM 371  F,S  2C,1T  0.5  
Partial Differential Equations of Applied Mathematics 1  
First order partial differential equations and methods of characteristics, second order partial differential equations, boundary value problems and related numerical methods, vibrating string, 2-D membranes, heat equation and related problems; introduction to vector analysis.  
Prereq: AM 260, Math 230a/b, or consent of instructor.

AM 372  W  2C,1T  0.5  
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.

AM 381  F,S  2C,1T  0.5  
Ordinary Differential Equations 1  
Existence and uniqueness theorems, second and higher order equations, series solutions and Special Functions, Laplace transforms. Application to Mathematical Physics.  
Prereq: Math 230a/b

AM 389  F  0.5  
Reading Course

AM 399  W  0.5  
Reading Course

AM 405  Y  2C  1.0  
Applied Analysis (For Science Students)  
Prereq: Consent of instructor  
N.B.: Not open to students in the Faculty of Mathematics.

AM 430  F  2C  0.5  
Applications of Mathematics  
Integral equations and integral transforms will be applied to systems with memory.  
Prereq: Consent of instructor.
AM 440  W  2C  0.5  
Applications of Mathematics
As a project, students will develop a mathematical model and interpret its behaviour.
Prereq: Consent of instructor.

AM 461  F  2C  0.5  
Non-Linear Differential Equations
Non-linear mechanics, stability, quasi-linear and strongly non-linear systems, linear periodic systems, non-linear integral equations.
Prereq: AM 361/391, or consent of instructor.

AM 462  F  2C  0.5  
Measure and Integration
The theory of measure and the Lebesgue integral.
Prereq: Math 332a or PMath 351a.

AM 463  F  2C,1T  0.5  
Introduction to Differentiable Manifolds
Differentiable manifolds, vector fields, linear connections, tensor fields, differential forms, and the Cartan structure equations.
Prereq: AM 362 or consent of instructor.
N.B.: Cross listed with PMath 463.

AM 465  Y  2C  1.0  
Quantum Mechanics
Prereq: Math 231a/b. AM 371 or consent of instructor

AM 466  F  3C  0.5  
Fluid Mechanics
Fundamental equations of inviscid fluids, compressibility, vorticity; two and three-dimensional irrotational, incompressible flow, Blasius' theorem, Joukowsky hypothesis.
Prereq: AM 365

AM 468  F  2C  0.5  
Topics in Applied Mathematics
A selection of special topics given by members of the Applied Mathematics Department.
Prereq: Consent of instructor.

AM 472  W  2C  0.5  
Linear Operators
Linear operators in Hilbert spaces. Compact operators. Introduction to functional analysis.
Prereq: AM 462 or consent of instructor.

AM 473  W  2C,1T  0.5  
Selected Topics in Applied Differential Geometry
Prereq: AM 362 or consent of instructor.

AM 476  W  3C  0.5  
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  0.5  
Topics in Applied Mathematics
Same as in AM 468.
Prereq: Consent of instructor.

AM 481  Y  2C  1.0  
Partial Differential Equations of Applied Mathematics 2
Second-order partial differential equations and characteristics; d'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: AM 371, 381, 391, or consent of instructor.

AM 482  F  2C,1T  0.5  
Calculus of Variations
Prereq: Math 230a/b, or consent of instructor.

AM 485  F  2C  0.5  
Electromagnetism
Applications of Maxwell's equations. Introduction to wave guides and antennae.
Prereq: Phys 253 or consent of instructor.
AM 486 F 2C 0.5
**Statistical Mechanics**
Applications of probability theory to theoretical Physics.
*Prereq: Consent of instructor.*

AM 488 F 2C 0.5
**Control Theory**
*Prereq: Consent of instructor.*

AM 489 F 0.5
**Reading Course**

AM 495 W 2C,1T 0.5
**Elasticity**
Basic equations of elasticity for homogeneous isotropic bodies; bending of beams; plane elastic waves; Rayleigh surface waves, Love waves. Solution of problems by potentials, variational methods and Saint Venants’ principle.
*Prereq: AM 365.*

AM 499 W 0.5
**Reading Course**

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**Department of Combinatorics and Optimization**

**Course Descriptions**

**Note**
Course descriptions are given under the new course numbers introduced in 1979. The old numbers appear in brackets.

C & O 280 W 3C 0.5 (C & O 249b)
**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.
*Prereq: Math 231ab*
*N.B.: Credit will be granted for at most two of C & O 280, 282, 283.*

C & O 282. F 2C,2T 0.5 (C & O 239a)
**An Introduction to Combinatorics**
*Prereq: Math 124ab*
*N.B.: Credit will be granted for at most two of C & O 280, 282, 283. Also offered at St. Jerome’s College in Winter Term.*

C & O 283 W,S 2C,2T 0.5 (C & O 239b)
**An Introduction to Optimization**
*Prereq: Math 124ab*
*N.B.: Credit will be granted for at most two of C & O 280, 282, 283. Also offered at St. Jerome’s College in Fall Term.*

C & O 331a F,W,S 3C 0.5 (C & O 352a)
**Linear Programming**
Basic linear programming theory; review of relevant linear algebra, systems of linear inequalities, the simplex method, revised simplex method, pivot rules. Theory and applications of duality and complementary slackness. Sensitivity analysis.
*Prereq: Math 221ab.*
Combinatorics and Optimization

Course Descriptions

C & O 331b  F,W  3C  0.5 (C & O 352b)  
Introduction to Combinatorial Optimization
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.
Prereq: C & O 331a.

C & O 332  F,S  3C  0.5 (C & O 451a)  
Fundamentals of Continuous Optimization
Linear least squares. Properties of quadratic forms with applications to Newton's method and method of steepest descent. One dimensional optimization. Introduction to constrained optimization, including the elements of Kuhn-Tucker theory and Lagrange Multipliers.
Prereq: Math 220ab.

C & O 340  F,W,S  3C  0.5 (C & O 353a)  
Modelling and Optimization 1
An applications oriented course that illustrates how various mathematical models and methods of optimization can be used to solve problems arising in business, industry and science.
Prereq: Math 221ab
Coreq: C & O 331a.

C & O 341  W  3C  0.5 (C & O 353b)  
Modelling and Optimization 2
An applications oriented course complementary to C & O 340.
Prereq: C & O 340.

C & O 360  F  3C  0.5 (C & O 360b)  
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 231ab/b.

C & O 362  F  3C  0.5 (C & O 360a)  
Introduction to Combinatorial Design
Topics covered include orthogonal Latin squares, finite projective planes, balanced incomplete block designs, Hadamard matrices and Room squares.
Prereq: Math 231ab/b.

C & O 370a  F,W,S  3C  0.5 (C & O 351a)  
Introduction to Graph Theory 1
Graphs are basic mathematical structures which may be used, in a large variety of contexts, to model relationships between entities (routes between cities, friendship between people, and so on). Topics covered: basic definitions, trees, matchings, connectivity.
Prereq: Math 221ab/b.

C & O 370b  F,W  3C  0.5 (C & O 351b)  
Introduction to Graph Theory 2
Topics covered include: planar graphs; vertex, edge and face colouring; Hamilton cycles.
Prereq: C & O 370a.

C & O 373a (C & O 350a)  
Graph Theory with Applications 1
Not offered 1980-81.

C & O 373b (C & O 350b)  
Graph Theory with Applications 2
Not offered 1980-81.

C & O 384  F,S  2C  0.5 (C & O 330a)  
Mathematical Discovery and Invention 1
A study of about 100 challenging problems taken from many areas of elementary mathematics - number theory, combinatorics, geometry, probability, logic.
Prereq: None

C & O 385  W  2C  0.5 (C & O 330b)  
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 386a  F  2C  0.5 (C & O 337a)  
Combinatorial Geometry 1
Combinatorial aspects of the plane, such as, the number of regions into which the plane is divided by n lines; the number of two point lines formed from a set of n non-collinear points, etc. Properties of convex sets in the plane.
Prereq: Math 221a
N.B.: Offered at St. Jerome's College.

C & O 386b  W  2C  0.5 (C & O 337b)  
Combinatorial Geometry 2
This course introduces the idea of a finite geometry and partial geometry. It shows the connection between Latin squares, orthogonal arrays, finite geometries and block designs.
Prereq: C & O 386a
N.B.: Offered at St. Jerome's College.

C & O 431a  F,S  2C  0.5 (C & O 437a)  
Network Flow Theory
Prereq: C & O 331a.
C & O 431b  W  2C  0.5 (C & O 437b)  
**Combinatorial Optimization**
**Prereq:** C & O 431a

C & O 432  W  2C  0.5 (C & O 451b)  
**Continuous Optimization**
**Prereq:** C & O 332

C & O 433a  F  2C  0.5 (C & O 452a)  
**Topics in Linear Programming**
**Prereq:** C & O 332

C & O 433b  W  2C  0.5 (C & O 452b)  
**Numerical Linear Programming**
**Prereq:** C & O 433a

C & O 436  F  2C  0.5 (C & O 457a)  
**Integer Programming**
**Prereq:** C & O 331a

C & O 442a  F,S  2C  0.5 (C & O 454a)  
**Game Theory**
Game theory provides, through analysis of appropriate mathematical models, insight into the mechanics of competitive situations, such as those arising in social, economic, political or military conflict. Topics covered: matrix and bimatrix games, utility theory, bargaining problems.  
**Prereq:** C & O 331a and Stat 220

C & O 442b (C & O 454b)  **Game Theory 2**
Not offered 1980-81.

C & O 443a  F  2C  0.5 (C & O 450a)  
**Linear and Quadratic Programming 1**
**Prereq:** C & O 331a

C & O 443b  W  2C  0.5 (C & O 450b)  
**Linear and Quadratic Programming 2**
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 443a

C & O 444  F,S  2C  0.5 (C & O 453a)  
**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 behaviour including balking, reneging and jockeying.  
**Prereq:** Stat 220

C & O 446  F  2C  0.5 (C & O 457b)  
**Boolean Methods**
**Prereq:** Math 321a/b

C & O 447a  F,W,S  2C,1T  0.5 (C & O 456a)  
**Scheduling 1**
Algorithms for functions of completion or due times. Applications to quality control, organization of data files, machine shops. Precedence relations, parallel machines, implicit enumeration algorithms, generalized travelling salesman problem.  
**Prereq:** C & O 331a or C & O 340
C & O 447b W 2C,1T 0.5 (C & O 456b)
Scheduling 2
Topics complimentary to those of C & O 447a.
Prereq: C & O 447a and C & O 331b

C & O 448 F 2C 0.5 (C & O 455a)
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 problems, the travelling salesman problem, introduction to optimal control, an aggregate scheduling problem of inventory.
Prereq: C & O 331a

C & O 449 W 2C 0.5 (C & O 455b)
Topics in Optimization
The topics covered will vary from year to year depending upon the instructor and interests of the students.
Prereq: C & O 331a

C & O 460 W 2C 0.5 (C & O 460a)
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.
Prereq: C & O 360

C & O 462 W 2C 0.5 (C & O 460b)
Combinatorial Design
This is a continuation of C & O 362. Topics covered include error correcting codes, resolvable designs, affine designs, weighing matrices, and their interaction.
Prereq: C & O 362 or consent of instructor

C & O 464a F,S 3C 0.5 (C & O 438a)
Combinatorial Applications of Computer 1
General topics: methods of data storage for combinatorial 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: Math 321a/b and two of CS 140, 180, 240, 250

C & O 464b W 3C 0.5 (C & O 438b)
Combinatorial Applications of Computer 2
Prereq: C & O 464a

C & O 470a F 2C 0.5 (C & O 458a)
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.
Prereq: C & O 370a/b or consent of instructor

C & O 470b W 2C 0.5 (C & O 458b)
Graph Theory 2
Continuation of topics covered in C & O 470a.
Prereq: C & O 470a

C & O 472a (C & O 459a) Algebraic Graph Theory 1
Not offered 1980-81

C & O 472b (C & O 459b) Algebraic Graph Theory 2
Not offered 1980-81

C & O 487 F 2C 0.5 (C & O 446a)
History of Mathematics 1
A study of selected topics from Greek geometry. Some related work of post-renaissance scholars is included. Topics include: famous construction problems, pythagorean arithmetic, regular solids, four discoveries of Archimedes, the problem of Apollonius; selected works of Archimedes, Euclid, Apollonius, Euler, Steiner.
Prereq: None

C & O 488 W 2C 0.5 (C & O 446b)
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 form elementary number theory, a collection of outstanding problems in geometry (Fagnano, Steiner-Lehmus, Morley).
Prereq: None

C & O 499 F,W,S 2R 0.5 (C & O 499)
Reading in Combinatorics and Optimization
Prereq: Consent of department
Course Descriptions

Note
More detailed course descriptions and course outlines are available upon request from the Computer Science Department. Students in faculties other than mathematics should take particular note of the following courses: CS 112, CS 115, CS 116, CS 118, CS 316

CS 112 F,W 2C,2T 0.5
Introduction to Business Problem Solving by Computer
Emphasis on the solution of mathematical problems in business. Concept and properties of an algorithm. Language and notation for describing algorithms. Analysis of problems, development of models and algorithms; implementation in a procedure-oriented language (usually FORTRAN IV); execution of these programs using several systems.
Prereq: none
N.B.: Credit will only be granted for one of CS 112, CS 116, CS 118 or CS 140. CS 112 cannot be counted for credit toward a BMath degree.

CS 115 W 2C,2L 0.5
Introduction to Commercial Problem Solving by Computer
Introduction to file processing techniques such as file maintenance, sorting and report generation. Language and notation for describing such algorithms. Analysis of problems dealing with files, and development of algorithms for their solution. Introduction to procedure-oriented languages (usually COBOL) for solving such problems.
Prereq: CS 112 or the equivalent
N.B.: Credit will only be granted for one of CS 115 or CS 140. CS 115 cannot be counted for credit toward a BMath degree.

CS 116 F 2C,1T 0.5
Introduction to Computing
This course provides students in 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
N.B.: Credit will only be granted for one of CS 112, CS 116, CS 118 or CS 140. CS 116 cannot be counted for credit toward a BMath General or Honours degree.

CS 118 F,W 3C,2L 0.5
Introduction to Scientific Problem Solving by Computer
An introduction to the analysis of scientific problems, development of mathematical models and algorithms for their solution; implementation in a procedure-oriented language (normally FORTRAN IV). Topics discussed are: solution of equations, computation of integrals, graph plotting, and simulation.
Prereq: Grade 13 mathematics is recommended.
N.B.: Credit will only be granted for one of CS 112, CS 116, CS 118 or CS 140.

CS 140 F,W,S 3C,2L 0.5
Introduction to Mathematical Problem Solving by Computer
An introduction to the analysis of mathematical problems, development of mathematical models and algorithms for their solution; implementation in a procedure-oriented language (normally FORTRAN IV). Topics discussed are: solution of equations, computation of integrals, graph plotting, and simulation.
Prereq: Grade 13 mathematics is recommended.
N.B.: Credit will only be granted for one of CS 112, CS 116, CS 118 or CS 140.

CS 160 F,W 2C,2L 0.5
Introduction to File Processing
Introduction to the use of computers. Concept of an algorithm. Language and notation for describing algorithms. Analysis and solution of problems dealing with files. Introduction to a procedure-oriented language (usually COBOL). The preparation and debugging of programs in such a language. Topics include: file processing and maintenance, sorting, report generation, and file design.
Prereq: Grade 13 mathematics is recommended.
N.B.: Credit will only be granted for one of CS 115 or CS 180.
CS 210  F  3C  0.5
Introduction to Numerical Computing
A survey of numerical procedures with emphasis upon computer implementation using the FORTRAN IV programming language. Topics include: interpolation, curve fitting, solution of non-linear equations, numerical integration, numerical solution of ordinary and partial differential equations, matrix algebra, and solution of systems of linear equations. Prereq: at least one course in calculus, algebra, and computer science.
N.B.: CS 210 cannot be counted for credit toward a BMath Honours degree.
Credit will only be granted for either CS 210 or for the courses in the CS370/371 sequence.

CS 240  F,W,S  2C,2T  0.5
Programming Principles, Languages, and Techniques
A disciplined approach to program design. The need for and use of various control structures and data structures. Features of several high level languages; techniques for their effective use. Specific topics include: structured programming, linked list processing, recursion, string processing, tree processing and language development. Prereq: CS 140 or CS 180 or the equivalent. CS 250 is recommended.

CS 250  F,W,S  2C,2T  0.5
Characteristics of Computers and Computer Systems
Introduction to machine and assembly language programming and basic machine architecture. Addressing modes, indexing, and indirection. Subroutine linkage and macro instructions. Characteristics of peripheral devices. A survey of software which assists user programs: assemblers, compilers, loaders, input/output routines, operating systems. Prereq: CS 116 or CS 118 or CS 140 or CS 180

CS 316  W  2C,2L  0.5
Introduction to Statistical Problem Solving by Computer
This is an applications oriented course which prepares the nonmathematical student to use the computer as a research tool. Topics include aids for statistical analysis and the preparation of documents such as reports and theses. The course provides sufficient background for application to other problems specific to the individual's field. Prereq: A one term statistics course
N.B.: CS 316 cannot be counted for credit toward a BMath degree.

CS 330  F,W,S  2C  0.5
Computer Applications in Business: Introduction
A discussion of the implementation of business procedures on computers. Students study and modify a computerized accounting system as an illustration of the methods used. The accounting system is then extended to consider other applications such as inventory control and also more complicated file structures to improve the performance of the system. Prereq: CS 180; Econ 191/192 or consent of instructor.
N.B.: CS 330 cannot be counted for credit toward a BMathHonours Computer Science degree.

CS 331  F,W  2C  0.5
Computer Applications in Business: Data Bases and Data Communications
A user-oriented approach to data communications and to the management of large collections of data. The three basic models (hierarchical, network, and relational) are presented. Specific examples are used to illustrate data base design. Data communication principles are related to specific business applications. Prereq: CS 330 or consent of instructor.
N.B.: Credit will only be granted for one of CS 331 or CS 448. CS 331 cannot be counted for credit toward a BMath Honours Computer Science degree.

CS 340  F,W,S  3C  0.5
Data Structures
The study of data structures in a language independent setting. Levels of data description and their role in design of structures. The effects of secondary store. Introduction to the analysis of algorithms. Topics include: primitive data types; sequences; designing representation-independent data structures; tuples; arrays and tables; trees and forests; sets. Prereq: CS 240

CS 350  F,W,S  3C  0.5
Machine Structures
The intent is to give a basic understanding of what goes on inside a computer, of machine architecture, and of some fundamental operating system services. Topics include: introduction to an actual computer; representation of data; memory; central processor; addressing schemes; input/output; linking and loading. Prereq: CS 250
CS 360  F,W,S  3C  0.5

Introduction to The Theory of Computing
Models of computers including finite automata and Turing machines. Basics of formal languages with applications to syntax of programming languages. Unsolvable problems and their relevance to the semantics of programming. Concepts of computational complexity including algorithm optimality.
Prereq: CS 240

CS 369  F,W,S  3C  0.5

Digital Networks
Prereq: CS 250

CS 370  F,W,S  2C,2T  0.5

Introduction to Scientific Computation: Numerical Algebra
Pitfalls in computation; solution of linear algebraic equations; finding zeros of a single nonlinear equation and systems of nonlinear equations; the algebraic eigenvalue problem. The emphasis is on exposure to modern computer techniques for solving mathematical problems. Heavy use of mathematical subroutine libraries is anticipated.
Prereq: Knowledge of a high level programming language, preferably FORTRAN; Math 220a/b, and Math 221a/b or 224a
N.B.: Credit will only be granted for either CS 210 or for courses in the CS 370/371 sequence.

CS 371  F,W  2C,2T  0.5

Introduction to Scientific Computation: Numerical Approximation
Polynomial interpolation; least squares and minimax approximation; numerical integration and differentiation; numerical solution of initial value problems and boundary value problems. As in CS 370, the intent is to expose students to modern computer techniques for solving mathematical problems.
Prereq: Knowledge of a high level programming language, preferably FORTRAN; Math 220a/b, and Math 221a/b or 224a
N.B.: Credit will only be granted for either CS 210 or for courses in the CS 370/371 sequence.

Note
Enrolment in some fourth year courses may be restricted to students registered in Honours Computer Science.
CS 450  F,S  3C  0.5
Computer Architecture
The course is intended to prepare the student to choose a suitable computer for a given application. Review of combinational and sequential logic circuits. Discussion of "building blocks" - central processing units, stores, input/output systems, and bus structures. Case studies of machines.  
Prereq: CS 350 and CS 369

CS 452  F,W,S  3C  0.5
Real Time Applications of Minicomputers
This course is intended to give students experience with minicomputers 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 350

CS 454  F,W,S  3C  0.5
Principles of Operating Systems
Basic concepts of computer hardware; program translation; program loading and linking; co-operating sequential processes - computational data structures, critical section problem, process synchronization primitives, parallel programming; introduction to multiprogramming; operating system nucleus; file systems; reliability; protection; system performance, measurement and evaluation.  
Prereq: CS 340 and CS 350

CS 456  W  3C  0.5
Data Communications
This course is intended to introduce the student to the basic concepts of data communications, the computer - communication interface, and new telecommunications services. Topics include: basic queueing theory, data communications and the telephone network, computer architecture for data communications, protocols, error handling, multiplexing and switching, and packet switching networks.  

CS 457  F,S  3C  0.5
Queueing Models: Analysis, Simulation, and Computer Applications
An introduction to the basic results of queueing theory and the techniques of discrete event simulation. Emphasis is placed on the application of queueing models to computer systems and computer communication networks.  
Prereq: Stat 231 and Stat 333; CS 240 and CS 350  
N.B.: Credit will only be granted for one of CS 437 or CS 457. CS 437 cannot be counted for credit toward a BMath Honours Computer Science degree.

CS 462  F  3C  0.5
Formal Languages and Parsing
Prereq: CS 360  
N.B.: This course may also be offered in the Spring.

CS 464  W  3C  0.5
Computability and Recursive Function Theory
Models of the computational process as reflected by computers, linguistic systems, functional specifications, transformational systems, formal logic, etc. Equivalence of these models. Computational complexity for specific models and abstractions fitting all models. Formal reducibilities between computational problems, and the complexity of these reducibilities.  
Prereq: CS 360

CS 466  F,S  3C  0.5
Algorithm Design and Analysis
Design of good algorithms and analysis of the resources they consume. Lower bounds on the resource requirements of algorithms to compute certain functions. Problems from the following areas are discussed in this light: sorting and order statistics, data structures, arithmetic computations, the NP-complete problems.  
Prereq: CS 340. CS 360 is recommended

CS 468  W  3C  0.5
Program Verification
Methods of program verification. Implications for structured programming. Inductive reasoning about recursive program and recursively defined data structures.  
Prereq: CS 360

CS 472  W  3C  0.5
Numerical Linear Algebra
Prereq: CS 370, Math 221b or 324a
CS 474 F 3C 0.5
Numerical Approximation
Prereq: CS 371, Math 322b

CS 476 F 3C 0.5
Numerical Solution of Differential and Integral Equations
Prereq: Consent of the instructor

CS 478 W 3C 0.5
Numerical Solution of Partial Differential Equations
Prereq: Consent of the instructor

CS 482 F,S 3C,2T 0.5
Techniques in Systems Analysis
Techniques in organization and management theory. Organization of large software systems. Data base concepts. Implementation of computer based information systems. Survey of current topics of interest such as distributed processing, microcomputers and on-line systems.
Prereq: CS 340 and fourth year standing in Honours Computer Science.
N.B.: Credit will only be granted for one of CS 432 or CS 482 or CS 498F.

CS 486 W 2C,2T 0.5
Introduction to Artificial Intelligence
Prereq: CS 340

CS 487 W 3C 0.5
Introduction to Symbolic Computation
An introduction to the use of computers for symbolic mathematical computation, involving traditional mathematical computations such as solving linear equations (exactly), analytic differentiation and integration of functions, and analytic solution of differential equations.
Prereq: CS 240, Math 331ab or 234b/334b

CS 488 F,W,S 3C 0.5
Introduction to Computer Graphics
Software and hardware for interactive computer graphics. Implementation of device drivers, 3-D transformations, clipping, perspective, and input routines. Data structures, hidden surface removal, colour shading techniques, and some additional topics will be covered.
Prereq: CS 340 and CS 350; Math 231a or 234a

CS 492 W 4C 0.5
The Social Implications of Computers
This course is designed to consider the problems caused for organizations and society by the advent of computer technology so that constructive solutions to these problems may be discussed.
Prereq: CS 330 and CS 331, or CS 340, or equivalent.

CS 498 0.5
Advanced Topics in Computer Science
See the course offerings list for topics available.

CS 499 0.5
Readings in Computer Science
Department of Pure Mathematics

Course Descriptions

Note
More detailed course descriptions and course outlines are available upon request from the Pure Mathematics Department.

P Math 230a F 2C,1T 0.5
Introduction to Pure Mathematics
Ideas and examples in geometry, number theory, algebra, and analysis. Modern theories are motivated by consideration of historically important topics such as angle trisection, solution by radicals, the real number system, non-Euclidean geometry, and computability of functions.
Prereq: None

P Math 230b W 2C,1T 0.5
Introduction to Pure Mathematics
Similar to, but independent of P Math 230a.
Prereq: None

P Math 341a F,S 3C 0.5
Algebra
Fundamentals of group, ring, field theory, and other algebraic structures.
Coreq: Math 231a
N.B.: P Math 341a may be substituted for Math 331a whenever this is a requirement in an honours programme.

P Math 341b W 3C 0.5
Algebra
Continuation of P Math 341a.
Prereq: P Math 341a
N.B.: P Math 341b may be substituted for Math 331b whenever this is a requirement in an honours programme.

P Math 351a F,S 2C,1T 0.5
Real Analysis
Theory of functions of real variables. The notions of compactness, connectedness and uniformity are used in a study of continuity, differentiation, and integration.
Prereq: Math 230a/b
N.B.: P Math 351a may be substituted for Math 332a whenever this is a requirement in an honours programme.

P Math 351b W 2C,1T 0.5
Real Analysis
Continuation of P Math 351a.
Prereq: P Math 351a

P Math 352a F,S 2C,1T 0.5
Complex Analysis
Holomorphic functions, Cauchy's integral theorem, Cauchy's integral formulas, Taylor and Laurent expansions, classification of isolated singularities, the Residue theorem.
Prereq: Math 230a/b
N.B.: P Math 352a may be substituted for Math 332b whenever this is a requirement in an honours programme.

P Math 352b W 2C,1T 0.5
Complex Analysis
Continuation of P Math 352a.
Prereq: P Math 352a

P Math 361 Euclidean Geometry
Not offered 1980-81

P Math 362 Projective Geometry
Not offered 1980-81

P Math 363 W 3C 0.5
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: A knowledge of linear algebra.
N.B.: This course will be of interest to all math students.

P Math 365 F 2C,1T 0.5
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. Applications of tensors in Relativity and Continuum Mechanics.
Prereq: Math 230a/b, or consent of instructor.
N.B.: Cross listed with AM 362.

P Math 367 F 3C 0.5
Set Theory and General Topology
Intuitive set theory, metric spaces, point set topology.
Prereq: Math 230a/b

P Math 399
Readings in Pure Math
P Math 430a  F,S    2C,1T    0.5
Introduction to Mathematical Logic
N.B.: This course will be of interest to all math students. Credit will only be granted for one of P Math 430a or 432a.

P Math 430b  W    2C,1T    0.5
Introduction to Mathematical Logic
Continuation of P Math 430a. Gödel's incompleteness theorem (in outline). Logicism, intuitionism, formalism. Selected topics (some of intuitionistic logic, modal logic, the representation theorem for Boolean Algebras normally are treated).
Prereq: P Math 430a
N.B.: This course will be of interest to all math students. Credit will only be granted for one of P Math 430b or 432a.

P Math 432a  F    2C    0.5
Mathematical Logic
First order languages and theories. This course is more specialized and at a more advanced level than P Math 430.
N.B.: Credit will only be granted for one of P Math 430a or 432a.

P Math 432b  W    2C    0.5
Mathematical Logic
Continuation of P Math 432a. A treatment of at least one of the following: set theory, model theory, undecidability.
Prereq: P Math 432a
N.B.: Credit will only be granted for one of P Math 430b or 432b.

P Math 441a  F    2C    0.5
Introduction to Number Theory
Elementary Theory of Numbers, quadratic reciprocity, applications to Diophantine equations.
Prereq: Third or fourth year standing or consent of instructor.
N.B.: This course will be of interest to all math students.

P Math 441b  W    2C    0.5
Number Theory
Continuation of P Math 441a.
Coreq: Math 331b or P Math 341b

P Math 443  Linear Algebra 2
Not offered 1980-81

P Math 445  W    2C    0.5
Ring Theory
Continuation of the theory of rings and modules.
Prereq: Math 331a/b or P Math 341a/b
Offered in Winter 1981 and Fall 1982

P Math 446  F    2C    0.5
Group Theory
Permutations, Cayley Theorem, Sylow Theorem, Jordan-Holder Theorem, nilpotent and solvable groups, direct and semidirect products, free groups.
Coreq: Math 331a/b or P Math 341a/b
Offered in Fall 1980 and Winter 1982

P Math 447  F    2C    0.5
Field Theory
Field extensions and Galois theory.
Prereq: Math 331a/b or P Math 341a/b

P Math 451a  F    2C    0.5
Measure and Integration
An introduction to integration and measure theory with emphasis on the real line.
Prereq: Math 332a or P Math 351a/b

P Math 451b  W    2C    0.5
Functional Analysis
Banach spaces and linear operators.
Prereq: P Math 451a

P Math 452a Complex Analysis 2a
Not offered 1980-81

P Math 452b Complex Analysis 2b
Not offered 1980-81

P Math 461  Finite Geometries
Not offered 1980-81

P Math 465  W    2C,1T    0.5
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
N.B.: Cross listed with AM 463.

P Math 467  W    2C    0.5
Riemannian Manifolds

P Math 468  W    2C    0.5
Topology
Topics from algebraic, combinatorial and geometric topology.
Prereq: P Math 367
P Math 470a  Functional Equations
Not offered 1980-81.

P Math 470b  F  2C  0.5
Functional Equations
Solutions of special functional equations. Theorems
about general types of equations. General and
restricted domains. Mathematical and other
applications.

P Math 499
Readings in Pure Math

Department of Statistics
Course Descriptions

Stat 202  F  2C,1L  0.5
Elementary Statistics for Biologists
Elementary probability, populations, samples and
distributions with biological examples. Methods for
data summary and presentation including an
introduction to interactive programming. Estimation,
hypothesis testing, two-sample techniques and
paired comparisons. Contingency tables.
Prereq: None
N.B. Stat 202 is for Science Students only.

Stat 204  F  2C,1L  0.5
Statistics for the Physical Sciences 1
Descriptive statistics. Probability, random variables,
discrete and continuous distributions. Estimation
and hypothesis testing, goodness of fit.
Prereq: None
N.B.: Stat 204 is for Science Students only.

Stat 205  W  2C,1L  0.5
Statistics for the Physical Sciences 2
Linear regression. Introduction to the design of
experiments. Completely randomized and
randomized block designs. Analysis of variance.
Nonparametric statistics.
Prereq: Stat 202 or 204
N.B.: Stat 205 is for Science Students only.

Stat 210  F,W  3C,1T  0.5
Applied Probability and Statistics
Laws of probability. Discrete and continuous random
variables. Uniform, binomial, Poisson, normal
distributions. Sampling from a normal population.
Student-t, chi-square, F distributions. Estimation and
hypothesis testing. Simple linear regression.
Prereq: Math 110a/b
N.B. 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  0.5
Introduction to Statistical Methods
Descriptive statistics. Graphical methods, model
fitting. Probability theory; discrete and continuous
random variables.
Prereq: Math 120a/b, one of CS 116, CS 118, CS 140
N.B.: Stat 220 is not open to Honours Mathematics
students. Credit will be given for only one of Stat
220, 230.
Stat 221  F,W,S  3C,1T  0.5  
**Introduction to Statistical Methods 2**
Tests of significance, maximum likelihood estimation and large sample theory; estimation and testing in the normal distribution. Correlation, regression and the method of least squares.
Prereq: Stat 220
N.B.: Stat 221 is not open to Honours Mathematics students. Credit will be given for only one of Stat 221, 231.

Stat 230  F,W,S  3C,1T  0.5  
**Probability**
The laws of probability, discrete and continuous random variables, expectation, central limit theorem.
Prereq: Math 120a/b
N.B.: Credit will be given for only one of Stat 220, 230

Stat 231  F,W,S  3C,1T  0.5  
**Statistics**
Estimation, tests of significance, probability plots. Contingency tables, normal distribution theory, simple linear regression.
Prereq: Stat 220
N.B.: Credit will be given for only one of Stat 221, 231.

Stat 270  F,W,S  3C  0.5  
**Mathematics of Investment**
The theory of rates of interest and discount. Annuities and sinking funds with practical applications to mortgage and bond questions. Yield rates.
Prereq: At least second year standing.
N.B.: 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  0.5  
**Mathematics of Finance**
The theory of rates of interest and discount including the theoretical continuous case of forces of interest and discount. Annuities and sinking funds, including the continuous case. Practical and theoretical applications, primarily to mortgages and bonds. Yield rates.
Prereq: Math 130a/b
N.B.: Only one of Stat 270, 273 can be taken for credit. Students planning to enroll in Honours Actuarial Science must take Stat 273.

Stat 284  F,W,S  3C  0.5  
**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 and MTHEL 305a

Stat 300  W  2C,1T  0.5  
**Principles of Survey Design**
The design of surveys of human or natural populations for research and planning. How to take a representative sample; efficient estimation of population quantities and sample size determination; ways of reducing response bias.
Prereq: An introductory half course in statistics.
N.B.: Stat 300 cannot be taken for credit toward a BMa th degree.

Stat 330  F,W  3C  0.5  
**Introduction to the Theory of Statistics**
Prereq: Stat 221 or equivalent
N.B.: Credit will be given for only one of Stat 330, 350.

Stat 331  F,W,S  3C  0.5  
**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 the equivalent.
N.B.: Credit will be given for only one of Stat 331, 351.

Stat 332  F,S  3C  0.5  
**Sampling**
Introduction to survey sampling of populations. Elementary sampling designs. Efficiency comparisons for sampling designs and estimation procedures.
Prereq: Stat 221 or the equivalent
N.B.: Credit will be given for only one of Stat 332, 454.

Stat 333  F,W,S  3C  0.5  
**Applied Probability**
Prereq: Stat 230 or Stat 220/221
Stat 334 F,W 3C 0.5
**Probability and Stochastic Processes**
*Prereq: Stat 333 or consent of instructor*

Stat 350 F,W,S 3C 0.5
**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 230a/b, Stat 231 or consent of instructor.*
*N.B.: Credit will be given for only one of Stat 330, 350.*

Stat 351 F,W 3C 0.5
**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 231a/b*
*N.B.: Credit will be given for only one of Stat 331, 351.*

Stat 373 F,W,S 3C 0.5
**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.
*Prereq: Math 130a/b, 134a/b*

Stat 374 F,W,S 3C 0.5
**Life Contingencies - Single Life Functions**
An advanced course on problems with single lives, including population theory.
*Prereq: Stat 284*

Stat 383 F,W 3L 0.5
**Topics in Actuarial Mathematics**
Topics in Actuarial Mathematics for students intending to take the professional examinations.
*Prereq: Stat 273, 373*

Stat 384 F,W 3C 0.5
**Life Contingencies - Multiple Life Functions**
An advanced course on problems with multiple lives; multiple decrement theory; accidental death and disability benefits.
*Prereq: Stat 374*

Stat 340 F,S 2C 0.5
**Experimental Design 1**
The requirements for a good experimental design prior to the accumulation of data. The concepts of randomization, replication and experimental errors 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.*
*N.B.: Credit will be given for only one of Stat 340, 452.*

Stat 431 W 2C 0.5
**Experimental Design 2**
Factorial experiments, confounding, fractional replication. Applications of designs. Incomplete block designs. Analysis of covariance.
*Prereq: Stat 430*
*N.B.: Credit will be given for only one of Stat 431, 452.*

Stat 440 W 2C 0.5
**Exploratory Data Analysis**
*W statistics and tests for normality. Computational techniques in multiple unweighted and weighted regression.*
*Prereq: Stat 331 or 351, and an ability to program in FORTRAN.*

Stat 442 W 3C 0.5
**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, Stat 330 recommended.*
*N.B.: Credit will be given for only one of Stat 442, 450.*

Stat 444 S 2C,1S 0.5
**Statistical Methods with Socio-Economic Applications 1**
*Prereq: Stat 331 or 351.*

Stat 445 **Statistical Methods with Socio-Economic Applications 2**
Continuation of Stat 444.
*Prereq: Stat 444*
*N.B.: May or may not be offered in 1980-81.*
Stat 450  F  3C  0.5  
**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 390*
*N.B.: Credit will be given for only one of Stat 442, 450.*

Stat 451  W  2C  0.5  
**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 consent of instructor*

Stat 452  F,S  3C  0.5  
**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*
*N.B.: Credit will be given for only one of Stat 430/431, 452.*

Stat 453  Theory of Experimental Design 2  
*Not offered 1980-81*

Stat 454  W  3C  0.5  
**Sampling Theory and Practice**
Introduction to sample theory and practice. Elementary sampling and designs and estimation procedures. Statistical inference in survey sampling. Interrelationships between survey sampling and the design of experiments.
*Prereq: Stat 331 or 351*
*N.B.: Credit will be given for only one of Stat 332, 454.*

Stat 455  Sample Survey Design  
*Not offered 1980-81*

Stat 456  W  2C  0.5  
**Topics in Probability Theory**
*Prereq: Stat 333/4 or consent of instructor*
*N.B.: May or may not be offered 1980-81*

Stat 460  **Topics in Statistics 1**  
*Prereq: Stat 350/1 or consent of instructor*
*N.B.: May or may not be offered 1980-81*

Stat 467  **Topics in Statistics 2**  
*N.B.: May or may not be offered 1980-81*

Stat 468  **Readings in Statistics 1**

Stat 469  **Readings in Statistics 2**

Stat 470  W  3C  0.5  
**Seminar in Actuarial Mathematics 1**
Selected topics for the advanced actuarial student. 
*N.B.: May or may not be offered 1980-81*

Stat 471  **Selection of Risks 1**  
*Not offered 1980-81*

Stat 472  F,S  3C  0.5  
**Basic Pension Mathematics**
*Prereq: Stat 384 or consent of instructor.*

Stat 473  F,S  3L  0.5  
**Advanced Topics in Actuarial Mathematics**
Topics in Actuarial Mathematics for students intending to take the professional examinations.
*Prereq: Stat 284, 374, 384, or consent of instructor.*

Stat 475  F,S  3C  0.5  
**Construction of Life Tables**
Methods of analysis of data to produce raw rates for mortality, morbidity and other tables.
*Prereq: Stat 284, or consent of instructor.*

Stat 476  F,S  3C  0.5  
**Introduction to Demographic Statistics**
Topics in demography with emphasis on population projections, mortality theories, and construction of life tables.
*Prereq: Stat 284 or consent of instructor.*

Stat 477  F,S  3C  0.5  
**Risk Theory 1**
*Prereq: Stat 330, Math 332b or consent of instructor.*

Stat 480  W  3C  0.5  
**Seminar in Actuarial Science 2**
Selected topics for the advanced actuarial student. 
*Prereq: Consent of instructor.*

Stat 481  **Selection of Risks 2**  
*Not offered 1980-81.*
Stat 482 W 3C 0.5
Pension Funding
Group and other generalized cost methods for Pension plans. Effects of early retirements, plan design and actuarial assumptions on Pension costs. Cost forecasts applied to private and public pension plans – in particular to the CPP.
Prereq: Stat 472, 476 or consent of instructor.

Stat 486 Graduation of Life Tables
Not offered 1980-81

Stat 487 W 3C 0.5
Risk Theory 2
Calculations of net premiums and reinsurance premiums. Ruin theory. Utility theory.
Prereq: Stat 477

Stat 500 W 2C,1T 0.5
Principles of Survey Design
The design of surveys of human or natural populations for research and planning. How to take a representative sample; efficient estimation of population quantities and sample size determination; ways of reducing response bias.
Prereq: An introductory half course in statistics
N.B.: Stat 500 is intended for senior undergraduates and graduate students in faculties other than Mathematics. It cannot be taken for credit towards a Mathematics degree.

Stat 520 Introduction to Mathematical Statistics
N.B.: May or may not be offered 1980-81.

Electives for Mathematics Students

MTHEL courses are not restricted to students in the Faculty of Mathematics. When taken by Mathematics students, MTHEL courses count as non-mathematics electives.

MTHEL 100 F,W,S 2C 0.5
Commercial Law for Mathematics Students
Prereq: None

MTHEL 102 W,S 3C 0.5
Uses and Abuses of Statistics
This course provides an appreciation of how to correctly use statistical arguments in a wide variety of applications. Topics include descriptive statistics, sample surveys, experimental design, index numbers, regression models.
Prereq: None

MTHEL 206a F,W 2C 0.5
Introduction to Mathematics Education
Current trends in education, professional practices and administration, the role of the department head, lesson planning, techniques of teaching, evaluation of students, special students, extra-curricular activities, the relationship between elementary and secondary school mathematics, audio-visual materials, current text books.
Prereq: None
N.B.: This course is offered only to students in the co-op Teaching Option.

MTHEL 302a F 2C 0.5
Introduction to Biomathematics 1
Biometry is a biological discipline requiring both a knowledge of Mathematics and some basic understanding of specific biological phenomena. The course material has been selected from Genetics and Gerontology to provide examples of where both mathematics and biology have contributed to the advancement of knowledge in interdisciplinary areas.
Prereq: None

MTHEL 302b W 2C 0.5
Introduction to Biomathematics 2
A continuation of Biomathematics 1. Topics considered are first order reaction kinetics in biological systems including statistical considerations in enzyme kinetics, models for and the measurement of Evolution from a knowledge of genetics and protein structure and assessing the relative importance of environmental factors as evolutionary determinants.
Prereq: MTHEL 302a
N.B.: MTHEL 302a/b are cross-listed with Helth 302/303.

MTHEL 303a Readings in Modern Mathematics
Not offered 1980/81.

MTHEL 304a F 3C 0.5
Foundations of Mathematics
An introduction to the problems of the foundations of mathematics. This course will normally be taken in third or fourth year.
Prereq: Consent of instructor.

MTHEL 304b F 3C 0.5
Foundations of Probability Theory
An introduction to the problems of the foundations of probability theory. This course will normally be taken in third or fourth year.
Prereq: Consent of instructor
MTHEL 305a  F,W,S  3C  0.5
General Life Insurance 1
Types of Life Insurance contracts and their uses, basis of risk measurements, deficiency reserves, modified valuation methods, non-forfeiture values, dividend formulae, selection of risks, substandard risks, and principles of reinsurance.
Prereq: None

MTHEL 305b  W,S  3C  0.5
General Life Insurance 2
Legal aspects of life insurance, settlement options, principles of group and industrial insurance, organization and structure of life insurance companies, financial statements, the mathematics underlying insurance taxation.
Prereq: MTHEL 305a

MTHEL 402a  F  2C  0.5
Topics in Mathematical Aspects of Chemistry, Biology and the Medical Sciences 1
Topics will be selected from the area of epidemiology and mathematical models of disease processes with special reference to heart disease and cancer.
Prereq: MTHEL 302a/b or consent of the instructor

MTHEL 402b  W  2C  0.5
Topics in Mathematical Aspects of Chemistry, Biology and the Medical Sciences 2
Factors contributing to various disease processes will be discussed with special references to the quantitative evaluation of environmental factors relevant to human disease and aging processes.
Prereq: MTHEL 302a/b, 402a or consent of the instructor

Department of Mechanical Engineering

Professor, Chairman of the Department
D. J. Burns, BSc, PhD (Bristol), PEng, CEng

Professor, Associate Chairman Graduate Studies
H. W. Kerr, BASc, MASc, PhD (Toronto), PEng

Professor, Associate Chairman Undergraduate Studies
A. B. Strong, BASc (Waterloo), MSc (London), PhD (Waterloo), PEng

Professor, Vice President Academic
T. A. Brzustowski, BASc (Toronto), AM, PhD (Princeton), PEng

Professor, Director, Office of Research Administration
E. L. Holmes, BSc (Bristol), MASc, PhD (Toronto), PEng

Professors
G. M. Bragg, BASc (Toronto), PhD (Cambridge), PEng
E. Brundrett, BASc (OAC), BASc, MASc, PhD (Toronto), PEng
M. B. Danard, BASc (Br. Col.), MA (Toronto), PhD (Chicago)
R. N. Dubey, BSc (Hons) (Patna), BSc (Eng) (Bihar), PhD (Waterloo), PEng
D. French, BSc, CEng, PEng
C. E. Hermance, BE (Yale), MA, MSE, PhD (Princeton)
K. G. T. Hollands, BASc (Toronto), PhD (McGill), PEng
J. H. G. Howard, BSc (Queen’s), MSc, PhD (Birmingham), PEng
H. R. Martin, BSc, MSc (Queen’s Belfast), PhD (Nottingham), PEng
P. Niessen, BSc (McMaster), MASc, PhD (Toronto), PEng
G. F. Pearce, BASc (Br. Col.), MASc (Toronto), PEng
K. R. Piekarski, Dipl Ing (London), PhD (Cambridge), PEng
A. Plumptree, BSc, PhD (Nottingham), PEng, CEng, FIM
G. D. Raithby, BESc, MESc (W. Ont.), PhD (Minnesota), PEng
J. A. Schey, Dipl Ing, CSc (Budapest), PEng
D. M. R. Taplin, BSc (Aston), DPhil (Oxford), DSc, PEng, CEng, FIM
M. M. Yovanovich, BSc (Queen’s), MS (Buf.), MEScD (MIT)
Course Descriptions
Mechanical Engineering

Associate Professors
K. G. Adams, BSc (Queen's), MASc, PhD (Waterloo), PEng
G. C. Andrews, BASc, MASc (Br. Col.), PhD (Waterloo), PEng
A. M. Hale, BSc, MA (New Br.), BASc (Toronto),
MASc, PhD (Waterloo), PEng
U. H. Mohaupt, BASc, MASc, PhD (Waterloo), PEng
R. J. Pick, BASc (Br. Col.), MSc (Imperial College),
PhD (Waterloo), PEng
P. R. Slawson, BASc, MASc, PhD (Waterloo), PEng
H. F. Sullivan, BASc (Waterloo), AM, PhD (Princeton), PEng

Assistant Professors
G. A. Davidson, BASc (Hons) (Toronto), PhD (Toronto),
PEng
G. E. Schneider, BASc, MASc, PhD (Waterloo)
J. L. Tevaarwerk, BASc, MASc (Waterloo),
PhD (Cambridge)

Adjunct Professor
R. G. R. Lawrence, QC

Undergraduate Programmes
Details of the undergraduate programme in Mechanical Engineering are to be found in Chapter 9. All courses extend over one term only, and consist of 3 hours of lectures per week unless otherwise specified. In general, the only prerequisites are the core courses, unless otherwise specified.

Course Descriptions

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 copyright, Bills of Exchange, Company Law, incorporation of companies. Common and Preferred shares, the Law of Master and Servant, Surveying Law, Constitutional Law, Private International Law, and other topics. This course is restricted to senior Mechanical Engineering students.

ME 116 W,S 2C,4L 0.75
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 0.0
Introduction to Mechanical Engineering 1
Discussion of Structure of Mechanical Engineering curriculum, operation of Department, Faculty, University, technical societies.

ME 201 F,W 3C,1T 0.5
Advanced Calculus
Infinite series: Tests for absolute; conditional, uniform convergence; power series; series expansions; differentiation and integration. Partial differentiation: total derivatives; estimation of errors; chain rule; geometry; maxima and minima; Taylor series; Jacobians. Multiple integration: areas, centroids, moments of inertia, centres of gravity. Vector analysis: gradient divergence, curl, Laplacian; integral theorems.

ME 202 F,W 3C,1T 0.5
Statistics for Engineers (Equivalent to M Sci 21)

ME 203 S,F 3C,1T 0.5
Ordinary Differential Equations
Course Descriptions
Mechanical Engineering

M E 204  S,F  3C,1T  0.5
Numerical Analysis
A survey of numerical procedures with emphasis upon computer implementation using the WATFIV programming language. In particular, the following topics are covered: interpolation, curve fitting, solution of non-linear equations, numerical integration, numerical solution of ordinary differential equations, matrix algebra and solution of systems of linear equations, and problems in the solution of partial differential equations.

M E 212  F,W  3C,1T  0.5
Dynamics

M E 215  F,W  3C,3L  0.5
Structure and Properties of Materials
The relevance of materials to engineering practice. The microstructure of materials, crystallinity and crystal imperfections, glasses and amorphous solids. Elastic and plastic deformation in metals, viscoelasticity of plastics, fracture of brittle and ductile solids. Electrical and magnetic properties of materials.

M E 219  F,W  2C,1D,1T  0.5
Mechanics of Deformable Solids 1

M E 220  S,F  2C,1D,1T  0.5
Mechanics of Deformable Solids 2
A general treatment of the behaviour of structural components from the study of stress and strain in solids. Topics include super-position, energy theorems, theories of failure, elastic and inelastic analysis of symmetrical bending, torsion of circular members, columns and stability, and virtual work.

M E 230  S,F  3C,3L  0.5
Control of Properties of Materials

M E 250  S,F  3C,1L  0.5
Thermodynamics

M E 300  S,W  1C  0.0
Introduction to Mechanical Engineering 2
Technical specialties in Mechanical Engineering. Discussion of options in Mechanical Engineering curriculum, seminars and technical topics in the various options.

M E 305  S,W  3C,1T  0.5
Partial Differential Equations

M E 321  S,W  3C,1L  0.5
Kinematics and Dynamics of Machines

M E 322  F,W  3C,1T,1L  0.5
Mechanical Design 1
Analysis and synthesis of machine elements. Factors affecting working stresses, fatigue, creep and impact considerations. Design of shafting, springs, screws, clutches, brakes and gears.

M E 340  S,W  3C,1T  0.5
Manufacturing Processes
The principles of manufacturing unit processes including casting, forming, machining and joining. Interactions between design, materials (metals, polymers, ceramics) and processes. Advantages and limitations, relative cost, and production rates of competitive processes.
ME 351  S,W  3C,3L  0.5
Fluid Mechanics 1
Physical properties of fluids and fundamental concepts in fluid mechanics. Hydrostatics. Conservation laws for mass, momentum and energy. Flow similarity and dimensional analysis as applied to engineering problems in fluid mechanics. Laminar and turbulent flow. Engineering applications such as flow measurement, flow in pipes and fluid forces on moving bodies. Introduction to compressible flow.

ME 353  F,W  3C,2T,1L  0.5
Heat Transfer 1
Introduction to heat transfer mechanisms. The formulation and solution of steady and transient heat conduction. Radiant heat transfer including exchange laws and view factors. Introductory convective heat transfer.

ME 354  S,W  3C  0.5
Thermodynamics 2
Emphasis on applications of thermodynamics to flow processes, real fluids, evaluation of state functions of real fluids. Non-reacting mixtures, reacting mixtures, equilibrium considerations. Introduction to the kinetic theory of gases.

ME 360  F,W  3C,2T,1L  0.5
Introduction to Control Systems

ME 362  F,W  3C,1T,1L  0.5
Fluid Mechanics 2
Basic equations of two-dimensional flow, exact viscous solutions, introduction to lubrication, boundary layers, and introduction to turbulence. Turbomachinery fundamentals and applications. Selected advanced topics.

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 group.

ME 423  F,S  3C,1T  0.5
Mechanical Design 2
This is a continuation of the ME 322 course in analysis and synthesis of machinery, including advanced analysis of machine elements such as clutches, brakes, couplings, journal bearings and gears. The latter part of the course includes advanced machine design concepts such as reliability, optimization and techniques for stimulating innovative design. A synthesis project involving the machine elements studied is usually included.
Prereq: ME 322

ME 432  F,S  0.5
Physical Metallurgy 2 - Plastic Deformation and Fracture
Microscopic origins of plastic and anelastic behaviour. Plastic flow at low and high temperatures with emphasis on the microscopic mechanisms and their application to engineering design. Deformation mechanism maps. Types of fracture and micromechanism fracture maps. Application of fracture mechanics. Environmental effects.

ME 435  F,W  3C  0.5
Industrial Metallurgy
This course is intended for those students interested in acquiring a working knowledge of metallurgy. It will cover: Metals and alloy systems, iron-carbon alloys, heat treatment and the function of alloying elements in steel, corrosion and scale resistant alloys, copper and nickel base alloys, light metals and their alloys; casting, hot and cold working of metals; soldering, brazing and welding; corrosion and oxidation; metal failure analysis.

ME 443  W  3C  0.5
Metal Casting Processes

ME 448  W  3C,2T  0.5
Production Engineering: Design of Manufacturing Systems
The interaction and relationship of manufacture to the factory organization. Product design and development, planning and control of production. Principles of mass and flow production. Machine loading and line balancing. Design analysis and evaluation techniques of plant layout and materials handling systems as basic components of a manufacturing facility and system.
M E 452  W  3C  0.5
Energy Transfer in Buildings
Thermodynamic properties of moist air; psychrometric charts; humidity measurements; direct water contact processes; heating and cooling of moist air by extended surface coils; solar radiation; heating and cooling of loads on buildings; effects of the thermal environment; air conditioning and calculations; air flow in and around buildings, diffusers.

M E 456  F,S  3C  0.5
Heat Transfer 2
Selected topics in heat transfer fundamentals and applications. Topics to be covered include the fundamentals of convection with analytical solutions to simple laminar flow problems and approximate solutions to turbulent flow problems based on analogies between momentum and heat transfer. Also covered is radiant exchange in grey enclosures and in black enclosures containing emitting-absorbing gases. The remaining topics will be chosen from design of heat exchangers, condensation heat transfer, boiling heat transfer, and the treatment of problems in heat conduction.

M E 459  S,F  3C  0.5
Energy Conversion
Review of reserves and consumption trends of Canada’s and the world’s energy resources. Design of fossil-fuel central power plants including boiler efficiency calculations and advanced steam and binary cycles. Review of atomic physics including fission and fusion energy. Design of nuclear fission power plants including design of reactor core for critical conditions, fuel cycles and radiation hazards. Design considerations for solar energy conversion devices including: availability of solar energy, solar-thermal converters, thermal storage and photovoltaics. Principles of fuel cells and some aspects of their design. Other topics as appropriate.

M E 462  S,F  3C,2T,3L  0.5
Introduction to Automation
Number systems, Codes and Coding, minimization techniques applied to design of logic systems. Comparison of microprocessors, memories, input/output logic elements; design and application of Digital systems for data collection, and control of pneumatic, hydraulic and mechanical systems; comparison of software and hardware techniques in such applications.

M E 463  F,W  3C  0.5
Tribology 1
The science of friction, lubrication and wear. The topography and contact mechanics of real surfaces. The measurement of friction and wear. Friction and wear theories for elastic and plastic contact. Lubrication mechanisms; hydrostatic, hydrodynamic, elastohydrodynamic, boundary, extreme pressure, and solid film. Physical and chemical properties of lubricants. Bearings and their selection.

M E 469  F,W  3C  0.5
Introduction to the Environmental Sciences

M E 482  S,F,W  9L  0.5
Mechanical Engineering Projects
Engineering assignments requiring the student to demonstrate initiative and assume responsibility. Student activity is guided and co-ordinated by faculty supervisor. In selecting projects, particular account is taken of the student’s field of specialization. Projects, in general, involve technical disciplines beyond the strictly mechanical engineering field.

M E 524  W  3C,1T  0.5
Advanced Dynamics and Stress Analysis in Design
This course is related to M E 423, although M E 423 is not an essential prerequisite. M E 524 brings together dynamics and stress analysis in an application to design of dynamic machinery. Basic kinematic and dynamic concepts are reviewed and extended. Lagrangian and computer simulation methods are introduced. Basic stress analysis methods are reviewed and indeterminate structures are discussed, along with finite-element and other computer techniques. A design project (involving synthesis), utilizing the concepts studied, is usually included.

M E 525  F,S  3C  0.5
Mechanical Vibrations in Machines
ME 527 W 3C 0.5  
**Mechanics of Deformable Solids 3**  

ME 531 F,S 3C 0.5  
**Physical Metallurgy 1**  

ME 534 W 3C 0.5  
**Non-metallic Materials**  

ME 541 W 3C,1L 0.5  
**Deformation Processes**  

ME 544 W 3C 0.5  
**Welding**  
Features and advantages of the various welding processes. Welding arc characteristics. Temperature distributions around Welds. Metallurgy of the weld metal and heat affected zone in various alloys, including carbon and stainless steels, and aluminum alloys. Origin of various weld defects and methods of detecting them. Static and dynamic design of welded joints. Residual stresses, distortion and fracture of welds.

ME 548 S,F 3C,4L 0.5  
**Numerical Control of Machine Tools 1**  

ME 557 W 3C 0.5  
**Combustion 1**  
Combustion thermodynamics, Introduction to chemical kinetics of combustion; Combustion properties of fuels; Flammability of combustible mixtures. Flame propagation mechanisms, pre-mixed and diffusional; Stability of flames; Introduction to combustion aerodynamics, jet flames; Atomization; Droplet and spray combustion; Elementary ignition concepts and theory; Basic detonation theory.

ME 561 S,F 3C 0.5  
**Fluid Power Control Systems**  

ME 563 W 3C 0.5  
**Turbomachines**  

ME 565 W 3C 0.5  
**Gas Dynamics**  
Basic laws of compressible fluid flow. Wave propagation in compressible fluids, isentropic flow of a perfect gas, normal and oblique shock waves. Prandl-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.

ME 566 S,F 3C 0.5  
**Fluid Mechanics 3**  
ME 566 W 3C 0.5
Noise Analysis and Control

ME 569 S,F 3C 0.5
Fluid Mechanics-Design Topics
A study of the design aspects of fluid mechanics, Unsteady flow, pipe and duct systems, two and three dimensional flow techniques, practical calculation of boundary layers, separation, base pressures, jets, wakes and shear layers, diffusers and flow distribution devices, flow control, two-phase flow, instrumentation, wind tunnel modelling, wind loading. The course will be oriented to practical design techniques for flow systems, reactors, air pollution control equipment, etc.

ME 571 S,F 3C 0.5
Air Pollution 1
Nature and sources of air pollution, chemical and biological aspects, effects on health and environment. Physical aspects of the atmosphere, thermodynamics, vertical variation of wind and temperature, stability, convection, atmospheric turbulence, diffusion equations, plumes, thermals, jets in stratified flow, radioactive plumes, particulate dispersion, instrumentation (micrometeorological), air pollution control techniques and equipment monitoring instrumentation.

Music

Associate Professors
H. Martens, BA, MA (Minnesota), PhD (Columbia)
W. R. Maust, BS (Eastern Mennonite), BM (Peabody Conservatory), MM, PhD (Indiana University)

Lecturer, Undergraduate Officer
L. Enns, BSM (CMBC), BMus (Wat. Luth.) MMus (Northwestern)

Part-time Lecturers
K. Hull, BA (Waterloo), BMus (W. Ont.)
M. Jarrett
A. Martin, BMus (Toronto), MMus (Eastman)

Course Descriptions

Music 100G F,W,S 3C 0.5
The Basics of Music
An introduction to music terminology, techniques and styles, through lectures and listening, with examples from all eras of music history but with an emphasis on twentieth-century music, including computer music.

Music 125G S 3C 0.5
Popular Music and Culture
An examination of the popular music world and the interplay between rock, folk, jazz and gospel idioms and classical music. The social, commercial and technological elements of popular music are considered.

Music 150G F,J 3C 0.5
Introduction to Music 1
Examination by means of listening, lectures, discussion, and analysis of music ranging from early Christian Chant through the music of Haydn, Mozart, and Beethoven.

Music 151G W,A 3C 0.5
Introduction to Music 2
Examination by means of listening, lectures, discussion, and analysis of music of the 19th and 20th centuries. Compositions include symphonies, concertos, chamber music, operas, electronic, and computer music.
Prereq: Music 150G or consent of instructor.
Music 160G  F  2C,1L  0.5
Choral Literature 1
A survey of choral literature of the Middle Ages, Renaissance, and Baroque eras. Lectures, listening, discussion and reading sessions introduce the material. Participation in one of the Music Department's choral ensembles is required.

Music 161G  W  2C,1L  0.5
Choral Literature 2
A survey of choral literature from the Classical era to the present. Lectures, listening, discussion and reading sessions introduce the material. Participation in one of the Music Department's choral ensembles is required.
Prereq: Music 160G or consent of instructor.

Music 250G  F,S  3C,1L  0.5
Music Theory 1 (Medieval and Renaissance)
The study of scales, melody, two-part counterpoint, and basic harmonic concepts emphasizing the Middle Ages and Renaissance. Ear-training and sight-singing lab sessions will cover diatonic melodic and simple two-part exercises.
Prereq: A basic knowledge of scales, triads, and musical notation.

Music 251G  W  3C,1L  0.5
Music Theory 2 (Baroque and Classic)
The study of four-part homophonic and contrapuntal music, of diatonic and simple chromatic harmonies, and of elementary forms, emphasizing Baroque and Classical music. Ear-training and sight-singing lab sessions will cover four-part diatonic exercises.
Prereq: Music 250G or permission of the instructor.

Music 253G  F  3C  0.5
Medieval and Renaissance Music
The study of music that flourished under courtly and church patronage from the early Christian Church to 1600. Gregorian chant, liturgical drama, mass, motet, secular songs, and instrumental music are studied.
Prereq: Music 150G and Music 151G or Music 1OOG or consent of the instructor.

Music 262G  F  2C,2L  0.5
Instrumental Literature 1
A study of the music written for a variety of instrumental groups, such as chamber music, symphony, concerto. The course includes a laboratory component.
Prereq: Music 150G/151G or Music 100G or permission of instructor.

Music 263G  W  2C,2L  0.5
Instrumental Literature 2
A study of the music written for a variety of instrumental groups, such as chamber music, symphony, concerto. The course includes a laboratory component.
Prereq: Music 150G/151G or Music 100G or permission of instructor.

Music 266G  F,W  std  0.5
Music Studio
Private music studio is offered in Voice, Piano, Organ, Classical Guitar and orchestral instruments. This course is available only to Music majors and minors.
Prereq: Audition with Music Faculty. Studio Fee.

Music 267G  F,W  std  0.5
Music Studio
(See Music 266G for course description.)
Prereq: Music 266G and consent of Music Faculty. Studio Fee.

Music 273G  F,W,S  3C  0.5
Traditional Folk Music
A delineation of the characteristic motifs of folk music as found in Great Britain, Canada, the United States and Australia. Various folk instruments will be introduced.

Music 274G  F  3C  0.5
Introduction to Jazz
A survey of the development of jazz "schools" and individual styles as well as a study of melodic, harmonic, and rhythmic improvisation. Recordings and "live" performances by a small jazz orchestra will be used.

Music 275G  W,S  3C  0.5
Computer Applications in Music
A survey of computer applications in music history, analysis and composition. Concepts from computer science and specific techniques and implementations of these various music activities are examined. Theoretical study is coupled with practical hands-on experience.
Prereq: Music 100G or 150G/151G or consent of instructor.
Music 280G 3C 0.5  
**Canadian Music**  
An historical study of the development of music in Canada from colonial times to the present, with particular emphasis on the composers and music of the 20th century.  
*Prereq:* Music 150G/151G or consent of instructor.

Music 353G F 3C 0.5  
**Music of the Romantic Period (19th Century)**  
The study of the music of the 19th century by means of lectures, seminars, reading, and listening to recordings and live performances. Representative composers include Beethoven, Schubert, Chopin, Tchaikowsky, Verdi, and Wagner.  
*Prereq:* Music 150G/151G, or Music 100G, or consent of instructor.

Music 354G W 3C 0.5  
**Music of the Twentieth Century**  
The study of the various genres of music of the 20th century in the context of the various artistic, political, and social movements. The course will include seminars, lectures, listening, and analysis.  
*Prereq:* Music 150G/151G, or Music 100G, or consent of instructor.

Music 355G/356G S S 0.5/0.5  
**Music and Culture in Vienna**  
A Spring seminar to be taught in Vienna and environs. The course includes daily lectures and attendance of music performances during the Vienna Music Festival, as well as tours of places relating to the culture of Vienna.  
*Prereq:* Music 150G/151G or Music 100G or consent of instructor.

Music 360G F 2C,1D 0.5  
**Music of the Church**  
A study of the music, and the philosophy of church music (including its roots in Jewish worship music) from early Christianity to the present. Attendance at various liturgical and non-liturgical services is required.  
*Prereq:* Music 150G/151G or Music 100G or consent of instructor.

Music 361G W 2C,1D 0.5  
**Music of the Church**  
Continuation of Music 260G.  
*Prereq:* Music 360G or consent of instructor.

Music 366G F,W std 0.5  
**Music Studio**  
(See Music 266G for course description.)  
*Prereq:* Music 267G and consent of Music Faculty.  
Studio Fee.

Music 367G F 3C,1L 0.5  
**Music Studio**  
(See Music 266G for course description.)  
*Prereq:* Music 366G and consent of Music Faculty.  
Studio Fee.

Music 370G F 3C,1L 0.5  
**Music Theory 3 (19th Century)**  
The study of the harmonic, melodic, and formal aspects of 19th century music. Ear-training and sight-singing lab sessions will cover chromatic chord progressions and modulatory melodies.  
*Prereq:* Music 250G/251G or consent of instructor.

Music 371G W 3C,1L 0.5  
**Music Theory 4 (20th Century)**  
The study of the compositional aspects of 20th century music, including extended tonality, atonality, 12-tone writing, neo-classical idioms, and contemporary compositional procedures. Lab sessions will cover non-tonal melodic reading and complex chord structures.  
*Prereq:* Music 370G.

Music 372G F 2C,1L 0.5  
**Choral Music, Repertoire and Techniques 1**  
A study of conducting techniques, rehearsal procedures, and score analysis.  
*Prereq:* Music 150G/151G and 250G/251G or consent of instructor.

Music 373G W 2C,1L 0.5  
**Choral Music, Repertoire and Techniques**  
Continuation of Music 372G.  
*Prereq:* As in Music 372G.

Music 380G/381G F,W 0.5/0.5  
**Directed Study in Music**  
*Prereq:* Advanced standing in music and consent of instructor.

Music 466G F,W std 0.5  
**Music Studio**  
(See Music 266G for course description.)  
*Prereq:* Music 367G and consent of Music Faculty.  
Studio Fee.

Music 467G F,W std 0.5  
**Music Studio**  
(See Music 266G for course description)  
*Prereq:* Music 466G and consent of Music Faculty.  
Studio Fee.

Music 490G/491G F,W 0.5/0.5  
**Senior Honours Seminar**  
A research seminar required of all honours students. The topics will vary from year to year depending on the interests of the students and instructor(s).
School of Optometry

Professor, Director of School
M. E. Woodruff, OD (College of Optometry of Ontario)
PhD (Indiana)

Professors
W. K. Adrian, Dipl-Ing, Dr-Ing, (TH Darmstadt), Dr habil, apl Professor (Karlsruhe)
C. W. Bobier, OD (College of Optometry of Ontario), BA (Toronto), 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)
R. D. Pellowe, OD (College of Optometry of Ontario)

Associate Professors
R. D. Beauchamp, BA (McMaster), MA PhD (Brown)
M. G. E. Callender, OD (College of Optometry of Ontario), BSc (Sir Wms), IMSc (Waterloo)
A. P. Cullen, DipOpt (City Univ. London), MSc (Ontario), OD (Penn College of Optometry), PhD (City Univ. London), DCLP
A. R. 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) LOSc (Melbourne)

Assistant Professors
W. F. Long, BA (William Jewell Coll, Mo), MS, PhD (Mich State Univ), OD (Indiana)

Adjunct Professors
D. E. Andrew, BA, MD (Toronto)
I. Baker, OD (College of Optometry of Ontario)
R. R. Hansford, OD (College of Optometry of Ontario)
S. Hoffman, MD, DPH (Toronto)
D. H. Lamont, BA (Toronto), QC
G. W. Wyszecki, Dipl Ing, Dr Ing (Tech. Univ. Berlin)

Adjunct Lecturer
M. H. Todd, BSc, PhD (Leeds)

Lecturers
J. V. Lovasik, BSc (McGill), OD, MSc (Waterloo)
B. Robinson, OD (Waterloo) MPH (Washington)
M. J. Samek, OD (College of Optometry of Ontario), MSc (Waterloo)

Clinic Supervisors – Full time (1979-1980)
W. R. Bobier, BSc (Queens), OD (Waterloo)
D. B. Buck, OD (College of Optometry of Ontario)
S. C. Craig-Paul, OD (Waterloo)
C. C. Dalziel, OD (Waterloo)
D. J. Egan, Bsc (St. Johns Univ.), OD (Penn. College of Optometry)
J. Jantzi OD (Waterloo)
R. Pace, OD (Waterloo)
S. D. Riome, OD (College of Optometry of Ontario)
K. M. Robertson, OD (College of Optometry of Ontario), MSC (Waterloo)
J. G. Strong, OD (Waterloo)
R. Wiggins, BS, OD (Indiana)

Clinic Supervisors – Part-time (1979-1980)
W. B. Andrews, OD (Waterloo)
W. R. Andrews, OD (College of Optometry of Ontario)
D. Bock, OD (Waterloo)
R. R. Bock, OD (College of Optometry of Ontario)
J. A. Brisson, OD (Waterloo)
R. Burton, OD (Waterloo)
J. E. Chantry, OD (Waterloo)
R. R. Chen, OD (College of Optometry of Ontario)
K. S. Chhatwal, OD (Waterloo)
G. M. Curik, OD (Waterloo)
P. A. Devenny, OD (Waterloo)
T. A. Dietrich, OD (Waterloo)
M. H. Falke, OD (Waterloo)
G. A. Grant, OD (College of Optometry of Ontario)
R. M. Haber, BSc (Toronto), OD (Waterloo)
D. A. K. Hayhoe, OD (Waterloo)
D. M. Hector, OD (Waterloo)
G. L. Hollands, OD (Waterloo)
L. Hirano, OD (Waterloo)
R. R. Chen, OD (College of Optometry of Ontario)
L. W. Hornfield, OD (Waterloo)
D. Klein, OD (Waterloo)
V. A. Kuraitis, OD (Waterloo)
L. Markaryan, OD (Waterloo)
J. M. McDowell, OD (Waterloo)
R. E. Miller, BSc (Toronto), OD (Waterloo)
D. A. Neff, OD (Waterloo)
B. H. Rice, OD (Waterloo)
R. L. Saari, OD (Waterloo)
R. J. Scheid, OD (Waterloo)
P. Shaw, OD (Waterloo)
J. S. Smibert, OD (Waterloo)
R. L. Wilson, OD (Waterloo)
M. Wolf, BSc, OD (Waterloo)
S. Woodruff, OD (Waterloo)
W. R. Woolner, OD (Waterloo)

Clinic Residents (1979-1980)
D. LutzI, OD (Waterloo)
C. Smith, OD (Waterloo)
J. Sorbara, OD (Waterloo)
Course Descriptions

Students in other disciplines may register for Optometry courses only upon the approval of the Director of the School of Optometry.

Optom 100 F 2C 0.5
History and Orientation
A brief history of the profession and the development of visual science; a consideration of legal and organizational development of optometry; the role of professional associations. The role and scope of optometry and its relationship to other professions and the community.

Optom 105 F 3C,1T 0.5
General Pathology
(See Optom 305 for detailed description)

Optom 106 F 3C,3L 0.5
Geometrical Optics
Prereq: Phys 121, 121L, 122, 122L, Math 113

Optom 111 W 3C,3L 0.5
Physiological Optics
Prereq: Optom 106

Optom 104 F 3C,3L 0.5
Anatomy of the Eye and Associated Structures
The gross, microscopic and ultra structure of ocular tissues. The embryology and comparative anatomy of the eye will be emphasized. The relationship of the eye to the vascular supply of the head and the nervous system will be studied. This course is credited only upon completion of Optom 114.
Coreq: Biol 201

Optom 114 W 3C,2L 0.5
Anatomy of the Eye and Associated Structures
A continuation of Optom 104.
Prereq: Optom 104

Optom 115 W 4C,1T 0.5
General Pathology
(See Optom 315 for detailed description)

Optom 116 W 3C,4L 0.5
(See Optom 306 for detailed description)
Optom 316  W  3C,4L  0.5
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  0.5
Physiological Optics

Optom 402  F  3C,2L  0.5
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  0.5
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  0.5
Ocular Pathology
Signs, symptoms, clinical detection of primary and secondary ocular disease; instrument techniques; record keeping, patient counselling, referral procedures; management of ocular emergencies; primary health care responsibilities.  
Prereq: Optom 305, 315

Optom 406  F  2C,4L  0.5
Optometrical Optics
The lecture course deals with problems involved in selecting, preparing and fitting ophthalmic materials. Optical, cosmetic and comfort requirements, and patient counselling are considered. The laboratory course provides experience in preparing and fitting materials to patients.  
Prereq: Optom 306, 316

Optom 407  F  3C,2L  0.5
Optometric Specialties: Contact Lenses
A series of lectures and laboratories on the principles and procedures of prescribing and fitting contact lenses.  
Prereq: Optom 401, 402

Optom 408  Y  8 Clinic  1.0
Optometric Clinic
The student is assigned to the various areas of the clinic and under the direct supervision of optometrists of the clinic staff, carries out routine clinical investigations of patients.

Optom 409  W  3C,3L  0.5
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 410  W  3C,2L  0.5
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 411  W  3C,2L  0.5
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 412  W  3C,2L  0.5
Ocular Pathology
A continuation of 405.  
Prereq: Optom 405

Optom 413  W  3C,2L  0.5
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  W  1.0
Spring Clinic
Each student is required to complete 120 hours of clinical practice during the spring.  
Prereq: Successful completion of Year 4 programme.
Course Descriptions
Optometry

Optom 500  F  2C  0.5  
Optometrical Praxis  
Practice management; financial management, establishing a practice, interprofessional relations, office design, optometric assistants, professional associations.

Optom 501  F  3L  0.5  
Optometry Research Project  
Students with an interest in research may arrange with a professor to undertake a research project of mutual interest. This course serves as an alternative to Psych 357. Contact the course co-ordinator for details.

Optom 502  F  3C  0.5  
Advanced Contact Lens Practice  
A series of lectures and practical demonstrations of the principles and procedures of advanced contact lens materials and resources including their physiological implications.

Pediatric Optometry  
Special aspects of the management of vision problems of infants and young children are discussed.

Visual Aspects of Learning Difficulties  
The aspects of vision problems related to learning difficulty including tests and measurements taken by optometrists. The role of the optometrist in conjunction with the parents, teachers, and psychologists in assisting children to achieve is discussed.  
Prereq: Optom 302, 312, 402, 412

Optom 504  F  4C,1L  0.5  
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  0.5  
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  0.5  
Community Health Optometry  
Governmental and social aspects of health and vision care delivery are discussed in relation to the epidemiology of vision problems.

Optom 510  W  2C  0.5  
Optometrical Jurisprudence  
Lectures relating to the legal aspects of practising optometry in Canada. The rights and responsibilities of the optometrist in practice are examined and discussed.

Optom 511  F  3L  0.5  
Optometry Research Project  
A continuation of 501. This course serves as an alternative to Optom 513.  
Prereq: Optom 501

Optom 512  W  3C  0.5  
Advanced Contact Lens Practice  
A continuation of Optom 502 with an emphasis on research.

Visual Gerontology  
Aspects of the aging process on the visual system and the optometrical management of the visual problems of older persons.

Recent Advances in Optometrical Technology and Instrumentation  
The use and interpretation of new resources for collecting, recording, analyzing and using optometrical data.

Optom 513  W  2C  0.5  
Optometric Communication  
Verbal communication and counselling during the optometrical examination, alternatives to technical terminology, report and letter writing, preparing and delivering papers and talks to professional societies and public information.

Optom 514  W  2C  0.5  
Genetics for Optometrists  
A brief review of Mendelian genetics, and the molecular basis of modern genetics. Inherited conditions of particular interest, e.g., colour vision, albinism, aniridia, refractive error, retinoblastoma, etc. Genetic counselling, and the detection of carriers.  
Prereq: Optom 405, 415

Optom 518  W  24 Clinic  0.5  
Optometry Clinic  
A continuation of 508  
Prereq: Optom 508
Optom 519  W  4C  0.5
Aspects of prevention of accidents and injury to the visual system.
The production of efficient and comfortable vision at work and recreation.

Optom 599 (A-E)  W
Comprehensive examinations in Anatomy and Physiology, Pathology and Pharmacology, Optometric Optics, Optometrical Optics, Optometry. Graduation in Optometry is contingent upon successful completion of these comprehensive examinations involving oral, written and clinical applications of optometry. These examinations are ordinarily held in the final examination period of the Winter term, fourth professional year. These examinations have been approved for purposes of licensure for 1980 by the Council of the College of Optometrists of Ontario.

Peace and Conflict Studies
Assistant Professor, Director of the Programme
C. G. Brunk, BA (Wheaton), MA, PhD (Northwestern)

Members of the Peace and Conflict Studies Faculty Group

Professors
L. Costa-Pinto, BA, PhD (Brazil)
F. H. Epp, (Bethel), MA, PhD (Minnesota)
W. Klaassen, BA, BD (McMaster), D.Phil (Oxford)
D. E. Smucker, BA (Bluffton), BD (Princeton), MA, PhD (Chicago)

Associate Professors
J. G. Holmes, BA, MA (Carleton), PhD (North Carolina)
M. F. McDonald, BA (Toronto), MA, PhD (Pittsburgh)

Assistant Professors
C. G. Brunk, BA (Wheaton), MA, PhD (Northwestern)
R. Lahue, BSc (Fordham), PhD (Waterloo)
R. J. Sawatsky, BA (Bethel), MA (Minnesota), MA, PhD (Princeton)
J. O. Stubbs, BA (Toronto), MSc Econ (London), DPhil (Oxford)

Lecturers
W. B. Moul, BA, MA (Br.Col.)

Core Courses

The Core Courses for each year of the programme are designed to bring together students from various disciplines who are interested in the problems of conflict and peace, with the objective of acquainting them with other disciplinary approaches to those problems. Core courses are taught in Conrad Grebel College by members of the PACS Faculty Group, other qualified and interested members of participating departments, or by eminent scholars in the field who will be invited to the University from time to time.

PACS 201  F  2C,1D  0.5
Peace and Conflict Studies 1
An examination of influential theories of the nature and roots of human conflict on both the interpersonal and inter-group level. Contributions of the behavioral and social sciences, as well as the humanities, will be explored.
Brunk
Course Descriptions
Peace and Conflict Studies

PACS 202  W  2C,1D  0.5  
**Peace and Conflict Studies 2**
A continuation of PACS 201, with special emphasis on the means of conflict resolution or management. Included are critical assessments of negotiation, arbitration, confrontation, litigation, violence and nonviolent resistance, and other models of conflict resolution.

Brunk

PACS 301  F  3S  0.5  
**Peace and Conflict Studies 3**
A seminar course investigating special issues related to peace and conflict. The content of this and PACS 302 will vary from year to year as specialists in various aspects of these issues are invited to teach the courses.

Staff

PACS 302  W  3S  0.5  
**Peace and Conflict Studies 4**
(Same as 301, above)

Staff

PACS 498  F  T  0.5
**Senior Honours Seminar 1**
Each Honours student will work on a research paper and will meet regularly with other students working on similar projects to discuss and evaluate his own work.

Staff

PACS 499  W  T  0.5
**Senior Honours Seminar 2**
Continuation of PACS 498.

Staff

Peace and Conflict Studies Content
Courses Offered by Participating Departments

The following are courses approved as PACS-related which are offered by the participating departments under their own designations. Additions may occur following the suggestion of the departments concerned and approval by the PACS Faculty Group. Full course descriptions are found in the departmental sections elsewhere in this chapter.

Arts
These are PACS Content Courses of an interdisciplinary nature offered by Conrad Grebel College.

Arts 230G  Nonviolence and Political Reality
Arts 271G  Introduction to Peace Research 1
Arts 272G  Introduction to Peace Research 2
Arts 398G  Special Topics in Peace and Conflict
Arts 399G  Special Topics in Peace and Conflict

History

Hist 102C  The Origins of Wars in the Twentieth Century
Hist 204E  War and Society in the 20th Century
Hist 216  Irish History, Part 1
Hist 217  Irish History, Part 2
Hist 241  The Emergence of Modern Europe: Renaissance
Hist 242  Europe in Transition, 1500-1650
Hist 245G  Canadian Minorities 1
Hist 246G  Canadian Minorities 2
Hist 253  Change and Continuity in 20th Century America, 1898-1945
Hist 254  Change and Continuity in 20th Century America, 1945-1978
Hist 288  History of Modern Revolutions 1
Hist 289  History of Modern Revolutions 2
Hist 313  International History Since 1871 Part 1
Hist 314  International History Since 1871 Part 2
Hist 323  Canada and World Affairs: The Twentieth Century Part 1
Hist 324  Canada and World Affairs: The Twentieth Century Part 2
Hist 347G  Radical Reformation 1
Hist 348G  Radical Reformation 2

Philosophy

Phil 125  Fundamentals of Social and Political Philosophy
Phil 216  Rational Behaviour and Decision-Making
Phil 225  Social and Political Philosophy: Canadian Problems
Phil 243  Risk, Decision, Games, Amalgamation
Phil 325  Political Philosophy 1
Phil 326  Political Philosophy 2
Phil 327A  Philosophy of Law 1
Phil 327B  Philosophy of Law 2
Phil 328  The Philosophy of Karl Marx
Phil 329  War, Peace, and Justice

Political Science

P Sci 101  Introduction to Politics
P Sci 102A  Imperialism and International Relations
P Sci 102K  Mass Political Violence
P Sci 225  Political Theory 1
P Sci 226  Political Theory 2
P Sci 281  International Politics 1
P Sci 282  International Politics 2
P Sci 321  Marxist Theory
P Sci 322  Marxism and Revolution after Marx
P Sci 350  The Politics of Developing Areas
P Sci 380  World Politics
P Sci 479  Violence in the Political Process
P Sci 481  Research Seminar on World Politics
Course Descriptions

Philosophy

Psych 254  Interpersonal Relations
Psych 316  Moral Development
Psych 333  Industrial Psychology
Psych 353  Aggression and Social Conflict
Psych 354  Interpersonal Processes in Critical Situations

Religious Studies
R S 253  History and Thought of Christian Pacifism 1
R S 254  History and Thought of Christian Pacifism 2
R S 255  Christian Ethics 1
R S 256  Christian Ethics 2
R S 262  Religion and Politics 1
R S 263  Religion and Politics 2
R S 275  Religion and Psychotherapy
R S 353  Ethics in Indian Thought

Social Development Studies
Psych 221R  Interpersonal Interaction
Soc 221R  Master Trends in Modern Society
Soc 225R  Race and Culture and the Third World 1
Soc 226R  Race and Culture and the Third World 2
Soc 327R  Canadian Ethnic and Cultural Minorities
Soc 328R  Canadian Ethnic and Cultural Minorities

Sociology
Soc 106  Collective Behaviour
Soc 190G  Sociology of Dissent
Soc 222  Juvenile Delinquency
Soc 227  Crime and Society
Soc 233  Social Psychology of Beliefs and Attitudes
Soc 256  Ethnic and Racial Relations
Soc 331  Social Change
Soc 336  Sociology of Militarism
Soc 370G  Sociology of Law

Department of Philosophy

Professor, Chairman of the Department
R. A. George, MA, PhD (Michigan State)

Associate Professor, Associate Chairman and Undergraduate Officer
M. F. McDonald, BA (Toronto), MA, PhD (Pittsburgh)

Professor, Associate Dean (Graduate Affairs), Faculty of Arts
L. L. Haworth, BA (Rollins), MA, PhD (Illinois)

Professors
E. J. Ashworth, BA, MA (Cambridge), PhD (Bryn Mawr)
T. L. Batke, MASC, PhD (Toronto)
J. S. Minas, BA (Wayne), PhD (Illinois)
J. F. Narveson, BA (Chicago), MA, PhD (Harvard)
B. S. Suits, BA, MA (Chicago), PhD (Illinois)
J. W. Tucker, BSc, BA, PhD (London)

Professor Emeritus
P. Seligman, BA, PhD (London), (part-time)

Associate Professors
W. R. Abbott, BA (Kenyon), PhD (Ohio State)
G. T. Campbell, BA (W. Ont.), PhL, PhD (LaVal) J
F. Centore, BSc (Canisius), MA (Maryland), PhD (St. John’s) J
D. T. DeMarco, BS (Stonehill, Mass.), MA, PhD (St. John’s) J
B. P. Hendley, BA (Marquette), MA, PhD (Yale)
J. R. Horsen, BA, MA (W. Ont), BTh (Huron), PhD (Columbia)
J. Huertas-Jourda, BA (Florida), MA, PhD (New York), (part-time)
A. Kerr-Lawson, BA (Toronto), MA (Chicago), PhD (McMaster)
A. C. Minas, BA (Radcliffe), MA, PhD (Harvard)
D. D. Roberts, BA (Roosevelt), MA, PhD (Illinois)
J. W. Van Evra, BA (Valparaiso), MA, PhD (Michigan-State)

Assistant Professors
C. G. Brunk, BA (Wheaton), MA, PhD (Northwestern) G
C. R. Girodat, BA (W. Ont.), MA (Detroit), PhD (Toronto) J
R. H. Holmes, BA., MA (Montana), PhD (Washington)
J. Wubnig, BA (Swarthmore), MA, PhD (Yale)

Faculty members holding joint appointments as shown
*Department of Pure Mathematics
*Department of Chemical Engineering
Course Descriptions

Philosophy

Note 1
Any full course or two half courses in Philosophy can be used to satisfy the Group A(i) requirement.

Note 2
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. Each Spring, the Department will publish 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 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 a "G" are administered by Conrad Grebel 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 101 Y 2C,1D 1.0
Great Works of Western Philosophy
This is a year long examination of some of the greatest writings in Western philosophy. Students will be encouraged to come to a critical appreciation of such masterworks as Plato's Republic, Descartes' Discourse on Method, Hobbes' Leviathan, Hume's Enquiry, Kant's Prolegomena, Nietzsche's Zarathustra, and an outstanding work in contemporary philosophy.

Phil 111 F,W 3C 0.5
Philosophy of Life
"Who am I?" "What can I hope for after death?" "How can I tell what to do?" "What can I know?" are questions that have led people to philosophize. Approaches, such as those of the mystic, the scientist, the existentialist, the pleasure seeker, and the practical man, will be discussed.

Phil 120 F,W,S 3C 0.5
Science, Technology, and Society
Alternative philosophical perspectives on problems raised by scientific and technological developments including moral issues (e.g. privacy and data-gathering, 'clean' vs. 'dirty' energy.) Also an examination of the nature and scope of scientific and technical knowledge as it bears on the responsibilities of scientists and engineers.

Phil 125 F,W 2C,1D 0.5
Introduction to Social and Political Philosophy
An introduction to basic concepts and principles in classical and contemporary social and political philosophy. Differing views on basic questions are examined, with applications to such issues as capital punishment, welfare provisions, taxation, natural resource ownership, and terrorism.

Phil 135 F,W 3C 0.5
Introduction to the Philosophy of Religion
Beginning with a consideration of such contemporary religious and anti-religious options as secularism, mysticism, occultism, and charismatic renewal, this course moves to a critical discussion of such topics as religious experience, faith, God, and miracles.

Phil 140 F,W,S 3C 0.5
Introduction to Formal Logic
Elementary sentence and predicate logic. Translation from English into the formalism, decision methods and deductions. Application of Graphic Methods to Logic. This course is a preparation for courses in the foundations of mathematics, scientific methods, and more advanced logic courses.

Phil 145 F,W,S 3C 0.5
Critical Thinking
An analysis of basic types of reasoning, structure of arguments, critical assessment of information, common fallacies, problems of clarity and meaning.

Phil 150 W 2C,1D 0.5
Introduction: Knowledge and Reality
Discussion of the nature of reality. Rival theories concerning mind, matter, freedom, the existence of God, and the place of experience and reason in human knowledge are considered.

Phil 201 F,W 2C,1D 0.5
Love
A philosophical analysis of different forms and functions of love. Among the topics to be considered: love and sexuality, religious love, love and knowledge. Classical and contemporary sources will be treated.
Philosophy of Women
A study of some of the issues raised by the Women's Liberation movement. Philosophical writings of the past and present will be used on such subjects as: the two sexes, physiological femininity, personal and social relations between the sexes, the position of women in public life, marriage and its alternatives, the importance of childbearing.

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.

Philosophy in Literature
Each term philosophical themes (such as alienation, freedom, and responsibility) will be explored through appropriate literary works (e.g. works by Camus, Dostoevsky, Kafka, and Sartre).

Professional Ethics
Study of ethical and moral issues that typically arise in professional activity. What responsibilities to society at large do people in such professions as teaching, engineering, planning, architecture, and accounting have? How far should professional autonomy extend?

Rational Behaviour and Decision-Making
An elementary introduction to the subject of ‘rational’ behaviour and decision-making for individuals and groups. Emphasis is on the definition and measurement of utility functions and various criteria employed in models of decision-making. This course is intended to help those whose work will involve them in making decisions in either the public or private sectors.

Moral Issues
The aim of this course is to improve the student’s understanding of ethical ideas and principles by careful discussion of selected concrete moral issues, such as abortion, euthanasia, capital punishment, and violence. Choice of issues is partly determined by student interest.

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.

Contemporary Ethical Theory
Continues the history and discussion of ethics begun in Phil 221 with writings from 1900 to the present. Theories such as intuitionism, emotivism, utilitarianism, and relativism are examined via the writings of such people as Moore, Hare and Warnock.

Prereq: 221 recommended

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.

Social and Political Philosophy: Canadian Problems
Basic ideological perspectives – conservative, socialist, and liberal – on Canadian problems – such as native rights, nationalism, separatism, and regionalism – are philosophically presented and assessed.

Prereq: Philosophy 125 or consent of the instructor.

Ethics and the Life Sciences
An investigation of some critical ethical issues in human research and therapy. Includes discussions of the right to live and right to die, behavior control (e.g. psychosurgery, behavior modification and psychotherapy), human experimentation (including “informed consent” and fetal research) and human engineering.

Prereq: One of Phil 125, 221, 222, or consent of instructor

Philosophy and Mysticism
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.
Phil 236 2C 0.5
Philosophy of Religion: The Occult
A critical philosophical discussion of reports of several kinds of extraordinary experiences, such as magic, extra-sensory perception, mysticism, and divination will lead us to discussions of such concepts as insanity, irrationality, the supernatural, and the miraculous.

Phil 240 Y 3C 1.0
Logic
A systematic development of the propositional calculus and of the first-order functional calculus. Some attention will be devoted to extensions and interpretations of such formal systems.
Prereq: None for second-year students and above; consent of instructor for others.

Phil 241 F,W 3C 0.5
Intermediate Logic
Axiom systems of logic are developed and compared with natural deduction procedures. Then certain properties of these logical systems, such as consistency, completeness, and compactness, will be investigated.
Prereq: Phil 140 or consent of the instructor.

Phil 242 W 3C 0.5
Extensions and Applications of Elementary Logic
The classical logic introduced in Phil 140 will be extended to form systems of modal logic, including logics of obligation, belief and knowledge, necessity, and temporal order. Essentialism, future contingencies, proofs for the existence of God will be discussed.
Prereq: Phil 140 or consent of the instructor.

Phil 243 F,W 3C 0.5
Risk, Decision, Games, Amalgamation
Fundamentals of probability and game theory. Problems of decisionmaking 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

Phil 258 F 3C 0.5
Introduction to the Philosophy of Science
A discussion of the fundamental concepts on which science is based. Consideration is given to such topics as scientific 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.

Phil 265 3C 0.5
The Existentialist Experience
An introduction to the existentialist view of man using both literary and philosophical texts from such authors as Kierkegaard, Unamuno, Nietzsche, Ortega y Gasset, Camus, Sartre, Heidegger and others.

Phil 270/271 3C 0.5
Special Topics in Philosophy
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.

Phil 280 F 3C 0.5
History of Ancient Philosophy 1
From the beginnings to Plato.
Prereq: Second year standing or above, or consent of instructor

Phil 281 W 3C 0.5
History of Ancient Philosophy 2
From Aristotle to the close of classical antiquity.
Prereq: Phil 280

Phil 282 F 3C 0.5
History of Modern Philosophy 1
Earlier period beginning with Descartes.
Prereq: Second year standing or above, or consent of instructor

Phil 283 W 3C 0.5
History of Modern Philosophy 2
Later period including Hume and Kant.
Prereq: Second year standing or above, or consent of instructor. Phil 282 recommended.

Phil 284 3C 0.5
19th Century Philosophy
The 19th century. Philosophers covered may include Hegel, Mill, Schopenhauer, James, and Kierkegaard.

Phil 285 3C 0.5
20th Century Philosophy
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.
Phil 300  F,W  3C  0.5
**The Philosophy of Games**
An introduction to philosophical issues relating to sports and other games. Among the issues examined will be the nature of games, games and sports, and the relevance of games and sports to other philosophical interests: e.g., ethics and aesthetics.

Phil 311  W  3C  0.5
**Philosophy of Education 1**
A philosophical analysis of classical and contemporary theories of education, with a view to formulating a clear workable concept of education, its aims and methods.
*Prereq: At least second year standing or consent of instructor*

Phil 312  F  3C  0.5
**Philosophy of Education 2**
An introduction to current work in the field, particularly that of Peters, Hirst, and Dearden. Special attention will be paid to the question of the desirability of a core curriculum and its proposed content.
*Prereq: Phil 311 or consent of instructor*

Phil 321/324  3C  0.5
**Studies in Ethics**
Various half courses dealing with special topics; one or more of these will be offered each year as announced by the Department.
*Prereq: Phil 221/222. See Note 1*

Phil 325  3C  0.5
**Political Philosophy 1**
Philosophical analysis of central concepts in political theory and its relation to moral and metaphysical problems of various periods.
*Prereq: Phil 125 or consent of the instructor*

Phil 326  3C  0.5
**Political Philosophy 2**
A detailed discussion of contemporary theories.
*Prereq: Phil 125 or consent of the instructor*

Phil 327A  F  0.5
**Philosophy of Law – Part 1**
An investigation of alternative views of law and legal reasoning forms the core of this course. Law's relations to morality, social practice, and politics are considered. Authors to be studies include Aquinas, Kant, Austin, and Hart.
*Prereq: Phil 221 or another approved values course, or consent of the instructor.*

Phil 327B  W  0.5
**Philosophy of Law – Part 2**
An examination of areas within the law in which philosophical problems and methods are featured prominently. Topics such as liberty, responsibility and liability, punishment, rights and possession are considered.
*Prereq: Phil 327A or consent of the instructor.*

Phil 328  3C  0.5
**The Philosophy of Karl Marx**
A systematic, critical study of the main philosophical ideas of Marx and Engels. Considerable reading from their original writings, early and late, with discussion and analysis, is the main work of the course; some recent interpretative and critical work is used.
*Prereq: One full or two half Philosophy courses, or consent of instructor*

Phil 329  3C  0.5
**War, Peace and Justice**
An intensive study of the moral issues involved in war and armed revolution. Critical evaluation of "just war" theories, and international rules of warfare is pursued as well as the moral arguments for and against pacifism and conscientious objection.
*Prereq: Phil 125, or 221/222, or consent of instructor*

Phil 331  3C  0.5
**Aesthetics**
Philosophical consideration of works of art and the problems of beauty using selected readings to enable the student to recognize and formulate his own views in a philosophic manner.
*Prereq: One full or two half Philosophy courses, or consent of instructor.*

Phil 335  3C  0.5
**Philosophy of Religion**
A critical examination of the methods and substantive arguments found in selected major works of religious philosophy. The writings chosen for consideration will be announced in advance each year.
*Prereq: One full or two half Philosophy courses, or consent of instructor.*
*See Note 1.*
Phil 340  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  F  3C  0.5
Epistemology 1
The first part of Phil 350.

Phil 350B  W  3C  0.5
Epistemology 2
The second part of Phil 350.

Note
Either 350A or 350B may be taken separately.

Phil 359  3C  0.5
Philosophy of the Formal Sciences
A study of philosophical problems concerning mathematics. Topics discussed include formalism, intuitionism, logicism, the mathematical paradoxes, and other topics in foundations and metamathematics.
Prereq: At least second year standing or consent of instructor

Phil 362  3C  0.5
Philosophy of the Social Sciences
Problems about the fundamental methods and aims of the social sciences generally, and problems specific to Psychology, Sociology, Political Science, etc., and their relations to one another will be considered.
(Cross-numbered as Soc 371)

Phil 363  Y  3C  1.0
Philosophy of Language and Linguistic Analysis
The first part examines issues in the philosophy of language, such as synonymy, propositions, meaning, semantics, reference. The second part will consider ordinary language analysis as a method for solving philosophical problems as compared with structural linguistics.
Prereq: At least second year standing or consent of instructor

Phil 363A  F  3C  0.5
Philosophy of Language
The first part of Phil 363.

Phil 363B  W  3C  0.5
Linguistic Analysis
The second part of Phil 363.

Note
Either Phil 363A or Phil 363B may be taken separately.

Phil 365-366  3C  0.5
Oriental Philosophy
Studies of a selected area of non-western Philosophy (e.g. Indian or Chinese). Parallels will be drawn between modes of Eastern thinking and European conceptions with emphasis on essential differences as well as similarities.
Prereq: Consent of instructor

Phil 370-372  3C  0.5
Special Subjects
One or more half courses will be offered at different times as announced by the Department.
Prereq: Consent of instructor. See Note 1

Phil 380-389  3C  0.5
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: Appropriate course(s) from Phil 280-285 or Phil 390/391, or consent of instructor.
See Note 1

Phil 390  3C  0.5
Medieval Philosophy 1
The early period of the 13th century. Among those considered will be: Augustine, Boethius, Anselm, and Ablallard.
Prereq: one full or two half courses in Philosophy
Phil 391 3C 0.5

**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  F,W,S  R  0.5

**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  0.5

**Philosophy of the City**  
Analysis and evaluation of the philosophical points of view that underlie current criticism of urban life and prevalent schemes for its reconstruction.  
*Prereq: One half Philosophy course*

Phil 435-439 3C  0.5

**Students 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  0.5

**Studies in Logic**  
Various half courses dealing with specific topics; one or more of these will be offered each year as announced by the Department.  
*Prereq: Phil 240, 241, 242 or 340 or Math 346. See Note 1*

Phil 446 3C  0.5

**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 Philosophy.*
Phil 120J  F,J  3C  0.5
Philosophy of Life and Death
A study of what some of the great philosophers have said about the meaning of life and death and the transition from life to death. Students are urged to raise questions and help direct discussion.
Offered in the evening fall term.

Phil 130J  W,A  3C  0.5
Philosophy of Discontent
A study of what some of the great philosophers have said about the causes of discontent. Social disobedience and the extent to which ethical principles can be altered to accommodate changing conditions are possible topics for discussion.
Offered in the evening winter term.

Phil 200J  W  3C  0.5
Intentional Logic
An introduction to the understanding of how words are used, the formation of propositions, the construction of arguments and the examination of fallacies to help the student to argue with order, with facility and without error.

Phil 205J  F  3C  0.5
Philosophy of Nature
An examination of ancient and modern accounts of the natural world. Problems include whether matter alone can account for change, whether there is more than one cause, whether nature operates by purpose or chance.

Phil 206J
Philosophy of Science
Not offered in 1980-81.

Phil 210J  F  3C  0.5
Philosophy of Man
What is man? What is man’s place among other creatures? Is man an accident of evolution? What are the major views on man as a species? How are love and sex aspects of man’s life?

Phil 218J  F  3C  0.5
Ethical Theory
A normative approach, employing several of the classic Western traditions of rational thought, to general ethics. The various schools of ethical thought will be discussed.
Offered in the evening.

Phil 219J  F/W/J  3C  0.5
Practical Ethics
This course will discuss the applications of general ethics to more specific areas of human endeavour. Among the topics discussed will be abortion, contraception, sex, obscenity, violence, drugs, egoism, dishonesty, and various forms of human exploitation.
Offered in the evening winter term.

Phil 230J  F  3C  0.5
God and Philosophy
An investigation of several aspects concerning the meaning and existence of God. Is God-talk possible? Can faith and reason be reconciled? Is religious experience a meaningful argument? A wide range of different views will be considered.
Offered in the evening.

Phil 237J  W  3C  0.5
Ethics and Society
This course examines the nature and purpose of community living as well as such traditionally controversial issues as private and public morality, the individual good and the common good, personal freedom and group responsibility.
Offered in the evening.

Phil 260J  W  3C  0.5
Issues in Higher Education
Why go to university? What are the present realities in Canada? What is the role of the liberal arts? The primary interest will be upon what can be done in practice rather than upon ideal schemes.

Phil 300J  F  3C  0.5
The Western Philosophical Tradition (to 1600)
An intensive overview of the major recurring themes in Western intellectual history from both an historical and a philosophical viewpoint.
Prereq: Second year standing.

Phil 301J  W  3C  0.5
The Western Philosophical Tradition (1600-Present)
A continuation of 300J. Descartes to Existentialism.
Prereq: Second year standing.

Phil 318J  W/A  3C  0.5
Philosophy of the Family
A philosophical examination of the family: its foundation, its purpose, its importance in personal growth and its relation to political community.
Prereq: One course in moral philosophy, or consent of instructor

Phil 333J Contemporary Philosophical Problems in Art
Not offered in 1980-81.
The Thomistic Tradition in Philosophy
An examination of the work of Thomas Aquinas, his philosophical relation to his time, the revival of Thomism in the modern era.
Prereq: One full course in philosophy, and third year standing or consent of instructor.

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

Department of Physics

Professor, Chairman of the Department
N. R. Isenor, BSc (Acadia), MSc, PhD (McMaster)

Associate Professor, Associate Chairman of the Department
J. K. Brandon, BSc, PhD (McMaster), MA (Cantab)

Professor, Associate Dean Graduate Affairs, Faculty of Science
R. A. Aziz, BA, MA, PhD (Toronto)

Professors
A. Anderson, MA, DPhil (Oxon)
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. Grindlay, BSc (Glasgow), DPhil (Oxon)
J. Kruuv, BASc (Waterloo), PhD (W. Ont.)
J. W. Leech, BS, PhD (London), FinstP
J. D. Leslie, BASc (Toronto), MS, PhD (Illinois)
A. D. S. Nagi, BA, BSc, MSc (Panjab), PhD (Delhi)
J. L. Ord, BASc (Toronto), MS, PhD (Illinois)
R. K. Pathria, BSc, MSc (Panjab), PhD (Delhi)
Recipient of the Distinguished Teacher Award
W. B. Pearson, DFC, MA, DSc (Oxon), FRSC, FCIC
M. M. Pintar, BSc, MSc, PhD (Ljubljana)
G. Scolas, BSc, PhD (Genova)
R. A. Snyder, BSc, PhD (W. Ont.)
D. M. R. Taplin, BSc (Aston), DPhil (Oxford), DSc, PEng, CEng, FIM
S. F. Wang, DSc (Nagoya)

Associate Professors
J. M. Corbett, BASc (Toronto), MSc, PhD (Waterloo)
A. E. Dixon, BSc (Mt. Allison), MSc (Dalhousie), PhD (McMaster)
P. C. Eastman, BSc, MSc (McMaster), PhD (Br. Col.)
H. K. Ellenton, BSc (W. Ont.), MA (Toronto)
M. P. FitzGerald, BSc, MSC (Toronto), PhD (Case)
D. Hemming, BSc, PhD (Bristol)
C. C. Lim, BA (DePauw), MA (Nebraska), PhD (Toronto)
R. S. Moore, BSc, MSC (McMaster), PhD (Alberta)
H. M. Morrison, BSc, PhD (Edinburgh)
H. J. T. Smith, BSc, PhD (London)
B. H. Torrie, BASc (Toronto), PhD (McMaster)
J. Vanderkooy, BEng, PhD (McMaster)
K. A. Woolner, BSc (London)

Assistant Professors
J. R. Lepock, BS, MS (W. Virginia), PhD (Penn State)
D. R. Rayburn, BSc (Calgary), PhD (Queen’s)
Course Descriptions

Physics

Senior Demonstrators
A. B. Haner, BSc, MSc (Waterloo)
D. S. McVicar, BSc (Waterloo)

Research Assistant Professor
G. L. H. Harris, BA (Mount Holyoke), MA (Wesleyan),
PhD (Toronto) (part-time)

Adjunct Faculty
W. E. Harris*, BSc (Alberta), MSc, PhD (Toronto)
M. L. Klein*, BSc, PhD (Bristol)
J. Lit*, BSc, DipEd (I long Kong), DSc (Laval)
L. A. A. Read*, BA, MSc (McMaster), PhD (Waterloo)
M. C. Richardson*, BSc, ARCS (Imp. Coll.),
PhD (London)
P. G. Sutherland*, BSc (McGill), MS, PhD (Illinois)

Faculty members holding cross or adjunct appointments as shown
1Department of Biology
2Department of Chemistry
3Department of Applied Math
4Department of Mechanical Engineering
5National Research Council
6Wilfrid Laurier University
7McMaster University

Course Descriptions

Note 1
Details of the undergraduate programmes offered by the Faculty of Science are to be found in Chapter 14.

Note 2
Prerequisites are given as a guide to the student and may be waived with the consent of the instructor.

Physics

Phys 001  T  0.0

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 010  F,W,S  1C  0

Physics Seminar
This seminar brings together Honours Physics (including Co-op students) in Years 2, 3 and 4, to receive information concerning the activities of the Physics Department and to hear invited speakers.

Phys 011  F  4C,2T  0.5

Mechanics

Phys 103  W  3C,3L,2T  0.5

Mechanics in Human Movement
An introduction to the physical principles required for the analysis of the mechanics of human movement. A course for Kinesiology students.
Lab alternate weeks, optional tut.

Note
Normally students who have completed Ontario Year 5 Phys should select Phys 104 instead of 103.

Phys 104  W  3C,3L,2T  0.5

Mechanics in Human Movement
An introduction to the physical principles required for the analysis of the mechanics of human movement. A course for Kinesiology students.
Prereq: Ontario Year 5 Phys Lab alternate weeks, optional tut.

Phys 105  F  3C,3L,2T  0.5

Electrical Science
Basic electricity, magnetism and electronics. An introduction to the physical principles required for an understanding of the electrical instruments used in Kinesiology. A course for Kinesiology students.
Prereq: Phys 103 or 104. Lab alternate weeks, optional tut.

Phys 111  F  3C,1T  0.5

Physics For the Life Sciences 1
An introduction to physics for students intending to concentrate their further studies in biology, medicine or dentistry; includes particle kinematics and dynamics, energy and momentum conservation, gravitation, rotational mechanics, fluid mechanics, elasticity and oscillations.

Phys 111L  F  3L  0.25

Physics For the Life Sciences 1 Laboratory
For students taking Phys 111. Lab alternate weeks.

Phys 112  W  3C, 1T  0.5

Physics For the Life Sciences 2
A continuation of Phys 111; includes wave motion, normal modes of vibration, sound, hearing, temperature, heat, kinetic theory of gases, thermodynamics, electrostatic force and potential, electric current and power, DC circuits, magnetic fields and induction.
Phys 112L  W  3L  0.25  
**Physics For The Life Sciences 2 Laboratory**
For students taking Phys 112. Lab alternate weeks.

Phys 121  F  3C, 1T  0.5  
**Introductory Physics 1**
An introductory course in physics for students intending to concentrate their future studies in the physical sciences, optometry or mathematics; includes particle kinematics and dynamics, forces in nature, work and energy, conservation of energy and linear momentum.  
**Prereq:** Ontario Year 5 Math-Functions and Relations, and Calculus. Ontario Year 5 Physics recommended. Science students must take 121L with this course.

Phys 121L  F  3L  0.25  
**Introductory Physics 1 Laboratory**
For students taking Phys 121. Lab alternate weeks.

Phys 122  W,S  3C,1T  0.5  
**Introductory Physics 2**
This course is a continuation of Phys 121; includes rotational kinematics and dynamics, conservation of angular momentum, gravitation, electrical currents and resistive circuits, capacitative and inductive circuits, alternating currents and resonant circuits.  
**Prereq:** Phys 121. Science students must take 122L with this course.

Phys 122L  W,S  3L  0.25  
**Introductory Physics 2 Laboratory**
For students taking Phys 122. Lab alternate weeks.

Phys 162  F  3C,1T  0.5  
**Enriched Introductory Physics 1**
This is an enriched version of Phys 121; includes the topics listed in the description of Phys 121 plus enrichment topics, e.g. Taylor series, numerical methods for solving differential equations and programming the Physics Nova computer.  
**Prereq:** At least 75% average in Ontario Year 5 Phys, Math-Functions and Relations, and Calculus. Science students must take 162L with this course.

Phys 162L  F  3L  0.25  
**Enriched Introductory Physics 1 Laboratory**
For students taking Phys 162. Lab alternate weeks.

Phys 163  W,S  3C,1T  0.5  
**Enriched Introductory Physics 2**
This course is a continuation of Phys 162; includes topics listed in the description of Phys 122 plus enrichment topics, e.g. Fourier series, complex exponentials.  
**Prereq:** Phys 162. Science students must take 163L with this course.

Phys 163L  W  3L  0.25  
**Enriched Introductory Physics 2 Laboratory**
For students taking Phys 163. Lab alternate weeks.

Phys 222  F  3C  0.5  
**Electricity and Magnetism 1**
Coulomb's law, electric field, Gauss' 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  0.25  
**Electricity and Magnetism 1 Laboratory**
For students taking Phys 222. Lab alternate weeks.

Phys 223  W  3C  0.5  
**Electricity and Magnetism 2**
Magnetic fields, induced electromotive forces, magnetic properties of matter, alternating currents, electromagnetic waves.  
**Prereq:** Phys 222. Not for Hans. Phys students. Phys Majors must take 223L with this course.

Phys 223L  W  3L  0.25  
**Electricity and Magnetism 2 Laboratory**
For students taking Phys 223. Lab alternate weeks.

Phys 226  F  2C  0.5  
**Optics 1**
Reflection and refraction at plane and curved surfaces, thin and thick lenses, optical instruments.  
**Prereq:** First year phys and calculus. Not for Hons. Phys students. Phys Majors must take Phys 226L with this course.

Phys 226L  F  3L  0.25  
**Optics 1 Laboratory**
For students taking Phys 226. Lab alternate weeks.
Phys 227 W 2C 0.5

Optics 2
The wave nature of light, interference, diffraction, slits and gratings, resolution, polarization, photometry, colour.

Phys 227L W 3L 0.25

Optics 2 Laboratory
For students taking Phys 227. Lab alternate weeks.

Phys 243 F,W,S 3C 0.5

Electricity and Magnetism
Prereq: First year phys and calculus. This course is primarily intended for Hons. Chem students.

Phys 243L F,W,S 3L 0.25

Electricity and Magnetism Laboratory
For students taking Phys 243. Lab. alternate weeks.

Phys 244A F 2C 0.5

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.
Prereq: A first year phys course and Math 113 or equivalent.

Phys 244B W 2C 0.5

Quantum Physics 2
Schrodinger 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.
Prereq: Phys 244A or equivalent.

Phys 246 W 3C,1T 0.5

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 0.25

Physical Optics Laboratory
For students taking Phys 246. Lab alternate weeks.

Phys 250 F 3C 0.5

The Solar System
An introduction to the astronomy and astrophysics of the solar system for students with a background in (elementary) University Physics and Mathematics.
Prereq: First year Phys and Math.

Phys 251 W,S 3C 0.5

The Stellar System
An introduction to the astronomy and astrophysics of objects beyond the solar system for students with a background in (elementary) University Physics and Mathematics.
Prereq: First year Phys and Math.

Phys 253 W,S 3C 0.5

Electricity and Magnetism
An introductory course in electricity and magnetism; includes Coulomb's Law, electric fields, Gauss' Law, electric potential, capacitance and dielectrics, magnetic forces and fields, inductance, magnetization, Maxwell's equations, electromagnetic waves.
Prereq: First year phys and calculus, Math 216. Physics majors must take 253L with this course. Recommended for students in Honours programmes. This course forms a basis for the understanding of most of today's electronic and electrical technology.

Phys 253L W,S 3L 0.25

Electricity and Magnetism Laboratory
For students taking Phys 253. Lab alternate weeks.

Phys 254 F 3C 0.5

Thermal Physics and Properties of Matter
An introductory course in properties of matter, kinetic theory and heat; includes elasticity, fluid mechanics, viscosity, diffusion, kinetic theory of gases, transport properties, temperature and heat, thermodynamics, heat engines.
Prereq: First year phys and calculus. Recommended for students in Honours programmes.
Phys 255  W,S  3C  0.5
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, Schrödinger 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  0.5
Wave Motion and Optics
An introductory course in wave motion and optics; includes wave functions, the wave equation and wave speeds, superposition, energy density, standing waves, Fourier analysis, modulation and detection, Doppler shift, interference, diffraction, resolution of optical instruments, polarization.
Prereq: First year phys and calculus. Physics majors must take 256L with this course. Recommended for students in Honours programmes.

Phys 256L  F  3L  0.25
Optics Laboratory
For students taking Phys 256. Lab alternate weeks.

Phys 259  W,S  3C  0.5
Crystallography and X-Ray Diffraction
Space lattices, symmetry, crystal structure, crystal geometry and stereographic projections. Electronic structure of atoms and atomic bonding in solids. Theory of X-ray diffraction, X-ray methods and the reciprocal lattice. Crystal formation, crystal defects and physical properties of crystals.
Prereq: First year phys and calculus. Coreq: Phys 259L

Phys 259L  W,S  3L  0.25
Crystallography and X-Ray Diffraction Laboratory
For students taking Phys 259. Lab alternate weeks.

Phys 270  F  3L  0.25
Laboratory
Further experiments in optics and properties of matter, for students taking Phys 256L. Lab alternate weeks.

Phys 271  W,S  3L  0.25
Laboratory
Further experiments in electricity, magnetism and properties of matter, for students taking Phys 253L.

Phys 301  F  3C  0.5
Physical Techniques for Biologists 1
Visible, UV, dark field, phase, interference, polarizing and fluorescence microscopy; electron microscopy; visible and UV spectroscopy; polarography; pH and ion electrodes; osmometers; densitometers; radioactive tracers and counters; introductory electronics; data analysis.
Prereq: First year phys. Physics students may not take this course for credit.

Phys 302  W  3C  0.5
Physical Techniques for Biologists 2
Infrared, Roman and fluorescence spectroscopy; nuclear magnetic and electron paramagnetic resonance spectroscopy; optical rotary dispersion and circular dichroism; X-ray diffraction; chromatography and electrophoresis; differential scanning calorimetry; ultra centrifugation; flame photometry; X-ray and atomic absorption spectroscopy; cell counting, cyt fluorometry and cell viability.
Prereq: First year physics. Physics students may not take this course for credit.

Phys 324  F  3C  0.5
Atomic and Nuclear Physics 1
Fundamentals of modern physics, special theory of relativity, quantization of electromagnetic radiation, wave properties of particles, the hydrogen atom.

Phys 325  W  3C  0.5
Atomic and Nuclear Physics 2
Many electron atoms, atomic and X-ray spectra, nuclear structure, nuclear reactions, molecular and solid state physics.
Prereq: Phys 324. Recommended for students in General programmes.

Phys 350  F  3C  0.5
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  0.5  
Astrophysics 2  
**Prereq:** None, however, familiarity with the contents of Phys 250-251 will be assumed. For third and fourth year students.

**Note**  
Phys 449, Phys 451, are also open to third and fourth year students. Phys 350 alternates with Phys 451 and Phys 351 alternates with Phys 449.

Phys 352  F,S  3C  0.5  
Electronics 1  
A brief introduction to modern electronics including a discussion of semiconductors and solid state components. Basic electronic circuits including power supplies and amplifiers.  
**Prereq:** Phys 122 or 243.  
**Coreq:** Phys 352L

Phys 352L  F,S  3L  0.25  
Electronics 1 Laboratory  
For students taking Phys 352.  
Lab alternate weeks.

Phys 353  W  3C  0.5  
Electronics 2  
A continuation of the study of electronic circuits. Introduction to simple digital circuits. Commonly used analogue and digital instruments.  
**Prereq:** Phys 352.  
**Coreq:** 353L

Phys 353L  W  3L  0.25  
Electronics 2 Laboratory  
For students taking Phys 353.  
Lab alternate weeks.

Phys 354  F,S  3C  0.5  
Atomic and Molecular Physics  
The Schrödinger equation applied to simple one-and three-dimension potentials, hydrogen atoms, angular momentum and spin, molecular vibrations and rotations, many electron atoms, radiation processes.  
**Prereq:** Phys 255.

Phys 355  W  3C  0.5  
Nuclear and Particle Physics  
Nuclear structure, interactions of nuclear radiations with matter, radioactive decay, nuclear reactions, nuclear force, elementary particles.  
**Prereq:** Phys 255.

Phys 358  F,S  3C  0.5  
Thermodynamics  
Thermodynamic systems, equation of state, the laws of thermodynamics with applications. Change of phase.  
**Prereq:** Math 213a-213b and a first year phys course.

Phys 359  W  3C  0.5  
Statistical Mechanics  
**Prereq:** Phys 358

Phys 360A  F,S  3L  0.25  
Intermediate Laboratory  
Selected experiments in mechanics, atomic physics, solid state physics, optics and electronics.  
**18 hours of experiments**

Phys 360B  W  3L  0.25  
Intermediate Laboratory  
Continuation of 360A.  
**18 hours of experiments**

Phys 362  F,S  3C  0.5  
Classical Mechanics 1  
Formal structure of classical mechanics with simple applications: foundations of Newtonian mechanics, dynamics of particles and systems of particles, linear oscillations, variational methods, Hamilton's Principle, Lagrangian and Hamiltonian dynamics.  
**Prereq:** First year phys, Math 113, 213a-213b and 216.  
This course is primarily intended for Hons. Phys students.

Phys 363  W  3C  0.5  
Classical Mechanics 2  
Application of the methods of classical mechanics to central force motion, nonlinear oscillations, two-particle collisions, motion in noninertial frames, rigid body rotation, coupled oscillations.  
**Prereq:** Phys 362.  
This course is primarily intended for Hons. Phys students.

Phys 364  F,S  3C  0.5  
Mathematical Physics 1  
Vector analysis and applications. Vector operators using curvilinear coordinates. Cartesian tensors. Inertia tensor; stress, strain and rate of strain tensors. Applications to elasticity, fluids, electromagnetism and relativity.  
**Prereq:** Math 213a-213b and 216.  
This course is primarily intended for Hons. Phys students.
Phys 365  W  3C  0.5
Mathematical Physics 2
Fourier series, integral and transform with applications. Use of the Laplace transform in physics. Partial differential equations of mathematical physics. Separation of variables. Bessel and Legendre functions with application. Sturm-Liouville theory. Other special functions. **Prereq:** Math 213a-213b and 216. **This course is primarily intended for Hons. Phys students.**

Phys 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 Earth 368). **Prereq:** First year phys and calculus.

Phys 369  W  3C  0.5
Geophysics 2
The geology of the ocean basins. Topics in physical oceanography. Physical properties of ocean water, heat budget of the world oceans. Oceanic circulations. Coriolis effects. Some idealized current regimes. (Identical to Earth 369). **Prereq:** First year phys and calculus

Phys 371A  F,S  3L  0.25
Intermediate Laboratory
Further experiments in atomic, nuclear and solid state physics, optics and electronics. For honours students who are taking Phys 360A. **18 hours experiments**

Phys 371B  W  3L  0.25
Intermediate Laboratory
Continuation of 371A. For honours students who are taking Phys 360B. **18 hours experiments**

Phys 380  F  3C  0.5
Molecular Biophysics
Macromolecular structure and function, weak interactions, DNA replication, protein synthesis, energy production, photosynthesis, control of intracellular processes, structure of viruses; physical techniques.

Phys 381  W  3C  0.5
Cell Biophysics
Structure and function of cellular membranes and organelles, membrane potentials and ion transport, nerve conduction, muscle contraction, vision and interaction of light with cells intercellular communication, growth control.

Phys 362  W  3C  0.5
Physics of Solid State Devices
The theories of solid state physics are applied to explain the operation and use of several modern electronic devices, including the p-n junction, transistors, thyristors, tunnel diodes, field effect devices, optical devices, etc. **Prereq:** Phys 435

Phys 433  Y  6L  1.0
Experimental Research Project
An experimental research project. This course is designed for students in the Honours Physics 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  3C  0.5
Introductory Quantum Mechanics
Origins and necessity for quantum mechanics and its concepts and formulation. The Hamiltonian operator and Schrödinger's equation, the harmonic oscillator (Schrödinger's treatment). The uncertainty principle. Momentum representation. One dimensional potential problems. Angular momentum. The hydrogen atom. **Prereq:** Phys 354

Phys 434B  W  3C  0.5
Quantum Mechanics

**Note**
**Phys 434B is strongly recommended for students intending to do graduate work.**

Phys 435  F  3C  0.5
Solid State Physics
Introductory concepts in crystal diffraction and the reciprocal lattice. Crystal bonding, lattice vibrations, thermal properties of insulators, free-electron theory of metals, band theory, semiconductors. **Prereq:** Phys 255
Phys 437A  F,W  3R  0.5
Theoretical Physics Project
Selected subjects for advanced study by theoretically inclined students, topics in relativistic, quantum, and statistical physics. Fall term enrolment will be limited. Students in the regular Hons Phys programme must take either Phys 437A 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 437B  W  3R  0.5
Continued Theoretical Physics Project
A continuation and extension of the project initiated in Phys 437A. Available only to those students who have satisfactorily completed that portion of the project contained in Phys 437A in the immediately preceding term.

Note
Students intending to take both Phys 437A and 437B must register for both courses, and have their registration approved by the Theoretical Physics Project co-ordinator, at the start of the Fall term.

Phys 441  Y  3C  1.0
Electromagnetic Theory
A generalized treatment of the basic laws of electricity and magnetism, mathematical techniques for the problems of electrostatics, solution of Maxwell's equations in free space and the study of plane waves, theory of waveguides and introduction to radiation.
Prereq: Phys 222-223 or Phys 253, Phys 364-365.

Phys 442  W  3C  0.5
Structure of Solids
A survey with emphasis on the physical properties and behaviour of metals and alloys. Elastic and plastic deformations of crystals. Solidification, structure of alloys, free energy of alloy systems, equilibrium diagrams, diffusion, solid state phase transformations.
Prereq: Phys 435

Phys 443  F  3C  0.5
Continuum Mechanics
Prereq: Phys 364-365

Phys 444  W  3C  0.5
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  W  3C  0.5
Modern Optics
Prereq: Phys 256, 354 or equivalents.

Phys 449  W,S  3C  0.5
Radio Astronomy
Radio telescopes. Radio sources including the sun. H II regions, H I regions. The galactic centre, pulsars, quasars, other extragalactic sources, cosmological implications.
Prereq: Phys 223 and Phys 250-251

Phys 450  F  3C  0.5
Astrophysics 3
Solar system astrophysics (excluding the sun). The physical nature of planetary (and satellite) surfaces, atmospheres and interiors. Asteroids, meteorites and comets. The interplanetary medium (solar wind). Solar interactions with the interplanetary medium and earth's magnetosphere.
Prereq: none, however, familiarity with the contents of Phys 250-251 will be assumed.

Phys 451  F  3C  0.5
Astrophysics 4
The structure of stellar interiors, nuclear reactions and energy sources in the stars of the main sequence, early evolution of stars from the main sequence. Lifetimes of the stars.
Prereq: None, however, familiarity with the contents of Phys 250-251 will be assumed.

Note
Phys 350, Phys 351 are also open to third and fourth year students. Phys 350 and Phys 351 are offered in alternate years to Phys 449 and Phys 451.

Phys 452  F  2C,3L  0.5
Electronics 3
This course is meant to be of practical use to the experimentalist. Fundamental and advanced concepts of digital systems presented in terms of modern techniques. A brief treatment of microprocessors and minicomputers.
Prereq: Phys 352-353.
Phys 453 W 3C 0.5
**Electronics 4**
A variety of topics in the operation of systems. Transistors, modern circuit techniques, noise, stability under feedback, information theory, and possible student motivated topics. Includes laboratory demonstrations.
*Prereq: Phys 352-353*

Phys 464 F 3C 0.5
**Mathematical Physics 3**
Applications to Physics of the theory of functions of a complex variable.
*Prereq: Phys 364-365*

Phys 465 W 3C 0.5
**Mathematical Physics 4**
*Prereq: Phys 464*

Phys 480 F 3C 0.5
**Radiation Biophysics**
The effect of radiation of various kinds on cells and tissues, exposure calculations, mechanism of damage, repair theories, genetic effect, target theory, isotopic tracers in biophysical research.

Phys 481 W 3C 0.5
**Biophysics of Organ Systems**
Physics of hemeostasis, interactions with the environment, circulation of blood, temperature regulation, respiration, transport problems and special organ systems.

Phys 482 W 3C 0.5
**Biophysics of Nervous Systems**
Neurons; nerve conduction, sensory transducers; coding, processing and storage of information; control of muscles and other effector organs. 
*Recommended for third or fourth year students in Math, Eng, Sci or HKLS.*

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**Department of Political Science**

*Assistant Professor, Chairman of the Department*
R. J. Williams, BA, MA (McMaster), PhD (Toronto)

*Professors*
I. L. Campbell, BA (Carleton), MSc (London) R
J. E. Kersell, BA, MA (Queen’s), PhD (London)
(On leave 1980-81)
T. H. Qualter, BA (New Zealand), PhD (London)
(On leave 1980-81)
J. M. Wilson, BA, MA (Toronto)

*Associate Professors*
J. D. Fraser, BA (Cambridge), PhD (Leicester)
A. Kapur, BA (Punjab), MA (George Washington), PhD (Carleton)
A. D. Nelson, AB, AM, PhD (Chicago)

*Assistant Professors*
T. J. Downey, BA (Waterloo), MA, PhD (W. Ont.)
_Undergraduate Officer_
J. J. Jorgensen, BA, MA (North Carolina), PhD (McGill)
J. E. Surich, BA, MA (Waterloo)
R. P. Woolstencroft, BA, PhD (Alberta),
_Co-op Officer_

*Lecturers*
S. D. Burt, BA, MA (Waterloo)
W. B. Moul, BA, MA (Br. Col.)

*Adjunct Professors*
D. R. Gordon, BA (Queen’s), MA (Toronto)
W. W. Johnston, BA (Memorial), LLB (Queen’s)
W. J. Morrison, BA (W. Ont.), LLB (Osgoode)

**Course Descriptions**

*Note*
Extensive descriptions of the content of Political Science courses are available in the Department at the time of pre-registration.

P Sci 101 F 0.5
**Introduction to Politics 1**
An introduction to the nature of politics and to the conflict of modern political ideas. The course involves a common lecture series and tutorials led by faculty members.

*Note*
Political Science 102 consists of a series of courses dealing with different aspects of politics. Students should select the course which most closely corresponds to their interests.
Course Descriptions
Political Science

P Sci 102A W 2C 0.5
Imperialism in International Relations
A discussion of the idea of imperialism in ancient and modern international relation, the causes and motives of imperialism, changes in imperial strategies, and the difference between the 'old' and the 'new' imperialism.

P Sci 102C W 0.5
Politics in Action
An examination of the way in which society's conflicting demands are organized, articulated, and translated in action. The part played by the various political and economic forces in society will be examined in a comparative framework.

P Sci 102D W 0.5
The Political Process in the Modern Democracies
A study of power and influence in the modern democracies, based on an examination of three contending models in the political process – the liberal-democratic or popular rule model, the pluralist model, and the elitist model.

P Sci 102E W 0.5
Political Rights and Obligations
An introductory examination of the idea of individual rights as a limitation on legitimate governmental authority, the possible grounds for such claimed rights, and their relationship to political obligations (duties).

P Sci 102F Citizen Participation in Canada
Not offered 1980-81

P Sci 102K W 0.5
Mass Political Violence
A distinctive social feature of our century is the amount of political violence. Man-made deaths number approximately one hundred-million. This course will describe and evaluate various theories of political violence.

P Sci 102M W,S 0.5
Contemporary Issues in Canadian Public Policy
An evaluation of various public policy responses to some contemporary Canadian social, cultural, economic, environmental, and political problems, as well as the process of policy-making.

P Sci 214 2C,1L 0.5
Quantitative Analysis
An introduction to the use of quantitative methods in Political Science. Only a rudimentary understanding of mathematics is required. 
Prereq: Second year standing

P Sci 225 F 2C,1T 0.5
The History of Political Theory 1
A survey of the principal ideas of Western political theorists from the earliest times to the seventeenth century.
Prereq: Second year standing

P Sci 226 W 2C,1T 0.5
The History of Political Theory 2
A survey of the principal ideas of Western political theorists since the seventeenth century.
Prereq: Second year standing

P Sci 253 F 2C 0.5
Comparative Communism 1
An examination of the historical development of the communist international system, the cause of its diversity and doctrinal variety, with emphasis on common problems and the role of ruling parties, their objectives, performance, and strategy.
Prereq: Second year standing

P Sci 254 W 2C 0.5
Comparative Communism 2
This course will concentrate on contemporary issues in communist politics, examining selected ruling and non-ruling communist parties.
Prereq: Political Science 253 or Consent of the Instructor

P Sci 260 Y 2C,1D 1.0
Canadian Government and Politics
An analysis of the structure and practices of the Canadian political system.
Prereq: Second year standing

P Sci 260A F,S 2C,1D 0.5
Canadian Government and Politics 1
The first half of P Sci 260, for students in co-operative programmes only.
No prereq for students in the second year and above

P Sci 260B W 2C,1D 0.5
Canadian Government and Politics 2
The second half of P Sci 260, for students in co-operative programmes only.
Prereq: P Sci 260A or consent of instructor

P Sci 264 F,W 2C 0.5
American Government and Politics
The theory and practice of the American political system as revealed by the institutions and operations of American national government.
No prereq for students in the second year and above
Course Descriptions
Political Science

P Sci 268  2C,1T  0.5
British Government and Politics
An examination of the uniquely British characteristics of the British political system.
No prerequisite for students in the second year or above

P Sci 271  F  2C,1L  0.5
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 prerequisite for students in the second year and above

P Sci 272  W  2C,1L  0.5
Political Behaviour 2
An examination of the political attitudes and behaviour of men and women in different political systems.
Prerequisite: P Sci 271 or consent of instructor

P Sci 281  F  2C  0.5
International Politics 1
This course studies the transformation of the international system stressing East-West, Rich-Poor, and North-South perspectives and interactions.
No prerequisite for students in the second year and above

P Sci 282  W  2C  0.5
International Politics 2
This course studies the roots of foreign policy behaviour of selected western and non-western (particularly Asian) states.
Prerequisite: P Sci 281 or consent of instructor

P Sci 291  F,S  3C  0.5
The Canadian Legal Process
An analysis of the manner in which the Common Law functions, together with an examination of the structure and jurisdiction of the Canadian court systems. Taught by a member of the legal profession.
Prerequisite: Open to all students in the second year and above

P Sci 292  W  3C  0.5
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.
Prerequisite: Open to all students in the second year and above

P Sci 293  F  L/S3  0.5
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 prerequisite for students in the second year and above

P Sci 311  0.5
Methodology of Political Science: The Foundations
A selective examination of seminal works which have contributed to our understanding of the methods appropriate to the study of politics. Not a survey course.
Prerequisite: Consent of the instructor

P Sci 312  2C,2L  0.5
Approaches to Survey Analysis in Political Science
This course introduces students with previous experience in statistical methods to the special problems associated with the analysis of the nominal data collected in surveys.
Prerequisite: P Sci 214

P Sci 315  0.5
Research Design in Political Science
Introduction to the logic and limitations of experimental and non-experimental research designs. Selected studies of politics are examined to demonstrate how plausible threats to validity are made less plausible with appropriate design and data analysis.
Prerequisite: P Sci 214 or consent of instructor

P Sci 321  F  2S  0.5
Marxist Theory
An examination of the formation of Marx's method and of its significance for the proletariat.
No prerequisite for students in the third year and above

P Sci 322  0.5
Marxism and Revolution After Marx
A selective study of developments in Marxist theory and political movements after Marx.
Prerequisite: P Sci 321

P Sci 323  0.5
Ancient Political Philosophy
A selective examination of political philosophy during the classical period in Greece.
Prerequisite: Consent of the instructor

P Sci 324  0.5
Modern Political Philosophy
A selective examination of political philosophy in the modern period.
Prerequisite: Consent of instructor
P Sci 325 W 2S 0.5
Radical Political Theory
A discussion of non-marxian political ideas such as social gospel, populism, fascism and Fabian socialism, and their socio-economic roots and sources.
Prereq: Consent of the instructor

P Sci 327 0.5
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

P Sci 331 F 2C 0.5
Public Administration 1
An introduction to the principles of public administration illustrated by the study of Canadian institutions largely at the federal level, but including provincial and municipal examples.
Prereq: P Sci 260 or consent of instructor

P Sci 332 W,S 2S 0.5
Public Administration 2
Analyses of problems and issues in the field applying the knowledge gained in P Sci 331.
Prereq: P Sci 331 or consent of instructor

P Sci 341 F 2C,1S,1L 0.5
Provincial Politics
A comparative analysis of the political systems of the Canadian provinces which explores the possibility that as many as ten political cultures exist in Canada.
Prereq: P Sci 260

P Sci 342 W 2C 0.5
Politics in Quebec
A seminar dealing with the political and social development of Quebec. The emphasis will be on the problems and issues of contemporary Quebec.
Prereq: P Sci 260 or 341 or consent of instructor

P Sci 343 F 2C 0.5
Canadian Municipal Government
A study of the assumptions, structures, and performance of municipal government in Canada with reference to metropolitan and regional structural innovations (particularly in Ontario). Open to students in the third year and above with at least one previous course in Political Science.

P Sci 344 W,S 2C,1T 0.5
The Politics of Local Government
A study of the political process in selected Canadian cities focusing on citizen participation, internal decision-making, leadership, and the allocation of power.
Prereq: P Sci 343 or consent of instructor

P Sci 350 Y 3C 1.0
The Politics of the Developing Areas
An examination of selected topics in the politics of developing areas, with emphasis on the theoretical and empirical adequacy of explanations of macro and micro political and economic change in Asia, Africa and Latin America.
No prereq for students in the third year or above

P Sci 350A F 3C 0.5
The Politics of the Developing Areas 1
The first half of P Sci 350.
No prereq for students in the third year or above

P Sci 350B W,S 3C 0.5
The Politics of the Developing Areas 2
The second half of P Sci 350. May be taken separately.
No prereq for students in the third year or above

P Sci 351 2S 0.5
Comparative Federal Systems
A comparative examination of federal systems, with an emphasis on the problems and processes of integration and disintegration.
Prereq: Consent of the instructor

P Sci 352 F 3S 0.5
Comparative Legislative Systems
A comparison of the institutional and behavioural characteristics of legislatures in a comparative framework, with emphasis on Canada, the United States, Great Britain, and Australia.
Prereq: Consent of the instructor

P Sci 356 F 2S 0.5
Soviet Government and Politics
An intensive survey of the development of Soviet political structures with analysis of the relative influence of ideological goals on the one hand and social forces on the other.
Prereq: P Sci 253-254 or consent of instructor

P Sci 364 0.5
Politics in Italy
An examination of the social, economic, and ideological forces underlying contemporary politics in Italy.
Prereq: Consent of the instructor.
P Sci 371 W 2S 0.5
Political Culture
An analysis of the development of the concept of political culture as an analytical tool.
Prereq: P Sci 271/272 or consent of instructor.

P Sci 273 0.5
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 adaption and the dilemma of principles versus power.
Prereq: At least one of P Sci 260, 262, 264, 268, 271, or 272.

P Sci 374 F 2S 0.5
Interest Group Politics
A study of interest group theory and comparative analysis of the internal politics of interest groups and their role in the political process.
Prereq: At least one of P Sci 260, 262, 264, 268, 271, or 272.

P Sci 380 Y 1.0
World Politics
An examination of the structure or institutional arrangements of global society and their interrelationships 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 380A F 0.5
World Politics 1
The first half of P Sci 380.
Open only to students in the third year and above.

P Sci 380B W 0.5
World Politics 2
The second half of P Sci 380.
Open only to students in the third year and above.

P Sci 390-398 0.5 each
Special Studies
From time to time courses of special study may be added to the programme at the third year level. Students wishing to add such courses should consult the Department's Undergraduate Officer.

P Sci 411 F 3S 0.5
Theories and Methods of Political Science
An examination and evaluation of explanations of political phenomena with the emphasis upon the criteria with which to compare competing theories and the methods of analysis which are appropriate to a given problem.
Prereq: Fourth year honours standing and consent of instructor.

P Sci 424 0.5
Contemporary Socialist and Communist Thought
This course examines recent trends in Marxist theory and its contribution to the analysis of capitalist and socialist societies.
Prereq: Consent of instructor.

P Sci 425 English Political Theory of the Nineteenth Century
Not offered 1980-81.

P Sci 426 0.5
Selected Subjects in Political Philosophy
A selective treatment of basic themes in political philosophy in the modern and pre-modern periods.
For third year Political Science students, but open to others with prereq P Sci 221, 222, 323 or 324, or consent of instructor.

P Sci 427 F 0.5
Special Topics in Political Philosophy
A selective examination of basic problems in political philosophy in the modern and pre-modern periods.
Prereq: Consent of the instructor.

P Sci 435 W 2S 0.5
The Politics of Canadian Resource Development
A seminar focussing on the strategies of resource development policies, with an emphasis on the economic, political, environmental and cultural implications of oil, natural gas, and mineral exploitation.
Prereq: Consent of instructor.

P Sci 436 W, S 2S 0.5
Comparative Public Policy
A comparative examination of public policy and approaches to the study of public policy, with case studies from Germany, Britain, France, Sweden, Canada, the United States and India.
Prereq: Consent of the instructor.

P Sci 442 W 3S 0.5
Politics in Ontario
A critical examination of the distinctive elements of government and politics in the Province of Ontario.
Prereq: P Sci 260 or 341 or consent of the instructor.
Course Descriptions
Political Science

P Sci 443 2S 0.5
Politics in Western Canada
A critical examination of the distinctive elements of government and politics in the provinces of Manitoba, Saskatchewan, Alberta, and British Columbia.
Prereq: P Sci 260 or 341 or consent of instructor. Alternates with P Sci 445.

P Sci 445 0.5
Politics in the Atlantic Provinces
A critical examination of the distinctive elements of government and politics in the provinces of Newfoundland, Prince Edward Island, Nova Scotia, and New Brunswick.

P Sci 451 0.5
Comparative Parliamentary Systems
An analytical comparison of parliamentary institutions and processes as they have developed in various political systems influenced by Britain.
Prereq: P Sci 251 or consent of instructor.

P Sci 453 F 3S 0.5
Problems in Comparative Politics 1
A critical examination of contending approaches to the study of comparative politics.
Prereq: Consent of the instructor.

P Sci 454 W 3S 0.5
Problems in Comparative Politics 2
A critical examination of selected topics in the politics of Western Europe.
Prereq: P Sci 453.

P Sci 461 F 2C,1S 0.5
Problems in Canadian Politics 1
A critical examination of various problems of Canadian politics, with an emphasis on political integration, federalism and political parties.
Prereq: Consent of the instructor.

P Sci 462 0.5
Problems in Canadian Politics 2
A senior research course on selected aspects of Canadian political life, with emphasis on the preparation of a major and original research paper. For fourth year Political Science students but open to others with prereq P Sci 461.

P Sci 471 2S 0.5
Public Opinion and Propaganda
Not offered 1980-81.

P Sci 473 2S 0.5
Voting Behaviour
Prereq: P Sci 214, 373 or consent of instructor.

P Sci 475 F 2S 0.5
Political Socialization
A study of the processes and agents of political socialization and their effects on political stability or change in liberal-democratic societies.
Prereq: Consent of the instructor.

P Sci 476 W 0.5
Research Seminar in Political Behaviour
A research-oriented seminar on selected theoretical works in political behaviour, with an emphasis on the development of research projects dealing with Canadian topics.
Prereq: Consent of the instructor.

P Sci 479 2S 0.5
Senior Research Seminar: Violence in the Political Process
Politics can be brutal. This seminar deals with violence in the political process. The focus is on the relationships between the society and the coercive apparatus of the state.
Prereq: Third or Fourth Year standing.

P Sci 481 F 2S 0.5
Research Seminar on World Politics
An examination of research on the causes and consequences of interstate warfare.
Prereq: P Sci 380 or consent of instructor.

P Sci 483 F 3S 0.5
Comparative Foreign Relations 1
This focuses on the theoretical literature dealing with (1) the nature of the international system, and (2) various approaches to the study of foreign policy with a particular emphasis on decision-making and bargaining.
Prereq: Consent of the instructor only.

P Sci 484 W 3S 0.5
Comparative Foreign Relations 2
This seeks to apply some of the aforesaid theories to specific case studies drawn from great, middle and small powers. The choice of countries will depend essentially on students' interests.
Prereq: Consent of the instructor only.
Course Descriptions
Psychology

P Sci 486 F 3S 0.5
Middle Powers and World Politics
The course studies the literature on middle powers (including Canada). Particular emphasis is on the study of self-images, views of power, of power politics, and the sources of influence of these powers.
Prereq: P Sci 281-282 or third or fourth year standing.

P Sci 490-498 0.5 each
Special Subjects
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.

P Sci 499 Y 1.0
Senior Honours Essay
Students wishing to undertake a senior honours essay in their fourth year should consult the Department's Undergraduate Officer.

Department of Psychology

Professor, Chairman of the Department
T. G. Waller, BS, MS (Southern Mississippi), PhD (Vanderbilt)

Professor, Associate Chairman Graduate Affairs
R. A. Steffy, BA (Albright), MA, PhD (Illinois)

Associate Professor, Associate Chairman Undergraduate Affairs
G. E. MacKinnon, BA (Queen's), PhD (Johns Hopkins)

Professor, Dean, Faculty of Arts
R. K. Banks, BA, MA, PhD (Toronto)

Associate Professor, Associate Dean (Undergraduate Affairs), Faculty of Arts
G. A. Griffin, BA (Colgate), MA, PhD (Wisconsin), Recipient of the Distinguished Teacher Award

Professors
G. A. Barnard, BA, MA (Cambridge), PhD, DSc (London)
K. S. Bowers, BA, PhD (Illinois)
M. Breidenbaugh, BA (Wittenberg), PhD (Vienna)
M. P. Bryden, BS (MIT), MSc, PhD (McGill)
W. C. Corning, BA (Heidelberg), PhD (Rochester)
D. P. Crowne, BA (Antioch College), EdM (Rochester), PhD (Purdue)
J. A. Dyal, BA (Oklahoma), PhD (Illinois)
C. K. Knapper, BA (Sheffield), PhD (Sask.)
H. M. Lefcourt, BA (Antioch), MA, PhD (Ohio State)
M. J. Lerner, BA, MA (Ohio State), PhD (New York)
R. G. Marteniuk, BPE, MA (Alberta), EdD (California)
D. Meichenbaum, AB (City College of New York), MA, PhD (Illinois)
P. M. Merikle, BA (Knox), MA, PhD (Virginia)
S. Reinis, MD, SCs (Charles)
P. M. Rowe, BA (Toronto), MA (Dalhousie), PhD (McGill)
D. A. Sprott, BA, MA, PhD (Toronto), FSS
M. D. Vogel-Sprott, BA (McMaster), MA, PhD (Toronto)
M. P. Zanna, BA, PhD (Yale)
Course Descriptions

Psychology

Associate Professors
R. J. Alapack#, BA (Scranton), MA, PhD (Duquesne)
D. M. Amoroso, BA, MA (Toronto), PhD (Waterloo)
J. M. Anglin, BA (Toronto), PhD (Harvard)
R. F. Asarnow, BS (Rutgers), MA, PhD (Illinois)
T. E. Cadell, BA (Br. Col.), MA (Massachusetts), PhD (Wisconsin)
J. A. Cheyne, BA (WLU), MA, PhD (Waterloo)
J. M. Cornell, BA, MS, PhD (Washington)
J. G. Holmes, BA, MA (Carleton), PhD (North Carolina)
P. J. Naus#, BA, PhD (Nijmegen)
J. E. Orlando#, BA (W. Ont.), MA (Detroit), MA, PhD (Michigan)
H. Ross, BA (Toronto), PhD (North Carolina)
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. Thysell#, BA (Montana), MA, PhD (Iowa)
D. M. Willows, BA (Manitoba), PhD (Waterloo)
D. L. Wahlsten, BS (Alma College), PhD (California, Irvine)
E. E. Ware, BA, MA (Richmond), PhD (Illinois)

Assistant Professors
F. A. Allard#, BA, BPE, MA, PhD (Waterloo)
P. E. Bowers, BA (Rosemont), MA, PhD (Illinois)
N. Charness, BA (McGill), MS, PhD (Carnegie-Melion)
R. H. Lahue#, BSc (Fordham), PhD (Waterloo)
T. J. Lottman#, BS, MA (Xavier), PhD (Loyola of Chicago)
J. A. Van Evra#, BA (Valparaiso), MA (Bowling Green), PhD (Michigan State)

Adjunct Professors
J. R. Amdur, BS (Portland State), MA, PhD (Denver)
D. S. Barnes, BA, MD (W. Ont.)
B. S. Francis, BS (Ursinus), MA, PhD (Arizona)
J. J. Hartford, MD (Toronto)
E. S. Lucy, BA (Hobart)
P. L. Ritchie, BA (McGill), PhD (Duke)
G. Sumner-Smith, MRCVS, BVSc (Liverpool), FR-CVS, MSc (Guelph)
J. L. Williams#, BA, MA (Alberta), PhD (Missouri)

Lecturer
J. Theis#, BA (W. Ont.), MA (Notre Dame)

Faculty members holding cross appointments as shown:
Sociology
Statistics
Kinesiology
Counselling Services
Environmental Studies
Renison College
St. Jerome's College

Course Descriptions

Psych 101  F,W,S  3C  0.5
Introductory Psychology
A general survey course designed to provide the student with an understanding of the basic concepts and techniques of modern psychology as a behavioural science.
Also offered at Renison and St. Jerome's Colleges

Psych 102  F,W,S  3C  0.5
Introductory Psychology Special Topics
A study in greater depth of selected broad issues and problems introduced in Psychology 101.
Also offered at Renison and St. Jerome's Colleges

Psych 102A
Applied Psychology
Applications of Psychological research to contemporary problems: man and environment, human factors engineering, management and organizations, crime and violence, and public health.

Psych 102B
Nature, Nurture and Human Behaviour
The role of heredity and environment in the development of intelligence, personality and personality disorders, and conflict and aggression.

Psych 102C
Culture's Influence on Behaviour
The role of culture on the development of Percepcion, Cognition, Learning, and memory; cultural influences on personality and personality disorders, and on conflict and aggression.

Psych 102D
Psychology of Consciousness
Modes of thinking, emotion, creativity, and altered states of consciousness.

Psych 200  F,W  3C,1L  0.5
Measurement in Psychology
The logic of measurement in Psychology. Descriptive procedures for collecting and handling data. Making inferences from test scores. The use of correlational procedures in measuring intelligence, achievement, aptitudes, interests and personality.

Psych 201  F,W  3C,1T  0.5
Statistical Methods in Psychology
An introduction to data analysis. Topics covered include descriptive statistics and the logic and methods of inferential statistics with emphasis on applications in psychology. Little mathematics background is assumed.
Psych 202  W  3C,1T  0.5
Experimental Design
An examination of the effective use and interpretation of statistics in design and understanding of experiments in the social sciences.  
Prereq: Psych 201

Psych 203  F,W,S  3C  0.5
Learning and Motivation
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 204  F,W  3C  0.5
Perceptual Processes
An examination of data and theory concerning perceptual processes. Topics will include the perception of form and space, perceptual learning and a consideration of the effect of personality variables in perception.  
Prereq: Psych 101

Psych 207  F,W  3C  0.5
Cognitive Processes
An examination and evaluation of selected topics dealing with human learning, thinking, concept formation, memory and language.  
Prereq: Psych 101

Psych 211  F,W,S  3C  0.5
Development Psychology
An examination of the process and factors of human development.  
Prereq: Psych 101  
Also offered at St. Jerome's College

Psych 212  F,W,S  3C  0.5
Educational Psychology
A consideration of the main variables affecting learning in the classroom with special focus upon the conditions essential to efficient learning.  
Prereq: Psych 101  
Also offered at St. Jerome's College

Psych 213  F,W  3C  0.5
Exceptional Children
Educational problems associated with mental retardation, emotional disturbances, sensory and physical impairments and intellectual giftedness.  

Psych 214  F,W  3C  0.5
Psychology of Adolescence
A study of the psychological processes in the second decade of human development.  
Consideration is given to such areas as intellectual, emotional and social growth, and identity formation. Current concepts, issues, and research are stressed.  
Prereq: Psych 211  
Also offered at St. Jerome's College

Psych 218  F,W  3C  0.5
Aging, Dying and Death
An examination of the psychological aspects of aging and the traditional and recent literature relating to various views on the reality of death in the life of man. Therapy with dying individuals are reviewed and evaluated.  
Prereq: Psych 101  
Offered at St. Jerome's College

Psych 231  F  3C  0.5
Psychology of Religious Experience
Approaches of traditional psychological theories and especially of a modern psychology of consciousness toward phenomena of religious experience, mysticism and meditation are examined. The transcendent phenomena are compared with other altered states of consciousness.  
Prereq: Psych 101  
Offered at St. Jerome's College

Psych 236  F,W  3C  0.5
A Psychological Analysis of Human Sexuality
This course will examine psychological and social psychological theories and empirical investigations of human sexuality.  
Prereq: Psych 101 or permission of instructor  
Offered at St. Jerome's College

Psych 253  F,W,S  3C  0.5
Social Psychology
An introduction to theories and research on people in their physical and social environment. Typically, topics such as conformity, persuasion, attraction, prejudice, communication, aggression, the psychology of freedom, justice and human exchange will be introduced.  
Prereq: Psych 101  
Cross-listed as Psych 220R

Psych 254  W  3C  0.5
Interpersonal Relations
A psychological analysis of social interaction. The development of interpersonal attraction from first impressions to long-term relationships. The roots of hostility, conflict and communication problems.  
Prereq: Psych 253  
Cross-listed as Psych 221R

Psych 258  F  3C  0.5
Principles and Evolution of Psychoanalytic Thought
This course expresses the fundamental psychoanalytic vision as articulated by Sigmund Freud, and its relevance to the humanities. The theme is to understand the potentially liberating spirit which is at the root of psychoanalysis.  
Prereq: Psych 101  
Offered at St. Jerome's College
Psych 261  F,W  3C  0.5  
**Physiological Psychology**
The structure and function of the nervous system and their relation to behaviour.
Prereq: Psych 101 or permission of instructor

Psych 271  F,W  3C  0.5  
**Animal Behaviour**
An in-depth study of the behaviour of animals emphasizing both observational and experimental research.
Prereq: Psych 101 or permission of instructor

Psych 293  F,W  2C,2L  0.5  
**Research in Learning and Motivation**
Open only to students in a Psychology Programme (Honours, Joint Honours, General or Minor Programmes).
Prereq: Psych 201 and one of Psych 203 or 271

Psych 295  F,W  2C,2L  0.5  
**Research in Perceptual and Cognitive Processes**
Open only to students in a Psychology Programme (Honours, Joint Honours, General or Minor Programmes).
Prereq: Psych 201 and one of Psych 206 or 207

Psych 301  F,W  3C,1T  0.5  
**Tests and Measurement**
An introduction to the theory and use of psychological tests. Special emphasis is placed on the assessment of personality, intelligence, aptitudes and interests.
Prereq: Psych 201

Psych 305  **Sensory Processes**
Not offered 1980-81

Psych 307  **Cognitive Neurology**
Not offered 1980-81
Cross listed as Kin 456 which is offered in 1980-81

Psych 311  F,W  3C  0.5  
**Behaviour and Development of Human Infants**
The purposes of this course are to study the behaviour and development of human infants, to gain direct experience with infants, and to examine community attitudes and resources available for infant care.
Prereq: Psych 211 or permission of instructor

Psych 312  F,W,S  3C  0.5  
**Learning Disabilities**
A critical examination of the concept of learning disability and of current issues in the assessment and remediation of learning problems.
Prereq: Psych 211 or Psych 212 or Psych 213
Also offered at St. Jerome's College

Psych 316  
**Moral Development**
Not offered 1980-81

Psych 317  F,W  3C  0.5  
**The Emotionally Disturbed Child**
A review of traditional concepts, current thoughts and major research on the psychopathology of childhood. Specific attention will be given to socialization processes and educational procedures.
Prereq: Psych 211
Offered at St. Jerome's College

Psych 322  Y  2C  1.0  
**Principles and Practice in Early Childhood Education I**
Current principles of teaching preschool-aged children. An emphasis is placed on those curricula which aim to foster social and cognitive development. Topics include: characteristics and needs of children in group-care settings; classroom management; curriculum planning.
Prereq: Acceptance into the Early Childhood Education and Care Option

Psych 323  Y  3P  0.5  
**Practicum in Early Childhood Education I**
Directed supervision with young children in group settings. The course requires 3 hours of field work per week. Must be taken concurrently with Psych 322.
Prereq: Acceptance into the Early Childhood Education and Care Option

Psych 331  W  3C  0.5  
**Individual Differences**
An analysis of individual and group differences in behaviour, with emphasis on studies of intelligence.
Prereq: Psych 200 or Psych 301

Psych 333  F  3C  0.5  
**Industrial Psychology**
An introduction to the methods and problems in Industrial Psychology.
Prereq: Psych 101
Psych 334  F,W  3C  0.5

**Theories of Counselling Psychology**
An introduction to the methods, theories and problems in Counselling Psychology.
*Prereq: Psych 101*
*Also offered at Renison and St. Jerome's Colleges*

Psych 335  F,W  3C  0.5

**Personality and Behaviour Change**
Forms of psychological intervention that produce important changes in the way people think, feel and behave including psychoanalysis, behaviour therapy, brainwashing, cult conversions, deprogramming, hypnosis, biofeedback and meditation.
*Prereq: Psych 101*

Psych 339  F  3C  0.5

**Personnel Psychology**
An examination of the following major topics in personnel psychology: employment planning, selection and recruitment, selection techniques, career development, performance appraisal, training programmes, labour relations, compensations systems.
*Prereq: Psych 333*

Psych 340  Community Psychology
*Not offered 1980-81*

Psych 341  F  3C  0.5

**Psychology of Early Childhood Education**
An introduction to theories and issues in early childhood education. Topics include issues differentiating preschool programmes and application of psychological theory/research to early education.
*Prereq: Psych 211*

Psych 350  Y  3C  1.0

**Group and Individual Counselling**
The practice of counselling in terms of current psychological theories and research. The demonstration and development of these concepts are aided by personal participation, exercises, role play and videotape stimulation.
*Prereq: Psych 355, 357, and 334 or suitable alternative and permission of instructor*
*Offered at St. Jerome's College*

Psych 353  W  3C  0.5

**Aggression and Social Conflict**
This course will examine the genetic, physiological, and social causes of aggression, with the emphasis on social-psychological causes.
*Prereq: Psych 253*

Psych 354  W  3C  0.5

**Interpersonal Processes in Critical Situations**
The course will examine reactions to victims of misfortunes such as serious physical and mental illness, natural disaster, poverty and discrimination.
*Prereq: Psych 253*

Psych 355  F,W  3C  0.5

**Personality Theory**
An examination and evaluation of some of the outstanding theories of personality.
*Prereq: Psych 101*
*Cross-listed as Psych 322R*

Psych 357  F,W,S,  3C  0.5

**Psychopathology**
The nature and origin of deviant behaviour.
*Prereq: Psych 101*
*Cross-listed as Psych 323R*
*Also offered at St. Jerome's College*

Psych 359  W  3C  0.5

**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*

Psych 362(A-Z)  3C  0.5

**Special Subjects**
One or more half courses will be offered at different times as announced by the Department.
*Prereq: Consent of instructor*

Psych 370  W  3C  0.5

**Cross-Cultural Psychology**
An examination of the influence of cultural differences on perceptual-cognitive processes, personality characteristics, and psychopathology.
*Prereq: A minimum of two half courses in Psychology*

Psych 372  F  3C  0.5

**Environmental Psychology**
This course is intended to increase the awareness and understanding of the impact of the environment on human behaviour and experience. Topics to be discussed include: spacing, territoriality, crowding, subjective impressions of environments, and research paradigms.
*Prereq: Psych 101 and 201 or permission of instructor*
*Offered at St. Jerome's College*
Psych 393  F,W  2C,2L  0.5
Research in Development Psychology
Open only to students in a Psychology Programme (Honours, Joint Honours, General or Minor Programmes).
Prereq: Psych 201 and 211

Psych 395  F,W  2C,2L  0.5
Research in Social Psychology
Open only to students in a Psychology Programme (Honours, Joint Honours, General or Minor Programmes).
Prereq: Psych 201 and 253

Psych 397  F,W  2C,2L  0.5
Research in Personality and Psychopathology
Open only to students in a Psychology Programme (Honours, Joint Honours, General or Minor Programmes).
Prereq: Psych 201 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 an historical context.

Psych 422  Y  2C  1.0
Principles and Practice in Early Childhood Education II
An examination of the various aspects of planning and administration in early childhood education programmes. Topics include: practical applications of Piaget’s theory; parent education.
Prereq: Psych 322 and 323

Psych 423  Y  6P  0.5
Practicum in Early Childhood Education II
Practicum for advanced students in early childhood education. The course requires 6 hours of field work per week in preschool, kindergarten or daycare settings. Must be taken concurrently with Psychology 422.
Prereq: Psych 322 and 323

Seminars

Psych 451  F  2S  0.5
Senior Seminar in Learning
Admission by consent of instructor

Psych 452  W  2S  0.5
Senior Seminar in Perception
Admission by consent of instructor

Psych 453  F,W  2S  0.5
Senior Seminar in Development Psychology
Admission by consent of instructor

Psych 454  W  2S  0.5
Senior Seminar in Educational Psychology
Admission by consent of instructor

Psych 455  F  2S  0.5
Senior Seminar in Social Psychology
Admission by consent of instructor

Psych 456  W  2S  0.5
Senior Seminar in Personality
Admission by consent of instructor
Also offered at St. Jerome’s College

Psych 457  F,W  2S  0.5
Senior Seminar in Clinical Psychology
Admission by consent of instructor
Also offered at St. Jerome’s College

Psych 458  F  2S  0.5
Senior Seminar in Cognitive Processes
Admission by consent of instructor

Psych 459  Senior Seminar in Motivation
Not offered 1980-81

Psych 461  W  2C  0.5
Senior Seminar in Physiological Psychology
Admission by consent of instructor

Psych 462  F  2S  0.5
Senior Seminar in Animal Behaviour
Admission by consent of instructor

Psych 463 (A-Z)  2S  0.5
Senior Seminar in Special Topics
Admission by consent of instructor

Psych 464 (A-Z)  2S  0.5
Senior Seminar in Special Topics
Admission by consent of instructor

Psych 465 (A-Z)  2S  0.5
Senior Seminar in Special Topics
Admission by consent of instructor

Psych 466 (A-Z)  2S  0.5
Senior Seminar in Special Topics
Admission by consent of instructor

Psych 480  Y,M  3R  1.0
Directed Studies in Special Topics
For the student who desires to pursue a particular topic in depth through independent experimental research and/or extensive reading. A faculty member must approve a student’s project prior to registration for this course. Open to exceptional students with permission of the instructor and the Department. Also offered at St. Jerome’s College
Psych 498 Y,M R 1.0
Senior Honours Essay - Review Paper
Each student will work under the direction of a member of the department on a critical integrative review of an issue in 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

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 0.5,0.5
Introductory Psychology

Psych 220R F 3C 0.5
Social Psychology

Psych 221R W 3C 0.5
Interpersonal Interaction

Psych 322R F 3C 0.5
Personality (Personality Theory)

Psych 323R W 3C 0.5
Abnormal Psychology (Psychopathology)

Psych 367R-369R
Special Topics in Psychology

Psych 369R W 3C 0.5
Advanced Topics in Counselling Psychology

Psych 398R/399R S,F,W/S,F,W R 0.5/0.5
Independent Study
(Open to senior Social Development Studies majors only)

Department of Recreation

Associate Professor, Chairman of the Department
D. Ng, BA (Lingnan), MA (Carver), MS, ReD (Indiana)

Dean, Faculty of Human Kinetics and Leisure Studies
G. S. Kenyon, BPE (Br. Col.), MS (Indiana), PhD (New York)

Assistant Professor and Associate Chairman.
Undergraduate Affairs
R. Johnson\(^1\), BA, MA (Windsor), PhD (Minnesota)

Assistant Professor, Associate Chairman,
Graduate Affairs
S. L. Smith, BA (Wright State), MA (Ohio State), PhD (Texas A & M)

Professor
E. M. Avedon\(^2\), BBS (William and Mary), MA, EdD (Columbia)

Associate Professors
J. Levy\(^3\), BA (Wat. Luth.), BPE (Waterloo), MSW (Wat. Luth.), PhD (Waterloo)
J. Zuzanek\(^4\), CSc (Prague Institute of Sociology), PhD (Charles University, Prague)

Assistant Professors
K. S. Brown\(^4\), PhD (Waterloo)
P. Eagles, BSc (Waterloo), MSc (Guelph), PhD (Waterloo)
L. Heywood, BA (North Dakota), MA (Florida State), PhD (Wisconsin)
M. L. Hutchison, BA (Queen's), MS (Dalhousie), EdD (Boston)
W. B. Kinney, BSE (Suny Courtland), MS (Illinois), PhD (New York)
R. C. Mannell, BA (McMaster), MPE, PhD (Windsor)
G. Nogradi, BSc (Waterloo), MS, PhD (Oregon)
R. Payne, BA (Guelph), MA (New England, Australia), PhD (Calgary)

Lecturer
R. D. Graham, BA, MA (W. Ont.)

Faculty member holds cross appointment as shown:
1Geography
2Sociology
3Urban and Regional Planning
4Statistics
Course Descriptions

Rec 100  F  3C  0.5
Introduction to the Study of Leisure and Recreation
An overview of the total field of recreation emphasizing the understanding of leisure phenomena and implications for contemporary society.

Rec 101  F,W  2C,1T  0.5
Introduction to Leisure Services
An introduction to various leisure service agencies and the services provided. Field trips to municipalities, specialized institutions, and voluntary agencies.

Rec 200  F,S  3C  0.5
Theories of Play
A critical analysis of definitions, concepts and assumptions of classical, recent and modern theories of play with implications for research strategies, programming and planning for play.

Rec 201  F,S  3C  0.5
Leisure and the Social Sciences
Examination of modern methodological and theoretical approaches to the study of leisure behaviour with emphasis upon the socio-cultural, socio-psychological and economic dimensions.

Rec 204  S  3C  0.5
Leisure and Recreation in Historical Perspective
Analysis of socio-cultural determinants which have influenced Canadian Leisure behaviour. Prereq: Rec 100 or consent of instructor.

Rec 210  F,W  3C  0.5
Organization and Administration of Recreation Services
The organization and administration of recreation on federal, provincial and municipal levels; legislation, financing, budgeting, problem solving, public relations, administrative practices and departmental organization with particular emphasis on the municipal level.

Rec 220  F,W  2C,2L  0.5
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  F,W  3C  0.5
Introduction to Outdoor Recreation
A study of outdoor recreation in relation to contemporary lifestyles, natural and human resource systems. Includes the examination of outdoor settings as an integral part of an outdoor recreation continuum. Includes the role of selected governmental and non-governmental bodies.

Rec 241  S  3C  0.5
Administration of Camping and Outdoor Education
The philosophy and objectives of camping and outdoor education; administration, organizing, planning, staff relationships, leadership training, trends in camping and outdoor education. The emphasis in this course will be the place of the resident camp in education and recreation. Prereq: Rec 230

Rec 250  F,W  3C  0.5
Introduction to Recreation for Special Populations
Examines the philosophical, theoretical and empirical frameworks of recreation as a therapeutic service and process to individuals with physical, emotional and intellectual disabilities.

Rec 252  W,S  3C  0.5
Recreation and Mental Retardation
An analysis of the motoric and psycho-social behavioral dimensions specific to the retarded with direct and obvious applicability to the planning, implementing and evaluating of recreational programmes. Prereq: Rec 250, Psych 242

Rec 253  W  3C  0.5
Recreation and Physical Disabilities
The psycho-social aspects of physical disabilities will be analysed, with special focus given to the planning, implementing and evaluating of leisure activities. Prereq: Rec 250, permission of instructor

Rec 254  W,S  3C  0.5
Recreation and Mental Health
A psycho-social analysis of the determinants and consequences of recreative behaviour as related to positive and negative mental health, discussing in detail, structure, semiotic factors and interaction patterns. Prereq: Rec 250

Rec 270  F  3C  0.5
Statistical Techniques Applied to Leisure Studies
An introduction to descriptive and inferential statistics and the interpretation of data. A major consideration of the course is the use of statistics in the solution of problems in recreation and leisure.
Rec 300 W 3C 0.5  
Philosophy of Leisure  
Examination of major philosophical themes through the ages with reference to contemporary viability and effect upon social behaviour.  
Prereq: Consent of instructor, third year standing

Rec 301 S 3C 0.5  
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 F 3C 0.5  
Travel and Tourism  
The scope and nature of travel and tourism as contemporary leisure experiences. Economic, political and social ramifications, research strategies employed, implications for the future.  
Prereq: Rec 301

Rec 303 F,S 3C 0.5  
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,S 3C 0.5  
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 0.5  
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 W 3C 0.5  
School Recreation  
An analysis of the relationship between recreation an education with particular emphasis on the sponsoring of community recreation programmes by education authorities including leisure education and co-curriculum activities.  
Prereq: Rec 210

Rec 312 W 3C 0.5  
Recreation and Community Action  
The role of the citizen in recreation systems with regard to social change. Students will examine models for social change which interact with recreation systems and power relationships between citizen's groups and recreation systems.  
Prereq: Rec 210

Rec 316/Plan 344 F 3C,1L 0.5  
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 S 2C,2L 0.5  
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

Rec 321-324 0.5  
Selected Topics in Recreation  
The study of particular topics pertaining to recreation. Course topics will be announced in advance, but will not be offered on a regular basis.  
Prereq: Consent of instructor

Rec 331 F 2C,2L 0.5  
Outdoor Education in Recreation  
The present status of outdoor education in modern society; government functions and policies related to outdoor education services; the planning and administration of outdoor education activities. Current problems.  
Prereq: Rec 230

Rec 332 S 2C,2L 0.5  
Theory and Practice in Outdoor Recreation  
Emphasis on methods and techniques for the selection, development, and implementation of programmes and projects through the utilization of diverse and unique natural settings and environments.  
Prereq: Rec 230, 241
Rec 334  F  3C,1L  0.5  
**Park Management**
Basic administrative procedures in park management. Operational techniques are examined together with general policies of acquisition, operation and development. 
**Prereq:** Rec 210, Rec 230 or equivalent

Rec 361  W,S  3C  0.5  
**Aging and Leisure**
Social parameters of the aging process with particular reference to the Leisure Service Industry. 
**Prereq:** Rec 301

Rec 370  F,W,S  0.5  
**Directed Study in Special Topics**
For the student who desires to pursue a particular topic in depth through guided independent research and/or reading. A faculty member must approve a student's project prior to registration. May be repeated once in a subsequent term. 
**Prereq:** Faculty approval

Rec 371  F,W  3C  0.5  
**Research Designs Applicable to Leisure Studies**
An introduction to the methods and techniques of research as applied to leisure studies and services. General consideration will be given to the technical problems involved in various stages of research methodology with emphasis on the logic underlying the research process. 
**Prereq:** Rec 270

Rec 400  W  3C  0.5  
**Seminar in Recreation and Leisure**
An in-depth analysis of the current major issues and trends. 
*Fourth year Departmental students only*

Rec 402  Colloquium on Religion and Leisure 
*Not offered 1980-81*

Rec 406  S  1.0  
**Comparative Recreational Systems**
A study of multi-national recreation systems. Course meets on Campus and in the field in other countries. Full term study over a period of 6-8 weeks. Laboratory fee varies with field observation.

Rec 410  W  3C,1L  0.5  
**Planning of Recreation Facilities**
A course to introduce the students to the planning, design and layout of recreation areas and facilities. 
**Prereq:** Rec 210

Rec 432  F  3C,1L  0.5  
**Interpretation**
Concepts, philosophy and practices relative to understanding the use of the natural environment. 
**Prereq:** Rec 332 or consent of the instructor

Rec 434  W  3C  0.5  
**Advanced Park Management**
A study of policies, procedures, and practices relative to the management of natural resources. Emphasis is placed on a systems approach to management as it relates to park management at all levels of government. 
**Prereq:** Rec 334

Rec 435  F  3C  0.5  
**Recreation Resource Policy**
A study of policies, policy development and policy gaps related to recreation resources in Canada. Based on a literature review and discussion of decision-making procedures, roles and tools used in the recreation field; students are required to research real and theoretical situations for seminar presentation. 
**Prereq:** Rec 100 and Rec 230 or consent of instructor

Rec 470\1471  F,W,S  3C  0.5  
**Research Project**
An independent research project on an approved topic supervised by a faculty member. Required of all students enrolled in the Honours Recreation Programme. 
*Rec 470 includes an approved design and completion of the first segment of the paper.* 
*Rec 471 requires the completion of the project begun in 470.*

Rec 580  2C,2D  0.5  
**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.
Department of Religious Studies

Associate 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
W. J. Bildstein, BA (W. Ont.), STB (Gregorian), MA (Windsor), STD (Angelicum) J
M. S. Bird, BA, MA, PhD (Iowa) R
M. D. Bryant, BA (Concordia), STB (Harvard), MA, PhD (St. Michael's) R
F. C. Gérard, MA (College St. Dominique, France), BD, STM (McGill), PhD (Hartford Seminary Foundation) P
J. W. Miller, BA (Goshen), MA (NYU), BD (Princeton), ThD (Basel) G
D. Sahas, BD (Athens), STM (Christian Theological Seminary), PhD (Hartford Seminary Foundation) R
A. F. Thompson, BA (Toronto), BTh (Huron), MA (W. Ont.), STM, PhD (McGill)

Assistant Professors
R. D. Legge, BA (Transylvania), STB (Harvard), PhD (McMaster) P
H. J. Sawatsky, BA (Bethel, Kansas), MA (Minnesota), MA, PhD (Princeton) G

Lecturers
A. L. Evans, BA (Toronto), BD (Emmanuel), STM (McGill), DMin (Andover-Newton) P
S. A. MacDonald, BA, STB (W. Ont.), MA (San Francisco) J
V. G. Shillington, BA, MA (W. Laur.) P

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.

Course Descriptions

Note
Numbers below the course description indicate the area of Religious Studies to which the course belongs. Refer to page 115 in programme section.

R S 100A-K Introduction to Religion
An introduction to Religion, religious phenomena, beliefs, ideas, practices and experience through the study of material and examples from the various fields in Religious Studies:

R S 100A F,W 3C 0.5
Religions of the East
An introduction to the religious traditions of the East: history, religious beliefs and practices of Hinduism, Buddhism, Confucianism, Taoism and Shinto.
Area 1, Thompson and Legge

R S 100B F,W 3C 0.5
Religions of the West
Encounter with Judaism, Christianity and Islam: the characteristics and interaction of the three major religious traditions that have shaped the image of the Western World.
Area 1, Sahas

R S 100C F 3C 0.5
Religious Quests
Profiles, biographies and autobiographies of individuals in search of ultimate meaning. Persons studied are spiritual seekers from all walks of life: traditional religious figures, artists, novelists, scientists and others.
Area 5, Bryant

R S 100D W 3C 0.5
Religious Movements
A consideration of religious movements, old and new, inside as well as outside the traditional churches. Also, an exploration of religiously-inspired cultural movements in the social, political and artistic realms of society.
Area 5, Bryant

R S 100E F,W 3C 0.5
Biblical Studies I
A survey of the literature, history and religion of ancient Israel as seen in its cultural setting in the ancient Near East.
Area 3, Miller
Biblical Studies II
A survey of the literature, history and religious thought of the Christian community during the New Testament period as seen in its cultural setting in the Greco-Roman world.
Area 3, Hubbard

Catholic Theology
A study of the principal teachings of the Christian Faith affecting Catholics today. Topics will include Bible and Tradition; worship and sacraments; authority; changing views concerning laity, women, ministry and ecumenism.
Area 4, Bildstein

Protestant Theology
An introduction to the study of the sources and issues of traditional and contemporary, liberal and conservative, Protestantism.
Area 4, Gérard

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.
Area 3, Shillington

The Study of Religion
An exploration of the nature of religion through: 1) the history of the study of religion, 2) exposure to varying methods and ways of approaching religious phenomena, and 3) consideration of accounts of religious experience.
Note: Open to RS majors only, Legge

Wisdom, Literature in the Old Testament
Not offered 1980-81

Worship Literature in the Old Testament
A study of psalms, prayers, hymns, and liturgical texts used in the worship of ancient Israel, against the background of religious practices in the ancient Near East.
Area 3, Miller

The Hebrew Prophets
A study of the prophetic movement from Amos to Malachi in the historical, social, and religious context of Israel and the ancient Near East.
Area 3, Hubbard

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.
Area 3, Miller

The Gospel of John
An interpretation of the Fourth Gospel in the light of the situation of the Church at the end of the first century, with an emphasis on the Johannine portrait of Jesus. The letters of John will also be studied.
Area 3, Staff

Religion in Japan
Not offered 1980-81

Hinduism
A study of the developments of religious thought in India from the Vedic Period to the present. The course will combine an historical survey with a study of representative texts from the religious, philosophical, social and political thought of the Hindus.
Area 1, Thompson

Buddhism in India and South-East Asia
An 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 so significant for the cultures of these areas.
Area 1, Legge

Religion in China
Not offered 1980-81
Course Descriptions
Religious Studies

RS 216 F 3C 0.5
Islam
An introduction to the Islamic faith and practice, with a review of the development, achievements and impact of the Muslim community from Muhammad the Prophet to the present days.
Area 1, Sahas

RS 217 W 3C 0.5
Judaism
An introduction to the religious tradition of the Jews, in terms of beliefs, practices, ideals and institutions from the beginning to the present time.
Area 1, Sahas

RS 218 S 3C 0.5
Christianity
An introduction to the Christian tradition: 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.
Area 1, Sahas

RS 220 F 3C 0.5
Evangelical Christianity
A descriptive, historical and theological review of the wing of North American Christianity known as evangelicalism, fundamentalism, or revivalism.
Area 2, Sawatsky

RS 221 W 3C 0.5
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.
Area 2, Sawatsky

RS 227 (Hist 235) F 3C 0.5
History of Christianity 1
The development of Western and Eastern Christianity to the end of the medieval period.
Area 2, Klaassen

RS 228 (Hist 236) W 3C 0.5
History of Christianity 2
Roman Catholicism, Eastern Orthodoxy and Protestantism from the Reformation to the present.
Area 2, Klaassen

RS 231A F 2C, 1S 0.5
The Evolution of Christian Thought 1
An analysis of the major theological developments in the Christian traditions from the apostolic era to the Reformation. Major documents of the Greek and Latin patristic literature are analysed.
Area 4, Bryant

RS 231B W 0.5
The Evolution of Christian Thought 2
An analysis of the major theological developments in the Christian traditions from the Reformation to the present.
Area 4, Bryant

RS 232A F 2C, 1S 0.5
Christ and Contemporary Man
An examination of interpretations of Jesus in a secular and pluralistic world.
Area 4, MacDonald

RS 232B W 2C, 1S 0.5
Christ and Contemporary Man
An examination of some historical-theological symbolic images of the Christ figure, current and past.
Area 4, MacDonald

RS 235 F 2C, 1D 0.5
Catholic Moral Consciousness: Theory and Practice
A study in moral theology of current social problems. Concrete possibilities for individual initiatives toward needed social change will be stressed.
Prereq: Second year standing or consent of instructor.
Area 4, Bildstein

RS 236 W, J 2C, 1D 0.5
Human Sexuality and Christian Morality
An investigation of the moral implications of an evolving sexual consciousness in the Christian tradition.
Prereq: Second year standing or consent of instructor.
Area 4, Bildstein

RS 238A W 3C 0.5
The Ecumenical Movement
A study of those unitive efforts which marked the history of the Christian Church, emphasizing developments from the Reformation to the present.
Area 4, Gérard

RS 238B The Ecumenical Movement
Not offered 1980-81

RS 253 F 3C 0.5
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.
Area 4, Staff
Course Descriptions
Religious Studies

R S 254 W 3C 0.5
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.
Area 4, Sawatsky

R S 255 W 3C 0.5
Christian Ethics
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.
Area 4, Legge

R S 256 Protestant Ethics
Not offered 1980-81

R S 260 W 3C 0.5
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.
Area 5, Legge

R S 262 Religion and Politics 1
Not offered 1980-81

R S 263 Religion and Politics 2
Not offered 1980-81

R S 264 F 2C,1D 0.5
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.
Area 5, Staff

R S 265 W 2C,1D 0.5
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 nation building, ecumenism, the open society and transcendence, and the post-Christian era.
Area 5, Staff

R S 266 F 2C,1S 0.5
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
Area 5, Bird

R S 267 W 2C,1S 0.5
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, Antonioni, Polanski.
Cross-listed as Fine 247(R)
Film fee $5.00
Area 5, Bryant

R S 268A F 3C 0.5
Religious Perspectives in Contemporary Literature
A discussion of religious perspectives in contemporary literary works. Emphasis will be on religious pluralism as reflected in the culture with a primary focus on man's search for meaning, both individually and culturally.
Area 5, Bryant

R S 268B Religious Perspectives in Contemporary Canadian Literature
Not offered 1980-81

R S 269 S 3C 0.5
Myth & Symbols of the Religions of India
An approach to understanding symbols and perennial themes of Indian religion through a study of representative art, architecture and folk-literature of Hinduism, Indian Buddhism and Jainism.
Area 1, Thompson

R S 270 F 3C 0.5
Psychology of Religion
A study of theories of the psychological nature of religious experience, the sources of religious belief and the religious significance of psychological phenomena. Topics include faith, doubt, evangelism, conversion, faith healing, mysticism, drugs and religious experience, tongues-speaking.
Area 5, Evans
Religious Studies

R S 271 W 3C 0.5
Personality and Religion
A study of the psychology of personality in its relationship between personality and religious thought, experience and behaviour.
Area 5, Evans

R S 274 W 3C 0.5
Religious Approaches to Personal Crises
A critical historical review of Judaeo-Christian approaches to emotional and interpersonal problems, with an analysis of the clinical pastoral education movement in the church.
Area 5, Lebold

R S 275 W 3C 0.5
Religion and Psychotherapy
A review and analysis of the dialogue between theistic religion in the West and the personality sciences since Freud: their respective views of God, man sin, sickness and the therapeutic process. Clinicians and theorists in psychotherapy and religion from the surrounding community will contribute to the exploration.
Area 5, Miller

R S 280 W 3C 0.5
The Parables of Jesus
Detailed examination of the stories Jesus told, their form, method, message, and significance for religious thought, past and present.
Area 3, Miller

R S 305 Y 3C 1.0
Intermediate New Testament Greek
Prereq: R S 106 or consent of Instructor
Area 3, Shillington

R S 307A-D Selected Topics in Biblical Theology
Not offered in 1980-81

R S 308 W 3C 0.5
The New Testament World
A study of the religio-cultural forces which influenced early Christianity, Jewish rabbinic and apocalyptic literature (including the Dead Sea Scrolls), Greek mystery religions and Gnosticism will receive special emphasis.
Area 3, Hubbard

R S 309 3C 0.5
New Testament Themes
A comparative study of the distinctive ways in which New Testament writers view key issues in the early Church; e.g. freedom and authority, social responsibility, the role of law, relations with the Jewish religion, the person of Jesus. An attempt will be made to relate their views to issues facing Christianity today.
Prereq: R S 100F or consent of the instructor.
Area 3, Staff

R S 313 Modern Religious Movements in India
Not offered 1980-81

R S 314 Zen Buddhism
Not offered in 1980-81

R S 318 Jesus in Islam
Not offered in 1980-81

R S 321 (Hist 347) Radical Reformation 1
Not offered in 1980-81

R S 322 (Hist 348) Radical Reformation 2
Not offered in 1980-81

R S 323 Medieval Church History from 312-1122
Not offered in 1980-81

R S 324 Medieval Church History from 1122-1449
Not offered in 1980-81

R S 325 W 3C 0.5
The Orthodox Church
Not offered in 1980-81
Course Descriptions
Religious Studies

R S 326 Anglicanism
Not offered in 1980-81

R S 331A F 3C 0.5
The Church in the Modern World
A study of the recent transformations of the Roman Catholic Church through the events, movements, personalities, and historical realities of the past fifty years.
Prereq: R S 100C/100D or 100H/100K and a 200-level course in theology or history of Christianity.
Area 2, MacDonald

R S 331B W 3C 0.5
The Church in the Modern World
A critical study of the church's role in contemporary secular society.
Area 2, MacDonald

R S 334 Islamic Theology, Philosophy and Mysticism
Not offered in 1980-81

R S 336A F 3C 0.5
Contemporary Theology 1
A study of: a) the sources of contemporary theology in 18th and 19th century thought, with particular reference to Kant, Schleiermacher, and Kierkegaard; b) selected 20th century theologians, including Buber, Barth, Tillich, Bonhoeffer, and Teilhard de Chardin.
Prereq: R S 100H or 100K or consent of instructor
Area 4, Legge

R S 336B Contemporary Theology 2
Not offered in 1980-81

R S 339 F,W 3C 0.5
Luther and Calvin: The Reformation in Theological Outline
This course will examine the religious experience and the theologies of Martin Luther and John Calvin in their respective historical contexts.
Prereq: one of R S 100H, R S 218, R S 227 or consent of instructor
Area 4, Gérard

R S 350 Christian Spirituality and Mysticism
Not offered in 1980-81

R S 360 F 3C 0.5
Religion and the Arts 1
A consideration of the spiritual dimension in art, both sacred and secular. An exploration of the quest for meaning in the various arts - painting, music, architecture, sculpture, dance, and cinema - encountered through slides, films, recordings, and readings.
Prereq: R S 100C or 266 or 267, or consent of the instructor
Area 5, Bird

R S 361 Religion and Art 2
Not offered in 1980-81

R S 365 F 3C 0.5
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.
Area 4, Rempel

R S 369A CS 1.0
In the Footsteps of the Christian Tradition
A travel seminar on the historical route of Eastern and Western Christianity and its interaction with Judaism and Islam. The travel includes visiting sites of interest and personalities of importance in Israel, Sinai, Constantinople, Greece, Italy, Switzerland and France.
Prereq: R S 100B or 218 or 227/228, or consent of the instructors.
Interested students should contact the Department Area 2, Sahas/Gérard

R S 369B F 1.0
Study-Travel Seminars in Religion
Observation and analysis of religious life in particular geographical areas, or of particular themes or problems, by means of on-location study. Topics and countries will be announced.
Area 5, Staff

R S 370 W 3C 0.5
Dreams in Religious Experience
The course examines the place of dreams in religious experience from ancient to modern times. Present day advances in understanding dream symbols will be explored, as well as the possibility of incorporating the use of dreams in one's personal religious growth and development.
Prereq: R S 271 or consent of instructor.
Area 5, Evans

R S 371 W 3C 0.5
Religion and Suicidal Behaviour
A study of self-destructive behaviour and its relation to relevant religious concepts. The range of experience from illness to suicide will be explored and related to the concepts of guilt, hope, and meaning in the Christian faith.
Prereq: R S 271 or consent of instructor.
Area 5, Evans
Religion and Social Change
Studies of issues that have arisen in the interaction of religious tradition with social change. Area 5, Siebert

Directed Reading in Special Subjects

Special Topics in Religious Studies

Honours Seminar
A course of study and research designed to provide the student with guidance and supervision towards completing an Honours research assignment. Prereq: Fourth year standing and consent of the Undergraduate Officer.

Note
Every student in the Honours R S Programme is required to take this seminar.

Directed Research in Special Subjects for Graduate Students

Directed Reading in Special Subjects for Graduate Students

†Students wishing to enrol in a course marked with a dagger (†) should consult the department.

Faculty of Science
The Faculty of Science offers the following courses of a general nature, intended for students registered in other Faculties (Arts, Environmental Studies, Engineering, Mathematics, Human Kinetics and Leisure Studies) as well as for Science students desiring electives. Normally, no more than four of the Science credits may be applied towards any Science degree programme.

Introduction to the Geology of Canada
Basic principles of Geology presented and illustrated with Canadian examples. Earth materials; the Earth's interior; volcanoes and earthquakes; the Earth's surface and its evolution; the history of life; application of geology to man's use of the environment. Field trips. (Not normally available to students in Earth Sciences programmes)

Note
Students desiring a full-year Geology elective should consider Earth 121-122 (Introductory Geology) to be found in the listings of the Earth Sciences Department. Students who are taking, or who have taken Earth 121-122 may not take Sci 100 for credit because of overlapping material.

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.

From Matter to Man
Chemistry: The nature of matter, atomic and nuclear reactions. Chemical bonds and the formation of molecules. 6 weeks.
Biology and Biophysics: Biological macromolecules, D.N.A. genetic code, protein synthesis, organic evolution. Photosynthesis, enzymes and A.T.P. Cells, organelles, specialization, nerve and muscle cells. 6 weeks.
A special course available to students in the Mathematics Faculty who do not have a strong science background, especially at the Secondary School Year 5 level. Not open to students registered in the Faculty of Science. No prereq.
Sci 120  The Physical Sciences
Not offered 1980-81

Sci 200  F 3C 0.5
Contemporary Science 1
The interaction between science and society will be discussed for several items of contemporary public interest. Recent topics have included noise pollution, its reduction and control; materials, structures and properties; atmospheric science, weather and climate; nuclear fission, new future or no future; outer space exploration, its effects on the activities of man; low temperature phenomena, their impact on society. Open to students in the Faculties of Arts, Environmental Studies, Human Kinetics and Leisure Studies, Mathematics and the Programme of Integrated Studies in the first as well as upper years.

Sci 201  W 3C 0.5
Contemporary Science 2
Elementary biology and genetic engineering. Radiation effects on humans and radiation pollution. Cancer - causes and cures. Freezing of human tissues and organs. (Students registered in Science or Engineering may not take this course for credit)

Sci 202  F 3C 0.5
Energy

Sci 203  W 3C 0.5
Applied Physics in the Modern World
Selected topics in the applications of physics such as acoustics, cosmology, fusion, health physics, lasers and holography, oceanography, physics in Canada, reactor physics, space research, superconductivity, symmetry.

Sci 205  F,W 2C,2L 0.5
Physics of High Fidelity Sound Reproduction
This course applies elementary physical principles to the study of high fidelity systems. A set of laboratory experiments designed to familiarize the student with basic components is included. The course will convey an appreciation of the physics of such systems and an understanding of the specifications of modern equipment. Prereq: None, Lab, alternate weeks

Sci 209  F,W 2C 0.5
Information (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 219  F 2C 0.5
Chemistry in Modern Society
The impact of chemistry on modern society will be considered by discussion of a number of topics including: marijuana and other non-medical drugs; food additives; birth controls; cancer-causing chemicals; pesticides and other chemical methods to control insects; chemical warfare. Prereq: at least one year of Secondary School Chemistry

Sci 220  W 2C 0.5
Chemistry of Pollution
A study of the chemistry involved in pollution problems encountered with consumer products and in selected industries. Progress 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 0.5
Descriptive Astronomy
A survey course in astronomy intended for non-Science students (primarily Arts, Environmental Studies, Human Kinetics and Leisure Studies students). The solar system, stars, the galaxy, galaxies and the universe. Open to first year or upper year students. (Not for Eng, Math or Sci students).

Sci 238  F,W,S 3C 0.5
Descriptive Astronomy
A survey course in astronomy intended for Mathematics, Engineering and Science students. The solar system, stars, the galaxy, galaxies and the universe. Open to first year or upper year students. (Students whose major field is Honours 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. 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.

Sci 249 W 3C 0.5
Continents Adrift
A new look at earth from the viewpoint of plate tectonics. The geophysical evidence for this concept is reviewed, as are its implications for such diverse phenomena as earthquake prediction, geomagnetic reversals, mineral exploration, the evolution of life, and the geology of Canada. (Students whose major field is Earth Sciences may not take this course for credit).

Sci 250 W 3C 0.5
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 0.5
Human Genetics
An examination of recent advances in human heredity including the genetic, cytological and biochemical aspects of individual inheritance. The principles of human population genetics will be discussed. The social implications of some of the modern discoveries will be stressed. (Students whose major field is Biology may not take this course for credit).

Sci 270 W 3C 0.5
Nuclear Science
A non-mathematical general treatment of the following areas of nuclear Science: historical development and discovery of new fundamental particles; artificial transmutation of elements; nuclear sources of energy; biological effects of radiation and use of radioisotopes in industry, medicine and agriculture. The impact of nuclear science on social, economic and political systems will be discussed. Prereq: At least one year Secondary School Chemistry or Physics

Sci 312 F 3C 0.5
Physics of Music 1
A discussion of the nature of musical sounds. The mathematical basis of harmony, musical scales. Sound production by various instruments, including the human voice; radiated power, sound spectrum. Acoustics of auditorium; amplifier and speaker systems. Recommended for any student who understands logarithms and who is interested in both Music and Physics

Sci 313 Physics of Music 2
Not offered in 1990-81

Sci 349 F 3C 0.5
Introductory Pedology
An introduction to soil forming processes and classification systems. Emphasis will be placed on the chemical and physical soil regimes as they relate to environmental, engineering and agricultural problems. (Students whose major field is Earth Sciences may not take this course for credit).

Sci 350 F 3C 0.5
Canadian Non-Renewable Natural Resources
An introduction to mineral resources and the state of reserves of selected minerals. Geologic factors affecting the occurrence of economic minerals and rocks, 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 0.5
Human Biology 1
An introduction to cell and developmental biology in relation to cancer of the human body. (Students whose major field is Biology may not take this course for credit).
Sci 352 Human Biology 2
Not offered in 1980-81

Sci 353 F 2C 0.5
The Plants of Canada
The composition, ecology and history of Canada’s flora. The role of plants in our environment, their use by native peoples and in modern agriculture and horticulture ethnobotany. An introductory course for non-biologists on the natural history of our flora.

Sci 400A F 2C 0.5
The History of Science 1
The development of scientific concepts from the Renaissance to the early 19th century. Astronomy from Copernicus to Newton, physics from Galileo to Newton. The physics and biological sciences during the 18th century. Lavoisier and La Révolution Chymique. The beginnings of the industrial revolution. Emphasis will be on reading the works of the originators of Science.
Prereq: First year Science or equiv.

Sci 400B W 2C 0.5
The History of Science 2
The growth of scientific ideas in the 19th and early 20th centuries. Developments in physics, chemistry, geology, biology (particularly Darwin) and technology. Emphasis will be on reading the works of the originators of science.
Prereq: First year Science or equiv.

Sci 410 0.5
Technical Report (for Students in co-op Applied Chemistry, co-op Applied Physics, co-op Applied Earth Sciences and co-op Biology 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 453 F 2C 0.5
The Seas and Man’s Effects Upon Them
Study of the oceans from a biological point of view, and consideration of the effects of exploitation and pollution upon the animals and plants that inhabit them.
(Students whose major field is Biology may not take this course for credit.)

Sci 454 W 2C 0.5
The Inland Waters and Man’s Effects Upon Them
Study of lakes, rivers and streams from a biological point of view, and consideration of the effects of pollution upon the animals and plants that inhabit them.

Sci 462 F 2C 0.5
Biology of Food Production
A survey of world food production from the biologist’s viewpoint. Topics: Nutrition; food chains; origins of agriculture; basic plants and animal food crops; primitive and modern scientific agricultural practices and the environmental implications of each.
### Social Development Studies

**Professors**

- I. L. Campbell, BA (Carleton), MSc (London School of Economics) R
- D. G. S. M'Timkulu, BA (South Africa), MA (Yale), Dip Anthropology, DipEd, PhD (Natal) R
- J. O. Towler, BA (Toronto), MEd, PhD (Alberta) R

**Associate Professors**

- M. I. Nagler, BA (Br. Col.), MA (Chicago), PhD (Stirling) R

**Assistant Professors**

- R. Lahue, BSc (Fordham), PhD (Waterloo) R
- M. Smyth, BA (Toronto), MA, PhD (York) R
- M. Zentner, BA (Temple), MSW (Kansas) R

**Associated Faculty**

- Assistant Professor, Religious Studies
  - M. Bird, BA, MA, PhD (Iowa) 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

- Professor, English
  - H. Tuyn, BA, MA (Oxford), MA (Utrecht), Docteur de l'Université de Paris R

**Co-ordinator of English Language Programmes**

- J. Miller, BA, BLS (McGill), MA, MPhil (Waterloo)

### Course Descriptions

#### Interdisciplinary Social Science

**ISS 120R**

**F 3C 0.5**

**Intellectual Foundations for the Social Sciences 1**

An introduction to the evolution of social, political and psychological thought in Western civilization prior to the 18th century which provides a background and context for the study of contemporary social issues and problems.

**Prereq:** ISS 120R

**ISS 121R**

**W 3C 0.5**

**Intellectual Foundations for the Social Sciences 2**

A continuation of the topics developed in ISS 120R beginning with the 18th century and moving to the present day.

**Prereq:** ISS 120R

**ISS 220R**

**The History of Development of Modern Day Social Problems**

Not offered in 1980-81

**ISS 221R**

**Community Issues**

Not offered in 1980-81

**ISS 250R**

**F 3C 0.5**

**Social Research 1**

Introduction to the philosophy and methods of applied social science, the problems and strategies of research design and analysis. Emphasis on collection, statistical analysis, and descriptive presentation of research data using a variety of quantitative methods.

**Prereq:** ISS 250R

**ISS 251R**

**W 3C 0.5**

**Social Research 2**

A continuation of ISS 250R

**Prereq:** ISS 250R

**ISS 320R**

**F 3C 0.5**

**Critical Encounter with the Study of Man**

An attempt to develop a critical sense of the relevance of the social sciences 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 343R**

**Interdisciplinary Investigation of Human Sexuality**

Not offered in 1980-81
ISS 350a  W  3C  0.5
The Non-Medical Use of Drugs, Drug Dependency and Its Management
This course will be concerned with contemporary non-medical drug use: the drugs in common use, their effects, their sources and the processes of distribution, the extent and patterns of use, various theories dealing with the causes of use and dependency, the social and psychological characteristics of users, and various approaches to the treatment of drug-dependent persons.

ISS 350b  W  3C  0.5
Problems of Adult Education from the Perspective of the Social Sciences
An interdisciplinary examination and analysis of adult education in Canada with particular reference to the local situation and its historical development, philosophical, psychological and sociological foundations. Political policies, practices, trends, and the status of adult education will be covered.

ISS 398R/399R  S,F,W/S,F,W  R  0.5/0.5
Independent Studies
Interdisciplinary focus, in greater depth than is available in other courses, on a selected area of concern to the student. Available to individuals or small groups of third- or fourth-year Social Development Studies students and arranged with one of the programme’s faculty members.
Prereq: Permission of Undergraduate Officer

Psych 120R  F  3C  0.5
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 121R  W  3C  0.5
Introductory Psychology (Special Topics)
A more in-depth study of selected topics introduced in Psych 120R.
Prereq: Psych 120R

Psych 220R  F  3C  0.5
Social Psychology
An examination of psychological principles involved in the interaction of the individual and society. Topics include conformity, attitude formation, prejudice, attraction, aggression, pro-social behaviour, social psychology of sexual attitudes.
(Cross-listed with Psych 253)
Prereq: An introductory psychology course

Psych 221R  W  3C  0.5
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
Course Descriptions
Social Development Studies

Psych 334R F 3C 0.5
Theories of Counselling Psychology
An introduction to the theories, methods and problems in Counselling Psychology.
Prereq: An introductory psychology course

Psych 367R-369R 0.5 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 0.5
Advanced Topics in Counselling Psychology
An in-depth study of special topics arising in Psych 334 (R)
Prereq: Psych 334 (R)

Psych 398R/399R S,F,W,S,F,W R/R 0.5/0.5
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 F 3C 0.5
Fundamentals of Sociology 1
An examination of the fundamental concepts of sociology and their application in seeking to understand the changing patterns and life-styles taking place specifically in Canada, and in general, within North American society.

Soc 121R W 3C 0.5
Fundamentals of Sociology 2
A more in-depth study of selected topics introduced in Soc 120R with emphasis on the analysis of social problems.
Prereq: Soc 120R

Soc 220R The Individual, Society and Religion
Not offered in 1980-81

Soc 221R S 3C 0.5
Master Trends in Modern Society
An introduction to the major problems of urbanization and industrialization in modern societies studied within a framework emphasizing social change. Illustrations will be drawn from emergent as well as advanced societies.
Prereq: Introductory Sociology course

Soc 225R F 3C 0.5
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: an introductory sociology course

Soc 226R Race and Culture in the Third World 2
Not offered in 1980-81

Soc 325R/326R S/S 3C/3C 0.5/0.5
Issues in Third World Development
The course will examine the impact of modernization on the value systems and social structures of selected African/Asian societies - Zambia, Malawi, Botswana, Lesotho and Swaziland with comparative reference to some developing Asian countries. The approach will be a case study approach within a theoretical framework. The course will in particular investigate the functioning of the new elite, including some analysis of its new habitat, the city.
Prereq: an introductory sociology course or consent of instructor

Soc 327R/328R F/W 3C/3C 0.5/0.5
Canadian Ethnic and Cultural Minorities
A detailed examination of various minorities in Canadian society. The first section of the course will stress the fundamental concepts and issues of race and ethnic relations and the final segments of the course will incorporate the application of these fundamentals to the various groups in the Canadian mosaic.
Prereq: second year standing or consent of instructor

Soc 367R W 3C 0.5
The Sociology of Physical Disability
This course will examine the social factors associated with and the consequences of physical disability for the disabled person and for those with whom they interact. Particular attention will be given to stigmatization and rehabilitation.
Prereq: an introductory sociology course

Soc 368R W 3C 0.5
The Sociology of Spoiled Identity
This course will examine the social causes and consequences of a spoiled self-image associated with conditions such as mental illness, sexual deviance, alcoholism, drug dependency, or a criminal record.
Prereq: an introductory Sociology course
Social Development Studies

Course Descriptions

Social Development Studies

Soc 369R F 3C 0.5
Custodial and Rehabilitative Institutions
An analysis of the theory, structure and function of institutions concerned with the incarceration, treatment and/or rehabilitation of either voluntary or involuntary inmates, clients or patients.
Prereq: an introductory Sociology course

Soc 398R/399R F,W/F,W R/R 0.5/0.5
Independent Study
An independent in-depth study of a selected area of concern to the student within the discipline of 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

Social Work

Socwk 120R S,F,W 3C 0.5
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.

Socwk 121R S,W 3C 0.5
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.

Socwk 220R S,F,W 3C 0.5
Social Casework 1
A presentation of some of the theoretical constructs necessary for the understanding of the individual in the casework relationship, as well as an introduction to some appropriate casework interventions. Emphasis in the course will be theoretical.
Prereq: Socwk 120R or consent of instructor

Socwk 221R S,F 3C 0.5
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: Socwk 120R or consent of instructor

Socwk 222R F 3C 0.5
Community Organization 1
An examination of social work practice as it relates to functional and geographical communities. The course will explore the theoretical foundations of organization practice as well as a variety of models.
Prereq: Socwk 120R or consent of instructor

Socwk 320R S,W 3C 0.5
Social Casework 2
A methodological examination of some of the more complex intellectual components of some 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: Socwk 220R, or consent of instructor

Socwk 321R S,W 3C 0.5
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: Socwk 221R, or consent of instructor

Socwk 322R W 3C 0.5
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: Socwk 222R, or consent of instructor

Socwk 326R W 3C 0.5
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: Socwk 120R, or consent of instructor

Socwk 350(a-f) Special Topics in Social Work
Not offered in 1979-80

Socwk 355R F,W 3C 0.5
Child Abuse: Identification and Treatment
The objectives of this course are to provide an understanding of the dimensions and causes of child abuse, to develop skills in identifying cases of this social problem and to explore current methods of management and treatment of persons involved in child abuse situations.
Prereq: Socwk 120R or consent of instructor
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: Socwk 120R or 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 241R Arts & Society 1
Arts 242R Arts & Society 2
Arts 320R/321R Special Topics in Chinese Thought and Culture

English
Engl 129R Basic Writing Skills
Engl 140R/141R The Use of English, 1 and 2
Engl 205R The Canadian Short Story
Engl 240R Form and Function 1
Engl 241R Form and Function 2
Engl 376R/377R Our Changing Language: Syntax and Semantics, 1 and 2
Engl 386R Twentieth Century Literature 1
Engl 387R Twentieth Century Literature 2

Fine Arts
Fine 246R/247R Religion and the Film, 1 and 2
Fine 248R Film as Social Criticism
Fine 348R The Films of Chaplin
Fine 349R The Films of Fellini

Geography
Geog 125R Introduction to the Third World
Geog 126R Development in the Third World
Geog 225R Urbanization in the Third World
Geog 226R Food and Agriculture and Integrated Rural Development in the Third World
Geog 325R/326R Special Topics in the Study of Third World Development

History
Hist 101R/102R Major Themes of Western Civilization, 1 and 2
Hist 288R History of Modern Revolutions 1
Hist 289R History of Modern Revolutions 2
Hist 364R The Enlightenment 1, Europe in Ferment
Hist 365R The Enlightenment 2, Europe in the 18th Century

Religious Studies
RS 100C Religious Quests
RS 100D Religious Movements
RS 231A The Evolution of Christian Thought 1
RS 231B The Evolution of Christian Thought 2
RS 260 Issues in Science, Technology and Religion
RS 262/263 Religion and Politics 1 and 2
RS 266/267 Religion and the Film, 1 and 2
RS 268A Religious Perspectives in Contemporary Literature
RS 268B Religious Perspectives in Contemporary Canadian Literature
RS 360/361 Sacred and Profane in the Arts, 1 and 2
RS 398/399 Directed Readings in Special Subjects
RS 460-463 Special Topics in Religion and Culture
Course Descriptions

Sociology

Course Descriptions

Soci 101 S,F,W 2C 0.5
Introduction to Sociology
An introduction to the basic concepts and frames of reference of sociological investigation and interpretation. Topics for analysis will include communities, associations and institutions, classes and status groups, crowds and publics, social processes, and social change. Special attention is given to Canadian society.

Not open to students who have taken Soci 101 (t), 101 (m), or 101 (u). 101 (m) is an introductory course intended as an elective for mathematics students or as a basis for a combined honours in Mathematics and Sociology. 101 (u) is especially designed for Planning students.

Also offered at Conrad Grebel, Renison and St. Jerome's Colleges

Soci 102 S,F,W 2C 0.5
Social Problems
An examination of cultural forces that create social problems and failures in personal and institutional adjustments. Specific attention is paid to the problems of emotional disturbance, poverty, delinquency and industrial disruptions in Canadian society.

Also offered at Renison College

Soci 103 S,F,W 2C 0.5
Canadian Society
An introductory survey of Canadian society. This course will examine issues in the socio-historical development of Canadian society, its present social structure, organizations and ideologies.

Soci 104 S,F,W 2C 0.5
Social Psychology and Everyday Life
Introducing students to symbolic interaction, a sociological social psychology, this course examines: the impact of a culture on socialization experiences; the development of self-identities and social reputations; and interaction patterns in a variety of casual, occupational and deviance contexts.

Soci 105 S,F,W 2C 0.5
Perennial Themes in Social Thought
Both classical and recent social theorists are shown to exhibit common preoccupations, e.g. the relation of the individual to society, the foundations of government, survival through productivity and adaptation, society's location in nature and the cosmos.
Soc 106 S,F,W 2C 0.5
**Collective Behaviour**
The sociological analysis of the behaviour of crowds, mobs, publics and related phenomena and their relationships to social organization and social change.

Soc 107 S,F,W 2C 0.5
**Social Structure and Character**
This course will examine the connections between organized social life and types of personalities found in it. Examples will be drawn from contemporary as well as historical situations.

Soc 200 F,W 2C 0.5
**Marriage and the Family**
A survey of sociological perspectives on marriage and the family in urban-industrial societies. Special attention is given to marriage and the family in Canada. Comparisons with U.S. and Britain will be undertaken.

*Prereq: Soc 101 or consent of instructor*

Also offered at St. Jerome's College

Soc 204 F,W 2C 0.5
**Sociology of Adolescence**
The social definitions of adolescence in cross-cultural and historical perspective. Social roles of adolescence in the institutional structures of urban-industrial societies with special emphasis on the family, education, and the economy. The relationship of adolescents' social roles to processes of social change and stability.

*Prereq: Soc 101 or consent of instructor*

Soc 206 F,W 2C 0.5
**Sex Roles**
An examination of male and female roles in contemporary Canadian society. Current and past roles of both sexes in different societies are considered. Selected topics of interest include sex role identity and its development, male role change, media images of men and women and men's and women's liberation.

*Prereq: Soc 101 or consent of instructor*

Soc 209 F,W 2C 0.5
**Family Origin and Personal Identity**
This course focuses on the intersection of biography and social structure within the family. Application of sociological theory and methods to students' own family backgrounds will be used to illustrate the social bases of identity.

*Prereq: Soc 101 or consent of instructor*

Soc 214 F.W 2C 0.5
**Social Inequality**
Analysis of social classes in society including their basis for development, composition and consequences for society. Special attention is given to social stratification in Canada.

*Prereq: Soc 101 or consent of instructor*

Soc 222 F.W 2C 0.5
**Juvenile Delinquency**
A systematic analysis and criticism is presented of biological, psychological, psychoanalytical and sociological theories of juvenile delinquency. Attention is given to statistics and contemporary research with special emphasis on the distribution and types of delinquent subcultures.

*Prereq: Soc 101 or consent of instructor*

Soc 223 F,W 2C 0.5
**Deviance: Perspectives and Processes**
The deviance-making process is examined in a variety of social contexts. Examines the emergence of rules and control agencies, the processes by which persons become involved in deviant activities, and the contingencies affecting persons' careers as deviants.

*Prereq: Soc 101 or consent of instructor*

Soc 224 W 2C 0.5
**Law and Order: Regulating Deviance**
Focusing on the "processes and problematics of social control", this course examines: the conditions affecting the emergence of legal norms; the enforcement of criminal law; and the processing of offenders.

*Prereq: Soc 101 or consent of instructor*

Soc 227 F,W 2C 0.5
**Crime and Society**
An analysis and criticism of the major theories of criminal behaviour. Emphasis is given to the relationship between social structure and criminal behaviour; types of criminal behaviour such as drug addiction statistics and contemporary research. Special attention is given to Canadian data.

*Prereq: Soc 101 or consent of instructor*

Soc 233 F,W 2C 0.5
**Social Psychology of Beliefs and Attitudes**
Examines the nature of social beliefs and attitudes toward various groups in society, such as ethnic, political and religious groups. Considers the sources, organization and distribution of beliefs and attitudes, and their implications for Canadian society.

*Prereq: Soc 101 or Psych 101 or consent of instructor*
Soc 235  F,W  2C  0.5
**Communication**
An analysis of the role of language and other symbol systems in social interaction; the interplay between communication and the social system, the formation of attitudes through language; social and individual disorders as caused by, and reflected in, the breakdown in the communication process.
*Prereq: Soc 101 or consent of instructor*

Soc 236  F,W  2C  0.5
**Social Movements**
The sociological analysis of varieties of social movements and their relationships to social organization and social change.
*Prereq: Soc 101 or consent of instructor*

Soc 242  F,W  2C  0.5
**Industrial Sociology**
Special emphasis is given in lectures, readings and assignments to the particular problems facing industrial Canada, especially in reference to regionalism, elitism, the multinational enterprise and the problem of foreign ownership.
*Prereq: Soc 101 or consent of instructor*

Soc 243  F,W  2C  0.5
**Occupational Sociology**
An introduction to the study of work and occupations; the problems of occupational choice, occupational socialization and identification; the concepts of career and career mobility; the professionalization process, the nature of professions, the impact of occupation on life styles, leisure and retirement.
*Prereq: Soc 101 or consent of instructor*

Soc 247  F,W  2C  0.5
**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 chances of individuals in society are described. North American issues of death and dying are considered against an historical background.
*Prereq: Soc 101 or consent of instructor*

Soc 248  F,W  2C  0.5
**Health, Illness, and Society**
This course focuses on the social aspects of health and illness, including social causes of illness, the social process of becoming ill, and the social consequences of being defined as ill.
*Prereq: Soc 101 or consent of instructor*

Soc 253  F,W  2C  0.5
**Population in Canadian Society**
Study of the basic demographic processes in the population of Canada. Demographic implications for selected social institutions. Use of Canadian enumeration and registration data. Emphasis on immigration and immigration policy.
*Prereq: Soc 101 or consent of instructor*

Soc 254  F,W  2C  0.5
**Comparative Social Structure**
General theoretical and methodological issues facing comparative sociology; comparative methods at work in the treatment of Western and non-Western societies (including Canada).
*Prereq: Soc 101 or consent of instructor*

Soc 255  F,W  2C  0.5
**Third World Development**
An analysis of issues of social and economic development in selected areas of the Third World, including Africa, Asia, and Latin America.
*Prereq: Soc 101 or consent of instructor*

Soc 256  F,W  2C  0.5
**Ethnic and Racial Relations**
Relations between different racial and cultural groups, analysis of majority-minority group status with special reference to Canada.
*Prereq: Soc 101 or consent of instructor*

Soc 264  F,W  2C  0.5
**Sociology of Religion**
Religion is defined broadly and its relation to phenomena like totalitarian movements, psychoanalysis and drug experience examined. The features common to all religions are explained, viz. myth, dogma, church, ritual, ethics, and religious experience.
*Prereq: Soc 101 or consent of instructor*
Also offered at St. Jerome's College

Soc 265  F,W  2C  0.5
**Political Sociology**
The sociological analysis of the institutionalization of power, political movements, parties, conflict and its accommodation.
*Prereq: Soc 101 or consent of instructor*

Soc 266  F,W  2C  0.5
**Sociology of Militarism**
A sociological approach to the role of the military corporation in different structural and historical contexts. Topics include the professionalization of the military, the development of military technology and its implications for national and international society.
*Prereq: Soc 101 or consent of instructor*
Sociology of the Contemporary University
How have recent demographic and economic changes in North America affected the organization and goals of higher learning? This course explores organizational crises and various attempts at containing and managing them.
Prereq: Soc 101 or consent of instructor

Introductory Sociological Theory
An examination of the object and function of sociological theory in social research. Types of sociological theories. Discussion of selected classics of sociological theory.
Prereq: Soc 101 or consent of instructor

Social Statistics and Social Indicators
A first course in sociological statistics, sampling, central tendency, probability, covariance, as illustrated in specifically sociological data.
Prereq: Soc 101 or consent of instructor

Methods I
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

Methods II
Continuation of Research Methods I. 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.
Prereq: Soc 281

Comparative Sociology of Youth
The aim of this course is mainly to study the prevailing patterns and resulting problems connected with the ways in which different societies react to the emergence of new generations. Concentrates on an analysis of the 1960s.
Prereq: Soc 101 and one other Sociology course

Crime as Business
Examines the inter-relatedness of crime and business, looking not only at the extent to which (1) crime represents business for its practitioners and (2) the criminal activities of legitimate business people, but also (3) the agencies regulating crime.
Prereq: Soc 101 and one Sociology course in the 220 series

Complex Organizations
Examines the role of large-scale organizations in industrial society, and their impact and influence. Illustrations will be drawn from commerce and industry, as well as education, health services and government.
Prereq: Soc 101 and Soc 242

Sociology of Industrial Relations
Using sociological concepts and theories, the course will examine the nature of the relationship between employers and employees, current issues facing unions and management, and the character of accommodation which may be realized between the two.
Prereq: Soc 101 and Soc 242

Sociology of Health Care
Examination of the organizations which provide health care, including assumptions under which they operate, interactive roles played by all members, including patients, alternative arrangements for providing health care, and the social positions held by health professionals.
Prereq: Soc 101 and Soc 248

Aging, the Aged and Leisure: A Sociological and Social Psychological Perspective
Employing a sociological and psychological frame of reference, the process and problems of aging are analyzed. Special emphasis will be given to the problems of leisure time in the later years of life.
( Same as Kin 352 and Rec 361).
Prereq: Soc 101 and one other Sociology course

Sociology of Leisure
Nature and extent of leisure phenomena in contemporary society. Examination of institutional and formal organization aspects, social role, social research strategies employed in the study of leisure.
( Same as Rec 301).
Prereq: Two term courses in sociology

Sport in Society
An introduction to the sociology of sport. Utilizing the major frames of reference of the social sciences, the function of sport in contemporary society is examined.
( Same as Rec 303 and Kin 452).
Prereq: Soc 101 and one other Sociology course
Soc 354  F,W  2C  0.5
World Population Problems
Comparative analysis of population problems across societies. Focus is on social institutions and their relationships to population. Emphasis on fertility and family planning.
Prereq: Soc 101 and Soc 253

Soc 364  F,W  2C  0.5
Social Change
A systematic review and analysis of sources, patterns, processes, and consequences of social change. Special topics include: Marxism, social change in developing countries, the role of ideas, and the breakdown and reorganization of social structure.
Prereq: Soc 101 and one other Sociology course. Also offered at St. Jerome's College

Soc 366  F,W  2C  0.5
Urban Sociology
The comparative study of urbanization as a process; the culture and organization of cities, urban problems; special attention is given to industrial cities of Canada, with comparative reference to the principal cities of Western societies.
Prereq: Soc 101 and one other Sociology course

Soc 371  3C  0.5
Philosophy of Social Science
Problems about the fundamental methods and aims of the social sciences generally, the problems specific to Psychology, Sociology, Political Science, etc., and their relations to one another will be considered.
(Same as Phil 362)
Prereq: Some previous work in a Social Science or in Philosophy.

Soc 380  F,W  2C  0.5
Quantitative Methods: Field Techniques
An application of symbolic interactionist theory, this course examines the contingencies affecting data collection and analysis of on-going group life. While doing field work, students have an opportunity to examine basic features of interactionist thought.
Prereq: Soc 101 and one other Sociology course

Soc 405  F,W  2C  0.5
The Development of Sociological Theory
Development of sociological theory in the 19th and early 20th centuries. Emphasis is on the European tradition, although selective attention is given to North American theorists.
Prereq: Soc 101 and one other Sociology course (Soc 271 is recommended).

Soc 406  F,W  2C  0.5
Contemporary Sociological Theory
Development of sociological theory in the 20th century. Included is discussion of current theoretical work.
Prereq: Soc 101 and one other Sociology course (Soc 271 is recommended).

Soc 404A,B,C,D,E,H,K,M,N,P,S,X  S,F,W  0.5
Directed Readings
Selected readings and essay assignments under the direction of a faculty member.
Prereq: Fourth year standing in Sociology

Soc 440A  F,W  0.5
Directed Readings in Deviance, Criminology, and Corrections
Instructors: Prus, Vaz, Wipper and others.

Soc 440B  F,W  0.5
Directed Readings in Social Psychology
Instructors: Lambert, Prus, and others.

Soc 440C  F,W  0.5
Directed Readings in Social Inequality
Instructors: Costa-Pinto, Curtis, Goyder, Hunter, and others.

Soc 440D  F,W  0.5
Directed Readings in Quantitative Methods and Statistics
Instructors: Goyder, Hunter, McDaniel and others.

Soc 440E  F,W  0.5
Directed Readings in Social Theory
Instructors: Costa-Pinto, DeGré, Fallding, and others

Soc 440H  F,W  0.5
Directed Readings in the Family
Instructors: Fallding, Fasick, Kirk, and others.

Soc 440K  F,W  0.5
Directed Readings in Industry, Work and Complex Organizations
Instructors: Scott, Wipper, and others.

Soc 440M  F,W  0.5
Directed Readings in Religion
Instructors: Fallding, Westhues, and others.
Sociology

Soc 440N  F,W  0.5
Directed Readings in Demography
Instructors: Kubat, McDaniel, and others.

Soc 440S  F,W  0.5
Directed Readings in Developing Nations
Instructors: Costa-Pinto, Wipper, and others.

Soc 440V  F,W  0.5
Directed Readings in Sex Roles
Instructors: McDaniel and others.

Soc 440X  F,W  0.5
Directed Readings in Medical Sociology
Instructors: McDaniel and others.

Soc 499  Y  1.0
Senior Honours Essay
Required of all honours students in Sociology or by election by joint honours students in their fourth year. For students electing Honours Sociology (Canadian Studies), the essay should bear on some topic of particular sociological significance for Canadian society.
Prereq: Fourth year Sociology Honours.

Conrad Grebel College

Soc 190G  F  3C  0.5
Sociology of Dissent
A study of social change and innovation from the perspective of the role of individuals who dissent from the dominant norms and institutions. Jesus, Conrad Grebel, Marx, Woodsworth and King will be considered among others.

Soc 207G  F,W,J  3C  0.5
Sociology of Education
This course is designed for co-op and regular students who plan to enter the teaching field. Attention will be focused on the concepts and theories of sociology as they apply especially to the educational system.
Prereq: Soc 101 or consent of instructor

Soc 220G  F,W  3C  0.5
Sociology of Business Management
A study of the structure, stratification and social roles in the organization, operation and management of businesses and industry. Attention will also be given to decision making, labour-management relations, the institutionalization of value systems, and job satisfaction.

Soc 225G  W  3C  0.5
Sociology of Sects and Cults
A sociological analysis of religious groups and movements considered deviant by the dominant societies.

Soc 275G  F  3C  0.5
The Mennonites as a Sociological Community
A case study of the Waterloo County Mennonites as a social system. Attention is paid to a methodology for studying a religious-cultural group by engaging in direct field studies. The community, charter resources, integration, family system, life ceremonies, adaptation to change, and survival techniques will be examined.
Prereq: An introductory social science course.

Soc 286G  W  3C  0.5
Sociology of Ecology
A study of the interaction between social organization and ecological factors such as pollution, energy and land resources.

Soc 290G  W  3C  0.5
Utopian Communities Past and Present
An examination of intentional 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.

Soc 307G  W  3C  0.5
Problems in Contemporary Education
A study of problems arising from the interplay between institutionalized education and the forces of rapid social change in the contemporary society. It emphasizes the changing roles of the learners and instructors and social dimensions of newer learning theories and programmes. Themes will be selected and studied in depth on a seminar basis.
Prereq: Soc 101 and 207G

Soc 326G  3C  0.5
Issues in Third-World Development
A study of, and sensitization for possible careers in, Third-World development and modernization with special emphasis on poverty issues, minority group problems and the roles of governmental and voluntary agencies.
Prereq: Soc 325 or permission of the instructor
Soc 370G  3C  0.5

Sociology of Law
Special attention will be paid to the growing public awareness of the failure of law to provide justice or social control in a growing number of situations. Local judges, lawyers and police officials are invited to discuss such issues as the jury system, police and violence, civil rights and mass media.
Prereq: Third year standing in a social science course or by permission.
Offered at St. Jerome's College

Soc 377G  0.5

Studies in the Sociology of the Mennonites
This seminar will devote attention to research methods, sociological theory and interdisciplinary approaches to the study of Mennonite communities and culture.
Prereq: Permission of the instructor.

The following courses are administered by St. Jerome's College

Soc 208J  F  3C  0.5

Education and Native Peoples
An examination of some of the limitations and alternatives to formal schooling employed mainly by Canadian and Australian indigenous groups (Indian, Inuit, and other aboriginal groups). Special emphasis is placed on skill training and the group's search for identity.

Soc 219J  W  3C  0.5

Catholic Sociological Thought
An analysis of the distinctive emphases and perspectives which characterize contemporary sociological theory in Catholic cultures. The course will focus on theories of the family, the community, human sexuality, politics and the economy.

Soc 249J  Sociology of Mental Illness
Not offered 1980-81

Soc 349J  W  3C  0.5

Mental Illness in the Family
An examination of sociological research and theory as it relates to mental illness in the family, including such topics as problems of interpretation and control of mental illness, hospitalization, after-care, the role of the family doctor.
Prereq: Soc 101.

Note
For other Sociology courses offered at Renison College, please see course descriptions for Social Development Studies.
Span 201A  F  3C,1L  0.5
**Intermediate Spanish I**
For students with some knowledge of Spanish. Seeks to reinforce the language, both oral and written, through selections from literary works and grammar review. Language laboratory also used to increase understanding and speaking skills. *Prereq: Span 101/102 or Grade 13 Spanish.* (WLU 201/251-33)

Span 201B  W  3C,1L  0.5
**Intermediate Spanish II**
A continuation of Spanish 201A. *Prereq: Span 201A or consent of Department* (WLU 201/251-33)

Span 203  F  3C,D  0.5
**Spanish Civilization I**
Development of Spanish Civilization and culture from the earliest times to the present. This course will be taught in English. (*WL*U 203/253-30)

Span 204  W  3C,D  0.5
**Spanish Civilization II**
A continuation of Spanish 203.

Span 205  F  3C  0.5
**Survey of Spanish Literature I**
Readings of major authors and study of the main literary trends from the middle ages to the eighteenth century. *Prereq: Span 102 or 201A/201B* (WLU 206/256-30)

Span 206  W  3C  0.5
**Survey of Spanish Literature II**
A continuation of Span 205 from the eighteenth century to the present. *Prereq: Span 205.* (WLU 206/256-03)

Span 217  F  3C,D  0.5
**Spanish American Civilization I**
A survey in English of the history of the former Spanish possessions in America, from the earliest times to the present, with emphasis on pre-Columbian cultures in Mexico and the Andean area. Several lectures on the role of women in Spanish America. No knowledge of Spanish required.

Span 218  W  3C,D  0.5
**Spanish American Civilization II**
A survey in English of the art, literature and music of Spanish America, with emphasis on pre-Columbian and modern Mexican art. No knowledge of Spanish required.

Span 227  F  3C,D  0.5
**Survey of Spanish American Literature I**
A survey of literary trends and most significant works from the Conquest to the nineteenth century. *Prereq: Span 102 or 201A/201B.*

Span 228  W  3C,D  0.5
**Survey of Spanish American Literature II**

Span 251A  F  3C,D  0.5
**Composition and Conversation I**
Intensive language study based on literary texts, including vocabulary, grammar and syntax. Essay writing, speeches, discussion. *Prereq: Span 201A/201B or consent of the Department.*

Span 251B  W  3C,D  0.5
**Composition and Conversation II**
A continuation of Span 251A. *Prereq: Span 251A*

Span 255 F  3C,D  0.5
**The Spanish Short Story**
Selected stories from outstanding writers in Spain, primarily of the twentieth century. *Prereq: Span 201A/201B.*

Span 266 W  3C,D  0.5
**The Spanish American Short Story**
Selected stories from outstanding writers in Spanish America of the nineteenth and twentieth centuries. *Prereq: Span 201A/201B.*

Span 304  F  2C  0.5
**Romanticism in Spain**
Drama: preliminary study of Moratin's Neo-Classical drama. Readings of selected plays by Duque de Rivas, Juan Eugenio Hartzenbusch, García Gutiérrez and José Zorrilla. Poetry: The search for selfhood in the romantic man, as expressed in the poems of Gustavo Adolfo Bécquer, Rosalía de Castro and other poets. *Prereq: Span 206.* (WLU 304/354-20)

Span 305  W  2C  0.5
**The Spanish Realist Novel**
Study of the fundamental narrative techniques and ideology in some of the most representative novels of Emilia Pardo Bazán, Benito Pérez Galdós, and Vicente Blasco Ibáñez. Other realist novelists will also be discussed within the context of European positivism and the psychological schools of the period. (WLU 305/355-02)
Spanish Descriptions

Span 311  F,W  2C  0.5
Applied Spanish Stylistics
A workshop-type course designed to develop advanced oral-aural skills, consecutive translation and composition. Written and oral translation of journalistic material. Frequent class presentations are required of students. 
Prereq: Span 351A/351B. 
(WLU 311/461-22)

Span 324  F  2C  0.5
Contemporary Spanish Theatre and Poetry
An in-depth analysis of the works of López-Rubio, Casona, Mihura, J. R. Jiménez, Salinas, D. Alonso, Aleixandre, et al, with emphasis on the works of Buero, Sastre and García Lorca. 
Prereq: Span 206. 
(WLU 324/474-20)

Span 325  W  2C  0.5
Contemporary Spanish Novel
Influences on the novel and literary tendencies, with stress on Cela, Matute, Laforet, Angel de Lera and Carlos Rojas. 
Prereq: Span 206. 
(WLU 325/475-02)

Span 326  F  2C  0.5
The Spanish Golden Age: Theatre & Poetry
A study of one verse drama each of Lope de Vega, Tirso de Molina, and Calderón de la Barca; also outstanding sonnets of the period by Garcilaso, Herrera, Góngora, Lope and Quevedo. 
Prereq: Span 206. 
(WLU 326/476-20)

Span 327  W  2C  0.5
The Spanish Golden Age: Don Quijote
A literary analysis of Don Quijote. 
Prereq: Span 206. 
(WLU 327/477-02)

Span 331  F  2C  0.5
Contemporary Spanish Essay
An overview of the historical essay in Spain: Ganivet, Maragal, Maeztu, Pidal, D’Ors, with special consideration of Madariaga, Unamuno and Ortega. 
Prereq: Span 206. 
(WLU 331/481-2)

Span 333  W  2C  0.5
Modern Spanish American Poetry
A study in depth of major poets and movements since Modernism. 
Prereq: Span 227. (Offered in alternate years)
Span 446 W 2C,D 0.5
Medieval Spanish Literature
Close study of the Poema de Mio Cid, El libro de buen amor and La Celestina plus selections from other works through the 15th century.
Prereq: Span 205/206.

Span 495 F 2C 0.5
The Novel in Mexico
Principal stress will be placed on novels dealing with the Mexican Revolution.
Corequisite: Span 227.

Span 497 W 2C 0.5
The Novel in South America
A study in depth of the major novelists of Spanish America outside Mexico, with emphasis on the 20th century.
Prereq: Span 227.

Course Descriptions
Personality and Religion
(SIPAR)

Studies in Personality and Religion (SIPAR)
Chairman & Director of the Programme:
A. L. Evans, BA (Toronto), BD (Emmanuel), STM (McGill), DMin (Andover-Newton)

Members of the SIPAR Advisory Committee:

Professor:
H. J. Fallding, BA, BSc, MA (Sydney), PhD (Australian National)

Associate Professors
D. M. Amoroso, BA, MA (Toronto), PhD (Waterloo)
J. M. Cornell, BA, MS, PhD (Washington)
F. C. Gerard, MA (College St. Dominique, France)
    BD, STM (McGill),
    PhD (Hartford Seminary Foundation)
J. R. Horne, BA, MA (W. Ont.), BTh (Huron),
    PhD (Columbia)
J. W. Miller, BA (Goshen), MA (NYU), BD (Princeton),
    ThD (Basel)

Assistant Professor
H. D. Legge, BA (Transylvania), STB (Harvard),
    PhD (McMaster)

Core Course Descriptions
Arts 202P 0.5
Psychology of Religion in Historical Perspective
A study of Psychology of Religion in its historical perspective from the nineteenth century to the present day. Methods, techniques and practices of research that are applicable to the examination of religious experience will also be introduced.

R S 270 0.5
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 and mysticism, drugs and religious experience, tongue-speaking.

R S 271 0.5
Personality and Religion
A study of the psychology of personality in its relationship between personality and religious thought, experience and behaviour.

Arts 302P 0.5
Seminar on Selected Topics in Personality and Religion
Courses Selected from Participating Departments
A further understanding of this subject may be developed through the study of selected courses offered by participating departments, which will either broaden the student's comprehension of the field or permit a deeper understanding of some particular aspect of Studies in Personality and Religion.

The actual combination of courses selected by a student is subject to the approval of the SIPAR advisor.

Religious Studies
R S 274 (0.5) Religious Approaches to Personal Crisis
R S 275 (0.5) Religion and Psychotherapy
R S 370 (0.5) Dream in the Religious Experience of Mankind
R S 371 (0.5) Religion and Self-Destructive Behaviour

Psychology
Psych 101 (0.5) Introductory Psychology
Psych 211 (0.5) Developmental Psychology
Psych 214 (0.5) Psychology of Adolescence
Psych 218 (0.5) Aging, Dying and Death
Psych 231 (0.5) Psychology of Religious Experience
Psych 254 (0.5) Interpersonal Relations
Psych 258 (0.5) Principles and Evolution of Psychoanalytic Thought
Psych 334 (0.5) Theories in Counselling Psychology
Psych 355 (0.5) Personality Theory
Psych 357 (0.5) Psychopathology

Philosophy
Phil 111 (0.5) Philosophy of Life
Phil 135 (0.5) Introduction to Philosophy of Religion
Phil 201 (0.5) Love
Phil 203 (0.5) Philosophical Perspectives on Death
Phil 235 (0.5) Philosophy and Mysticism
Phil 236 (0.5) Philosophy of Religion: The Occult
Phil 470 (0.5) Phenomenology

Sociology
Soc 101 (0.5) Introduction to Sociology
Soc 102 (0.5) Social Problems
Soc 233 (0.5) Social Psychology of Beliefs and Attitudes
Soc 247 (0.5) Sociology of Death and Dying
Soc 206 (0.5) Sociology of Sex Roles
Soc 209 (0.5) Family and Kinship
Soc 264 (0.5) Sociology of Religion

Social Development Studies
Soc 220R (0.5) The Individual, Society and Religion

Department of Systems Design

Professor, Chairman
K. Huseyin, MSc (Istanbul), PhD, DSc (Eng.) (London), PEng

Professor, Associate Dean, Undergraduate Studies
G. N. Soulis, RASc (Toronto), PEng

Associate Professor, Associate Chairman, Graduate Studies
K. Singhal, BTech (IIT, Kharagpur), MS, EngScD (Columbia)

Associate Professor, Associate Chairman, Undergraduate Studies
M. Chandrashekar, BTech (IIT, Kanpur), MASc, PhD (Waterloo), PEng

Professors
T. M. Fraser, MB, ChB (Edinburgh), MSc (Ohio State), LMCC, FACPM, PEng
H. K. Kesavan, BSc, BE (Mysore), MS (Illinois), PhD (Michigan State), PEng
P. H. O’N. Roe, BASc (Toronto), MSc, PhD (Waterloo), PEng
S. S. Sengupta, MA, DPhil (Calcutta)
D. A. Winter, BSc (Queens), PhD (Dalhousie), PEng

Associate Professors
M. L. Constant, BSc (Toronto)
G. F. Rabideau, BA, MA (Wisconsin), PhD (Purdue)
P. L. Seeley, BASc (Toronto)
S. Toida, BS (Tokyo), MSc, PhD (Illinois)
B. L. Willis, BASc, MASc, PhD (Waterloo), PEng
A. K. C. Wong, BSc, MSc (Hong Kong), PhD (Carnegie), PEng

Assistant Professors
C. K. G. Hahn, MASc (Waterloo)
K. W. Hipel, BASc, MASc, PhD (Waterloo), PEng
M. E. Jernigan, SB, SM, PhD (MIT), PEng
G. J. Savage, BASc, MASc, PhD (Waterloo), PEng

Adjunct Professor
C. Charalambous, BSc (Surrey), PhD (McMaster)

*(Cross Appointment with Department of Kinesiology)
Systems Design Course Numbering

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 applied mathematics
   2. computer systems
   3. socio-economic systems
   4. human systems
   5. physical systems
   6. the design of engineering systems
   7. communication and information systems
   8. engineering sciences
   9. laboratories

c) The number in the 100’s place refers to the year in the programme in which the student will encounter the course.

The majority of Systems Design courses are given on the basis of three formal lectures and one tutorial hour each week. The department endeavours to ensure that the formal course schedule remains below 30 hours per week in each term. Beyond this, other, less formally scheduled meetings between students and faculty are required.

Course Descriptions

Sy De 101/102 F,S 1C 0.0
Tutorial
Systems Design first year students will meet with a faculty member designated as their class professor. Performance in assignments, conceptual difficulties with courses, interrelation of coursework, later work and engineering practice will be discussed. Non-credit courses.

Sy De 111 F 3C,1T 0.5
Calculus 1

Sy De 112 S 3C,1T 0.5
Calculus 2
Techniques of systematic integration, applications of integration. Sequences, series, infinite series, power series, with applications.

Sy De 113 F 3C,1T 0.5
Linear Algebra

Sy De 114 S 3C,1T 0.5
Theory and Applications of Probability

Sy De 121 F 3C,1T 0.5
Digital Computation
Introduction to electronic digital computers; hardware and software organization, basic features of Fortran, examples of efficient algorithms for engineering computations.

Sy De 131 F 2C,1T 0.5
Engineering Economics
Cost-benefit analysis, critical path methods, interest, project economics, decision making, utility theory, project organizational theory.

Sy De 142 S 2C,2T 0.5
Introduction to Ergonomics
The man-machine environment complex; the nature of the operational environment; human sensory processes, perception, human information processing; motor function; human work, skill, fatigue; problems of acoustic noise, vibration, heat, cold; needs of ventilation and lighting.

Sy De 161 F 2C,2T 0.5
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.

Sy De 162 F 1C,1T,1L 0.5
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 solution, physical, economic and financial feasibility, solution evaluation and selection. Value and utility, simulation, modelling and optimization.
**Course Descriptions**

**Systems Design**

**Sy De 181 F 3C,1T 0.5**

**Statics**
Statics of particles, vectors, equilibrium of rigid bodies, centroids, the analysis of structures, forces in beams and cables, friction and moments of inertia.

**Sy De 182 S 3C,1T 0.5**

**Dynamics**
Rectilinear motion, plane motion, dynamics of particles, work and energy, linear momentum, rotational motion, angular momentum, harmonic motion, gravitational, wave motion.

**Sy De 183 F 3L 0.5**

**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.

**Sy De 184 S 2C,1T,2L 0.5**

**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.

**Sy De 201/202 W,F 1C 0.0**

**Tutorial**
Systems Design second year students will meet a faculty member designated as their class professor. Performance in assignments, conceptual difficulties with courses, inter-relation of coursework, later work and engineering practice will be discussed. Non-credit courses.

**Sy De 211 W 3C,1T 0.5**

**Applicable Mathematics for Systems Design 1**

**Sy De 212 F 3C,1T 0.5**

**Applicable Mathematics for Systems Design 2**

**Sy De 213 W 3C,1T 0.5**

**Theory and Applications of Statistics**

**Sy De 221 W 3C,1T 0.5**

**Numerical Analysis and Computation**
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.

**Sy De 252 F 3C,1T 0.5**

**Physical Systems 1**
Component models, interconnection models, systems equations and their rank properties and solutions. These concepts are developed with respect to electrical systems.

**Sy De 261 W 1C,3L 0.5**

**Systems Design Workshop 1**

**Sy De 262 F 1C,3L 0.5**

**Systems Design Workshop 2**
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 Workshop course sequence.

**Sy De 281 W 3C,1T 0.5**

**Mechanics of Deformable Solids**
Statics and resistance of materials. Equilibrium of particles, rigid bodies and deformable bodies. Vector fields, ray streams, stress-strain relationships. Elastic and inelastic behaviour of prismatic members subjected to axial, shearing, torsional and flexural deformations.

**Sy De 282 F 3C,1T 0.5**

**Thermodynamics**
An introductory course in engineering thermodynamics structured for students in Systems Design. Classical thermodynamics is presented as the systematic study of energy: its use, degradation, and waste. Applications focus on problems of energy and environment. The concepts of statistical thermodynamics are introduced briefly and their connections with information theory are described.
Course Descriptions
Systems Design

Sy De 284 F 3C,1T 0.5
Fluid Mechanics
Fundamental concepts in systems using fluid flow.
Basic treatment of statics, kinematics and dynamics of
fluids. Conservation laws. Similarity and dimensional
analysis. Brief introductions to boundary layers, lift and
drag, ideal and compressible flow.

Sy De 292 W 1C,3L 0.5
Systems Design Laboratory 1
Digital logic with emphasis on the use and
characteristics of integrated circuits; design of
sub-systems and systems using digital components.

Sy De 301/302 S,W 1C 0.0
Tutorial
Systems Design third year students will meet with a
faculty member designated as their class professor.
Performance in assignments, conceptual difficulties
with courses, interrelation of coursework, later work
and engineering practice will be discussed.
Non-credit courses.

Sy De 311 S 2C,1T 0.5
Systems Operations 1
Deterministic operations research models. Topics will
include: mathematical techniques of unconstrained and
constrained optimization, followed by the construction,
evaluation and applicability of various models in
allocation, inventory, replacement, sequencing and related
problems.

Sy De 322 W 3C,1T 0.5
Computer Simulation of Systems
System modelling, system simulation techniques,
digital computer methods, fundamentals of analog
computation, digital simulation of analog computers:
block-oriented languages, introduction to systems
simulation using hybrid computers.

Sy De 332 W 2C,1T 0.5
Mathematical Programming
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.

Sy De 333 S 2C,1T 0.5
Experimental Design
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.

Sy De 341 S 2C,1T 0.5
Industrial Ergonomics
Man-machine function and human reliability; human
stress and adaptation; work and skill in industry and the
operational environment; human factors in industrial
safety and occupational hygiene.

Sy De 351 S 3C,1T 0.5
Physical Systems 2
The subject matter is similar to Sy De 252 in that the
development is based on other physical systems such
as structural and hydraulic systems.

Sy De 352 W 2C,1T 0.5
Algorithms for Computer-Aided Systems Analysis
Techniques for tree selection, manipulation of
topological information, evaluation of the exponential
function of a matrix, etc. The emphasis is on the
algorithms but students will be expected to implement
them on the computers. A survey of the capabilities of
existing programmes for system analysis.

Sy De 354 W 3C,1T 0.5
Introduction to Linear Control Systems
Application of systems theory to the problems of
control. The course integrates this study with an
exposition of classical control theory.

Sy De 361 S 1C,3L 0.75
Systems Design Workshop 3

Sy De 362 W 1C,3L 0.75
Systems Design Workshop 4
A continuation of the Systems Design Workshop
sequence for third year students.

Sy De 364 W 3C,1T 0.5
Manufacturing Science
The generation and forming of surfaces. Concepts and
design of tooling for manufacturing processes. The
influence of materials on processes and choice of
processes on design. The behaviour of materials in
processes. Process limitations, tolerances, accuracy,
surface finish and economics. Costs in manufacturing.

Sy De 366 W 2C,1T 0.5
Aesthetic and Perceptual Aspects of Design
Presentation and discussion of appropriate and
possible methods for the designing of systems or
artifacts in which aesthetic characteristics and visual
form are primary requirements of the design.
Introduction to Pattern Recognition
Pattern Recognition as an information processing problem: recognition and classification of patterns in data; distinguishing features. Probability and statistics, linear algebra, and calculus are combined with concepts from communication theory and information science to develop techniques of data analysis. Examples include: optical character recognition, automated cytology, disease diagnosis, earthquake prediction, meteorology, aerial photograph analysis, personal credit rating, economic forecasting.

Materials 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.

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.

Systems Design Laboratory 2
Introduction to electronic filters, attenuation, amplification oscillation, modulation and detection; application to instrumentation.

Systems Design Laboratory 3
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 previous acquired knowledge in the areas of sensing, synthesis, control, measurement and evaluation. At least one experiment will be drawn from the digital control or computer control environment and one from the analog control environment.

Tutorial
Systems Design fourth year students will meet with a faculty member designated as their class professor. Conceptual difficulties, the interrelation of course work and engineering practice will be discussed. Non-credit courses.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Term</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sy De 443</td>
<td>F</td>
<td>2C,1T</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Human Function</strong></td>
<td></td>
<td></td>
<td>The structure and function of man in relation to the design of man-machine systems with specific emphasis on human physiology and bioengineering. The cell as micro-system and man as a complex of systems and sub-systems.</td>
</tr>
<tr>
<td>Sy De 445</td>
<td>F</td>
<td>2C,1T,2L</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Measurement Methods in Human Engineering</strong></td>
<td></td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>Sy De 453</td>
<td>F</td>
<td>2C,1T</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Time Domain Models for Physical Systems</strong></td>
<td></td>
<td></td>
<td>State equations for two-terminal component systems; time varying and non-linear components; analytical solutions for state models, numerical and analogue methods for solution.</td>
</tr>
<tr>
<td>Sy De 454</td>
<td>W</td>
<td>2C,1T</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Topics in Physical Systems Theory</strong></td>
<td></td>
<td></td>
<td>This course investigates the concepts and techniques used in hydraulic, power, communication and control systems. Established classical methods of analysis will be compared with recent graph-theoretic methods.</td>
</tr>
<tr>
<td>Sy De 456</td>
<td>W</td>
<td>3C,1T</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Large Scale Engineering Systems</strong></td>
<td></td>
<td></td>
<td>The course brings materials from the core Systems Design curriculum to bear upon the analysis of large engineering systems; examples from a variety of engineering disciplines such as energy systems, economics, transportation, hydraulics, mechanical, electrical, and structural systems and their combinations; techniques for the analysis of complex systems using digital computers.</td>
</tr>
<tr>
<td>Sy De 461</td>
<td>F</td>
<td>1C,5L</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Systems Design Workshop 5</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Sy De 462</td>
<td>W</td>
<td>1C,5L</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Systems Design Workshop 6</strong></td>
<td></td>
<td></td>
<td>A continuation of the Systems Design Workshop sequence for fourth year students.</td>
</tr>
<tr>
<td>Sy De 466</td>
<td>W</td>
<td>2C,1T</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Methodological Processes in Design</strong></td>
<td></td>
<td></td>
<td>Presentation and discussion of appropriate and possible methods for the design of systems or artifacts in which manufacturing processes, material properties and distribution processes constrain the design.</td>
</tr>
<tr>
<td>Sy De 468</td>
<td>W</td>
<td>3C,1T</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Structures and Design</strong></td>
<td></td>
<td></td>
<td>Structural forms. Structural requirements. Statistically determinate and indeterminate structures. Basic theorems of linear elastic structures. Methods of analysis: slope-deflection, moment distribution, etc. Application of Graph Theory to the analysis of structural systems.</td>
</tr>
<tr>
<td>Sy De 472</td>
<td>W</td>
<td>2C,1T</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Man-Machine Communications</strong></td>
<td></td>
<td></td>
<td>The nature and design of machine-mediated human communication systems. Displays, computer graphics, computer-aided instruction and mass communication media (film, T.V., radio, print). A systems approach will be adopted with special attention to the socio-economic aspects of such systems.</td>
</tr>
<tr>
<td>Sy De 525</td>
<td>F,S</td>
<td>3C</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Computer-Aided Simulation and Design</strong></td>
<td></td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>Sy De 535</td>
<td>F,S</td>
<td>3C</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Selected Topics for Socio-Economic Systems Design</strong></td>
<td></td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>Sy De 543</td>
<td>W</td>
<td>3C</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Human Engineering</strong></td>
<td></td>
<td></td>
<td>Man-machine systems; man-machine interface; presentation of information; design of displays and controls; workplace layout; human factors in design.</td>
</tr>
<tr>
<td>Sy De 544</td>
<td>F,S</td>
<td>3C</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Ergonomics</strong></td>
<td></td>
<td></td>
<td>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.</td>
</tr>
</tbody>
</table>
Course Descriptions
Urban and Regional Planning

Sy De 555   F,S   3C  0.5
Introduction to Physical Systems
This course introduces students to a unified approach to Physical System Theory, using a graph-theoretical modelling technique. Specific topics include: component modelling, the system graph and its matrices, system modelling by the branch, chord and branch-chord methods, power, energy, Tellegen's theorem, multi-terminal representations, piecewise analysis of systems through subsystems, multiport representations, formulation and solutions of state models, introduction to advanced topics.

Sy De 565   W   3C  0.5
Design Morphology and Organization
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   3C  0.5
Introduction to Systems Behaviour
The basic aim of this course is to introduce the student to the study and understanding of systems and their general behaviour, to broaden systems concepts and the techniques used in applying these concepts in a variety of fields. The fields chosen cover biological, ecological, social, operational, economic and man-machine systems. A number of case studies are conducted.

School of Urban and Regional Planning

Professor, Director
D. W. Hoffan, BSA, MSA (Toronto), PhD (Waterloo), PAg

Associate Professor, Associate Director
J. T. Horton, BA (Wheaton), MA (Northwestern)

Associate Professor, Graduate Officer
R. T. Newkirk, BA, MSc, PhD (W. Ont.)

Associate Professor, Associate Dean Graduate Affairs
G. G. Mulamoottil, BSc (Mysore), MSc (Bombay), PhD (Delhi)

Associate Professor, Undergraduate Officer
J. B. Theberge, BSc (Guelph), MSc (Toronto), PhD (Br. Col.)

Assistant Professor, In-Career Development Officer
M. E. Haight, BSc, MSc, PhD (McMaster)

Professors
H. S. Coblentz, BA (Halifax), MRP (North Carolina), MCIP, FRTPA, AIP, FSS
R. S. Dorney, BSc, MSc, PhD (Wisconsin), MCIP (on sabbatical 1981)
L. O. Gertler, BA (Queen's), MA (Toronto), MCIP
K. Izumi, BArch (Manitoba), MCP (MIT), ARCA, FRAIC, CMAOP
C. K. Knapper, BA (Sheffield), PhD (Sask)
R. R. Krueger, BA, MA (W. Ont.), PhD (Indiana)
P. H. Nash, BA, MA (UCLA), CE (Grenoble), MSc, MPA, PhD (Harvard), AIP, MCIP
L. H. Russwurm, BA, MA (W. Ont.), PhD (Illinois)

Associate Professors
S. Herzog, BArch (Toronto), MRAIC
J. Levy, BA (Waterloo), BPE (Waterloo), MSW (Waterloo), PhD (Waterloo)
L. R. G. Martin, BA (Queen's), MA, MRP, PHD (Syracuse) MCIP
N. E. P. Pressman, BArch (McGill), MArch, urb des Cornelii, Cert USP (Manchester), MCIP, AIP, AIU
G. B. Priddle, BA (W. Ont.), MA, PhD (Clark)
W. I. Shalinsky, BA, BSW (McGill), MSc, DSW (Western Reserve)
D. F. Walker, BSc (London), MA, PhD (Toronto)
S. M. Weaver, BA, MA, PhD (Toronto)
D. H. Wood, BComm, LLB (Toronto)
Course Descriptions
Urban and Regional Planning

Assistant Professors
R. C. Suffling, BSc Hons (Wales), PhD (Guelph)

Lecturer
N. M. Lazarowich, BA (Sask), MA, MCP, PhD (Cincinnati), AIP

Adjunct Professors
H. C. Abell, BHSc(Toronto), MS, PhD (Cornell)
A. deVos, MSc, PhD (Wisconsin)
M. K. Foster, BA (Toronto), MPhil, PhD (Columbia)
N. F. White, BSc (Queens), MDCM (McGill)
J. S. Wolfe, BA (Oxford), MA (Pittsburgh), PhD (McMaster)

Professional Liaison Officer
H. T. Lemon, FCIP

Planning Graphics Technician
M. A. Boggie, BID (Manitoba)

Faculty members holding joint and/or cross appointments as shown

1Planning and Biology
2Planning and Geography
3Environmental Studies
4Planning and Man-Environment Studies
5Planning and Anthropology
6Planning and Recreation
7Planning and Environmental Studies
8Environmental Studies and Psychology

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 S 111 Introduction to the Study of the Future
See Env S course descriptions, page 310.

Plan 156 F,W 2C,1D 0.5
Introduction to Urban and Regional Planning Concepts
An introduction to contemporary planning ideas for students whose subsequent work might bring them in contact with professional planners. Planning concepts and principles; the development of contemporary planning ideas; the nature, purpose and scope of urban and regional planning; the planning process and decision-making in a democratic society.
Prereq: None. (Not available for credit to planning students). Restricted to 1st and 2nd year students.

Plan 159 F,W 2std 0.5
Graphics for Planning
Basic instruction in graphic techniques used in planning. Emphasis will be placed on the use of graphics for the communication of ideas.
Prereq: Planning students or consent of instructor. Estimated cost to student: $30

Env S 195A Introduction to Environmental Studies
See Env S course descriptions, page 310.

Env S 195B Introduction to Environmental Problems
See Env S course descriptions, page 310.

Env S 200 Field Ecology
See Env S course descriptions, page 310.

Env S 201 Introduction to Environmental and Planning Law
See Env S course description, page 310.

Plan 222 W 2C,1D 0.5
Canadian Regional Issues
Selective study of Canadian development issues pertaining to the use of land, urbanization, regional and resource development; issues will be related to structural and functional forces that are characteristics of the major regions of Canada, e.g., Atlantic Provinces, British Columbia.
Prereq: None

Plan 230 F 3C 0.5
The Small Group in the Planning Process
The small group and its relevance to the planning process. Focus on work groups such as committees, councils and boards. Various important elements of small groups such as leadership, goal setting, influence, decision-making and interpersonal relationships will be examined and related to planning.
Prereq: Soc 101. or consent of instructor

Env S 252 Media Tools for Environmental Studies
See Env S course descriptions, page 311.
Env S 253 Media Tools for Environmental Studies - Advanced Level
See Env S course descriptions, page 311.

Plan 255 W 2C,2wkshp 0.5
Planning Surveys and Analyses
Sources of data for planning and their analyses. The course will emphasize the sources, methods of collection and analysis of urban and regional land-use data. Particular attention is paid to the types of land-use information essential to transportation, housing, public facilities and recreation planning. Both lecture and workshop are related to a significant problem of land-use planning in Ontario. Prereq: Plan 100, or consent of instructor

Plan 256 Y 2C,2std 1.0
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 0.5
Readings and Research in Planning
Special readings and research on planning topics chosen in consultation with an instructor. This course gives the opportunity for supervised individual reading and study of planning or related topics in which the student is particularly interested. Prereq: Plan 100, or consent of instructor
Prior to registering for this course students must arrange with a faculty member to serve as advisor

Env S 271 Introduction to Quantitative Research Methods
See Env S course descriptions, page 311.

Env S 272 Computer Programming in Environmental Studies
See Env S course descriptions, page 311.

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 0.5
Planning Design
A study of a particular design aspect of planning through a series of individual and group projects. The topic varies each term. Prereq: Planning students or consent of instructor

Plan 307 F,W 2C,1D 0.5
Social Survey Techniques
Social research and the planning process; interview and self-administered surveys; questionnaire design; profile data, data processing; sampling, non-survey data collection techniques; practical applications. Cross-listed as Geog 307 Prereq: Second or third year Planning students with Env S 271; other Env S students with consent of instructor.

Env S 310 Behavioural Studies
See Env S course descriptions, page 311.

Plan 316 W 3S 0.5
Multivariate Statistics
The theory and application of multivariate statistics, with particular emphasis upon the use of the computer. Cross-listed as Geog 316. Prereq: Env S 271, or consent of instructor

Plan 317 W 2C,1L 0.5
Nonparametric Statistics
The theory and application of non-parametric statistics with emphasis upon social science problems. Cross-listed as Geog 317. Prereq: Env S 271, or consent of instructor

Plan 318 F 3C 0.5
Spatial Analysis
Advanced quantitative analysis of spatial patterns and interactions. Focus on a selection of techniques from gravity models, linear programming, nearest neighbour analysis, Markov chain analysis, graph theory, simulation and trend surface analysis. Cross-listed as Geog 318. Prereq: Env S 271, or consent of instructor

Plan 319 F 2C,1L 0.5
Economic and Social Techniques for Regional Planning
Study and critical appraisal of a selection of descriptive and evaluative regional analysis techniques in common use. Reliability and applicability will be reviewed. Emphasis given to economic considerations of regional development. Discussion of input-output analysis; cost-benefit analysis, planning, programming and budgeting systems; and social area analysis. Cross-listed as Geog 319. Prereq: Econ 101, 102, or instructor's consent
Plan 330 W 2C,1S 0.5
Urban Social Planning
This course looks at social planning as a way of attacking urban social problems. Will examine the different types of social planning and the relationship between physical and social planning.
Prereq: Soc 101, or consent of instructor

Plan 332 F 3C 0.5
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

Env St 333 Parkland Management
See Env S course descriptions, page 311.

Plan 333 F 3C 0.5
The Sociology of Regional Planning
Power structures, basic social institutions, attitudes and values related to the implementation of regional plans; regional development of human natural resources in Canada and abroad.
Prereq: Soc 101 or consent of instructor

Plan 342 F 3C 0.5
Urban and Regional Planning: (Part 1)
Urban planning as a method of obtaining command over the major tools for problem identification, analysis and resolution. Planning types and practice, 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) Restricted to 3rd and 4th year students.

Plan 343 W 3C 0.5
Urban and Regional Planning: (Part 2)
The role of the public and private sectors in regional development and their relationship to the planning process; current urban and regional issues and plans.
Prereq: Plan 342 or consent of instructor. (Not available for credit to Planning students)
Plan 370 W 3C 0.5
Land Development Planning
An examination of planning issues related to the economics and financing of public and private development projects including shopping plazas, residential subdivisions, and new towns. The course focuses on sources of financing, financial programming, effects of planning decisions on land values, and techniques of project evaluation.
Prereq: Plan 255, or consent of instructor

Env S 380/381
Environmental Studies Workshop
See Env S course descriptions, page 311.

Plan 391 W Fldlab 0.5
Field Research Methods and Projects
Selected field trip experience directly related to the theme content of Plan 300, including assignments, follow-up discussion, and presentation of research papers. The School covers part of the cost of travel and accommodations for field trips. Approximately $60.00 will cover the remainder of transportation and accommodation costs on a one week field trip. Students are responsible for the cost of their meals.
Prereq: Enrolment in Plan 300

Env S 400 Professional Development in Environmental Management
See Env S course descriptions, page 311.

Env S 401 Environmental Law
See Env S course descriptions, page 311.

Env S 402 Planning Law
See Env S course descriptions, page 312.

Env S 411 Alternative Future Environments 1
See Env S course descriptions, page 312.

Env S 412
Alternative Future Environments 2
See Env S course descriptions, page 312.

Plan 414 F 3C 0.5
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 S 417 Land Use History and Landscape Change 1
See Env S course descriptions, page 312.

Env S 418 Land Use History and Landscape Change 2
See Env S course descriptions, page 312.

Plan 420 F 2C 0.5
Health, Environment, and Planning
A seminar course on the environmental sources and causes of disease and illness, the concepts of health, e.g. medical, scientific, economic, political, etc., the health services and facilities and related technologies and the role and responsibility of (urban and regional) planners in the creation of a more “healthful” environment.
Prereq: Fourth year planning students or consent of instructor

Plan 430 F 3C 0.5
Social Policy Planning
This course develops a reasoned systems approach to understand change and develop strategies for change through an integration of social goals, policy and 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 0.5
Citizen Involvement, Planning and Social Change
The theory and practice of citizen involvement and social change in relation to planning and policy formulation. Included are the ideology of involvement, social change and intervention strategies, policy planning and local area planning. Canadian case materials are emphasized, and there is some skills training.
Prereq: Soc 101, fourth year Planning students; students from other Departments with consent of instructor

Env S 444 Land Evaluation and Resource Management
See Env S course descriptions, page 312.

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
<table>
<thead>
<tr>
<th>Plan Code</th>
<th>Type</th>
<th>Credits</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan 450</td>
<td>Y</td>
<td>1.0</td>
<td>Canadian Urban and Regional Planning: (Part 2)</td>
<td>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</td>
</tr>
<tr>
<td>Plan 454</td>
<td>W</td>
<td>2S 0.5</td>
<td>Professional Practice in Planning</td>
<td>This course is intended for undergraduate planning students in their final year who will be starting professional practice on graduation. The course discusses professional responsibility, administrative tools and methods, office organization and similar topics. Concepts and techniques in other courses will be dealt with from the point of view of the practitioner. Prereq: Fourth year planning students or consent of instructor</td>
</tr>
<tr>
<td>Plan 456</td>
<td>Y</td>
<td>2C 1.0</td>
<td>Political and Administrative Processes in Urban and Regional Planning</td>
<td>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</td>
</tr>
<tr>
<td>Plan 470</td>
<td>W</td>
<td>2C 0.5</td>
<td>Concepts and Ideas in Contemporary Urban Planning</td>
<td>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</td>
</tr>
<tr>
<td>Plan 475</td>
<td>F,W</td>
<td>3S 0.5</td>
<td>Projects, Problems and Readings in Planning</td>
<td>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.</td>
</tr>
<tr>
<td>Plan 476</td>
<td>Y</td>
<td>3S 1.0</td>
<td>Projects, Problems and Readings in Planning</td>
<td>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.</td>
</tr>
<tr>
<td>Plan 480</td>
<td>Y</td>
<td>3S 1.0</td>
<td>The Philosophy and Methodology of Urban and Regional Planning</td>
<td>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</td>
</tr>
<tr>
<td>Plan 490</td>
<td>Y</td>
<td>2.0</td>
<td>Seniors Honours Essay</td>
<td>Practical experience in the identification of a problem in the planning field. Conduct of individual research into this problem and presentation of the results of this research in a form that meets both professional and academic standards, as further elaborated in a policy statement available from the undergraduate officer. Prereq: Fourth year Planning students only</td>
</tr>
</tbody>
</table>
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, there has been consistent development of specific courses on women, as well as the integration of women's studies in many of the more general courses offered.

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. These courses do not deal exclusively with women. A substantial proportion of the course material is an examination of women in the context of the particular subject matter. Courses on women have been offered in the Departments of Anthropology, English, History, Philosophy, Political Science, Psychology, Sociology and Social Development Studies. 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
   (not offered 1980-81)

Engl 108E Women in Literature

Engl 208E Women Writers of the Twentieth Century

Hist 204H The individual and the family in History

Phil 201 Love

Phil 202 Philosophy of Women

Phil 220 Moral Issues

P Sci 272 Political Behaviour 2

P Sci 325 Radical Political Ideas
Ross Cruickshank, LLD, assisted by the Registrar, signs the Graduate Register at Spring Convocation, 1979.
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C. Horrigan
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R. Lebold, BA, BD, MTh (President, Conrad Grebel)
I. L. Campbell, BA, MSc (Principal, Renison)
F. C. Gérard, MA, BD, STM, PhD (Principal, St. Paul’s)

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J. G. Nelson, BA, MA, PhD (Environmental Studies)
G. S. Kenyon, BPE, MS, PhD (Human Kinetics and Leisure Studies)
W. F. Forbes, BSc, PhD, DSc, DIC, ARCS (Mathematics)
R. N. Farvolden, MSc, PhD (Science)
L. A. K. Watt, BSc, MS, PhD (Graduate Studies)

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vacancy (Mathematics)
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vacancy (St. Paul’s College)
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D. E. Brodie, BSc, MSc, PhD (At large)
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J. W. Dyck, AB, MA, PhD (At large)

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M. T. Winnett (Science)

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N. Livesey
P. G. McMenamin

To 1981
Undergraduate
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T. Diamond (Human Kinetics and Leisure Studies)
G. Zimmerman Mathematics)
J. Kama (At large)

Graduate
T. A. Cargill
vacancy

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Teaching Resource Person

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C. N. Sochasky
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A musical evening at the Humanities Theatre.
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